Sumitomo Drive Technologies

PARAMAX®

9000 Series

Maintenance manual

Sumitomo (SHI) Cyclo Drive Germany GmbH

MM_PARAMAX

Copyright and contact data

Contact data

www.sumitomodrive.com

Sociedad Industrial de Transmisiones S.A.

Paseo de Ubarburu 67

San Sebastián, Guipúzcoa

Spain

E-mail: smib.customerservice@shi-g.com

24/7 SERVICE HOTLINE

Tel.: +32 3 450 12 34

Contents

1 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. Sumitomo Drive Technologies 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 Sumitomo Drive Technologies 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 Sumitomo Drive Technologies.

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.

2 About this document

2.1 Function of the document

The document is only applicable for the "PARAMAX" 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.

2.2 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.

2.3 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.

2.4 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.

2.5 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.

2.6 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.	

2.7 Related documents

Document name	Document code	Target audience
General conditions of sale	-	• All personnel
Order acknowledgment	OA_XXXX	• Approved installation engineers
Certified drawing	Refer to the order acknowledgement.	• Approved installation engineers
Installation manual	IM_PARAMAX	• Approved installation engineers
Maintenance manual	MM_PARAMAX	• Approved maintenance engineers
Logbook, if applicable	LOG_PARAMAX	• Approved installation engineers • Approved maintenance engineers
Spare parts drawing, if applicable	SD_XXXX	• Approved maintenance engineers
Service manual of the lubrication and cooling system, if applicable	LC_XXXX	• Approved installation engineers • Approved maintenance engineers
Drive package documentation, if applicable	DP_XXXX	• Approved installation engineers • Approved maintenance engineers

Explanation of codes:

- XXXX: the manufacturing number of the gear unit. Refer to the type plate.

2.8 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.

2.9 Abbreviations

Abbreviation	Description
SDT	Sumitomo Drive Technologies
LSS	Low-Speed Shaft
HSS	High-Speed Shaft

2.10 Customer support

Procedure

1. If more information is necessary, speak to SDT.
2. Give the serial number and gear unit type to SDT. Refer to the type plate.

3 Description

3.1 Intended use

The gear unit is a part of a machine.

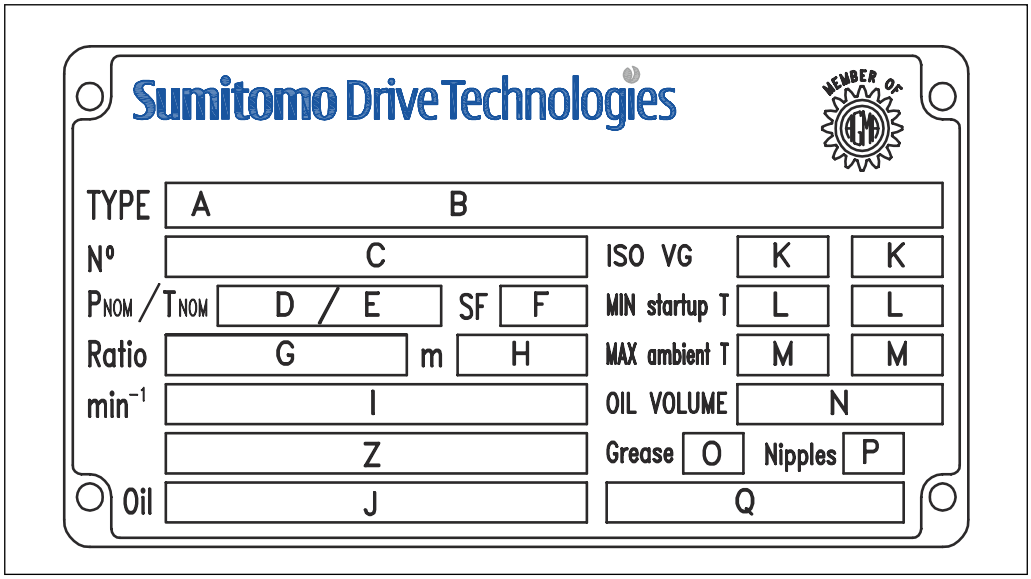
Only use the gear unit for the application, ambient conditions, operation conditions and other conditions of use shown in the order acknowledgement.

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. SDT is not responsible for system dynamics and related damage.

3.2 Type plate

3.2.1 Type plate

The type plate gives information about the gear unit.



