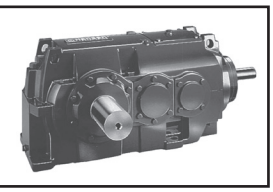
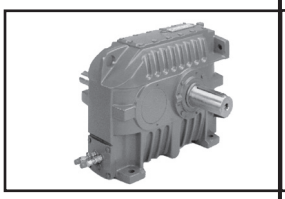
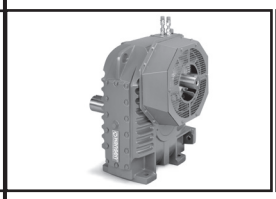
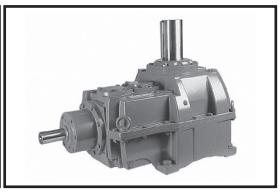
HANSEN P4

Standardized gear units
Service manual

SHIPPED WITHOUT OIL

Carefully read this manual before installing the gear unit.

MEMBER OF AGMA

ISO 9001

Sumitomo Drive Technologies
Always on the Move

Hansen® industrial gearboxes

: DANGER

: WARNING

M : MAINTENANCE

CONTENTS

WORLDWIDE TRANSMISSION SERVICE

See:

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QUICK REFERENCE

PRECAUTIONS TO TAKE ...

... upon reception and during storage

Take care of...	Possible damage if neglected
• Damaged packaging • Unpackaged - Check the protection of machined surfaces and shaft ends. - Provide the entire drive group with an adequate protection for the planned storage period.	• Corrosion of machined surfaces and shaft ends • Corrosion of gear unit parts and components • Damage to shafts, gears and bearings
• Store the gear unit in his original packing. • Long term storage: see chapter 4.	• Corrosion of gear unit parts and components
• Condensation not possible in the repository	• Corrosion of gear unit parts and components
• Don't store the gear unit near vibrating machines.	• Damage to gears and bearings

... during installation

Take care of...	Possible damage if neglected
• Alignment of: - Gear unit -> Motor - Gear unit -> Machine shaft	• Overload on high speed shaft & low speed shaft couplings, bearings and shafts • Vibrations: damage to shafts, gears, bearings and couplings
• Balancing of couplings	• Vibrations: damage to shafts, gears, bearings and couplings
• Correct positioning of mounting feet on bedplate by shimming	• Rupture of mounting feet • Distortion of gear unit
• Correct tightening of fixation & motor bolts • Retorque after 50 to 100 hours of first operation.	• Loosening of bolts and displacement of the gear unit -> misalignment -> ...
• Smooth mounting of couplings and brakes onto shafts, never use impact.	• Damage to bearings
• Lift and handle gear unit by special lifting eyes. Never lift it by the shafts.	• Damage to bearings

Note: This quick reference for handling the gear unit is not exhaustive.
The obligation to read the complete service manual remains.

... during installation, continuation

Take care of...	Possible damage if neglected
• Check before filling oil that no pipes are damaged during transport or installation. Replace damaged pipes.	• Insufficient lubrication -> damage to gear unit parts and components
• Installation: After installation of the gear unit, lubricate immediately the complete drive.	• Accidental start up of the drive group with insufficient lubrication -> damage to gear unit parts and components
• Oil level glasses should be calibrated with the dipstick of the gear unit. Apply indelible marks on the oil level glass. • Check and compare the oil level indication on the other oil level markings with the dipstick of the gear unit. Calibrate the other oil level indications if necessary.	• Oil level too low -> damage to gears and bearings • Oil level too high -> leakage, increased oil temperature
• Check the direction of rotation of the low speed shaft (built in backstop): refer to the dimensional drawing.	• Wrong direction of rotation -> damage to the backstop and other parts
• Test run of the gear unit: follow up all instructions of chapter 11: “Starting-up”.	• Damage to gear unit parts and components
• Long periods of standstill of the gear unit after installation and before starting-up: - follow up all instructions of paragraph 12.6 “Extended periods of standstill”, - always protect the drive group against possible corrosion.	• Corrosion of gear unit parts and components • Damage to gear unit parts and components

Note: This quick reference for handling the gear unit is not exhaustive.
The obligation to read the complete service manual remains.

... during start up

Take care of...	Possible damage if neglected
• Check the internal components of the gear unit for corrosion.	• Damage to gears and bearings
• Fill gear unit up to correct level.	• Oil level too low -> damage to gears and bearings • Oil level too high -> leakage, increased oil temperature
• Use required oil and correct viscosity.	• Viscosity too high (thick oil) -> lubrication is unsatisfactory with very low starting temperature. • Viscosity too low (very fluid oil) -> too thin oil film: bearing damage and pitting or scuffing on gears
• Use clean oil and fill oil trough prefiltered unit (avoid abrasive particles and water).	• Abrasive wear of bearings and gears due to foreign particles in oil
• Correct tightening of fixation bolts • Retorque after 50 to 100 hours of first operation.	• Loosening of bolts and displacement of the gear unit -> misalignment -> ...
• Correct functioning of control equipment	• No alarm in case of malfunctioning Damage to bearings and gears
• Install and connect correctly lubrication group and control switches.	• No lubrication -> damage to gears and bearings.
• Check the direction of rotation of the low speed shaft (built in backstop): refer to the dimensional drawing.	• Wrong direction of rotation -> damage to the backstop and other parts

... during normal operation

Take care of...	Possible damage if neglected
• First oil change after 100 hours, max 800 hours to take out small wear particles due to running in.	• Premature damage to gears and bearings (Final impact - long term effect)
• Regular oil change when oil has lost its lubrication capacity.	• If oil has lost its capacities, anti-scuffing and anti corrosion are unsatisfactory -> damage to gears and bearings
• Avoid entering of sand, water, cement,...	• Damage to gears and bearings
• Check breather.	• Obstructed breather -> leakages -> too low oil level -> damage to bearings and gears.

Note: This quick reference for handling the gear unit is not exhaustive.
The obligation to read the complete service manual remains.

MAINTENANCE ISSUES

Refer to chapter 12: Maintenance

M Maintenance table

Periodical inspections as stated below will increase the reliability and lifetime.

		Minimum		
	After first run	**Monthly**	**6-Monthly**	**Yearly**
Fixation of the gear unit	*			*
Corrosion (1)				*
Alignment	*			*
Oil leaks	*	*		
Lubrication	*			*
Cleanliness				*
Abnormal noise and vibrations	*		*	
Oil level	*		*	
Oil sample analysis			*	
Greasing		*		
Check the proper functioning of the backstop				*** (Or biennial)**
Couplings - elastic elements Refer to the appropriate service manual			*	

(1) Check the internal components of the gear unit for corrosion before start up.
Repeat this check after each extended period of standstill (refer to section 12.6).
The result of this inspection must be documented and made available on request.

Any evidence of corrosion on internal components of the gear unit must be reported to Hansen Industrial Transmissions nv.

Note: This quick reference for handling the gear unit is not exhaustive.
The obligation to read the complete service manual remains.

1. SCOPE

This service manual contains the storage, installation, operating, lubrication and maintenance instructions for the **Hansen P4** standardized gear units.

The **Hansen P4** gear unit is a component of a machine to decrease or to increase the input speed and respectively to increase or to decrease the transmitted torque.

Additional information can be obtained by contacting one of the Hansen Industrial Transmissions nv sales centres worldwide (p. 2).

All handling, storage, installation, start-up, inspection and maintenance of the equipment shall be done by personnel qualified in matters of industrial mechanical and - where applicable - electrical equipment.

2. GENERAL

2.1. GENERAL INSTRUCTIONS

Carefully read this manual before installing the gear unit.
Compliance with the instructions is required for long and troublefree operation of the gear unit.
The equipment should be checked against shipping papers and inspected for apparent damage caused during transport. Any shortage, discrepancy or damage must immediately be reported to Hansen Industrial Transmissions nv.

2.1.1. Warranty

The warranty clause of the "General Conditions of Sale" applies to gear units installed and maintained as per instructions contained in this manual 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 Acknowledgement" and on the certified drawings.
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 these parts which are subject to wear.

2.1.2. Security

Before starting activities it is essential to consult and study attentively the certified drawing of the gear unit.
The certified drawing contains the information which makes it possible to work in safe conditions and to avoid risks, damage and injury.

2.1.2.1. Application

It is not allowed to use the gear unit for other applications or in other operating conditions than those for which it was ordered.
The application, the operating conditions and the conditions of use are described in the "Order Acknowledgement".
In the absence of information or in case of doubt, refer to Hansen Industrial Transmissions nv.

2.1.2.2. Storage and packing

Read carefully the chapters “Shipping” and “Storage” to follow up the necessary instructions.
To protect the gear units from corrosion, they are treated with anti-corrosive products.
It is strongly recommended to carry out the unpacking and the inspection in a roomy, dry and aired workshop.

2.1.2.3. Handling

The **Hansen P4** gear units are easy to handle.
Use the suitable lifting equipment.
Use the appropriate lifting points at the gear unit housing (integral oval lifting eyes, lifting eye nuts with bolts or integral rods.
The other components of the gear unit cannot be used for lifting.
Before handling the gear unit, the state of the lifting points must be inspected for:

- signs of fatigue
- cracks
- deformation
- signs of rupture
- corrosion
- locking of the lifting eye bolts and the lifting eye nuts

Take care of a good load distribution and a horizontal handling of the gear unit.

2.1.2.4. Installation

The user shall be responsible for the proper installation of the complete equipment and the supply of protection guards and other safety equipment in accordance with the European Directives 2006/42/EG and the local safety regulations.

Sufficient space and protections must be provided, in such way that a person walking by cannot injure himself.

The gear unit contains rotating parts.
Before beginning the installation of the gear unit, it is necessary to check that involuntary starting up of the drive is impossible.

Heaters, coolers, electrical alarms and other safety or monitoring devices supplied by Hansen Industrial Transmissions nv separately or together with the gear unit, must be installed and connected by the user as indicated on the relative documents.

After installation and before starting up the gear unit, it is necessary to check that:

- **the rotating external parts are provided with adequate protections,**
- **the gear unit is lubricated,**
- **the lubricating system , the measuring-, safety- and control instruments, are connected and are functioning,**
- **the operating and control instruments, the tubes and the flexible pipes are protected against harmful external influences,**
- **the direction of rotation for the gear unit shafts and motor shaft are correct if the gear unit has a backstop. Refer to the dimensional drawing and paragraph 11.2 "Gear units equipped with a backstop".**

2.1.2.5. Temperature and heat

- Temperature
The temperature of the gear unit and the lubricants can be high.
Before approaching the gear unit or carrying out activities, it is strongly recommended to check that the temperature of the gear unit is equal to the ambient temperature.

If this safety directive cannot be followed, approaching the gear unit is only allowed if the temperature is lower than the value necessary to cause burns.

In addition the personnel must wear heat resistent clothing and gloves.
Suitable equipment will be necessary to protect the face and the eyes against possible oil splash.

- Heat

The gear unit produces heat due to losses. Sufficient space must be provided around the gear unit allowing the gear unit and the cooling system to exchange heat with the environment.

The gear unit as well as the cooling system must remain clean to assure the heat transfer with the environment.

An inadequate heat transfer leads to high temperatures and damaging of the gear unit parts. It might lead to a faulty operation of the gear unit.

2.1.2.6. Fire

Gear units with burning marks cannot be restarted. Only after revision and repair carried out by Hansen Industrial Transmissions nv, the gear units can be started safely.

Burning of lubricants and sealing

- Lubricants: oil and grease
Other chemical substances emerge from burning of oils and greases, which are harmful for human and environment.
Refer to the lubricant supplier to know:
- **possible dangers and consequences,**
- **safety specifications to follow up.**

- Sealing
Some seals in a gear unit can contain FKM[1] material (trade names e.g. Viton® [2] and Fluorel® [3]).
If seals, made out of FKM material, have been exposed to high temperatures (e.g. in case of a fire or when a bearing very close to the seal has experienced massive damage), highly corrosive organic fluorides may have been generated and contact with the skin must be avoided at all time.
Since it is not always clear whether the used material is in fact FKM, it is strongly recommended to handle every seal that has been exposed to high temperatures with extreme care and to take the necessary precautions (*).

