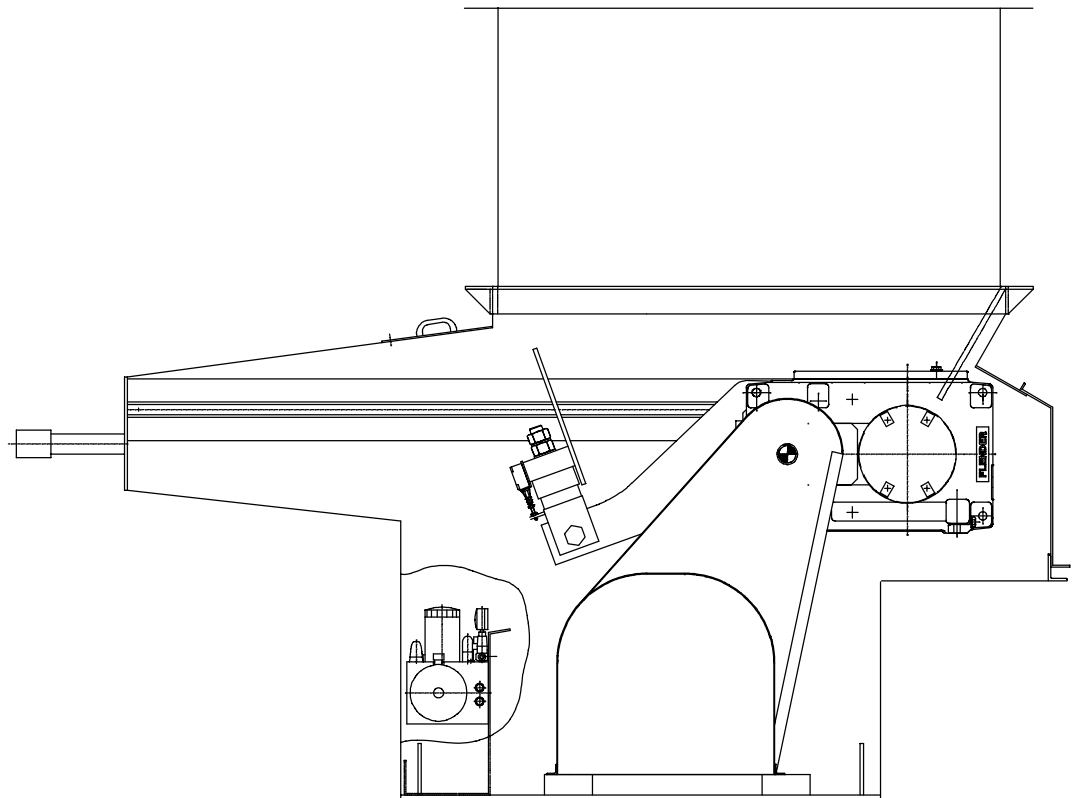


OPERATION INSTRUCTIONS

Retech Grinder RG 52



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These operating instructions are for the mounting-, operating and
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They contain technical regulations and drawings which are forbidden to
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Manufacturers Declaration

As defined by EU machinery directive 98/37/EEC,

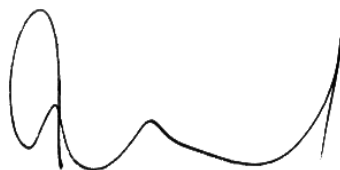
latest version

Herewith we declare that the type of

Retech Grinder RG 52 / 100 (SWU)

in the delivered execution is intended to be incorporated into machinery and/or assembled with other machinery to constitute machinery and must not be put into service the machinery into which it is to be incorporated has been declared in conformity with the provisions of the EU-directive, version 98/37/EC; EMV-directive 89/336/EEC and low voltage direction 73/23/EEC.

Bad Marienberg, 06.12.2001



Irene Scheidweiler
General Director



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Wolfgang Lipowski
Technical Director

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1 Foreword to the operating instructions

These operating instructions are designed to familiarise the user with the machine / plant and its designated use.

The instruction manual contains important information on how to operate the machine / plant safely, properly and most efficiently. Observing these instructions helps to avoid danger, to reduce repair costs and downtimes and to increase the reliability and life of the machine / plant.

The instruction manual is to be supplemented by the respective national rules and regulations for accident prevention and environmental protection.

The operating instructions must always be available wherever the machine / plant is in use.