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 n1-n1' (variable output speed n2-n2')

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

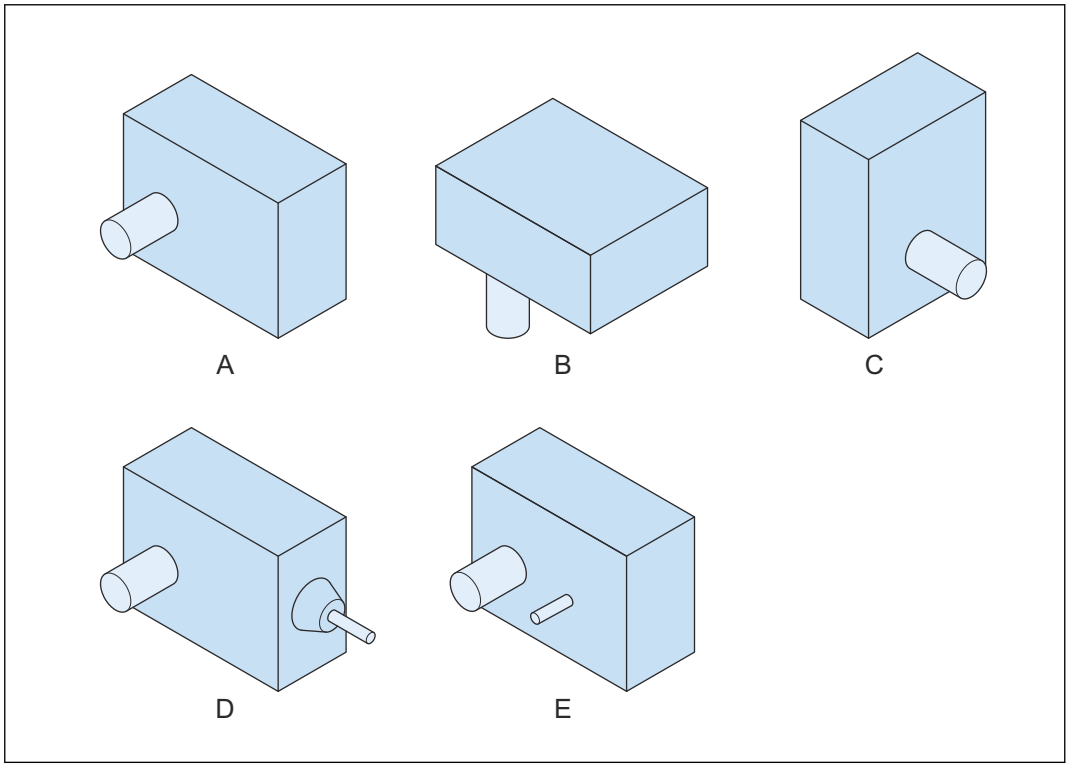
Q Grease type

Z Remarks

Note: The certified drawing shows more data:

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

3.3 Gear unit configurations



A "Horizontal" installation

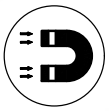
B "Vertical" installation

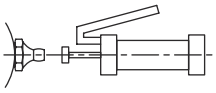
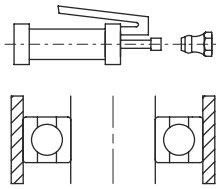
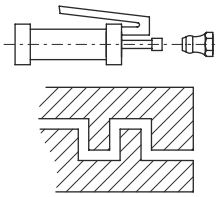
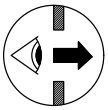
C "Upright" installation

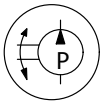
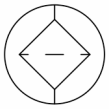
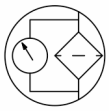
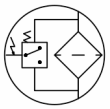
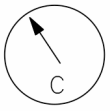
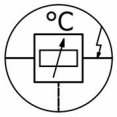
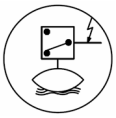
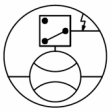
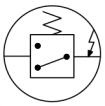
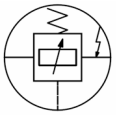
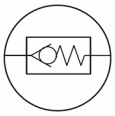
D "Right angle" shafts

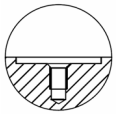
E "Parallel" shafts

3.4 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
	Magnetic
	Drain valve with hose coupling
	Oil fill plug
	Breather plug
	Anti-humidity

Sign	Description
	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
	Breather plug to prevent ingress of moisture
	Level indicator
	Gauge glass
	Overflow
	Inspection opening

Sign	Description
	Pump lubrication
	Filter
	Filter with mechanical contamination indicator
	Filter with electrical contamination indicator
	Temperature indicator
	Temperature transmitter
	Level switch
	Flow switch
	Pressure switch
	Pressure transmitter
	Pressure indicator
	Pressure relief valve

Sign	Description
	Built-in backstop
	Heater
	Protection cap for bolt or nut
	Hole for vibration sensor
	Ground connection
	ATEX

3.5 Description of the lubrication of the gear unit

3.5.1 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.