1: FKM is short for Fluoroelastomer
2: Viton® is a registered trademark of Dupont-Dow
3: Fluorel® is a registered trademark of Dyneon (3M)

* **Exctraction from 'handling precautions for Viton® and related chemicals', technical information from Dupont-Dow:**
Precaution in the event of fire.

Highly toxic products (**) of combustion can be generated in a fire involving Viton®. Personnel fighting such a fire must wear facemasks and a self-contained breathing apparatus. All unprotected personnel must leave the area immediately. Anyone exposed to fumes from the fire should be moved to fresh air at once and treated by a physician.
Anyone handling residues of Viton polymer or parts of Viton® that have been involved in a fire must wear Neoprene gloves to avoid skin contact with these possibly highly corrosive residues, which likely include hydrogen fluoride. (Polyvinylchloride [PVC] gloves may be used if the temperature of the residue is below the melting point of the gloves.) Such residues should be decontaminated by washing in lime water (calcium hydroxide solution) and disposed of in the same manner as Viton® polymer. To dispose of Viton®, landfill is preferred. The disposal method must be conform to national, state and local regulations.
Burning of Viton® is not recommended, unless conducted by an approved, licensed incineration process. In this case, the gaseous products should be treated by alkaline scrubbing. The gloves must be discarded after use.

(**) Combustion products of Vulcanizates of Viton®

Carbon Monoxide (CO)	Fluoroform (CHF_3)
Carbon Dioxide (CO_2)	Vinilidene Fluoride (H_2CCF_2)
Hydrogen Fluoride (HF)	Hexafluoropropylene (C_3F_6)
Carbonyl Fluoride (COF_3)	Low molecular weight fluocarbon fragments

2.1.2.7. Electricity

Before starting maintenance activities on the gear unit, it is necessary to disconnect the drive from the electric grid.
The electric switch must be locked so that electric supply to the drive is impossible.

Earthing the gear unit as an independent element is highly recommended.

The gear unit must never be part of an earthing circuit of other electric machines.
Leaks of electric current can damage the gears and the bearings of the gear unit compromising the reliability and the good performance of the gear unit.

2.1.2.8. Noice and vibrations

The drive group and its components cause vibrations and noise.
As limited as its emissions may be, it might be necessary, in conformity to the national or local directives, to use envelopes, separating walls and vibration (shock) absorbers to reduce the emission values of noise and vibration to a level lower than the values mentioned in the directives.

If the above mentioned directives can not be fulfilled, all personnel working nearby the drive groups must get the necessary protective equipment and use it to reduce the noise and vibration nuisance to an acceptable level.

2.1.2.9. The gear unit or drive as component of a machine

The gear unit or the drive is a machine component.
Always refer to the service manual of the machine to follow the safety and installation instructions which belong to the machine.

2.1.2.10. Maintenance

- Lighting:
Before starting maintenance activities on the gear unit, it is necessary to ensure sufficient lighting of the drive group to work in fully safe conditions.

- Maintenance during the warranty period:
- Maintenance activities like:
  - dis-assembly of the gear unit and its parts,
  - assembly of the gear unit and its parts,
  - replacement of parts by spare parts,

  will be done by qualified personnel that is authorized by Hansen Industrial Transmissions nv.

- The maintenance which is limited to:
  - the checking of the good performance of the instruments of operation and control,
  - the control of cleanliness of the installation,
  - the oil draining and oil filling of the gear unit, regreasing of the bearings and labyrinth seals,
  - the checking of the drive group alignment,
  - the checking for wear of the components of the drive group,
  - the maintenance of the lubrication system,

  will be carried out according to the description and the directives mentioned in this service manual.
  The maintenance shall be done by personnel qualified in matters of industrial mechanical and - where applicable -electrical equipment.

- Maintenance outside the warranty period:
The maintenance shall be done by personnel qualified in matters of industrial mechanical and - where applicable - electrical equipment.

The disassembly and the assembly of a gear unit and its parts require a qualification and a particular knowledge. It is strongly recommended to entrust this task to qualified personnel authorized by Hansen Industrial Transmissions nv.
Original parts of Hansen Industrial Transmissions nv should be used to replace the existing parts.

- After installation and before starting up the gear unit, it is necessary to check that:
- **the rotating external parts are provided with adequate protections,**
- **the gear unit is lubricated,**
- **the lubricating system , the measuring-, safety- and control instruments, are connected and are functioning properly,**
- **the operating and control instruments, the tubes and the flexible pipes are protected against the harmful external influences,**
- **the direction of rotation for the gear unit shafts and motor shaft are correct if the gear unit has a backstop. Refer to the dimensional drawing and paragraph 11.2 "Gear units equipped with a backstop".**

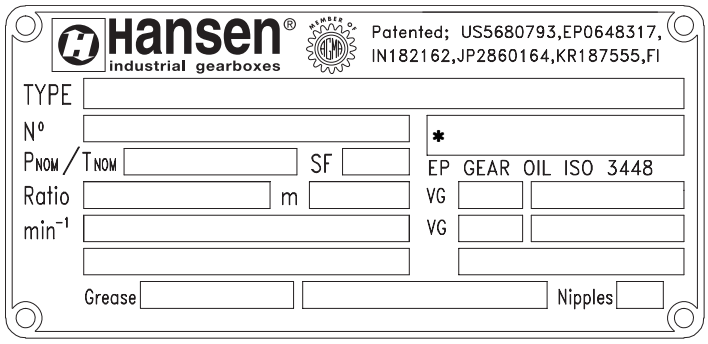
2.2. GENERAL SPECIFICATIONS

For general specifications such as dimensions, weight, connecting diagrams: refer to the certified drawing of the gear unit and/or to the **Hansen P4** standardized gear unit catalogues.

2.3. IDENTIFICATION

Inquiries concerning a gear unit should always specify the unit's complete type code and manufacturing number, which can be found on the nameplate.
This information is essential to identify the unit supplied by Hansen Industrial Transmissions nv.
The nameplate, which is fitted on each gear unit, also contains information about ratings and/or torque, speed and lubrication.

Nameplate



Key to symbols

Type	Type specification of the gear unit (serial number and code)
N°	Gear unit production number
P_{NOM}	Nominal power rating (kW) at high speed shaft of the gear unit
T_{NOM}	Nominal torque rating (kNm) at low speed shaft of the gear unit
SF	Service Factor
min^{-1}	Input and output speed (speeds)
EP GEAR OIL ISO 3448	Gear oil according to ISO 3448
VG	Oil viscosity for a specified ambient temperature range
*	(possible) Indication of the use of synthetic oil ("Synthetic Oil")
Grease	Grease lubrication: grease quantity (indication of grease type "Q." and brand name, refer to the chapters 12 and 13)
Nipples	Number of grease points (nipples)

3. SHIPPING

Each gear unit is inspected and approved by the QUALITY CONTROL DEPARTMENT before shipment. The inspection is carried out based on the order specification. The approval of the gear unit is granted after no load test of several hours, in normal operating position and at the speed indicated on the nameplate.

3.1. SHIPPING CONDITIONS

Unless otherwise specified, gear units are shipped in unpacked condition and depending on necessity, fixed on wooden pallets with open crating protection. Sometimes parts, such as spare filter elements, are separately packed. In such case, the end-user must take care of the assembly.

The Hansen P4 gear unit is shipped without oil.

All grease lubrication points are factory filled.

In case the gear unit, after arrival of the shipment from Hansen Industrial Transmissions nv (H.I.T.), has to be transported further, H.I.T. advises to avoid transport by train. If the gear units are nevertheless to be transported by train anyhow, then the necessary precautions must be taken by the forwarder to avoid false Brinelling damage on gears and bearings.

3.2. PAINTING

Unless otherwise specified, the standard external paint for Hansen Industrial gearboxes is an epoxy primer with high solids content, corresponding to the German Standard RAL 5021, water blue.
The paint system is designed for gear units installed indoors only and not exposed to humidity or aggressive chemicals.
The painting system is suitable to be applied in the atmospheric-corrosivity category “C1” according to ISO 12944-2.

Durability range according to ISO 12944-1: at least L, 2 to 5 years
The durability range is NOT a “guarantee time”. Durability is a technical consideration that can help the owner set up a maintenance programme.

Overcoating is possible with most paints based on alkyd-, epoxy or polyurethane resins.

3.3. PRESERVATION

The inner parts of the gear units are sprayed with rust preventing mineral oil. The breather plug (standard, dust-proof, anti-humidity) is neither removed nor sealed.
The shaft extensions are protected with a rust preventing grease. The hollow shafts and all unpainted machined surfaces are coated with an anti-oxidizing waxy varnish.
This standard system offers corrosion protection during transport and/or short term storage for up to one year indoors.

4. STORAGE

Always store gear units in their original packaging.
Gear units should not be stored near vibrating machines in order to avoid damage to bearings.

The changes in relative air humidity and in temperature must be such that no condensation can occur in the storage room.

4.1. SHORT TERM STORAGE - INDOORS

A standard preservation of the internal parts of the gear unit is provided for storage up to one year indoors in a dry, ventilated and sheltered area. The sheltered area must be protected against environmental influences.
Let the applied means of protection intact.

4.2. LONG TERM STORAGE

Upon request, the Hansen Industrial gearboxes can be treated in the factory for:
- **a protection up to five years after delivery ex works and with storage in a dry, ventilated and sheltered area,**
- **a protection up to two years after delivery ex works and for storage outdoors.**

INDOORS
Up to five years indoors in a dry, ventilated and sheltered area. The sheltered area must be protected against environmental influences. The gear unit has to be hermetically sealed. The gear unit has to be packed in a hermetically sealed envelope.

In case the units are stored for a period up to 5 years in a dry, ventilated sheltered area, the units have to be re-filled every two years with the small amount of mineral oil containing a volatile corrosion protective additive (always read the information on the sticker on the gear unit). Consult your oil supplier about life time, compatibility with the actual oil and about the volume concentration.
The corrosion protection of the shaft extensions has to be checked and possibly corrected. At these occasions the high speed shaft must be turned until the low speed shaft has made 2 complete revolutions. The duration of the operation is limited to a strict minimum. The gear unit must be hermetically resealed immediately.

OUTDOORS
Up to 2 years outdoors, in a hermetically sealed envelope and enclosed in a seaworthy packing case.
Leave the hermetically sealed envelope and the seaworthy packing case intact during the storage period of maximum 2 years starting from the date of delivery ex works Hansen Industrial Transmissions.
This warranty expires if the package is damaged or opened.

NOTES
The gear unit will be mounted, started up and in operation before the end of the specified storage period.
All gear units treated and packed for long term storage have the following sticker with caution and instructions.

CAUTION

This gear unit contains .... litres volatile corrosion inhibitor oil.
Type and brand name of the volatile corrosion inhibitor oil: refer to Hansen Industrial Transmissions nv.

STORE IN SHIPPING POSITION AND KEEP HERMETICALLY CLOSED TO PREVENT VAPOURS OR OIL FROM ESCAPING UNTIL PUTTING INTO OPERATION.

BEFORE PUTTING INTO OPERATION

- Replace the red plugs by the dipstick and breather (filter or plug).
- Drain the protective oil and fill the gear unit with the exact quantity of the prescribed gear oil (see also maintenance manual).

It is recommended to rinse the gear unit with the selected oil before starting up. In case of doubt: refer to Hansen Industrial Transmissions nv.
See paragraph 7.5, page 28 : The first oil filling.
See chapter 11, page 31 : Starting Up.

Handle any lubricant or oil with care and according to the handling and safety instructions to be supplied by the lubricant supplier on customer's request. These instructions have to be handed over to any personnel performing installation, maintenance or repair of the gear unit.

Do not open the gear unit near flames, sparks or hot objects and take preventive measures to protect people against the volatile corrosion protective substance.