These operating instructions must be read and applied by any person in charge of carrying out work with and on the machine / plant, such as

- Operation including setting up, troubleshooting in the course of work, evacuation of production waste, care and disposal of fuels and consumables.
- Maintenance (servicing, inspection, repair) and/or
- Transport

In addition to the operating instructions and to the mandatory rules and regulations for accident prevention and environmental protection in the country and place of use of the machine / plant, the generally recognised technical rules for safe and proper working must also be observed.

2 Range of use

This machine / plant is designed exclusively for the range of use as it is described in the order contract and in chapter "technical data, item 2 " of this manual.

It is not allowed to use the machine for other purpose than described in the contracts and in chapter "technical data, item 2 "of this manual without written approval of the **VECOPLAN** service- department (for address see chapter "spare parts and service"). **VECOPLAN** can not be held liable for any risk or damage due to using the machine / plant for other than the described purpose.

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1 Warnings and Symbols

1.1 Danger



This symbol refers to instructions and warnings designed to prevent injury or extensive damage. Observe these rules strictly and be extremely cautious. In addition to the operating instructions, observe all other generally applicable legal and other mandatory regulations relevant to accident prevention and environmental protection.

1.2 Attention

CAUTION

This symbol refers to special information and/or orders and prohibitions directed towards preventing damage.

2 Basic safety instructions

2.1 Designated use of the machine

- The machine / plant has been built in accordance with state-of-the-art standards and the recognized safety rules. Nevertheless, its use may constitute a risk to life and limb of the user or of third parties, or cause damage to the machine/plant and to other material property, if it is used for other than the designated use or if it is operated improperly.
- The machine / plant must only be used in technically perfect condition in accordance with its designated use and the instructions set out in the operating manual, and only by safety-conscious persons who are fully aware of the risks involved in operating the machine. Any functional disorders, especially those affecting the safety of the machine, should therefore be corrected immediately.
- The machine / plant is designed exclusively for the purposes as described in chapter "Technical Data, item 2 - Designed Use " of this manual.
- Using the machine / plant for purposes other than those mentioned above is considered contrary to its designated use. The manufacturer / supplier cannot be held liable for any damage resulting from such use. The risk of such misuse lies entirely with the user.
- Operating the machine within the limits of its designated use also involves observing the instructions set out in the operating manual and complying with the inspection and maintenance directives.

2.2 Organizational measures

- The operating instructions must always be at hand at the place of use of the machine / plant.
- In addition to the operating instructions, observe and instruct the user in all other generally applicable legal and other mandatory regulations relevant to accident prevention and environmental protection. These compulsory regulations may also deal with the handling of hazardous substances, issuing and/or wearing of personal protective equipment, or traffic regulations.
- Personnel entrusted with work on the machine must have read the operating instructions and in particular the chapter on safety before beginning work. Reading the instructions after work has begun is too late. This applies especially to persons working only occasionally on the machine, e.g. during setting up or maintenance.
- Verify from time to time - that operating personnel are carrying out the work in compliance with the operating instructions and paying attention to risks and safety factors.
- To insure personal safety, long hair must be tied back or otherwise secured, garments must be close - fitting and no jewellery - such as rings - may be worn. Injury may result from being caught up in the machinery or from rings catching on moving parts.
- Use protective equipment wherever required by the circumstances or by law.
- Observe all safety instructions and warnings attached to the machine / plant.
- Make sure that safety instructions and warnings attached to the machine are always complete and perfectly legible.
- In the event of safety-relevant modifications or changes in the behaviour of the machine / plant during operation, stop the machine/plant immediately and report the malfunction to the competent authority / person.
- Never make any modifications, additions or conversions to the machine without **VECOPLAN's** approval. This also applies to the installation and adjustment of safety devices and valves as well as to welding work on load-bearing elements.
- Spare parts must comply with the technical requirements specified by the manufacturer. Spare parts from original equipment manufacturers can be relied to do so.
- Never modify the electrical control or the software of programmable control systems without **VECOPLAN's** approval.
- Replace hydraulic hoses within stipulated and appropriate intervals (see chapter "Maintenance and Servicing") even if no safety-relevant defects have been detected.
- Adhere to prescribed intervals or those specified in the operating instructions for routine checks and inspections.

- For the execution of maintenance work, tools and workshop equipment adapted to the task at hand are absolutely indispensable.
- The personnel must be familiar with the location and operation of fire extinguishers.
- Observe all fire-warning and fire-fighting procedures.