3.5.2 Oil bath lubrication

The parts of the gear unit that turn get the oil from the oil bath and supply the oil on all the necessary parts of the gear unit. After the lubrication, the oil flows back to the oil bath in the housing of the gear unit.

3.5.3 Splash lubrication

The movement of the gears splashes oil on all the parts where lubrication is necessary.

3.5.4 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.

3.6 Breather plug

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

3.7 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.

3.8 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.

4 Safety

4.1 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.

SDT 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 SDT.
- 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.

4.2 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.

4.3 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.
- Do not use a gear unit that has damage.
- Do not use a gear unit that gives unexpected noise and vibrations.
- Do not cause a blockage of the air flow around the gear unit. For the dimensions, refer to the certified drawing.

4.4 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.

4.5 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.

4.6 Partly completed machine

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

4.7 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 SDT.
- Hazardous substances of combustion can be generated in a fire involving materials in section *Materials of the gear unit* on page 32.

4.8 Disposal of the gear unit or parts of the gear unit

- When you discard the gear unit or the components of the gear unit, obey the local environmental regulations.
- At the end of the service life of the gear unit or the components of the gear unit, try to recycle to prevent environmental pollution.

- Obey the local environmental regulations when you discard used oil. Do not put it on garden soil, wooded areas, in streams or in sewage drains.
- Remove spilled oil immediately.
- Sort metal and electrical components correctly. Make sure that these components are recycled.
- Obey the environmental regulations to discard materials that you cannot recycle.

4.9 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.

5 Maintenance

5.1 General maintenance instructions

5.1.1 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 8
2. If the maintenance task shows more than one limit, obey the limit that comes first.

5.1.2 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 SDT If not, SDT is not liable.

Procedure

1. Only do the maintenance tasks that are in the related documents. Refer to section *Related documents* on page 8.
2. If you cannot obey the instructions or if you think that there is an instruction not available, speak to SDT.

5.1.3 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.

5.2 Maintenance schedule (all gear units)

Task	Limit	Instruction
Change the oil.	800 hours of operation after the initial startup[1]	Section *Change the oil* on page 22
Do a check for oil leaks.	1 month	Section *Do a check for oil leaks* on page 23
Clean the gear unit.	3 months	Section *Clean the gear unit* on page 26
Do a check for unwanted noise and vibrations.	6 months	Section *Do a check for unexpected noise and vibrations* on page 23
Do a check on the gear oil level.	6 months	Section *Measure the gear oil level* on page 27
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 23

[1] Not before 100 hours of operation after the initial startup

Task	Limit	Instruction
Do a check on the breather plug.	6 months	Section *Do a check on the breather plug* on page 24
Do a check on the fixation of the gear unit.	1 year	Section *Do a check on the fixation of the gear unit* on page 24
Do a check on the position of the gear unit.	1 year	Section *Do a check on the position of the gear unit* on page 25
Do a check for corrosion.	1 year[2]	Section *Do a check for corrosion of internal parts of the gear unit* on page 30
Replace the oil filter cartridge.	800 hours of operation or if the contamination indicator tells you to[3]	Section *Replace the oil filter cartridge (if applicable)* on page 26
Change the oil.	8000 hours of operation or 18 months	Section *Change the oil* on page 22

5.3 Special maintenance (belt drives)

Task	Limit	Instruction
Do a check on the V-belt drive.	1 month	Section *Do a check on the V-belt drive* on page 31

5.4 Special maintenance (chain drives)

Task	Limit	Instruction
Do a check on the chain drive.	1 month	Section *Do a check on the chain drive* on page 31

5.5 Special maintenance (breather lines)

Task	Limit	Instruction
Drain the condensation water from the breather lines.	1 month	*Drain the breather lines* on page 29

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

[3] 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.

5.6 Special maintenance (drain lines)

Task	Limit	Instruction
Drain the condensation water from the drain lines.	1 month [4]	*Drain the drain lines* on page 29

5.7 Special maintenance (grease lubrication points)

Task	Limit	Instruction
Add grease to the grease lubrication points.	800 hours of operation after the initial startup[5]	Section *Add grease to the lubrication points for grease* on page 30

5.8 Special maintenance (lubrication points for bearings)

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

5.9 Special maintenance (backstop)

Task	Limit	Instruction
Do a check on the backstop.	1 year	Section *Do a check on the backstop* on page 26

5.10 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.