5. HANDLING

The **Hansen P4** gear units are easy to handle and to install. Make use of integral oval lifting eyes (horizontal mount) and lifting eye nuts with bolts or integral rods (vertical mount).
For equal load sharing make use of all available lifting points (4 lifting points), fixed to the gear unit, and use adequate tools.
Never use the lifting eye bolts of components mounted to the gear unit (eg.: motor, coupling, brake, lubrication system, etc.)

Make use of attached lifting eye nuts or mount the appropriate eye nuts (with bolt) to the lifting points of the housing.
Eye nuts (with bolt) must be fixed and secured before lifting the gear unit.
Never lift units with slings wrapped around the shafts or motor lantern.

5.1. LIFTING EYE NUTS WITH BOLTS ATTACHED TO THE GEAR UNIT

Max. force on the eye nut (kN)	M16	M20	M22	M24	M27	M30	M33	M36
	7	12	15	18	26	36	36	51
	4	7	8,7	10	15	20	20	28

Horizontal mount

- Single stage gear units (type QHP.1)
Use only the integral lifting eye and appropriate lifting eye nuts with bolts in housing feet

Gear unit size			**C**	**D**	**E**	**F**	**G**
Bolt size Grade 8.8	ISO	Low speed shaft side	M22	M27	M27	M33	M33
		High speed shaft side	Use only the integral lifting eye				

- Multi stage gear units (type QH...)
Use only integral oval lifting eyes

Vertical mount

- Two stage gear units (type QV..2)

Gear unit size			**C**	**D**	**E**	**F**	**G**	**H**
Bolt size Grade 8.8	ISO	Low speed shaft side	M16	M16	M20	M24	Use only the integral rods	
		High speed shaft side	M20	M24	M24	M30		

- Three and four stage gear units (type QV..3 and QV..4)

Gear unit size			**C**	**D**	**E**	**F**	**G**	**H**
Bolt size Grade 8.8	ISO	Low speed shaft side	M16	M16	M20	M24	M30	M30
		High speed shaft side	M16	M20	M24	M24	M30	M30

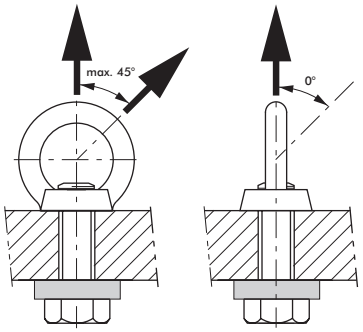
- For gear units (type QV...), sizes J up to T
Use only the integral rods

Note:

For handling of gear units equipped with a lubrication system caution is necessary.
Particular circumstances might dictate the temporary removal of thermostat(s), pressure gauge(s) and/or part of the oil feed piping. After removal of the latter elements, one should take special care to avoid ingress of moisture, etc... into the lubrication system of subject gear unit(s).

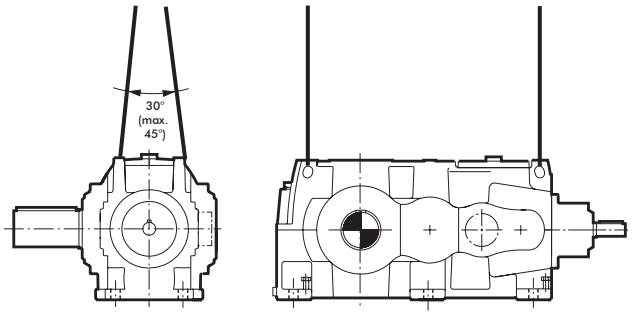
5.2. DIRECTION OF LIFTING FORCE FOR EYE NUTS (WITH BOLTS)

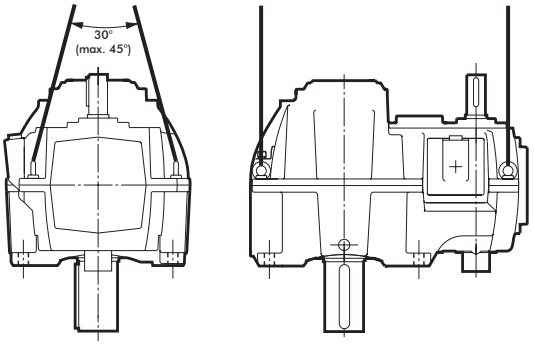
Lifting eye nuts (with bolts) must be fully engaged before lifting!

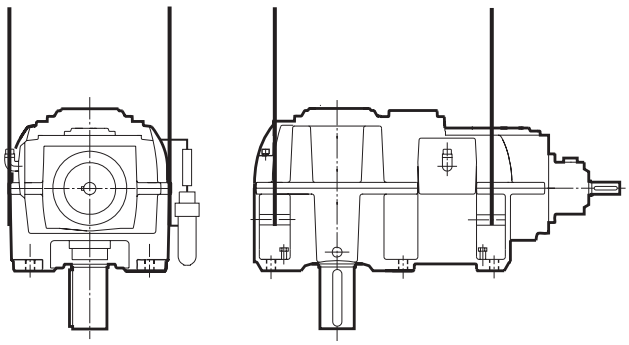


If the condition for direction of lifting force for eye bolts cannot be satisfied, bow (anchor) shackles, rotating eye bolts or movable eye bolts can be applied. Refer to your supplier for the appropriate selection of lifting tools. Functioning and security conditions of the selected lifting tools must always be satisfied.

5.3. LIFTING OF THE GEAR UNIT PROVIDED WITH FOUR LIFTING POINTS







The gear unit can only be lifted with lifting cables or lifting chains fixed to the mounted lifting eye bolts or integral rods.
The weight of the gear unit (or drive) and other instructions are mentioned on the dimensional drawing.
Always refer to the dimensional drawing before starting handling and transport activities.

The length of lifting cables or lifting chains must be chosen in such way that the angle between lifting cables or lifting chains is smaller than 45°.

If the gear unit is part of a drive package, the lifting points of the gear unit may **not** be used to lift the complete drive package. Refer to the dimensional drawing of the drive package to determine and use the appropriate lifting points.

Note
Proceed with caution for handling of gear units equipped with external components.
Pay attention that the external components will not be damaged when handling or transporting the gear unit.

6. INSTALLATION

6.1. FITTING OF ACCESSORIES

The metric shaft extensions are equipped with keyways according to DIN 6885 "Blatt 1 - Form N1 or N3".
Threaded centre holes in these shafts are according to DIN 332 Teil 2 Form D.
Couplings should be mounted on the shafts with fit according to specifications. Refer to the certified drawing of the gear unit and the dimensional drawing of the coupling. In case of doubt please refer to Hansen Industrial Transmissions nv.
Remove the protection from the shaft extensions and check the key fit and the keyway height in the component to be mounted onto the shaft. Heating the component to 80-100°C (175-210°F) will be helpful in case of interference fit. The threaded centre hole in the shaft may be used to assist in mounting the components onto the shaft.

Never mount components by hammering as this may cause damage to the bearings.

Never use rigid couplings except on free end machine shafts (e.g. mixers, aerators) or in executions with a torque arm.

6.2. COUPLINGS MOUNTED ON THE SHAFT ENDS OF THE GEAR UNIT – CORROSION PROTECTION

The coupling hubs are mounted on the shaft ends so that the front surfaces are flush or the front surface of the shaft end remains for a minimum length within the bore of the coupling hub.
If necessary, a spacer between shaft shoulder and coupling hub is mounted.
Where applicable, the coupling hub is secured on the shaft end with thrust washer and fixation bolt.
Refer to the certified drawing.
The assembly of coupling hub, spacer, thrust washer and fixation bolt must be corrosion resistant in accordance with the application and the atmospheric corrosion class (referring to ISO 12944) determined and mentioned by the customer.

For the cases where coupling hub, spacer, thrust washer and fixation bolt are supplied and mounted by Hansen Industrial Transmissions nv, all measures are taken to get a corrosion-resistant assembly in accordance with the application and the atmospheric corrosion class (ISO 12944) as mentioned in the “Order Acknowledgement”.

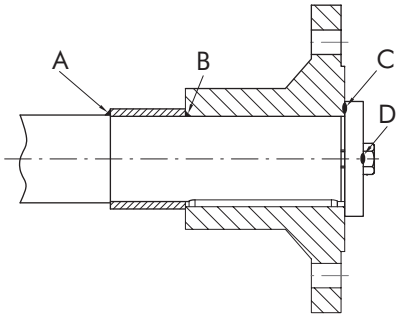
If the coupling hub, spacer, thrust washer and fixation bolt are provided and mounted by the customer, he ensures that the assembly will be corrosion-resistant in accordance with the selected atmospheric corrosion class according to ISO 12944.

Preservation – sealing paste and painting - recommendation

Degrease and clean all components. Only the bore in the coupling hub may be slightly greased to facilitate mounting on the shaft end. All other contact surfaces must remain clean and free of grease. Coat all contact surfaces (A, B, C, and D - see figure at next page) between shaft shoulder, spacer, coupling hub, thrust washer

and fixation bolt with an appropriate sealing paste. Remove the excess sealing paste after assembly. Check carefully if the air gaps between the various components are properly sealed.
After assembly and sealing, a paint system that matches the selected atmospheric corrosion class according to ISO 12944 will be applied. Refer to the "Order Acknowledgement".
Protect the oil seals of the gear unit against paint and harmful external influences.

Recommended sealing paste: refer to your supplier. In case of doubt, refer to Hansen Industrial Transmissions nv.



6.3. EXTERNAL LOADS

If external loads act on the gear unit, thrust blocks must be installed against the unit's feet, to prevent the gear unit from shifting.
Components transmitting radial load to the shaft should be mounted as close as possible to the housing.
Avoid exaggerated tension in transmission belts mounted on input or output shafts. On gear units with built-on motor and V-belt drive, tension has been factory set. Tension should be rechecked after 24 hours of operations.
Chain transmissions must be mounted without preliminary tension.
In case a pinion is mounted on the shaft extension of the gear unit, care should be taken to have normal required backlash between pinion and gear and good contact pattern must be assured.

6.4. ERECTION

6.4.1. Levelling

Always mount gear unit in the position for which it was ordered.

Before altering this mounting position of the gear unit, please consult Hansen Industrial Transmissions nv. It may be necessary to adapt the lubrication system.

6.4.2. Alignment

Align the gear unit as accurately as possible.
Install the gear unit horizontal, taking into account a max. inclination equal to 5 mm per 1 m (5/32 inch per 3 feet or 5 mrad or 17 arc minutes) or a max. indicated on the outline drawing for positions other than horizontal.

Use three fixation points of the gear unit for alignment. Adjust the other fixation points by shimming to 0,1mm (0.004 inch).

6.4.2.1. Connection gear unit - machine: allowable misalignment at the low speed shaft (except for single stage gear units)

The misalignment must be minimized to improve the steadiness of bearing and coupling life span. Ensure that the alignment remain unchanged at all operating conditions. The unavoidable misalignments may not exceed the values mentioned in the service manual of the coupling, unless otherwise stated on the certified drawing. These instructions apply for couplings provided by Hansen Industrial Transmissions NV and listed on the dimensional drawing.

For couplings **NOT** delivered by Hansen industrial Transmissions nv (H.I.T.), H.I.T. must be consulted. An evaluation of external factors which act on the gear unit (maximum admissible misalignment, overhung load on shaft ends, etc.) allows to check and to guarantee the good functioning of the gear unit.

