

Hansen P4

Standardized
gear units

Réducteurs de
vitesse standard

Normzahnrad-
getriebe

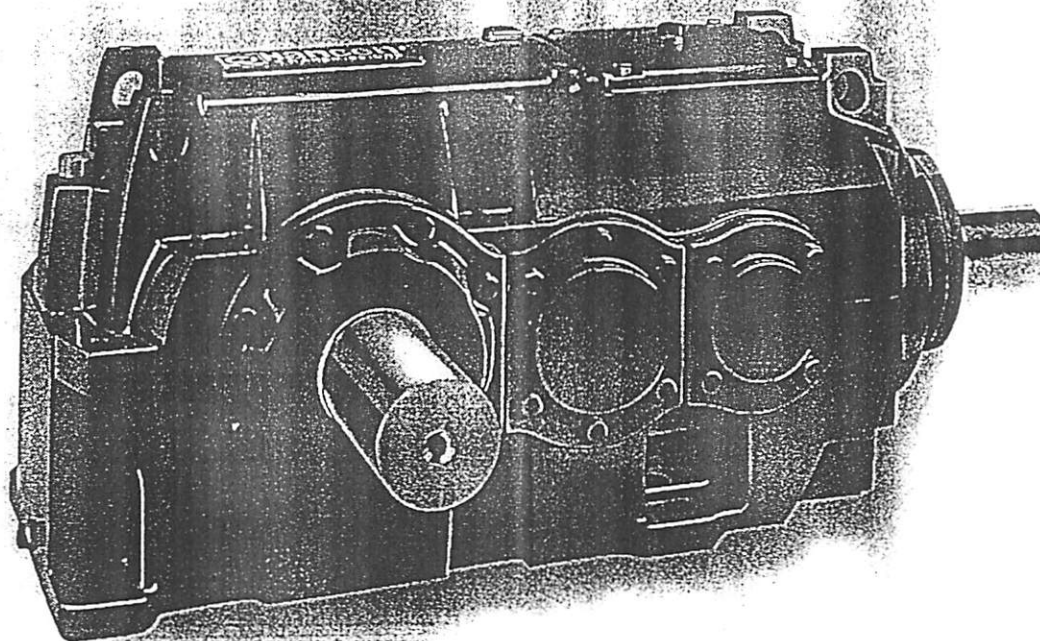
Standaard
tandwielkasten

Service
manual

Manuel
d'entretien

Betriebs-
anleitung

Bedrijfs-
handboek



Model No. : QHPK-F

SHIPPED
WITHOUT OIL

LIVRE
SANS HUILE

GELIEFERT
OHNE ÖL

GELEVERD
ZONDER OLIE



ISO 9001
CERTIFICATE
No 902270



**BROOK
Hansen**



P O W E R F U L C O N N E C T I O N S

ENGLISH : see pages 4...10

⚠ : CHECK POINTS

M : MAINTENANCE

CONTENTS	Page
1 GENERAL	4
2 SHIPPING	4
3 STORAGE	4
4 HANDLING	4
5 INSTALLATION	5-6-7-8
6 LUBRICATION	8-9
7 COOLING	9
8 BACKSTOPS	10
9 STARTING-UP	10
10 MAINTENANCE	10
LUBRICANTS	32

FRANCAIS : voir pages 11...17

⚠ : POINTS DE VERIFICATION

M : ENTRETIEN

INDEX	Page
1 GENERALITES	11
2 LIVRAISON	11
3 ENTREPOSAGE	11
4 MANUTENTION	11
5 INSTALLATION	12-13-14-15
6 LUBRIFICATION	15-16
7 REFROIDISSEMENT	16-17
8 ANTIDEVIREURS	17
9 MISE EN MARCHÉ	17
10 ENTRETIEN	17
LUBRIFIANTS	32

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SCOPE

This service manual contains the installation, operating, lubrication and maintenance instructions relative to the Hansen P4 standardised gear units. Additional information can be obtained by contacting one of the BROOK HANSEN sales centres worldwide (p. 2-3)

1. GENERAL

1.1. GENERAL INSTRUCTIONS

Carefully read this manual before installing the gear unit. Compliance with the instructions will assure long and troublefree operation of the gear unit.

- ⚠ The equipment should be checked against shipping papers and inspected for apparent damage sustained during transport. Any shortage, discrepancy or damage must immediately be reported to BROOK HANSEN.