[4] Also do the task at the beginning of a period of standstill
[5] Not before 100 hours of operation after the initial startup

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 29.
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 38.
   - 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 39.
   - For instructions on how to fill the gear unit with gear oil, refer to section *Fill the gear unit with gear oil* on page 27.
8. If an oil filter is installed, replace the oil filter cartridge. Refer to section *Replace the oil filter cartridge (if applicable)* on page 26.

5.11 Do a check for oil leaks

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.

5.12 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.

Warning: Do not use the gear unit before the source of the unexpected noise and vibrations is removed.

5.13 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 29.
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.

5.14 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.

5.15 Do a check on the fixation of the gear unit

5.15.1 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 (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.

5.15.2 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 *Specifications for the torque arm (hollow shaft)* on page 37.
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 torqe seal.

5.15.3 Do a check on the fixation of the gear unit (shrink disk)

Procedure

1. Measure the torque of the bolts of the shrink disk.
2. Compare the torque with the specification in section *Shrink disk specifications* on page 35.
3. If the torque is not correct, tighten the bolts. Start with one bolt and continue counterclockwise until the last bolt.

5.16 Do a check on the position of the gear unit

5.16.1 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.

5.16.2 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.

5.16.3 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.

5.16.4 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.

5.17 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.

5.18 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.

5.19 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.

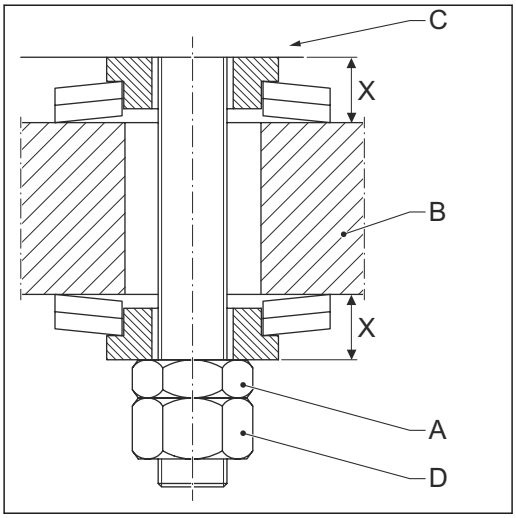
Procedure

1. Make sure that the backstop operates correctly.

5.20 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.
2. Turn the nut (A) to the distance (X) . (X) is the distance between the torque reaction point (B) and the gear unit (C). For the specification of (X), refer to section *Specifications for the torque arm (hollow shaft)* on page 37.
3. Turn the nut (D) tightly against the nut (A).
4. Apply torque seal to the nuts. Refer to section *Torque seal specification* on page 32.



5.21 Fill the gear unit with gear oil

5.21.1 Select the gear oil

Caution:

- Only use the gear oil that agrees with the type plate and with section *Lubricants* on page 38. 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:

- SDT 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

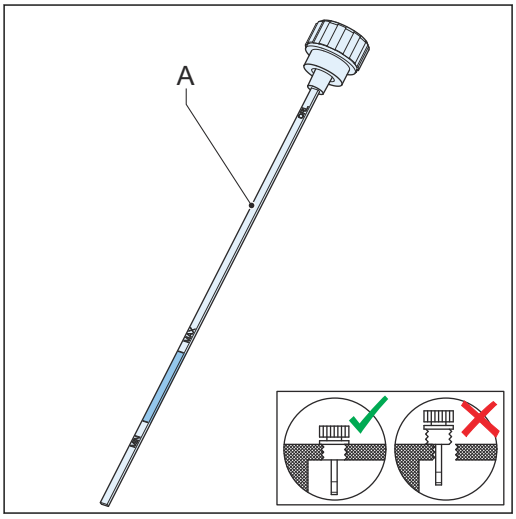
1. For the correct type and viscosity of gear oil, refer to the type plate.
2. With the type and viscosity, select the gear oil from the tables in section *Lubricants* on page 38.
3. If the gear unit contains gear oil for storage, drain it.

5.21.2 Measure the gear oil level

Procedure if the gear unit has a dipstick

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.

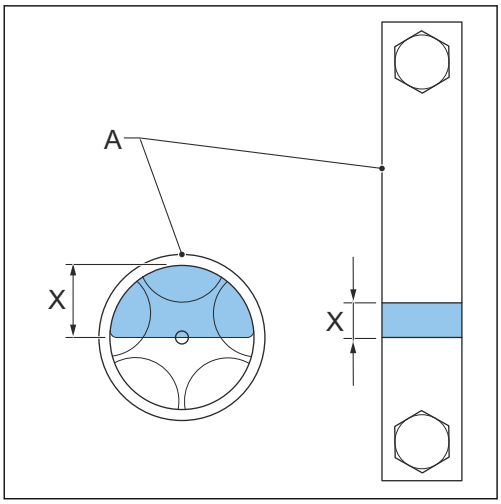


Procedure if the gear unit has a gauge glass

Procedure

1. Read the gear oil level on the gauge glass (A).

   The gear oil level must be in the range (X).
2. If the gear oil level is below the minimum level, add gear oil.
3. If the gear oil level is above the maximum level, drain gear oil.