2.3 Selection and qualification of personnel - basic responsibilities

- Any work on and with the machine / plant must be executed by reliable personnel only. Statutory minimum age limits must be observed. This personnel must be instructed especially about arising dangers before starting work.
- Employ only trained or instructed staff and set out clearly the individual responsibilities of the personnel for operation, set- up, maintenance and repair.
- Make sure that only authorised and trained personnel work on or with the machine.
- Define the machine operator's responsibilities - also with regard to observing traffic regulations - giving the operator the authority to refuse instructions by third parties that are contrary to safety.
- Do not allow persons to be trained or instructed or persons taking part in a general training course to work on or with the machine / plant without being permanently supervised by an experienced person.
- Work on the electrical system and equipment of the machine / plant must be carried out only by a skilled electrician or by instructed persons under the supervision and guidance of a skilled electrician and in accordance with the national electrical code.
- Work on hydraulic equipment of the machine / plant must be carried out only by personnel having special knowledge and experience in hydraulic systems.

2.4 Safety instructions governing specific operational phases

2.4.1 Standard operation

- Observe all other generally applicable legal and other mandatory regulations relevant to accident prevention and environmental protection.
- Avoid any operational mode that might be prejudicial to safety.
- Take the necessary precautions to ensure that the machine is used only when in a safe and reliable state.

- Operate the machine only if all protective and safety- oriented devices, such as removable safety devices, emergency shut- off equipment, sound- proofing elements and exhausters, are in place and fully functional.
- Check the machine / plant at least once per working shift for obvious damage and defects. Report any changes (incl. changes in the machine's working behaviour) to the plant supervisor immediately. If necessary, stop the machine immediately and lock it.
- In the event of malfunctions, stop the machine / plant immediately and lock it. Have any defects rectified immediately.
- During start- up and shut- down procedures always watch the indicators and control lights in accordance with the operating instructions.
- Before performing any work on the machine / plant it must come to a total stop. The main breaker must be turned off and locked.

Caution: It is not sufficient to stop the machine by pushing the emergency stop button.

- Before starting up or setting the machine / plant in motion, make sure that everyone is clear of the machine.
- The selector switch - if exists - for manual or automatic operation must be in AUTOMATIC- position and locked.
- Do not switch off or disconnect pneumatic transport systems or ventilation devices when the machine / plant is operating.

Vecoplan recommends: For fire prevention, shredders and conveyors should be cleared out at the end of the shift or before longer stoppages.

2.4.2 Special work in conjunction with utilization of the machine / plant and maintenance and repairs during operation; disposal of parts and consumables

- Observe the adjusting, maintenance and inspection procedures and intervals set out in the operating instructions, including information on the replacement of parts and equipment. These activities may be performed by skilled personnel only.
- Brief operating personnel before beginning special operations and maintenance work, and appoint a person to supervise the activities.

- In any work concerning the operation, conversion or adjustment of the machine and its safety- oriented devices or any work related to maintenance, inspection and repair, always observe the start- up and shut- down procedures set out in the operating instructions and the information on maintenance work.
- Ensure that the maintenance area is adequately secured.
- If the machine / plant is completely shut down for maintenance and repair work, it must be secured against inadvertent starting by:
- locking the principal control device and removing the ignition key and / or
- attaching a warning sign to the main switch.

Caution: It is not sufficient to stop the machine / plant by pushing the emergency stop button!

- To avoid the risk of accidents, individual parts and large assemblies being removed for replacement purposes should be carefully attached to lifting tackle and secured. Use only suitable and technically correct lifting gear and suspension systems with adequate lifting capacity. Never work or stand under suspended loads.
- The fastening of loads and the instructing of crane operators should be entrusted to experienced persons only. The marshaller giving the instructions must be within sight or sound of the operator.
- For carrying out overhead assembly work always use specially designed and approved ladders and working platforms. Never use machine parts as a climbing aid. Wear a safety harness when carrying out maintenance work at greater heights.
- Keep all handles, steps, handrails, platforms, landings and ladders free from dirt, snow and ice.
- Clean the machine, especially connections and threaded unions, of any traces of oil, fuel or preservatives before carrying out maintenance / repair. Never use aggressive detergents. Use lint- free cleaning rags.
- Before cleaning the machine with water and/or detergents, cover or tape up all openings which - for safety and functional reasons - must be protected against water or detergent penetration. Special care must be taken with electric motors, switchgear cabinets and hydraulic systems.
Do not clean the machine / plant with a steam jet (high- pressure cleaning)!
- Ensure during cleaning of the machine that the temperature sensors of the fire- warning and fire- fighting systems do not come into contact with hot cleaning agents as this might activate the fire- fighting system.