1.1.1. 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.

⚠ 1.1.2. Safety

It is not allowed to use the gear unit for other applications or in other operating conditions than the one for which it is ordered.

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 local safety regulations.

Heaters, coolers, electrical alarms and other safety or monitoring devices supplied by BROOK HANSEN with the equipment must be installed and connected by the user as indicated on the relative document

1.2. GENERAL SPECIFICATIONS

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

1.3. 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.

The nameplate, which is fitted on each gear unit, also contains ratings and/or torque, speed and lubrication instructions. This information is essential to identify positively the unit supplied by BROOK HANSEN

2. SHIPPING

Prior to shipment each unit has been inspected and accepted by the QUALITY CONTROL DEPARTMENT according to order specifications, and after no load test of several hours in its normal operating position and at speed indicated on the nameplate

2.1. 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 events, the end-user must take care of the assembly (see chapter 5. INSTALLATION p. 5).

- ⚠ The HANSEN P4 gear unit is shipped without oil.

All grease lubrication points are factory filled.

2.2. PAINTING

The standard external paint for Brook Hansen gear units is an epoxy primer with high solids content, corresponding to the German Standard RAL 5021, water blue.

This paint system offers a 5 year protection for indoor installation provided the gear unit is not subjected to humid or chemical aggressive atmospheric conditions.

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

2.3. 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 and waxed paraffin paper. 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 storage for up to one year indoors.

3. STORAGE

- ⚠ Always store gear units in their originally supplied shipping conditions.

Gear units should not be stored near vibrating machines in order to avoid damage to bearings.

3.1. SHORT TERM STORAGE

Up to one year indoors. Always store units in their originally supplied shipping conditions

3.2. LONG TERM STORAGE

Max. 5 years indoors or 6 months outdoors.

- The protection should be kept intact if long term storage was specified at order placement.
- In all other cases the gear unit must be filled with a small amount of mineral oil containing a volatile corrosion protection additive. All gear unit openings (dipstick, breather etc.) should be hermetically sealed. Some additives may be added to the normal oil. Consult your oil supplier.

4. 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 or integral rods (vertical mount).

For equal load sharing make use of all lifting eyes and use adequate tools

- ⚠ Lifting eye nuts must not be removed.
Never lift units with slings wrapped around the shafts.

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. INSTALLATION

5.1. FITTING OF ACCESSORIES

The metric shaft extensions are equipped with keyways according to ISO/R773-1969 and DIN 6885 "Blatt 1 - Form N1 or N3". Threaded centre holes in these shafts according to DIN 332 Teil 2 Form D. Recommended bore tolerance for the couplings or other components to be mounted is K7 (as per ISO 286). The inch shaft extensions are equipped with keyways according to USAS B17.1-1967.

Recommended bore tolerance :

- 0.0005" to - 0.001" for diameters $\leq 1 \frac{1}{2}"$
- 0.001" to - 0.002" for diameters $> 1 \frac{1}{2}"$

Remove protection from shaft extensions and check keyfit and keyway height in component to be mounted onto shaft. Heating the component to 80-100°C (175-210°F) will be helpful. Threaded centre hole in shaft to assist in mounting components onto shaft may be used.

⚠ Never mount components by impact 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.

5.2. EXTERNAL LOADS

If external loads act on the gear unit, thrust blocks must be installed against the unit's feet, to prevent 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 service. 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.

5.3. ERECTION

5.3.1. Levelling

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

Before altering this position or inverting the unit, please consult BROOK HANSEN.

It may be necessary to readapt the lubrication system.

5.3.2. Alignment

Align gear unit as accurately as possible with driving and driven machinery. Install gear unit level to better than 5 mm per 1 m (5/32 inch per 3 feet or 5 mrad or 17 arc minutes) or within the limits indicated on the outline drawing for positions other than horizontal.

Maximum allowable misalignment depends on the couplings fitted on the shaft extension, please refer to data provided with coupling.

Use three fixation points of gear unit for alignment. Adjust other fixation points by shimming to 0,1 to 0,2 mm (0.004 to 0.008 inch), depending on the size of the gear unit.

5.4. SECURING OF SOLID SHAFT GEAR UNIT

⚠ Gear unit must be mounted onto a rigid and stable bedplate or foundation in order to avoid vibrations.