Combination of angular and radial misalignment

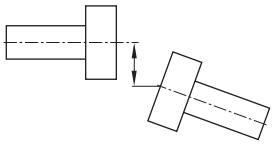
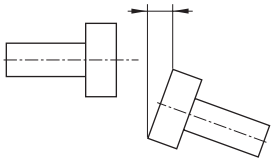
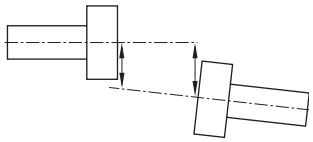
Angular and radial misalignment can occur simultaneously. The sum of the misalignments must satisfy the following condition:

dr : measured radial misalignment
Δr : allowable radial misalignment

da : measured angular misalignment
Δa : allowable angular misalignment

$$\frac{dr}{\Delta r} + \frac{d\alpha}{\Delta\alpha} \leq 1$$

6.4.2.2. Connection motor - gear unit : allowable misalignment at the high speed shaft (including all shaft ends of single stage gear units)

	Speed (min-1)	Allowable misalignment			
		Metric (mm)		Inch (mils)	
		Allowable	Excellent	Allowable	Excellent
Short "flexible" coupling Radial misalignment 	**750**	0,19	0,09	7,5	3,5
	900	0,15	0,08	6,0	3,0
	1000	0,12	0,08	4,8	3,0
	1200	0,10	0,06	4,0	2,5
	1500	0,09	0,06	3,5	2,4
	1800	0,08	0,05	3,0	2,0
Angular misalignment (*) 	**750**	0,13	0,09	13,0	9,0
	900	0,10	0,07	10,0	7,0
	1000	0,096	0,06	9,6	6,0
	1200	0,08	0,05	8,0	5,0
	1500	0,07	0,05	7,0	5,0
	1800	0,05	0,03	5,0	3,0
Spacer shaft and membrane (disk) coupling Radial misalignment (**) 	**750**	0,25	0,15	2,5	1,5
	900	0,20	0,12	2,0	1,2
	1000	0,18	0,11	1,8	1,1
	1200	0,15	0,09	1,5	0,9
	1500	0,12	0,07	1,2	0,7
	1800	0,10	0,06	1,0	0,6

(*) : Angular misalignment for coupling with a diameter of 100 mm or 10 inch
(**) : Radial misalignment for a spacer length of 100 mm or 1 inch

6.4.2.3 Alignment when mounting flexible gear couplings

When flexible gear couplings are mounted, the minimum allowable misalignment for the coupling may differ from the values listed in the table of permissible misalignment (see above).
Refer to Hansen Industrial Transmissions nv to get the appropriate alignment instructions and service manual of the gear coupling.

6.5. SECURING OF SOLID SHAFT GEAR UNITS

The gear unit must be mounted onto a rigid and stable bedplate or foundation in order to avoid vibrations and possible overload of the housing fixation pads.
Use the fixation holes indicated on the dimensional drawing.

After correct alignment and shimming of all the points, fix the gear unit solidly onto its foundation with the appropriate size steel bolts, grade 8.8 according to DIN 267 or SAE grade 5 for steel bolts 1 1/2" and smaller, ASTM.A-354 grade BC for steel bolts larger than 1 1/2", and grade 80 according to DIN 267 for stainless steel bolts. Dimensions and tightening torques: see tables.

Note: for some horizontal executions with parallel shaft and fans, the protection hood of the fan must be removed to enable tightening of the bolts. Remount the protection hood afterwards.

6.5.1. Tightening torques for steel bolts grade 8.8

Horizontal mount

- Single stage gear units (type QHP.1)

Gear unit size		**C**	**D**	**E**	**F**	**G**
Bolt size Grade 8.8	ISO	M20	M24	M24	M30	M30
Tightening torque	Nm	335	675	675	1350	1350
Bolt size Grade 5	UNC	3/4"	7/8"	1"	1 1/8"	1 1/4"
Tightening torque	lbf.in	2950	4850	6000	10300	12000

- Multi stage gear units (type QH...)

Gear unit size		**A**	**B**	**C**	**D**	**E-F**	**G-H-J-K**	**L-M**	**N-P-Q**	**R-S-T**
Bolt size Grade 8.8	ISO	M16	M20	M24	M24	M30	M36	M42	M48	M56
Tightening torque	Nm	180	335	675	675	1350	2350	3800	5700	9150
Bolt size Grade 5 /Grade BC	UNC	5/8"	3/4"	7/8"	1"	1 1/4"	1 1/2"	1 3/4"	2"	2 1/4"
Tightening torque	lbf.in	1550	2950	4850	6000	12000	21000	33650	50750	81050

Vertical mount

- Multi stage gear units (type QV...)

Gear unit size		**A**	**B**	**C**	**D**	**E**	**F-G(1)**	**G(2)-H-J-K**	**L-M-N-P-Q**	**R-S-T**
Bolt size Grade 8.8	ISO	M16	M20	M24	M30	M30	M36	M42	M48	M56
Tightening torque	Nm	180	335	675	1350	1350	2350	3800	5700	9150
Bolt size Grade 5 /Grade BC	UNC	5/8"	3/4"	1"	1 1/8"	1 1/4"	1 1/2"	1 3/4"	2"	2 1/4"
Tightening torque	lbf.in	1550	2950	6000	10300	12000	21000	33650	50750	81050

(1) size G : 2-stage unit
(2) size G : 3- and 4-stage unit

6.5.2. Tightening torques for stainless steel bolts grade 80

Horizontal mount

- Single stage gear units (type QHP.1)

Gear unit size		C	D	E	F	G
Bolt size Grade 80	ISO	M20	M24	M24	M30	M30
Tightening torque	Nm	340	Upon request			
Bolt size Grade 5	UNC	3/4"	7/8"	1"	1 1/8"	1 1/4"
Tightening torque	lbf.in	3000	Upon request			

- Multi stage gear units (type QH...)

Gear unit size		A	B	C	D	E-F	G-H-J-K	L-M	N-P-Q	R-S-T
Bolt size Grade 80	ISO	M16	M20	M24	M24	M30	M36	M42	M48	M56
Tightening torque	Nm	185	340	Upon request						
Bolt size Grade 5 /Grade BC	UNC	5/8"	3/4"	7/8"	1"	1 1/4"	1 1/2"	1 3/4"	2"	2 1/4"
Tightening torque	lbf.in	1650	3000	Upon request						

Vertical mount

- Multi stage gear units (type QV...)

Gear unit size		A	B	C	D	E	F-G(1)	G(2)-H-J-K	L-M-N-P-Q	R-S-T
Bolt size Grade 80	ISO	M16	M20	M24	M30	M30	M36	M42	M48	M56
Tightening torque	Nm	185	340	Upon request						
Bolt size Grade 5 /Grade BC	UNC	5/8"	3/4"	1"	1 1/8"	1 1/4"	1 1/2"	1 3/4"	2"	2 1/4"
Tightening torque	lbf.in	1650	3000	Upon request						

(1) size G : 2-stage unit
(2) size G : 3- and 4-stage unit

The alignment of the complete drive packages mounted on a bedplate has been carefully checked before shipment.
It is nevertheless required to check that the bedplate has not been deformed during transport or installation.
Therefore check again alignment of couplings or other elements after final installation.

6.6. SECURING OF HOLLOW SHAFT GEAR UNITS

6.6.1. Hollow shaft gear unit with shrink disc connection

The Hansen Industrial Transmissions nv supplied shrink disc is ready to be installed.

Do not dismantle shrink disc prior to first mounting.
The two-part shrink disc is used as standard (fig. 1c).
Another execution is available on request. Always refer to the dimensional drawing and the appropriate service manual of the shrink disc.

Mounting (fig. 1a)

- Clean and degrease contact surfaces (a) and (b).
- Smear surface (b) - **and not surface (a)** - with "Molykote D321R" or similar.
- After the applied coating has hardened, slide the O-ring (c) onto the shaft.
- Draw the gear unit onto the shaft of the machine using threaded rod (e), nut (f) and distance ring (g) until faces (h) and (i) make contact.
- Fit shrink disc (s). A locating groove on the shaft indicates the position of the shrink disc. Tighten bolts (ZS) with a torque wrench. The required tightening torque for the two-part shrink disc is indicated in table 1 and on the name plate (p).

Tightening bolts are prestressed to the right level when outer ring (o) and inner ring (n) are flush (optical check).

Tighten bolts (ZS) in indicated sequence (q) one by one, progressively over several rounds, until required tightening torque (TA) is reached.
Do not tighten bolts crosswise.
Mount protection hood.

NOTE: Never tighten bolts when shrink disc is unmounted.

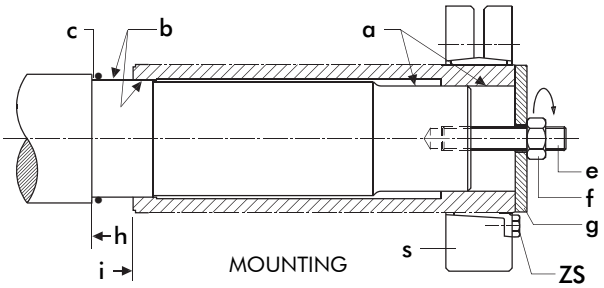


FIG.1a

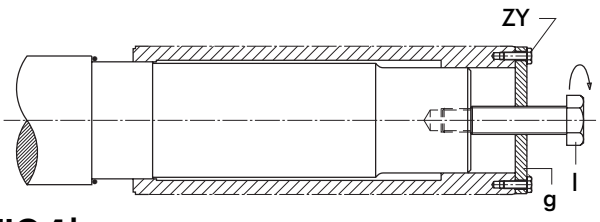


FIG.1b

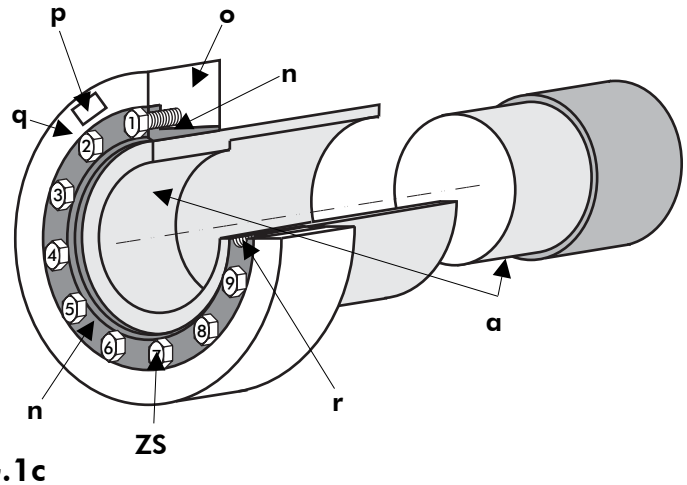


FIG.1c

Securing in case of axial load
If the axial load is not absorbed by the shoulder of the machine shaft, a distance ring (g) must be included (see fig. 2b, page 23).

Dismounting (fig. 1b)
- Loosen all tightening bolts (ZS) (fig.1c) uniformly, one by one in a continuous sequence, about a quarter of a turn per round.
- Should outer and inner ring of the shrink disc not release themselves, one can remove some tightening bolts and install them in tapped holes (r) (fig. 1c), in the inner ring, to trigger separation of both rings.
- Remove shrink disc from hollow shaft.
- Mount the distance ring (g) on the hollow shaft by means of bolts (ZY) (dimensions of ZY: see dimensional drawing).
- Place the disassembly bolt (l) into the central hole in the distance ring (g).
- Remove the gear unit from the shaft by tightening the disassembly bolt (l).

Note
The parts e,f,g,l and ZY are not included as standard. They can be supplied upon special request.
For technical data, refer to catalogue or certified drawing.

Cleaning and greasing
Dismounted shrink discs do not have to be taken apart for cleaning and regreasing prior to reinstallation, unless they have been used in a very dirty environment.
After cleaning, recoat the tapered surfaces using a solid lubricant with a friction coefficient of 0,04 , e.g. Molykote D321R or similar.