5.21.3 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.

5.21.4 Drain gear oil

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

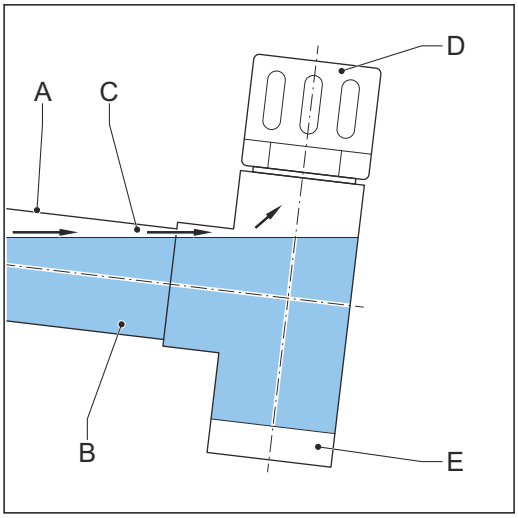
Procedure

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 35.
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.

5.22 Drain the breather lines

Procedure

1. If the breather line (A) is fully filled with condensation water (B) and air (C) cannot flow freely to the breather plug (D), increase the frequency of this procedure.
2. Remove the cap (E) and drain the breather line.



5.23 Drain the drain lines

Procedure

1. Refer to the certified drawing for the location of the drain valves.
2. Open the drain valve.
3. Close the drain valve when all the water is removed from the drain line.
4. Repeat step 2 and 3 for every drain valve.
5. Measure the gear oil level. Refer to *Measure the gear oil level* on page 27

5.24 Add grease to the lubrication points for grease

5.24.1 General procedure

Procedure

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

5.24.2 Select the grease type

Caution: Only use the grease type that agrees with the type plate and with section *Lubricants* on page 38. Do not use another grease type.

Note: If the supplier of grease changes the composition of the grease, SDT 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 38.

5.24.3 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 *Grease quantity at lubrication points for bearings* on page 41.

Procedure

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

5.25 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 SDT.

5.26 Do a check on the V-belt drive

For the specifications of the tension and the parameters for the visual check, refer to the documentation of the manufacturer of 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.

5.27 Do a check on the chain drive

For the specifications of the tension and the parameters for the visual check, refer to the documentation of the manufacturer of the chain drive.

Procedure

1. Do a check on the 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 chain drive immediately. Speak to the approved installation engineer.

6 Technical data

6.1 Dimensions and mass

Refer to the certified drawing.

6.2 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)
- NBR (nitrile rubber)
- For information on the paint and other materials, refer to the drive package documentation.

6.3 Torque seal specification

Parameter	Specification
Torque seal	Loctite 7417 torque Marque or similar

6.4 Paint specification

Note: The order acknowledgment shows the paint specifications for your gear unit. The table below gives general paint specifications.

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

6.5 Corrosion protection by SDT

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

Parameter	Specification
Unpainted machined surfaces	Anti-oxidising waxy varnish

6.6 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)

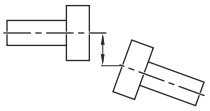
6.7 Ambient conditions for storage

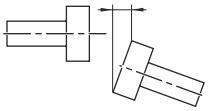
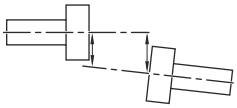
Parameter	Specification
Temperature [°C]	Above dew point temperature
Relative humidity, non-condensing [%]	Maximum 60 (indoors)
General protection	Against corrosion and contamination
Vibration	Not allowed

6.8 Misalignment of the LSS

Parameter	Specification
$\frac{dr}{\Delta r} + \frac{d\alpha}{\Delta\alpha}$ Misalignment equation, where • dr = measured radial misalignment [mm] • Δr = maximum permitted radial misalignment [mm] • dα = measured angular misalignment [mm] • Δα = maximum permitted angular misalignment [mm]	Smaller than or equal to 1

6.9 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)

Type of coupling	Speed of the HSS [1/min]	Maximum permitted misalignment [mm] ([mils])
Angular misalignment for coupling diameter 100 mm (10 inch) 	750	0.13 (13.0)
	900	0.10 (10.0)
	1000	0.096 (9.6)
	1200	0.08 (8.0)
	1500	0.07 (7.0)
	1800	0.05 (5.0)
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)