Use fixation holes indicated on dimensional drawing.

After correct alignment and shimming of all points, fix gear unit solidly onto its foundation with appropriate size bolts, grade 8.8 according to DIN 267 or SAE grade 5 for bolts $1 \frac{1}{2}"$ and smaller, ASTM A-354 grade BC for bolts larger than $1 \frac{1}{2}"$. Dimensions and tightening torques see table.

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

Horizontal mount

Gear unit size	A	B	C	D	EF	GHIK	L-M	N-P-Q	R-S-T
Bolt size	ISO M16	M20	M24	M24	M30	M36	M42	M48	M56
UNC	5/8"	3/4"	1/8"	1"	1 1/4"	1 1/2"	1 3/4"	2"	2 1/4"
Tightening torque	Nm	165	285	450	660	1150	2000	2500	3500
lbf.in	1450	2500	4000	5800	10000	18000	22000	31000	47000

Vertical mount

Gear unit size	C	D	E	F-G(1)	G(2)-H-I-K	L-M-N-P-Q	R-S-T
Bolt size	ISO M24	M30	M30	M36	M42	M48	M56
UNC	1"	1 1/8"	1 1/4"	1 1/2"	1 3/4"	2"	2 1/4"
Tightening torque	Nm	660	830	1150	2000	2500	3500
lbf.in	5800	7300	10000	18000	22000	31000	47000

(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 have been carefully checked before shipment. It is nevertheless required to check that the bedplate has not been deformed during transport or erection. Therefore check again alignment of couplings or other elements after final installation.

5.5 SECURING OF HOLLOW SHAFT GEAR UNITS

5.5.1. Hollow shaft gear unit with shrink disc connection

The BROOK HANSEN supplied shrink disc is ready to be installed.

Therefore do not dismantle shrink disc prior to first mounting.

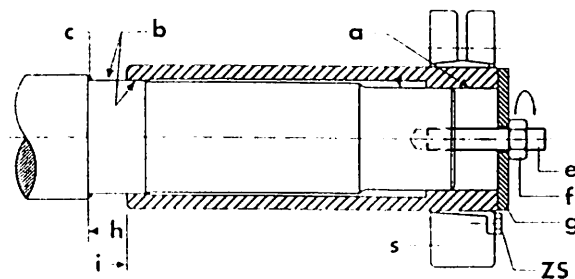
The HSD-type is used as standard (fig. 1c, page 6).

Upon request the SD-type is possible (fig. 1d, page 6).

⚠ Mounting (fig. 1a)

- Clean and degrease contact surfaces (a) and (b).
- Smear surface (b) and not surface (a) with "Molykote 321R" 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 HSD-type is shown in table 1 (page 6). For the SD-type it can be found on the dimensional drawing.

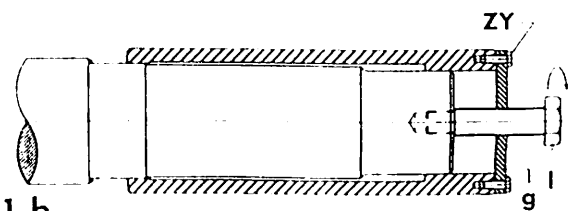
NOTE : Never tighten bolts when shrink disc is unmounted.



1 a

MOUNTING

FIG. 1



1 b

DISMOUNTING

HSD type (fig. 1c)

The tightening torques (TA) are 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).

SD type (fig. 1d)

The tightening torques are indicated on the name plate (p) and on the dimensional drawing. Remove spacers, attached for shipping, from between outer rings (o). When mounting and during tightening make sure that outer faces remain parallel.

HSD + SD type

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.

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 7).

Dismounting (fig. 1b, page 5)

- Loosen all tightening bolts (ZS) uniformly, one by one in a continuous sequence, about a quarter of a turn per round.
- Should outer and inner ring of the HSD-type not release themselves, one can remove some tightening bolts and install them in tapped holes (r), 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 dimension 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.