Table 1: tightening torque TA (Nm) for bolts ZS of the two-part shrink disc

Gear unit size	**H.I.T. part number**	**Stüwe** two-part shrink disc	**Ringfeder** two-part shrink disc	**Ringspann** two-part shrink disc	**Tas Schäfer** two-part shrink disc
A	113-H11082Q	121	120	The required tightening torque is reached when inner ring (n) and outer ring (o) are flush, see fig.1c.	120
B	113-H12582Q	121	120		120
C	113-H14082Q	193	190		-
D	113-H16581Q	295	290		290
E	113-H18581Q	295	290		-
F	113-H22082Q	570	570		570
G	113-H24082Q	570	570		570
H	113-H26082Q	570	570		570
J	113-H28082Q	570	570		570
K	113-H32082Q	980	1000		980
L	113-H34081Q	980	1000		980
M	113-H36082Q	980	1000		980
N	113-H39081Q	1450	1450		1450
P	113-H42082Q	1450	1450		1450
Q	113-H44082Q	1450	1450		1450
R	113-H48082Q	1970	1970		1450
S	113-H50081Q	1970	1970		1450
T	113-H53081Q	1970	-		-

6.6.2. Hollow shaft gear unit with keyway connection

Mounting (fig. 2a)
- Coat mating faces (b) of the machine shaft with mounting compound.
- Slide the O-ring (c) onto the machine shaft.
- Place supplied mounting key (d) into keyway of machine shaft, with the boss against the shaft face.
- Place the gear unit into position on the machine shaft. Make sure that the keyways are correctly positioned.
- Press the gear unit on the shaft, using a threaded rod (e), a nut (f), and a distance ring (g) until the mounting key (d) and the distance ring (g) make contact.
- Remove the nut (f), the distance ring (g) and the mounting key (d).
- Ensure that key (m) (fig. 2b) has sufficient clearance on top.
- Fit the key (m) into the shaft (≠ mounting key).
- Remount the distance ring (g) and the nut (f).
- Draw the gear unit further onto the shaft until the faces (h) and (i) make contact.
- Remove the nut (f), the distance ring (g) and the threaded rod (e).

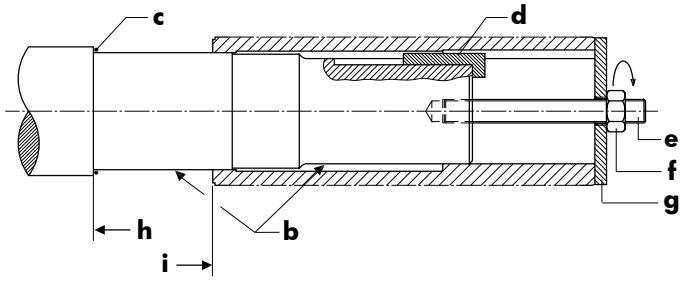
Securing (fig. 2b)
- Mount the distance ring (g) again on the machine shaft using correct fixation bolts (J).
- Install the protection cover (k).

In case of external axial loads on the shaft, please refer to specific instructions on the outline drawing.

Dismounting (fig. 2c)
- Remove the protection cover (k) and the fixation bolts (J) (fig. 2b).
- Mount the distance ring (g) on the hollow shaft by means of bolts (ZY) (dimensions of ZY: see dimensional drawing).
- Place the disassembly bolt (l) into the central hole in the distance ring (g).
- Remove the gear unit from the shaft by tightening the disassembly bolt (l).

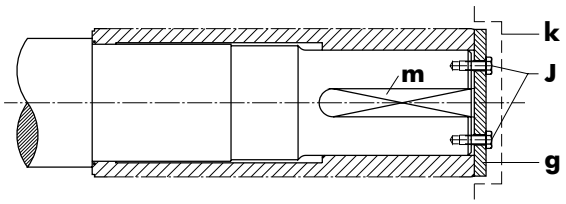
Note
The parts e,f,l and ZY are not included as standard, but can be supplied upon special request.
For technical data, refer to catalogue or certified drawing.

FIG.2a



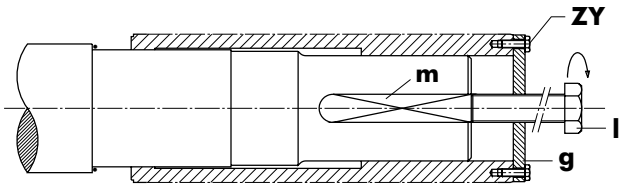
MOUNTING

FIG.2b



SECURING

FIG.2c



DISMOUNTING

6.6.3. Mounting of the torque arm

After fitting and securing the gear unit to the driven shaft (see par. 6.6.1 or 6.6.2), fix unit by means of the optionally supplied torque arm to a fixed torque reaction point. Refer to the certified drawing or catalogue for torque arm location on gear unit.

The connection between torque arm and reaction point must remain flexible and resilient. This is achieved by preloading the disc springs of the torque arm.

The preload of the disc springs (A) will be adjusted as follows:

- Determine the spacing S (fig. 3a), this is the spacing of the disk springs in unloaded and unmounted condition.
- Screw the inner nut until spacing S1 (spacing between gear unit and fixed point) is reached, where S1 = S - ΔS (fig. 3b, 3c, 3d).
  ΔS = spacing obtained after compression of the disk springs (table 2, 3 and 4) due to the weight of the gear unit and tightening of the inner nut.
- When the prescribed spacing S1 is obtained, lock the inner nut by tightening outer nut against it.

FIG.3a

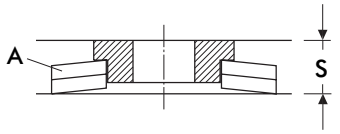


FIG.3b

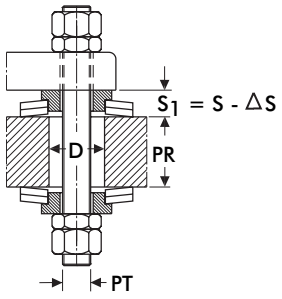


Table 2

Gear unit size	D ±5	PT	PR max		ΔS		A	
			mm	inch	mm	inch	Q*	DIN 2093
QH.A2	35	M16	40	1.57	0,7	0.028	2 x 2	A 80
QH.B2	35	M20	50	1.97	0,7	0.028	2 x 2	A 80
QH.C2	45	M24	60	2.36	0,9	0.035	2 x 2	A 100
QH.D2	45	M24	60	2.36	0,9	0.035	2 x 3	A 100
QH.E2	60	M30	75	2.95	1,0	0.039	2 x 3	A 125
QH.F2	60	M30	75	2.95	1,0	0.039	2 x 3	A 125
QH.G2	60	M36	90	3.54	1,0	0.039	2 x 4	A 125
QH.H2	60	M36	90	3.54	1,0	0.039	2 x 4	A 125

Q*: number of disc springs

FIG.3c

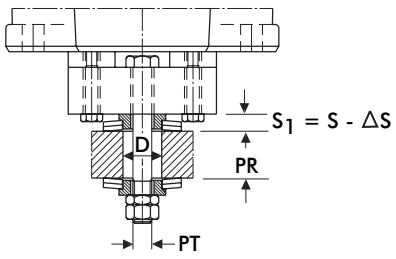


Table 3

Gear unit size	D ±5	PT	PR max		ΔS		A	
			mm	inch	mm	inch	Q*	DIN 2093
QH.C3	35	M20	50	1.97	0,7	0.028	2 x 3	A 80
QH.D3 - QH.D4	45	M24	60	2.36	0,9	0.035	2 x 2	A 100
QH.E3 - QH.E4	45	M24	60	2.36	0,9	0.035	2 x 3	A 100
QH.F3 - QH.F4	60	M30	75	2.95	1,0	0.039	2 x 2	A 125
QH.G3 - QH.G4	60	M36	90	3.54	1,0	0.039	2 x 3	A 125
QH.H3 - QH.H4	60	M36	90	3.54	1,0	0.039	2 x 3	A 125

Q*: number of disc springs

FIG.3d

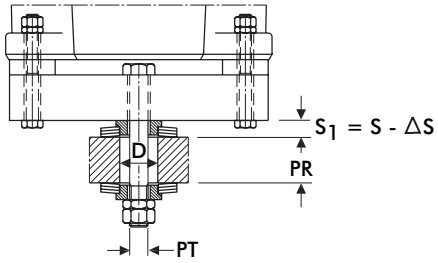


Table 4

Gear unit size	D ±5	PT	PR max		ΔS		A	
			mm	inch	mm	inch	Q*	DIN 2093
QH.J3 - QH.J4	80	M42	105	4.1	1,4	0.055	2 x 3	A 160
QH.K3 - QH.K4	80	M42	105	4.1	1,4	0.055	2 x 3	A 160
QH.L3 - QH.L4	80	M48	120	4.7	1,4	0.055	2 x 4	A 160
QH.M3 - QH.M4	80	M48	120	4.7	1,4	0.055	2 x 4	A 160

Q*: number of disc springs

6.7. LUBRICATION AFTER INSTALLATION

After levelling, alignment and securing, the gear unit must be lubricated. All instructions mentioned in chapter 7 "LUBRICATION" must be followed up.

If a long period of standstill is expected before starting up the gear unit, the instructions mentioned in paragraph 12.6 "EXTENDED PERIODES OF STANDSTILL" must be followed up.

7. LUBRICATION

Lubrication serves four main functions :
- prevents metal to metal contact in gears and bearings
- reduces friction losses
- dissipates the generated heat from gears and bearings
- prevents corrosion

Different lubrication systems can be used, depending on
- gear velocity
- gear unit mounting position
- operating conditions

Hansen Industrial Gearboxes use one of following systems :
- splash lubrication
- forced feed lubrication: - circulation lubrication
  - pressure lubrication

These systems can be completed with auxiliary cooling in different forms (see chapter 9: "COOLING").

7.1. SPLASH LUBRICATION

Splash lubrication is standard for **horizontal shaft gear units with one, two and three stages** and for speeds between 750 min-1 and 1800 min-1 at the high speed shaft.
Splash lubrication is standard for **horizontal shaft gear units with four stages** and for speeds between 1000 min-1 and 1800 min-1 at the high speed shaft.
All gears and output shaft bearings are lubricated by immersion in the oil bath. Oil splash from gears fill oil pockets in the housing, assuring gravity circulation lubrication of the bearings via channels in housing and covers.
For other speeds at the high speed shaft, refer to Hansen Industrial Transmissions nv.

7.2. FORCED FEED LUBRICATION

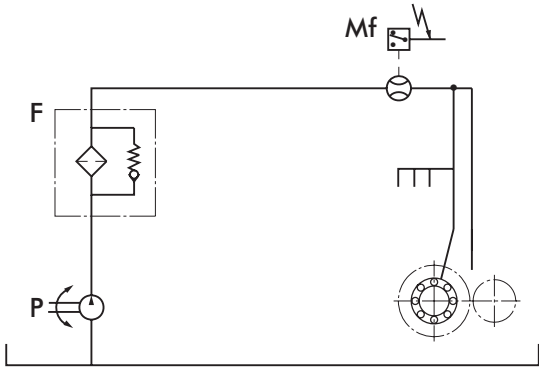
All rotating elements above oil bath level are lubricated by a gear pump forcing the oil through pressure lines.
Pumps can be either of the integral type, driven by one of the gear unit shafts, or a motorpump.
The integral type pumps are always provided with a built-in reversing device for operation in both directions.
Built-on pumps reach their normal operating capacity already after a few seconds.

In case of motorpumps the direction of rotation is always indicated.
Motorpumps should be switched on at least one minute before starting the gear unit.

7.2.1. Circulation lubrication

- With integrated pump (fig.4).
The circulation lubrication system consists of
  - a pump P
  - a filter F with bypass (standard from gear unit size G onwards)
  - a flow switch Mf (standard from gear unit size G onwards)

FIG. 4



Flow switch must be wired in a circuit to automatically stop the main drive motor when oil flow drops below alarm setting.

However, in order to avoid unwanted alarms during the start-up period, in operation or due to irregularities of the oil flow, we recommend retarding the alarm signal; the alarm should be triggered only after the oil flow has been interrupted for a continuous period of 5 seconds.

- With motorpump
The service manual of the lubrication and cooling system gives detailed information about the circulation lubrication system with motorpump.

7.2.2. Pressure lubrication

The service manual of the lubrication and cooling system gives detailed information about the pressure lubrication system.

7.2.3. Instrumentation and settings, if applicable

For detailed information on lubrication system, instrumentation and settings, refer to the certified drawing, the service manual of the lubrication and cooling system and/or separate leaflets on instrumentation, supplied with this manual.
Settings stated on the certified drawing have been set during testrun by Hansen Industrial Transmissions nv and should not be altered without written authorisation.
Presettings, if stated, are recommended values set by Hansen Industrial Transmissions nv, but may be altered according to local conditions.

7.3. OIL SELECTION

Always use oil with type and viscosity as indicated on the gear unit's nameplate.