6.10 Bolt specifications (solid shafts)

Bolts according to DIN 267 bolt quality grade 8.8

Gear unit size	Bolt dimension [ISO]	Torque [Nm]
9015	M12	79
9025	M16	180
9030	M20	335
9035	M20	335
9040	M24	675
9045	M24	675
9050	M24	675
9055	M24	675
9060	M30	1350
9065	M30	1350
9070	M36	2350
9075	M36	2350
9080	M36	2350
9085	M36	2350
9090	M36	2350
9095	M36	2350
9100	M42	3800
9105	M42 M36[6]	3800 2350[1]
9110	M48 M42[1]	5700 3800[1]

[6] For "right angle" shafts, double reduction, "horizontal" installation

Gear unit size	Bolt dimension [ISO]	Torque [Nm]
9115	M48	5700
9118	M48	5700
9121	M48	5700
9126	M48	5700
9128	M56	9150
9131	M56	9150
9136	M56	9150

6.11 Lubrication for installation (hollow shaft)

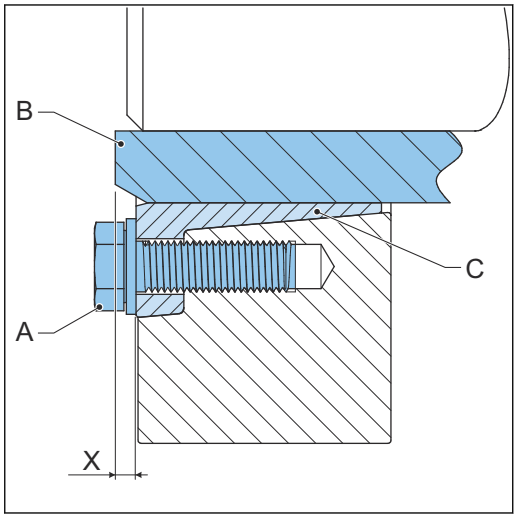
Parameter	Specification
Lubricant	Molykote D321R or similar (friction coefficient: 0.04)

6.12 Torque values for oil drain screw

Dimension of the drain screw	Torque
G ½ "	56,5 Nm
G ¾ "	73,4 Nm
≥ G 1 "	79 Nm

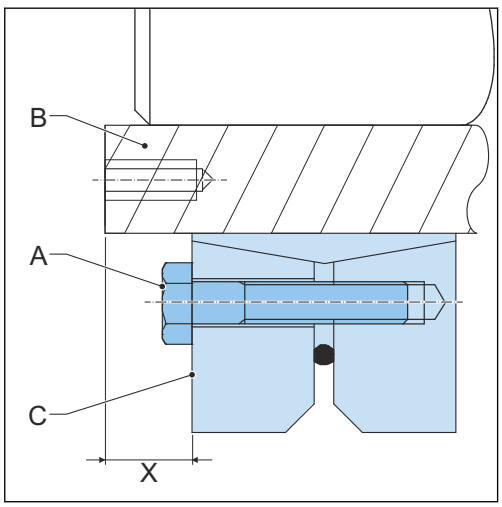
6.13 Shrink disk specifications

6.13.1 Shrink disk specifications (2-part shrink disk)



Gear unit size	SDT part number of the shrink disk	O-ring necessary	Torque of the bolts (A) [Nm][7]	Distance X between the hollow shaft (B) and the shrink disk (C) [mm]
9070	901-SDA2D185001	No	290	26
9075	901-SDA2D200001	No	290	24
9080	901-SDA2D220001	No	570	22
9085	901-SDA2D240001	No	570	25
9090	901-SDA2D240001	Yes	570	25
9095	901-SDA2D260001	Yes	570	21
9100	901-SDA2D260001	Yes	570	21
9105	901-SDA2D280001	Yes	570	21
9110	901-SDA2D300001	Yes	990	32
9115	901-SDA2D320001	Yes	990	32

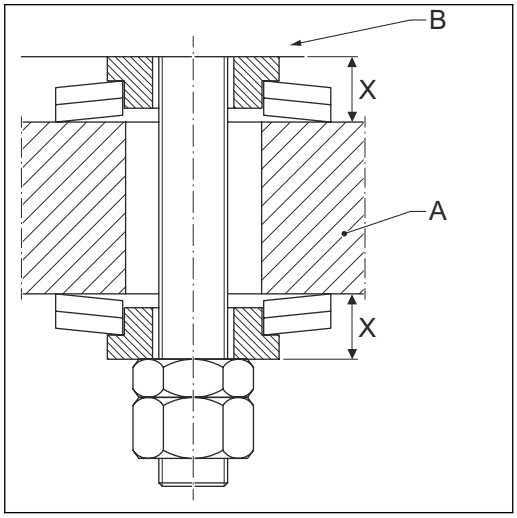
6.13.2 Shrink disk specifications (3-part shrink disk)