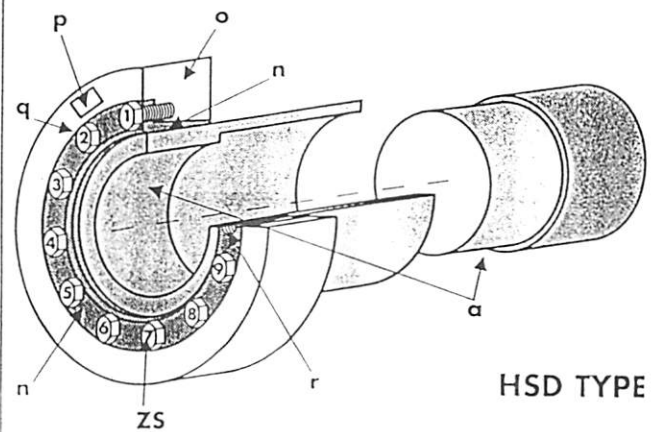
Cleaning and greasing

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 321R or similar.

Table 1

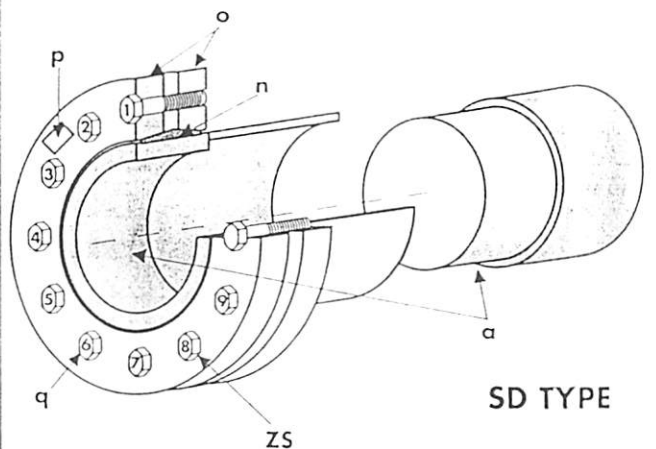
Shrink discs	TA Nm	TA lbf in
HSD 110 81 x 110	121	1070
HSD 125 81 x 125	121	1070
HSD 140 81 x 140	193	1700
HSD 165 81 x 165	295	2600
HSD 185 81 x 185	295	2600
HSD 220 81 x 220	570	5000
HSD 240 81 x 240	570	5000
HSD 260 81 x 260	570	5000
HSD 280 81 x 280	570	5000
HSD 320 81 x 320	980	8600
HSD 340 81 x 340	980	8600
HSD 360 81 x 360	980	8600
HSD 390 81 x 390	1450	12800
HSD 420 81 x 420	1450	12800
HSD 440 81 x 440	1450	12800
HSD 480 81 x 480	1450	12800
HSD 500 81 x 500	1970	17400
HSD 530 81 x 530	1970	17400



1 c

HSD TYPE

FIG. 1



1 d

SD TYPE

5.5.2. Hollow shaft gear unit with keyway connection

Mounting (fig. 2a)

- Cool mating faces (b) of the machine shaft with sealing 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) has sufficient clearance on top.
- Fit the key (m) into the shaft (= mounting key).
- Remove 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).

Dismounting (fig. 2c)

- Remove the protection cover (k) and the fixation bolts (j).
- 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 ports e, f, i and ZY are not included as standard, but can be supplied upon special request.
For technical data, refer to catalogue or certified drawing.

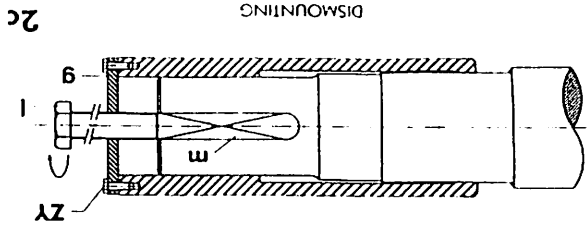
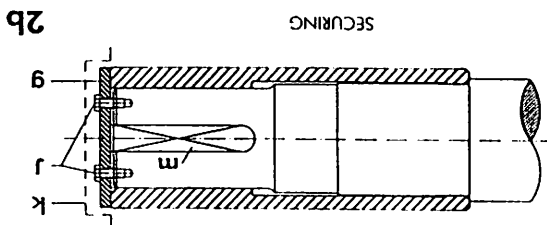
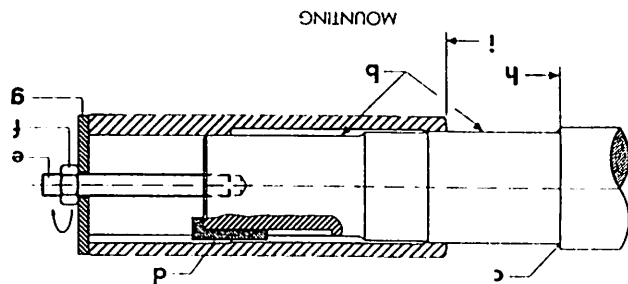
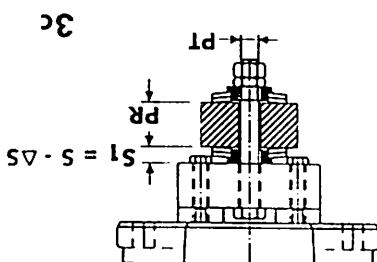
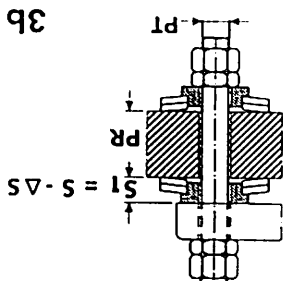
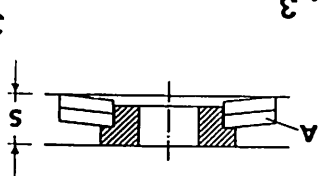