The oil must be selected from the table at page 38 of this service manual, listing mineral oils and greases recommended by their respective brand name owners.

The viscosity has been selected according to operating conditions specified in the "Order Acknowledgement".
The ISO viscosity class VG is mentioned on the nameplate and on the dimensional drawing.
For conversion from ISO viscosity class VG to other viscosity units see table of corresponding lubricants p. 38.

The oil suppliers are responsible for the selection and composition of their products.

Synthetic oils may be used only after written authorisation from the Engineering Department of Hansen Industrial Transmissions nv.
The use of synthetic oil is mentioned on the nameplate.

In that event, only synthetic oils specified by Hansen Industrial Transmissions nv with brand and product name may be used, refer to the table at page 39. These synthetic oils shall be of the polyalpha-olefine type (SHF-type, Synthetic Hydrocarbon Fluid).

To improve the steadiness of the bearing life time, it is highly recommended to use oil that has an initial oil cleanliness of -/15/12 (or better) according to ISO 4406.
Refer to the oil supplier to obtain this oil quality.

Handle any lubricant or oil with care and according to the handling and safety instructions to be supplied by the lubricant supplier on customer's request. These instructions have to be handed over to any personnel performing installation, maintenance or repair of the gear unit.

7.4. OIL QUANTITY

M **The oil level is determined by min. and max. markings on the dipstick** (see fig. 5, page 28).

The oil level will always be checked with the gear unit dipstick.

Possible other oil level markings are only indicative. Refer to the dimensional drawing.
An oil sight glass or an oil level switch is optionally available.

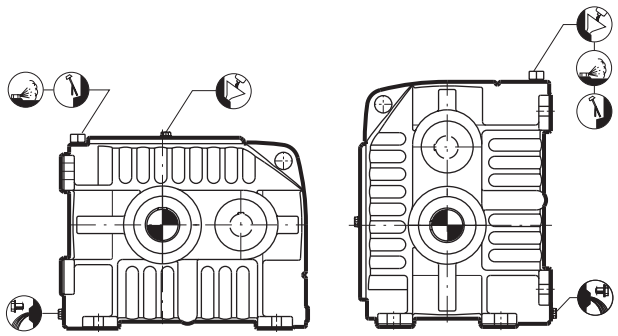
THREADED DIPSTICKS SHOULD BE CHECKED IN PLUGGED POSITION.

The oil level must be checked when the gear unit is not running.

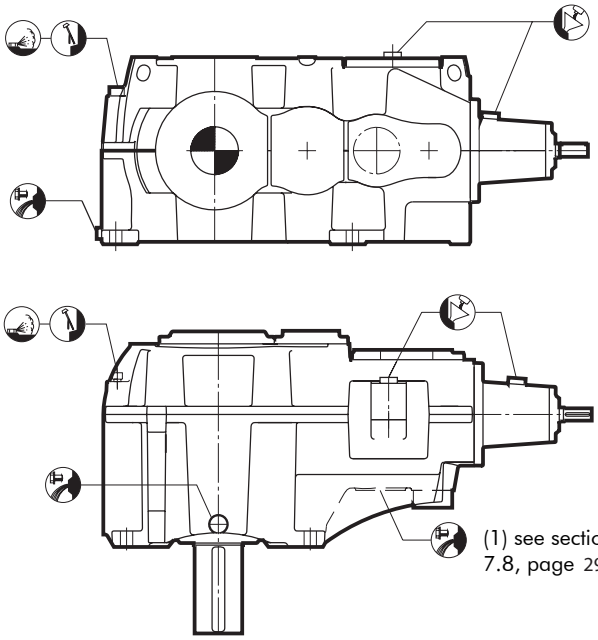
On systems with filters and coolers, the oil level must be checked with the lubrication and cooling system filled with oil and after short test run.
The cooling system is automatically utilized when the oil bath temperature rises above 60°C (140°F).
If oil filling is required to take place earlier, the air must be released from the cooler whilst the pump is in operation.
The oil quantity mentioned on the nameplate of the gear unit is an approximate value given only for procurement purposes.

FIG. 5

- Single stage gear units



- Multi-stage gear units

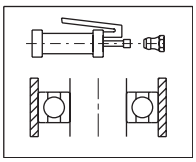


(1) see section 7.8, page 29

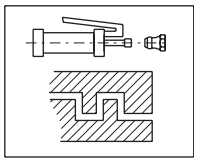
Position of oil filling plug, dipstick, oil draining plug, breather plug

Always refer to the certified dimensional drawing and stickers on the gear unit.

Dipstick | Oil draining | Oil filling | Ventilation | Condensation draining | Grease lubrication point



Grease lubrication point for bearings



Grease lubrication point for labyrinth seal

M 7.5. THE FIRST OIL FILLING (see fig. 5)

Fill units only after final installation, especially gear units with vertical downwards shafts, to prevent oil splashing over drywell during handling.

Fill the gear unit exclusively through the oil filling opening which is provided in the inspection cover for that purpose. In that way, all bearings are lubricated with fresh oil before start up.

Note :

- Additional oil filling of the bearing housing.

4-stage horizontal gear units with right angle shafts (QHR.4) and 3- and 4-stage vertical gear units with right angle shafts (QVR.3 + QVR.4) require also an additional oil filling of the bearing housing. See special sticker on gear unit. The additional oil quantity is mentioned on the certified drawing and on the sticker.

- Oil filling of a gear unit with M1 or M3 motor base.

For gear units with horizontal shafts (QH ..) equipped with a motorbase M1 or M3 an additional small quantity of oil must be added through the inspection cover located in the top face of the gear unit (see special sticker on gear unit).

If easy access to the oil filler plug is prevented due to lack of space between the motor base and the gear unit upper face, the motor base should be raised after removal of the belt.

The position of the oil filling plug is indicated by a sticker on the gear unit. Refer to to the certified dimensional drawing.

- If the gear unit is filled with storage oil, it has to be drained and it is strongly advised to rinse the gear unit with the selected oil before starting up. Check with the oil supplier.

- To improve the steadiness of the bearing life span, it is highly recommended to use oil that has an initial oil cleanliness of -/15/12 (or better) according to ISO 4406. Refer to the oil supplier to obtain this oil quality.

M 7.6. GREASE SELECTION (see table page 38)

If the gear unit is equiped with parts that need grease lubrication, and unless indicated otherwise on the gear unit's name plate or in the special technical manual of the specific gear unit (if existing), the grease must be selected from the table at page 38 of this service manual, listing mineral oils and greases recommended by their respective brand name owners.

Use only high quality greases with consistency NLGI-Grade 3.
Greases with consistency NLGI-Grade 2 may be used for regreasable labyrinth type seals and grease lubricated lower bearing of the low speed shaft.

The lubricant suppliers are responsible for the selection and composition of their products.

M 7.7. GREASE LUBRICATION POINTS (see fig. 5)

All greasing points for bearings which are not oil lubricated and for labyrinth seals are equipped with nipples according to DIN 71412 and have been filled before shipment.
The total number of nipples is indicated on the nameplate.

M 7.8. OIL DRAINING (see fig. 5)

⚠ **Drain the oil while the gear unit is still warm. Be careful while draining the hot oil. Use an appropriate hot oil recipient, heat resistent clothing and gloves to avoid burns.**

To facilitate oil draining, remove the dipstick. Units having a large oil volume can be drained easier through the drain plug when using a portable pump. With some executions a small quantity of oil remains beneath the high speed bearings. This oil can be drained by means of a second drain plug (1), see fig. 5 page 28.

M 8. VENTILATION (see fig. 5)

To prevent pressure build-up, the gear unit is provided with a breather which is integrated in the dipstick or with a separate breather (normal, anti-dust or anti-humidity breather).
Take care and check regularly that this breather does not become clogged.

9. COOLING

Heat generated in the gear unit due to friction and churning of the oil, must be dissipated through the housing into the environment. It is important not to decrease the heath dissipation capacity of the housing.
M **Regularly clean the surface of the housing.**

The temperature of the oilbath will rise with increased load. Continuous operating temperature of 80 to 85°C (175 to 185°F) is allowable for a standard gear unit filled with mineral oil.
Occasional operating temperatures of up to 95°C (200°F) are acceptable.

9.1. ADDITIONAL AIR COOLING

9.1.1. Fans

One or two fans may be mounted on gear unit shafts.

⚠ **Warning**
Do not run the gear unit without appropriate protection covers.

M **Check regularly that the air inlet and the air outlet are not obstructed.**
Fans need no special maintenance, except occasional cleaning.

9.1.2. Oil-to-air coolers

The service manual of the lubrication and cooling system gives detailed information about the oil-to-air cooler.

9.2. ADDITIONAL WATER COOLING

All water cooling systems must be connected to a non-calcareous water supply. See also the service manual on lubrication and cooling system and/or technical leaflets on specific instrumentation. The use of seawater must be specified with the order; coolers suited for use of seawater are available.

When the gear unit is not operating and freezing temperatures may occur, the water must be drained from the cooling system. Drain facilities have to be provided by the end user.

Unless otherwise stipulated, the water flow indicated on the dimensional drawing is the required rate for water at 20°C (70°F).

Depending on the load, the ambient temperature and the water temperature a lower rate can suffice. Adjust the water flow to obtain an oil temperature during operation between 60 and 80°C (140 and 180°F).

9.2.1. Oil-to-water coolers

Refer to the certified drawing for the connection of the oil-to-water cooler to the coolant supply system.
The service manual of the lubrication and cooling system gives detailed information about the oil-to-water coolers.

9.2.2. Cooling coils

The direction of the waterflow is optional.
The cooling coils are suited for fresh as well as for seawater.
Maximum allowable water pressure : 0,8 MPa (8 bar, 116 psi).

Connection of the cooling coil to the water supply.

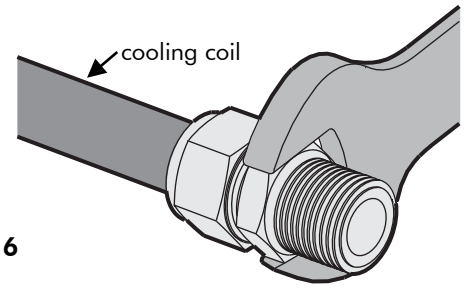


FIG. 6

Warning: In order to avoid torsioning of the cooling coil, hold the premounted connection with a suitable wrench as shown in fig. 6.

10. BACKSTOPS

Backstops are subject to wear and must be inspected or replaced at intervals depending on operating conditions. The customer must take all necessary precautions to prevent that failure of the backstop could cause physical injury and/or severe damage to the drive and/or application.

The time span between two checks of functioning depends on the operating conditions and the activation frequency, but should never exceed two years. These inspections are preferably carried out by qualified personnel authorized by Hansen Industrial Transmissions nv.
In case the backstop is part of a hoist drive which is subject to a periodical safety inspection, the check of the backstop must be included in the inspection procedure.

In case of transport of people: the user has to follow the local legislation re. the inspection of safety devices.

An inspection or replacement of the backstop is also required in the following circumstances:
- in case of disassembly of the gear unit or one of its components
- in the event that abnormal wear or material break-out of gears, bearings or any other component or pollution of the oil has been detected in the gear unit, since this may have affected the condition of the sprags and raceways of the backstop.

The outcome of the periodical inspection is to be reported in a log book.

⚠ **Never loosen any part of the backstop while the gear unit is loaded: loosening the backstop may cause reversal of the drive and running back of the load. Check if the gear unit is not loaded before loosening the backstop and secure the drive against unintentional movement.**

STANDARD BACKSTOP INTEGRATED IN THE GEAR UNIT:

These backstops are lubricated by the oil bath of the gear unit and require, apart from the regular inspections indicated above, no further maintenance.

❗ **Alteration of the direction of rotation of a backstop may only be carried out by qualified personnel authorized by Hansen Industrial Transmissions nv.**

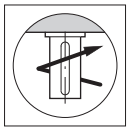
11. START UP

❗ 11.1. ALL GEAR UNITS

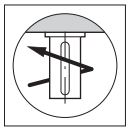
Check the internal components of the gear unit for corrosion before starting up the gear unit.
Repeat this check after each extended period of standstill (refer to section 12.6).
The result of this inspection must be documented and made available on request.
Any evidence of corrosion on internal components of the gear unit must be reported to Hansen Industrial Transmissions nv.