- After cleaning, remove all covers and tapes applied for that purpose.
- After cleaning, examine all fuel, lubricant and hydraulic fluid lines for leaks, loose connections, chafe marks and damage. Any defects found must be corrected without delay.
- Always tighten any screwed connections that have been loosened during maintenance and repair.
- Any safety devices removed for set- up, maintenance or repair purposes must be refitted and checked immediately upon completion of the maintenance and repair work.
- Ensure that all safety devices are fitted before operating after maintenance or repair.
- Ensure that all consumables and replaced parts are disposed of safely and with minimum environmental impact.
- Lids, doors or covers must not be opened or removed until the machine / plant came to a complete stop.

2.5 Warning of special dangers

2.5.1 Electric energy

- Use only original fuses with the specified current rating. Switch off the machine / plant immediately if trouble occurs in the electrical system.
- Work on the electrical system or equipment may only be carried out by a skilled electrician or by specially instructed personnel under the control and supervision of such electrician and in accordance with the national electrical code and all applicable codes.
- If provided for in the regulations, the power supply to parts of machines and plants, on which inspection, maintenance and repair work is to be carried out must be cut off. Before starting any work, check the de- energised parts for presence of power and ground or short- circuit them in addition to insulating adjacent live parts and elements.
- The electrical equipment of machines/plants is to be inspected and checked at regular intervals. Defects such as loose connections or scorched cables must be rectified immediately.

- Necessary work on live parts and elements must be carried out only in the presence of a second person who can cut off the power supply in case of danger by actuating the emergency shut- off or main power switch. Secure the working area with a red- and- white safety chain and a warning sign. Use insulated tools only.
- Before starting work on high voltage assemblies and after locking off the power supply, the feeder cable must be grounded and components, such as capacitors, short- circuit with a grounding rod.

2.5.2 Gas, dust, steam and smoke

- Carry out welding, flame- cutting and grinding work on the machine / plant only if this has been expressly authorized, as there may be a risk of explosion and fire.
- Before carrying out welding, flame- cutting and grinding operations, clean the machine / plant and its surroundings from dust and other inflammable substances and make sure that the premises are adequately ventilated (risk of explosion).
- Observe all existing national regulations if work is to be carried out in narrow rooms.

2.5.3 Hydraulic and pneumatic equipment

- Work on hydraulic equipment may be carried out only by persons having special knowledge and experience in hydraulic systems.
- Check all lines, hoses and screwed connections regularly for leaks and obvious damage. Repair damage immediately. Splashed oil may cause injury and fire.
- Depressurize all system sections and pressure pipes (hydraulic system, compressed- air system) to be removed in accordance with the specific instructions for the unit concerned before carrying out any repair work.
- Hydraulic and compressed- air lines must be laid and fitted properly. Ensure that no connections are interchanged. The fittings, lengths and quality of the hoses must comply with the technical requirements.

2.5.4 Noise

- During operation, all sound baffles must be closed.
- Always wear the prescribed ear protectors.

2.5.5 Oil, grease and other chemical substances

- When handling oil, grease and other chemical substances, observe the product- related safety regulations.
- Be careful when handling hot consumables (risk of burning or scalding). The regulations for handling dangerous compounds are valid.

2.6 Mobile machinery and equipment

(Machinery and equipment used at frequently changing places of operation)