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

Gear unit size	SDT part number of the shrink disk	O-ring necessary	Torque of the bolts (A) [Nm][8]	Distance X between the hollow shaft (B) and the shrink disk (C) [mm]
9015	TAS3091.4-080	No	35	14
9025	TAS3081. -090	No	35	14
9030	TAS3091.1-100	No	59	14
9035	TAS3093. -110	No	70	14
9040	TAS3081. -125	No	70	20
9045	TAS3093. -140	No	120	20
9050	TAS3093. -140	No	120	22
9055	TAS3091. -165	No	250	27
9060	TAS3091. -165	No	250	27
9065	TAS3091. -175	No	250	26
9070	TAS3081. -185	No	290	26
9075	TAS3081. -200	No	290	26
9080	TAS3081. -220	No	290	26
9085	TAS3081. -240	No	570	27
9090	TAS3081. -240	Yes	570	27
9095	TAS3081.1-260	Yes	535	27
9100	TAS3081.1-260	Yes	535	27
9105	TAS3081.1-280	Yes	535	27
9110	TAS3081.1-300	Yes	535	32
9115	TAS3091. -320	Yes	490	32

6.14 Specifications for the torque arm (hollow shaft)



[8] Torque values only valid for 'TAS Schäfer' branded shrink discs. For other brands, obey the installation instructions and torque values of the manufacturer.

Note: (X) Is the distance between the torque reaction point (A) and the gear unit (B).

Gear unit size	X	
	[mm]	[inch]
9015	13.1	0.516
9025	16.1	0.634
9030	18.9	0.744
9035	18.9	0.744
9040	21.7	0.854
9045	21.7	0.854
9050	21.7	0.854
9055	21.7	0.854
9060	32.2	1.28
9065	32.2	1.28
9070	38.2	1.50
9075	38.2	1.50
9080	38.2	1.50
9085	38.2	1.50
9090	38.6	1.51
9095	38.6	1.51
9100	47.6	1.87
9105	47.6	1.87
9110	48.5	1.91
9115	48.5	1.91

6.15 Lubricants

6.15.1 General specifications for lubricants

Parameter	Specification
Initial gear oil cleanliness	-/15/12 (or better) according to ISO 4406

Parameter	Specification
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])[9]	15 - 70 (60 - 158)

General specifications for gear oil per viscosity grade

Viscosity grade	AGMA
ISO VG68	2EP
ISO VG100	3EP
ISO VG150	4EP
ISO VG220	5EP
ISO VG320	6EP
ISO VG460	7EP

6.15.2 Gear oil filter specifications

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

6.15.3 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.

6.15.4 Mineral gear oil and related grease

Table 1: Mineral gear oil, ISO VG68 and 100

Supplier	ISO VG68	ISO VG100
BP	Energol GR-XP-68	Energol GR-XP-100

[9] 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

Supplier	ISO VG68	ISO VG100
CASTROL	Alpha SP68	Alpha SP100
	Optigear BM68	Optigear BM100
	Tribol 1100/68	Tribol 1100/100
CHEVRON TEXACO	Gear Compounds EP68	Gear Compounds EP100
	Meropa WM68	Meropa WM100
EXXON MOBIL	-	-
	Mobilgear 600XP 68	Mobilgear 600XP 100
SHELL	Shell Omala S2 G 68	Shell Omala S2 G 100
TOTAL	Carter EP68	Carter EP100

Table 2: Mineral gear oil, ISO VG150, 220 and 320

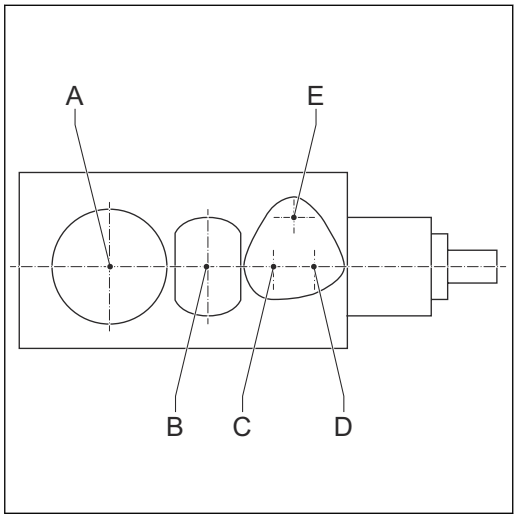
Supplier	ISO VG150	ISO VG220	ISO VG320
BP	Energol GR-XP-150	Energol GR-XP-220	Energol GR-XP-320
CASTROL	Alpa SP150	Alpha SP220	Alpha SP320
	Optigear BM150	Optigear BM220	Optigear BM320
	Tribol 1100/150	Tribol 1100/220	Tribol 1100/320
CHEVRON TEXACO	Gear Compounds EP150	Gear Compounds EP220	Gear Compounds EP320
	Meropa WM150	Meropa WM220	Meropa WM320
EXXON MOBIL	Spartan EP150	Spartan EP220	Spartan EP320
	Mobilgear 600XP 150	Mobilgear 600XP 220	Mobilgear 600XP 320
SHELL	Shell Omala S2 G 150	Shell Omala S2 G 220	Shell Omala S2 G 320
TOTAL	Carter EP150	Carter EP220	Carter EP320