Before start up, check the oil level with the dipstick and make sure that all grease lubricating points are filled.

Although all greasing points have been greased before delivery, it is advisable to give a few shots with a grease gun before start up.
Check all fixation points between gear unit and foundation. They may require retightening after some running time.
Make sure that protection hoods and air guiding plates, if any, are properly fitted.
Gear units can rotate in both directions except when direction of rotation is indicated.
Always refer to the stickers on the gear unit and to the certified drawing.



Direction of rotation: clockwise (CW)



Direction of rotation: counter-clockwise (CCW)

11.2. GEAR UNITS EQUIPPED WITH A BACKSTOP

❗ **The customer has to check the good functioning of the backstop.**

❗ **On gear units equipped with a backstop, check whether the direction of rotation of the motor corresponds to the backstop freewheeling direction, before coupling the motor to the gear unit.**

In case of complete drive groups, the direction of rotation of the motor has to be checked by means of a phase meter.

❗ **Rotation of the gear unit in reverse direction, even momentarily, may damage the backstop, and is therefore not allowed.**

11.3. GEAR UNITS EQUIPPED WITH HEATERS

Gear units equipped with heaters must not be started before the oil temperature is above 5°C (40°F). Heaters have to be switched off automatically when the oil temperature is above 15°C (60°F).

11.4. GEAR UNITS WITH FORCED FEED LUBRICATION

For the different parts of the lubrication system, refer to the service manual of the lubrication and cooling equipment and/or the technical leaflets concerning the specific components.

11.5. GEAR UNIT DRIVEN BY A TWO SPEED MOTOR

When switching from the higher to the lower speed, first decelerate to below the lower speed so that the motor has to accelerate when switched on at the lower speed. In this way high synchronisation peak torques can be avoided.

[M] 12. MAINTENANCE

Refer to the MAINTENANCE TABLE on page 6.
Read carefully all paragraphs of chapter 12.

Read also the [M] points in the other paragraphs.

12.1. INSPECTION AND MAINTENANCE

Rotating parts may cause injuries and damage.
For inspection and maintenance always de-energize the drive and make sure that the gear unit and the drive are externally secured against unintentional switch-on or movement.

[M] 12.2. OIL CHANGE AND REGREASING THE LUBRICATION POINTS

12.2.1. General directives

Handle any lubricant or oil with care and according to the handling and safety instructions to be supplied by the lubricant supplier on customer's request. These instructions have to be handed over to any personnel performing installation, maintenance or repair of the gear unit.

Use clean oil from clean barrels. Avoid any penetration of abrasive particles and water. The water content should be no higher than 0.05% (derived following titration method accepted by the oil manufacturer).

To improve the steadiness of the bearing life time, it is highly recommended to use oil that has an initial oil cleanliness of -/15/12 (or better) according to ISO 4406.
Refer to the oil supplier to obtain this oil quality.

It is recommended to change the oil before summertime, hence running with fresh oil in the most critical period when thermal load is higher.

If the gear unit is provided with a heater, disconnect the heater from the electric supply before draining the oil.

Drain the oil while the gear unit is still warm. Be careful while draining the hot oil. Use an appropriate hot oil recipient, heat resistent clothing and gloves to avoid burns.
Every time the lubricant is changed, it is recommended to flush the gear unit and the corresponding lubrication and cooling system with fresh oil. Check to make sure that the gear unit, the lubrication and cooling system items are well drained after flushing .
Don't forget to renew the filter cartridge.
Operating procedure and specifications are mentioned in the service manual of the lubrication and cooling equipment and / or the technical leaflets for the specific instrumentation.
Disposable filter cartridges can not be cleaned.

External dipsticks and sight glasses must be periodically checked against the gear unit dipstick.

[M] 12.2.2. Oil change and regreasing

The first oil change
After 100 hours and not later than 800 hours of service:
- First regrease the lubrication points, if present.
  The lubrication points have to be regreased while the gear unit is warm.
- Change the oil. Use new oil or reuse the removed oil after filtering. **Don't use the filter of the lubrication system (if available).**
  Filter the removed oil volume at least 10 times. Use a 10 μm filter or smaller with a beta ratio of 200 or higher. The filter must be compatible with the used oil.
- After changing the oil, replace the filter cartridge of the lubrication system of the gear unit, if present.

Filter (if present)
Replace the filter cartridge after every 800 hours of operation unless the filter has a contamination indicator.
Before replacing the filter cartridge, run the gear unit a while after regreasing if this applies.

Grease lubrication (if lubrication points are present)
- Bearings: regrease all lubrication points after every 800 hours of operation.
- Labyrinth seals: regrease all lubrication points after every 3000 hours of operation. The lubrication interval should eventually be reduced depending on the application and the working conditions. In any case, the outer grease chamber may never be dry.

For longer lubrication intervals: consult Hansen Industrial Transmissions nv.
See paragraph 7.6 (page 29) for the greases to be used
Grease quantity for bearings: see page 35
Grease quantity for labyrinth seal: see page 37

Subsequent oil changes
After 4000 to 8000 hours or max. 18 months of operation depending on working conditions:
- First regrease the lubrication points (if present) while the gear unit is warm.
- Change the oil. Use clean oil from clean barrels. Avoid any penetration of abrasive particles and water.
- Replace the filter cartridge, if present.

[M] 12.3. OIL SAMPLE

When the oil sump temperature is frequently 80° to 95°C (175° to 200°F), or in the event of a dusty or humid atmosphere, it is recommended to have an oil analysis performed (by a laboratory acknowledged) by the oil brand name owner after every 4000 hours of service in order to determine the expected lifetime of the oil.
Oil sump temperature must never be higher than 95°C (200°F), since oil then will degenerate very fast.
A representative oil sample should be taken directly out of the oil sump. Drain a certain amount of oil (recommended oil volume 2 litres) before taking the oil sample. Make sure to use only appropriate and clean sample bottles. For the characteristics, the chemical properties and the grade of cleanliness of the sample bottle: refer to the laboratory acknowledged by the oil brand name owner.

Be careful while draining the hot oil. Use an appropriate hot oil recipient, heat resistent clothing and gloves to avoid burns.
Before start up, check the oil level with the dipstick and add oil when required.

[M] 12.4. CLEAN THE HEATER

If the gear unit is provided with a heater, it is recommended to clean regularly (at every oil change) the heater and to eliminate the deposition, in order to improve the life span of the heater.

12.5. OIL-LOCK™ OIL-GUARD™ (as an option)

Oil-Lock™
The high speed shaft is equipped as standard with an OIL-LOCK™ system.
For the Hansen P4 single stage gear units also the low speed shaft is equipped with an OIL-LOCK™ system.
This oil seal is wear resistant and maintenance free due to its centrifugal operating principle. The dual purpose labyrinth seal also prevents the entrance of dirt and moisture.
Disassembly of the OIL-LOCK™ seal should only be carried out by qualified personnel.

Oil-Guard™ as an option
The high speed shaft may be equipped as option with an OIL-GUARD™ system.
During operation, even in submerged conditions, the OIL-GUARD™system ensures leak free running conditions.
Disassembly of the OIL-GUARD™ system should only be carried out by qualified personnel.

12.6. EXTENDED PERIODS OF STANDSTILL

When gear units are at standstill for an extended period, the protective oil film containing anti corrosion additives gradually disappears and the unprotected internal parts become subject to corrosion. Adverse ambient conditions such as humid, marine, tropical and chemically aggressive environments will accelerate the process.
A periodic visual inspection through the inspection cover is required.
Corrosion of the internals can be avoided by running the gear unit for a few minutes every two weeks (depending on the ambient conditions) thus allowing the formation of a new oil film.
Install a special breather (marked with the label shown below) to prevent moisture from entering the gear unit.

If it is not possible to run the gear unit regularly and the risk for corrosion is imminent, during extended periods of standstill the gear unit must be protected as follows :
- an oil soluble concentrate including corrosion inhibitors which are active both in the liquid and in the vapour phase has to be added. A 2% volume concentration is considered to be normal. Consult your oil supplier about lifetime, compatibility with the actual oil and about volume concentration.
- seal all gear unit openings (dipstick, breather etc.) hermetically .

Before starting-up: read chapters 11 and 12. Replace the hermetical seals by the originally mounted equipment.

12.7. SERVICE AFTER SALES

For technical assistance or additional information, the Hansen Industrial Transmissions nv sales centres are at your disposal. When you contact them, please specify the complete type code and the manufacturing number mentioned on the gear unit's nameplate.

12.8. REPAIRS

Any repair should only be carried out by qualified personnel.
Only original Hansen Industrial Transmissions nv spare parts should be used.

No products or substances may be used in the gear unit that could bring foreign ingredients (particularly solid or friction reducing additives amongst) in the oil.

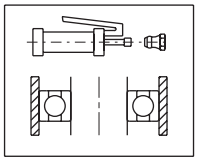
13. GREASE QUANTITIES FOR REGREASING

Grease quantity (Type Q.) in grams for bearings by regreasing

The type Q. is indicated on the nameplate (see page 11)

Greases, NLGI-Grade 3, recommended by the oil suppliers: see page 38

Sticker on the gear unit



Figures: see page 36

Bearings without grease nipple are oil lubricated.

Gear unit size	Type Q1	Type Q2	Type Q3	Type Q4		Type Q5	
	Fig. 7	Fig. 7	Fig. 7	Fig. 8		Fig. 9	
	B1	B1	B1	B1	B2	B1	B2
Z				10	20	10	20
A				20	20	20	20
B				30	30	30	30
C	50	60	50				
D	60	80	60				
E	90	110	90				
F	120	150	120				
G	170	200	170				
H	180	230	180				
J	220	280	220				
K	260	320	260				
L	320	400	320				
M	340	410	340				
N	380	380	290				
P	470	470	350				
Q	490	490	360				
R	500	500	380				
S	600	600	440				
T	620	620	470				

Gear unit size	Type Q6	Type Q7	Type Q8	Type Q9				
	Fig. 7	Fig. 7	Fig. 7	Fig. 10				
	B1	B1	B1	B1	B2	B3	B4	B5
Z								
A								
B								
C	100				50	30	20	10
D	130	100	120		60	40	30	20
E	180	130	170		90	50	40	20
F	240	180	220		120	80	50	30
G		220	320					
H		280	400	180				
J		320	410	220				
K		320	500	260				
L		410	590	320				
M		370	700	340				
N				290				
P				350				
Q				360				
R								
S								
T								

FIG. 7

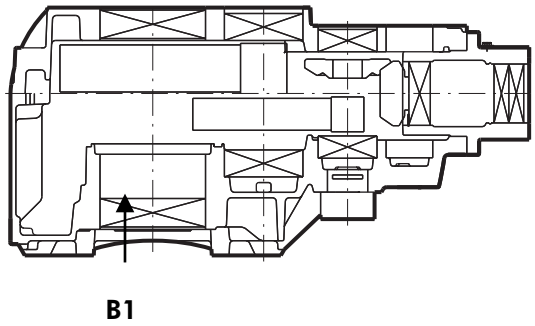


FIG. 8

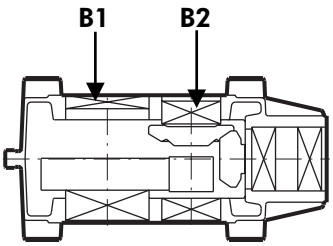


FIG. 9

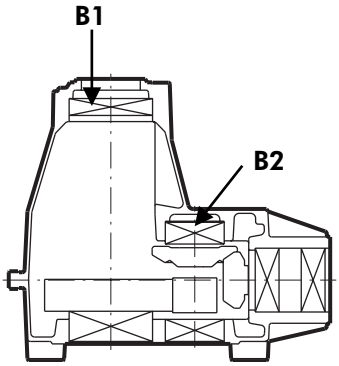
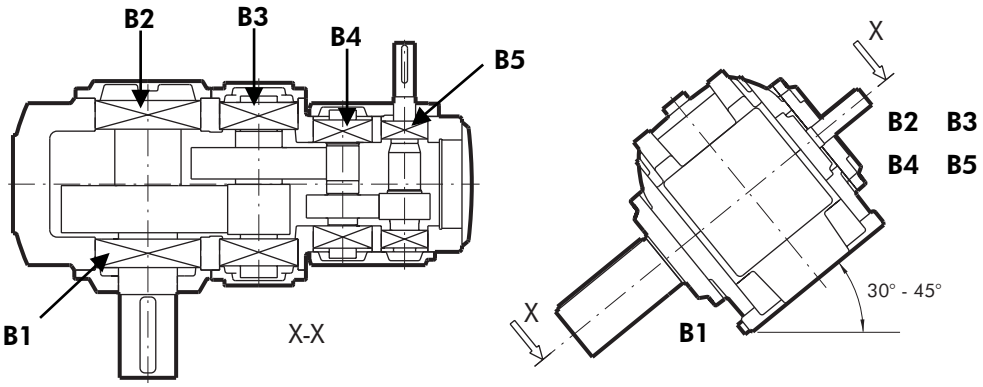