FIG. 2

FIG. 3



5.5.3. Mounting of the torque arm

After fitting and securing the gear unit to the driven shaft (see par. 5.5.1 and 5.5.2), 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 disc springs in unloaded and unmounted condition.
- Screw the nuts until spacing S1 (spacing between gear unit and fixed point) is reached, where $S1 = S - \Delta S$ (fig. 3b, 3c, 3d).
- Determine the spacing S (fig. 3a), this is the spacing of the disc springs in unloaded and unmounted condition.
- Screw the nuts until spacing S1 (spacing between gear unit and fixed point) is reached, where $S1 = S - \Delta S$ (fig. 3b, 3c, 3d).
- When the prescribed spacing S1 is obtained, lock the nuts by tightening outer nut against inner nut.

Gear unit size	PT	PR max	mm	inch	mm	inch	ΔS	Q°	A
QH.A2	M16	40	1.57	0.7	0.028	2 x 2	A 80	2 x 2	A 80
QH.B2	M20	50	1.97	0.7	0.028	2 x 2	A 100	2 x 2	A 100
QH.C2	M24	60	2.36	0.9	0.035	2 x 2	A 125	2 x 2	A 125
QH.D2	M24	60	2.36	0.9	0.035	2 x 2	A 100	2 x 2	A 100
QH.E2	M30	75	2.95	1.0	0.039	2 x 3	A 125	2 x 3	A 125
QH.F2	M30	75	2.95	1.0	0.039	2 x 3	A 125	2 x 3	A 125
QH.G2	M36	90	3.54	1.0	0.039	2 x 4	A 125	2 x 4	A 125
QH.H2	M36	90	3.54	1.0	0.039	2 x 4	A 125	2 x 4	A 125

Table 2

Q°: number of disc springs

Gear unit size	PT	PR max	mm	inch	mm	inch	ΔS	Q°	A
QH.C3	M20	50	1.97	0.7	0.028	2 x 3	A 80	2 x 3	A 80
QH.D3 - QH.D4	M24	60	2.36	0.9	0.035	2 x 2	A 100	2 x 2	A 100
QH.E3 - QH.F4	M30	75	2.95	1.0	0.039	2 x 3	A 125	2 x 3	A 125
QH.G3 - QH.G4	M36	90	3.54	1.0	0.039	2 x 3	A 125	2 x 3	A 125
QH.H3 - QH.H4	M36	90	3.54	1.0	0.039	2 x 3	A 125	2 x 3	A 125

Q°: number of disc springs

Table 3

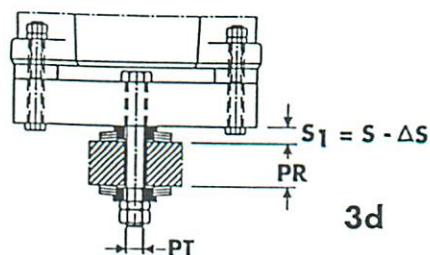


Table 4

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

Q*: number of disc springs

6. 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

BROOK HANSEN gear units 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 COOLING).

6.1. SPLASH LUBRICATION

Splash lubrication is standard with horizontal shaft gear units and for speeds between 750 and 1800 min⁻¹ at the high speed shaft. 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 BROOK HANSEN.