Table 3: Related grease

Supplier	Related grease
BP	Energrease LS EP2
CASTROL	For Alpha mineral oil: Spheerol AP3
	For Optigear mineral oil: Olista Longtime 3EP
	For Tribol mineral oil: Tribol 3020/1000-2
CHEVRON TEXACO	For Gear Compounds mineral oil: Duralith grease 68
	For Meropa mineral oil: Multifak EP2
EXXON MOBIL	For Spartan mineral oil: Beacon EP2
	For Mobilgear mineral oil: Mobilplex 48
SHELL	Shell Gadus S2 V 220 2
TOTAL	Multis EP2

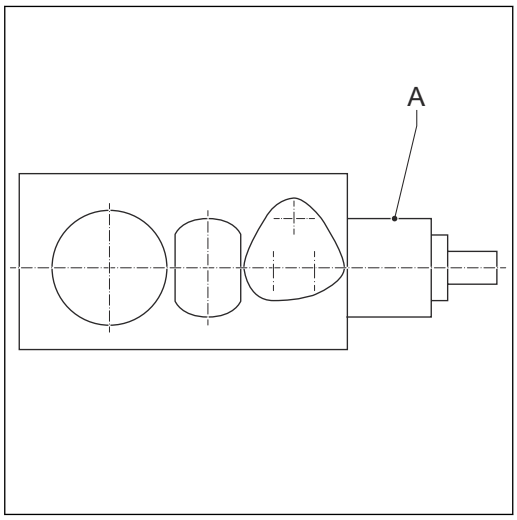
6.16 Grease quantity at lubrication points for bearings

6.16.1 Grease quantity for locations A to E



Gear unit size	Grease quantity per location [g]				
	Location A	Location B	Location C	Location D	Location E
9015	30	10	10	10	-
9025	30	10	10	10	-
9030	30	30	20	20	10
9035	40	30	20	20	10
9040	40	30	20	20	10
9045	50	30	20	20	10
9050	70	50	20	20	10
9055	100	50	20	20	10
9060	100	50	30	30	10
9065	150	50	30	30	10
9070	150	50	40	40	20
9075	150	70	40	40	20
9080	150	70	50	40	20
9085	200	70	50	40	20
9090	200	100	70	50	30
9059	200	100	70	50	30
9100	200	150	70	50	30
9105	200	150	70	50	30
9110	200	200	100	50	30
9115	200	200	100	50	30

6.16.2 Grease quantity for location A (multi-stage, right angle shafts)



Gear unit size	Grease quantity [g]		
	2-stage	3-stage	4-stage
9015	20	-	-
9025	20	-	-
9030	20	20	-
9035	20	20	-
9040	40	20	20
9045	40	20	20
9050	40	30	20
9055	40	30	20
9060	60	40	20
9065	60	40	20
9070	100	40	30
9075	100	40	30
9080	100	60	40
9085	100	60	40
9090	-	100	60
9059	150	100	60
9100	-	100	60
9105	150	100	60
9110	-	100	60
9115	200	100	60

6.17 Cooling water specifications

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

Parameter	Specification		
	[MPa]	[bar]	[psi]
Quality	Fresh water or salt water		

Sumitomo Drive Technologies

Headquarters Manufacturing
EMEIA

Hansen Industrial Transmissions NV
Leonardo Da Vincilaan 1 B-2650 Edegem | Antwerp | Belgium
Phone: +32 3 4501211 | Fax: +32 3 4501220
hit.info@shi-g.com

Sumitomo (SHI) Cyclo Drive Germany GmbH
CycloStraße 92 | 85229 Markt Indersdorf | Germany
Phone: +49 8136 66-0 | Fax: +49 8136 5771
scg.info@shi-g.com

See our worldwide sales service network at

emeia.sumitomodrive.com