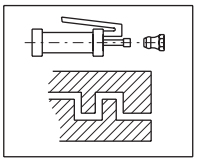
FIG. 10



Grease quantity in g for labyrinth seal by regreasing

Greases, NLGI-Grade 2, recommended by the oil suppliers: see page 38

Sticker on the gear unit



On low speed shaft

Single stage gear units

Gear unit Type	g
QHRC1Z-..N	75
QHRD1Z-..N	75
QHRF1Z-..N	45

Gear unit Type	g
QHPC1	10
QHPD1	10
QHPE1	15
QHPF1	25
QHPG1	35

Gear unit Type	g
QVPZ1	10
QVPB1	10

Multi stage gear units

Gear unit Size	..N g	..D / ..K g
C	25	25
D	35	25
E	55	30
F	60	65
G	75	65
H	60	120
J	60	130
K	130	145
L	135	155
M	145	160
N	215	
P	230	
Q	240	
R	255	
S		
T		

Gear unit Type	g
QVRZ2	50
QVRZ2L	30
QVRA2	70
QVRA2L	40
QVRB2	50
QVRB2L	55

..N: gear unit with solid low speed shaft

..D / ..K: gear unit with hollow low speed shaft

On high speed shaft

Single stage gear units

Gear unit Type	g
QHPC1	10
QHPD1	10
QHPE1	20
QHPF1	30
QHPG1	40

Multi stage gear units

Gear unit	QHP..		QHR..			QVP..		QVR..		
Size	QHP.2	QHP.3	QHR.2	QHR.3	QHR.4	QVP.2	QVP.3	QVR.2	QVR.3	QVR.4
Z	-	-	-	-	-	-	-	10	-	-
A ./. H	10	10	10	10	10	10	10	10	10	10
J ./. T	20	20	20	20	20	20	20	20	20	20

14. LUBRICANTS

14.1. MINERAL OILS AND GREASES

For Hansen P4 standardized gear units
Unless indicated otherwise on the gear unit's name plate, the oils and lubricants must be selected from the tables below, containing oils and greases recommended by the respective brand name owners. The required viscosity grade of the oil is mentioned on the name plate.
If nothing is mentioned on the gear unit's name plate, only mineral oils and greases have to be used.

mm²/s 40°C	ISO VG150 (1)	ISO VG220	ISO VG320	ISO VG460	Bearing grease Graisse pour roulement Wälzlagerfett Lagervet (2)
AGMA	4 EP	5 EP	6 EP	7 EP	
cSt/50°C	90	126	184	230	
E/50°C	11,9	16,6	24,3	30,4	
SUS/100°F	690	1100	1600	2300	
BP	Energol GR-XP 150 Formulation L04021PBA	Energol GR-XP 220 For- mulation L04022PBA	Energol GR-XP 320 Formulation L04023PBA	Energol GR-XP 460 Formulation L04024PBA	Energrease LS-EP 2 Energrease LS-EP 3
CASTROL	Alpha SP 150 Formulation L02045PBA	Alpha SP 220 Formulation L02046PBA	Alpha SP 320 Formulation L02047PBA	Alpha SP 460 Formulation L02048PBA	Spheerol EPL **(2)**
FUCHS EUROPE SCHMIERSTOFFE	Renolin CLP 150 Formulation 3110247	Renolin CLP 220 Formulation 3110248	Renolin CLP 320 Formulation 3110249	Renolin CLP 460 Formulation 3110250	Renolit FEP 3 / Renolit FEP 2 **(2)**
KLÜBER	Klüberoil GEM 1-150 N	Klüberoil GEM 1-220 N	Klüberoil GEM 1-320 N	Klüberoil GEM 1-460 N	Centoplex 2EP **(2)**
(EXXON)MOBIL	Mobilgear XMP 150 Formula(tion) RL001893E	Mobilgear XMP 220 Formula(tion) RL001893F	Mobilgear XMP 320 Formula(tion) RL001893H	Mobilgear XMP 320 Formula(tion) RL001893J	Mobilux EP 3
(EXXON)MOBIL	Mobilgear 600 XP 150	Mobilgear 600 XP 220	Mobilgear 600 XP 320	Mobilgear 600 XP 460	Mobilux EP 3
SHELL	Omala F 150 Formulation 1996 **(3)**	Omala F 220 Formulation 1996 **(3)**	Omala F 320 Formulation 1996 **(3)**	Omala F 420 Formulation 1996 **(3)**	Alvania EP 2 **(2)**
STATOIL	LoadWay EP 150 Formulation SL970307-150	LoadWay EP 220 Formulation SL970307-220	LoadWay EP 320 Formulation SL970307-320	LoadWay EP 460 Formulation SL970307-460	Uniway Li 62 **(2)**
TOTAL		Carter XEP 220 Formulation I31293	Carter XEP 320 Formulation I31293	Carter XEP 460 Formulation I31293	Multis EP 3
TOTAL		Carter EP 220 Formulation I31238	Carter EP 320 Formulation I31238	Carter EP 460 Formulation I31238	Multis EP 3

(1) Only for low ambient temperatures, see nameplate of the gear unit.
(2) Use only high quality greases, with EP-additives and consistency NLGI-Grade 3. Greases with EP-additives and consistency NLGI-Grade 2 may be used for regreasable labyrinth type seals and grease lubricated lower bearing of the low speed shaft.
(3) Composition formulation of the product designated by the year of its market introduction.

General notes

- If the gear unit is filled with storage oil, it has to be drained and it may in some instances be necessary to rince the gear unit with the selected oil before starting up. Check with the oil supplier.
- Oil and lubricant manufacturers can change product compositions.
- The lubricating oils with the composition formulations mentioned in the above tables have to be used.
- The greases mentioned in the above table have to be of a product composition formulation of before January 10th 2005; a confirmation from the grease or oil supplier is essential.
- Hansen Industrial Transmissions nv is not responsible nor liable for composition changes.
  The oil and lubricant suppliers are responsible for the selection and composition of their products.
- If the customer does not wish to follow Hansen Industrial Transmissions nv' oil and grease prescriptions, the customer assumes responsibility for the technical suitability of the lubricant used.
- If the customer would like to use another oil in the gear unit than the oil he last filled in the gear unit, he has to consult the oil supplier regarding the compatibility of the two oils and the measures that possibly should be taken for reliable operation of the gear unit with the new oil and the possible residues and/or components of the old oil that could be present in the gear unit.
- Any oil and lubricant shall be handled with care and according to the handling and safety instructions to be supplied by the lubricant supplier on customer's request.
  These instructions have to be handed over to any personnel performing installation, maintenance or repair of the gear unit.

14. LUBRICANTS

14.2. POLYALPHA-OLEFINE BASED SYNTHETIC OILS AND SUITABLE GREASE

For Hansen P4 standardized gear units
Unless indicated otherwise on the gear unit's name plate, the oils and lubricants must be selected from the tables below, containing oils and greases recommended by the respective brand name owners. The required viscosity grade of the oil is mentioned on the name plate.
If nothing is mentioned on the gear unit's name plate, only mineral oils and greases have to be used.

Synthetic oils may be used only after written authorisation from the Engineering Department of Hansen Industrial Transmissions nv.

mm^2/s 40°C	ISO VG150 (1)	ISO VG220	ISO VG320	ISO VG460	Bearing grease Graisse pour roulement Wälzlagerfett Lagervet (2)
AGMA	4 EP	5 EP	6 EP	7 EP	
cSt/50°C	90	126	184	230	
E/50°C	11,9	16,6	24,3	30,4	
SUS/100°F	690	1100	1600	2300	
BP	Enersyn EP-XF 150 Formulation L04025PBA	Enersyn EP-XF 220 Formulation L04026PBA	Enersyn EP-XF 320 Formulation L04027PBA	Enersyn EP-XF 460 Formulation L04028PBA	FAG Arcanol VIB3
CASTROL	Alphasyn EP 150 Formulation L98120PBA	Alphasyn EP 220 Formulation L98115PBA	Alphasyn EP 320 Formulation L98111PBA	Alphasyn EP 460 Formulation L98113PBA	FAG Arcanol VIB3
KLÜBER	Klübersynth GEM 4-150 N	Klübersynth GEM 4-220 N	Klübersynth GEM 4-320 N	Klübersynth GEM 4-460 N	FAG Arcanol VIB3
(EXXON) MOBIL	Mobilgear SHC XMP 150 Formulation RL001983E	Mobilgear SHC XMP 220 Formulation RL001983F	Mobilgear SHC XMP 320 Formulation RL001983H	Mobilgear SHC XMP 460 Formulation RL001983J	FAG Arcanol VIB3
(EXXON) MOBIL	Mobil SHC Gear Series 150	Mobil SHC Gear Series 220	Mobil SHC Gear Series 320	Mobil SHC Gear Series 460	FAG Arcanol VIB3
SHELL	Omala HD 150 = Omala S4 GX 150 Formulation 2007 **(3)**	Omala HD 220 = Omala S4 GX 220 Formulation 2007 **(3)**	Omala HD 320 = Omala S4 GX 320 Formulation 2007 **(3)**	Omala HD 460 = Omala S4 GX 460 Formulation 2007 **(3)**	FAG Arcanol VIB3
TOTAL		Carter SH 220 Formulation I31219	Carter SH 320 Formulation I31219	Carter SH 460 Formulation I31219	FAG Arcanol VIB3

(1) Only for low ambient temperatures, see nameplate of the gear unit.
(2) Use only high quality greases, with EP-additives and consistency NLGI-Grade 3. Greases with EP-additives and consistency NLGI-Grade 2 may be used for regreasable labyrinth type seals and grease lubricated lower bearing of the low speed shaft.
(3) Composition formulation of the product designated by the year of its market introduction.

General notes

- If the gear unit is filled with storage oil, it has to be drained and it may in some instances be necessary to rince the gear unit with the selected oil before starting up. Check with the oil supplier.
- Oil and lubricant manufacturers can change product compositions.
- The lubricating oils with the composition formulations mentioned in the above tables have to be used.
- The greases mentioned in the above table have to be of a product composition formulation of before January 10th 2005; a confirmation from the grease or oil supplier is essential.
- Hansen Industrial Transmissions nv is not responsible nor liable for composition changes.
  The oil and lubricant suppliers are responsible for the selection and composition of their products.
- If the customer does not wish to follow Hansen Industrial Transmissions nv' oil and grease prescriptions, the customer assumes responsibility for the technical suitability of the lubricant used.
- If the customer would like to use another oil in the gear unit than the oil he last filled in the gear unit, he has to consult the oil supplier regarding the compatibility of the two oils and the measures that possibly should be taken for reliable operation of the gear unit with the new oil and the possible residues and/or components of the old oil that could be present in the gear unit.
- Any oil and lubricant shall be handled with care and according to the handling and safety instructions to be supplied by the lubricant supplier on customer's request.
  These instructions have to be handed over to any personnel performing installation, maintenance or repair of the gear unit.

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