6.2. 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.

In case of motorpumps the direction of rotation is always indicated.

Built-on pumps reach their normal operating capacity already after a few seconds. However, in order to avoid unwanted alarm during the start-up period, we recommend to delay the triggering of the warning signal by 5 to 10 seconds.

⚠ Motorpumps should be switched on at least one minute before starting the gear unit.

6.2.1. Circulation lubrication

With integral pump (fig.4).

The circulation lubrication system consists of

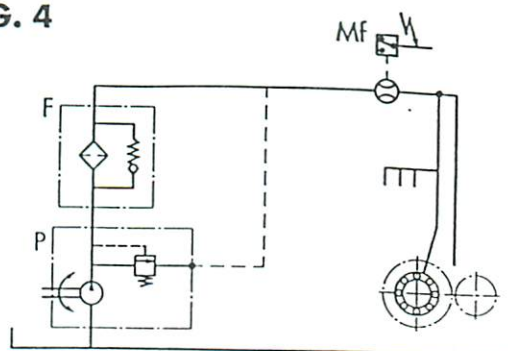
- a pump P
- a filter F with bypass (standard from gear unit size G onwards)
- a flow switch MF (standard from gear unit size G onwards)

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

With motorpump

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

FIG. 4



6.2.2. Pressure lubrication

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

6.2.3. Instrumentation and settings

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 BROOK HANSEN and should not be altered without written authorisation.

Presettings, if stated, are recommended values set by BROOK HANSEN, but may be altered according to local conditions.

6.3. LUBRICANT SELECTION

Mineral oils containing EP additives, which increase oil film load capacity, should be used.

⚠ Always use oil of the type and with viscosity characteristics corresponding to those given on gear unit's nameplate.

The viscosity has been selected according to operating conditions specified in the order.

For conversion from ISO viscosity class VG to other viscosity units see table of corresponding lubricants p. 32.

The table is not exhaustive; equivalent brands may be used.

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

⚠ Synthetic oils may be used only after written authorisation from the BROOK HANSEN Engineering Department.

Only synthetic oils of the polyalpha-olefine type (SHF-type, Synthetic Hydrocarbon Fluid) containing EP additives may be used. Due to the good oxidation-durability of synthetic oils their life expectancy is longer than that of mineral oils of the same viscosity and for the same working conditions. A longer use is only permitted if an oil analysis is made regularly (every 4000 hours) by the oil supplier or a qualified laboratory, in order to determine the exact life-time of the oil.

⚠ 6.4. OIL QUANTITY (see fig. 5, page 9)

Ⓜ The oil level is determined by min. and max. markings on the dipstick.

An oil level glass or an oil level switch are optionally available.

THREADED DIPSTICKS SHOULD BE CHECKED IN PLUGGED POSITION.

The oil level must be checked when the gear unit is out of operation.

On systems with filters and coolers, oil level must be checked with lubrication and cooling system filled with oil and after short test run.

The lubrication and cooling system, including the cooler, is automatically utilized when the oil bath temperature rises above 60°C (140°F). If oil filling is required to take place earlier, manual ventilation of the cooler must be carried out 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.

6.6. GREASE SELECTION (see table page 32)

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 re-greasing labyrinth type seals and grease lubricated lower bearing of the low speed shaft.

6.7. 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.
Some built-in backstops are greased lubricated.
For detailed information refer to appropriate leaflet supplied with this manual.

6.8. OIL DRAINING (see fig. 5)

Drain the oil while unit is still warm. To facilitate oil draining, remove dipstick. Drain units having a large oil volume through drain plug. Use 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).

6.9. VENTILATION (see fig. 5)

To prevent pressure buildup, the gear unit is provided with a breather which is generated integrated in the dipstick.
Take care and check regularly that this breather does not become clogged.
For some applications, the dipstick with breather hole is replaced by one without breather hole in combination with an anti-dust or anti-humidity breather.

7. 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 heat dissipation capacity of the housing. Regularly clean the surface of the housing.

7.1. SEPARATE AIR COOLING

7.1.1 Fans

One or two fans may be mounted on gear unit shafts.
Check regularly that the air inlet and the air outlet are not obstructed.
Fans need no special maintenance, except occasional cleaning.

7.1.2. Air oil coolers

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

7.2. SEPARATE WATER COOLING

All water cooling systems must be connected to a non-corrosive water supply. See also 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 unit is not operating and freezing temperatures may occur, water must be drained from cooling system. Drain facilities have to be provided by end user.
Unless otherwise stipulated, the water flow indicated on the dimensional drawing is the required rate for water at 20°C (70°F).
According to load, ambient temperature and the water temperature a lower rate will suffice. Adjust waterflow to obtain an oil working temperature between 60 and 80°C (140 and 180°F).

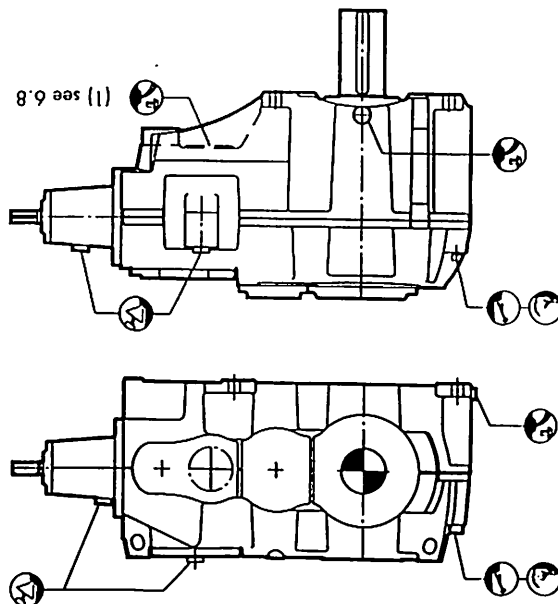
7.2.1. Water-oil coolers

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

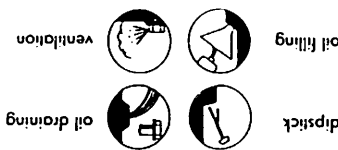
7.2.2. Cooling coils

Direction of 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)

FIG. 5



Type and position of the
stickers refer to certified
drawing and gear unit



6.5. 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.

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 on initial oil filling 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.
Units with horizontal shafts (QH) equipped with a motorbase M1 and M3 must be filled on initial filling with a small quantity of oil 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 through lack of space between the motor base and the gear unit upper face, the motor base should be raised following removal of the bell.
For gear units with M1 motor base the normal oil filling plug is located at the side of the output shaft, opposite the side where the dipstick is located.
For gear units with M3 motor base the normal oil filling plug is located at the side of the dipstick.
If the gear unit is filled with storage oil, it has to be drained and it may in some instances be necessary to rinse the gear unit with the selected oil before starting up. Check with the oil supplier.

8. BACKSTOPS

The standard backstops are integrated in the gear unit. They are lubricated by the gear unit oil bath and require no further maintenance.

The backstops have to be inspected at regular intervals; the time span between two inspections depends on the operating conditions and the braking frequency, but should never exceed two years.

The inspection should be executed by competent personnel.

⚠ Direction of rotation, indicated on the gear unit with a backstop, can only be altered by competent personnel.

For information relating to lubrication, maintenance and inspection of externally fitted backstops; refer to the corresponding Service Manual.

9. STARTING-UP

⚠ 9.1. ALL GEAR UNITS

Before starting-up, check oil level with dipstick and make sure that all points are lubricated.

Although all greasing points have been greased before delivery, it is advisable to give a few shots with a grease gun before starting-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, in case of fan cooling are properly fitted.

Gear units may rotate in both directions except when direction of rotation is indicated.

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

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

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

Units equipped with heaters must not be started before oil temperature is above 5°C (40°F). Heaters are automatically disconnected when oil temperature is above 15°C (60°F).

Temperature of oilbath will rise with increased load. Continuous operating temperature of 95°C (200°F) is allowable for a standard gear unit filled with mineral oil.

9.2. GEAR UNITS WITH FORCED FEED LUBRICATION

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

9.3. GEAR UNIT DRIVEN BY A TWO SPEED MOTOR

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

M 10. MAINTENANCE

Maintenance operations are limited to check oil level, to regular oil change, to regrease the lubrication points and filter cleaning.
Oil quantity : see paragraph 6.4, page 8.
Oil draining : see paragraph 6.8, page 9.

Read also **M** points in the other paragraphs.

M 10.1. OIL CHANGE

The first oil change should be carried out preferably after 100 hours and not later than 800 hours of operation. The removed oil may be used again after filtering. Use a 10 µm filter or smaller.

Subsequently the oil should be renewed after 4000 to 8000 hours or max. 18 months of operation depending on working conditions.

If the lubrication system has an oil filter, change the filter cartridge every 800 hours of operation.

Operating procedure and specifications are mentioned in the service manual of the lubrication and cooling equipment and / or the technical leaflets concerning the specific instrumentation.

Only steel mesh filter cartridge may be used again if thoroughly cleaned in a solvent.

When operating continuously at temperatures of 90° to 95°C (190 to 200°F) and in dusty and/or in humid atmosphere, it is recommended to have oil analyses by oil supplier or qualified laboratory at least after 4000 hours in order to define exact lifetime of oil bath.

M 10.2. GREASE LUBRICATION POINTS

Regrease all lubrication points after every 800 hours of operation. Recommended greases are given in lubricant table. (page 32)

For longer lubrication intervals: consult BROOK HANSEN.

10.3 MAINTENANCE FREE OIL-LOCK™ SEAL

The high speed shaft is equipped as standard with an OIL-LOCK™ oil seal. 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 skilled personnel.

10.4. SERVICE AFTER SALES

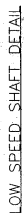
For technical assistance or additional information, the BROOK HANSEN sales centres are at your disposal. When you contact them, please specify the complete type code and the manufacturing number mentioned on the gear unit's nameplate.

10.5. REPAIRS

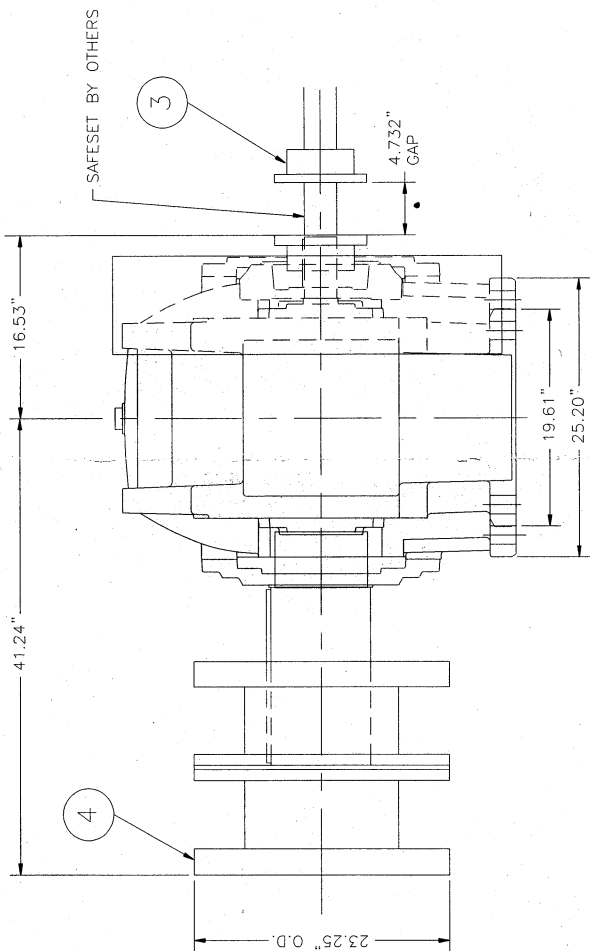
Any repair should only be carried out by skilled personnel. Only original BROOK HANSEN spares should be used.

ITEM	QTY.	SATUR OR DWS	DESCRIPTION	SUPPLIED BY
1	4		BROOK HANSEN P4 REDUCER TYPE OHKPK3-F-RUN EXACT RATIO 89.674 INCH SPEED REDUCTION 480 TO 1360 RPM / GEAR UN COUPLER WITH DOUBLE KEYWAY LOW SPEED SHAFT, STANDARD COOLING FAN ON HIGH SPEED SHART.	BROOK HANSEN
2				
3	4		HIGH SPEED COUPLING 102S620	BROOK HANSEN
4	4		LOW SPEED COUPLING 10B6C20	BROOK HANSEN

CUSTOMER P.O. 445005



· SCALE: 1 : 4



PAINT COLOUR: RAL 6016 TURQUOISE GREEN

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CERTIFIED
NAME: D.LAPOINTE
DATE: 22 DEC 00