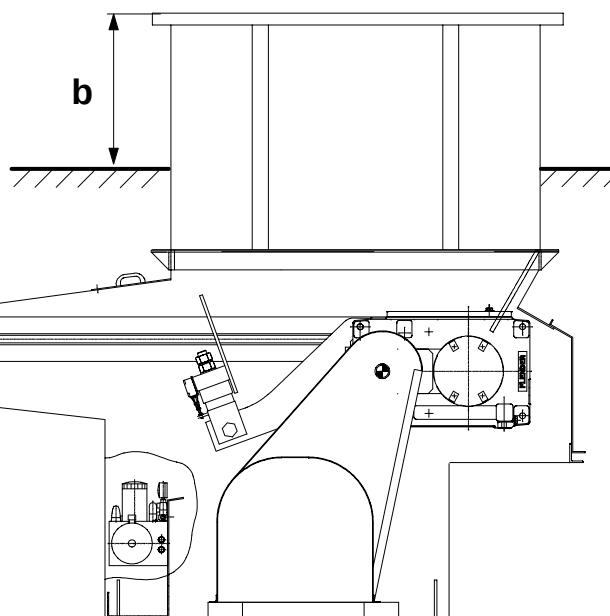
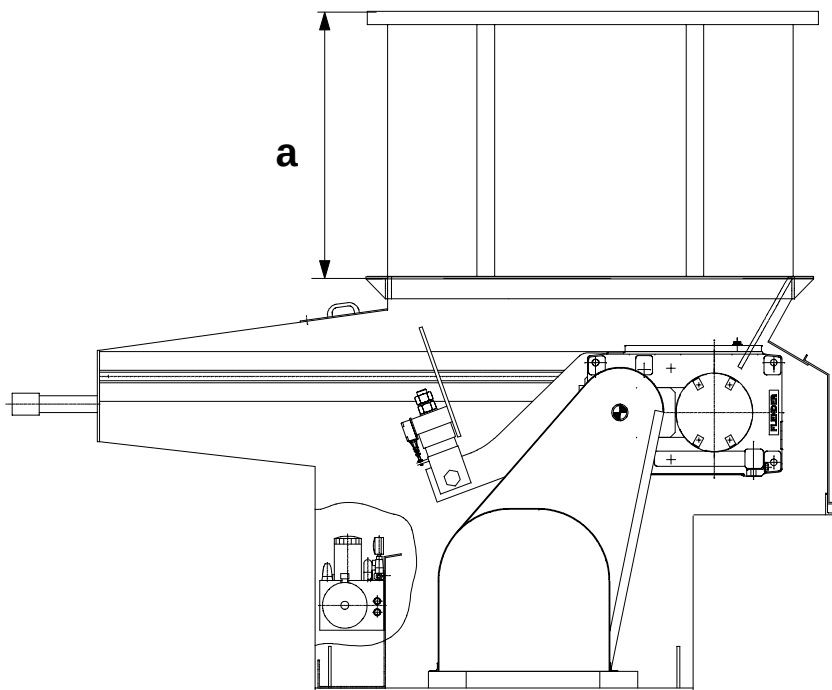
- For loading only use lifting gear and tackle of sufficient capacity.
- Appoint a competent operator to assist in the lifting operations.
- Lift machinery and equipment properly with suitable lifting gear and only in accordance with the operating instructions (fixing points for lifting tackle, etc . . .).
- Only use suitable means of transport of adequate carrying capacity.
- Fasten the loads safely using the suitable fixing points.
- Before or immediately after completion of the loading operations the machine / plant must be secured by means of recommended / supplied devices against unintentional changes of position and a corresponding warning sign attached to the machine / plant.

Before recommissioning the machine / plant these devices must be properly removed.

- Carefully refit and fasten all parts to be removed for transport purposes before recommissioning the machine / plant.
- Cut off the external power supply of the machine or plant even if only minor changes of place are envisioned. Properly reconnect the machine to the supply mains before recommissioning.
- For recommissioning only proceed in accordance with the operating instructions.

3 Safety distances

The machine must not be operated without hopper!

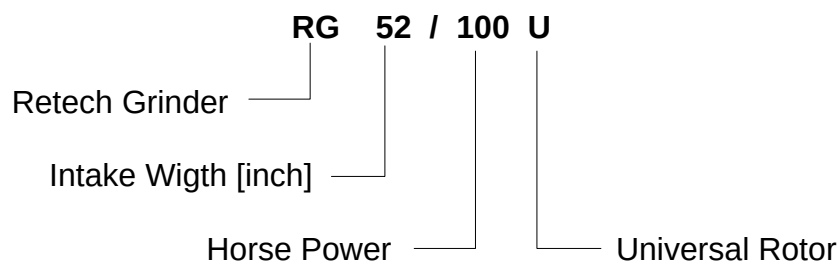
**Details:**

a = min. 24 inch

b = min. 48 inch

Obtain the following minimum safety distances in any case !

Contents		Page
1	Identification	1
2	Designated Use	1
3	Characteristics	1
4	General Overview	2
5	Torque Values for Screws	4
6	Dimensions, required Space	5
7	Electrical Connection	6
8	Dust Extraction	7
9	Noise Emission	7
10	Grease Spots	8

1 Identification**2 Designated Use**

The VECOPLAN- Retech-Grinder (RG) is exclusively designed for the reduction of the material, as agreed by contract.

Any use of the machine beyond the designated purpose is not allowed. **VECOPLAN** can not held liable for any damage as a result of using the machine for other than the designated purpose. The risk of such use is exclusively taken by the operator.

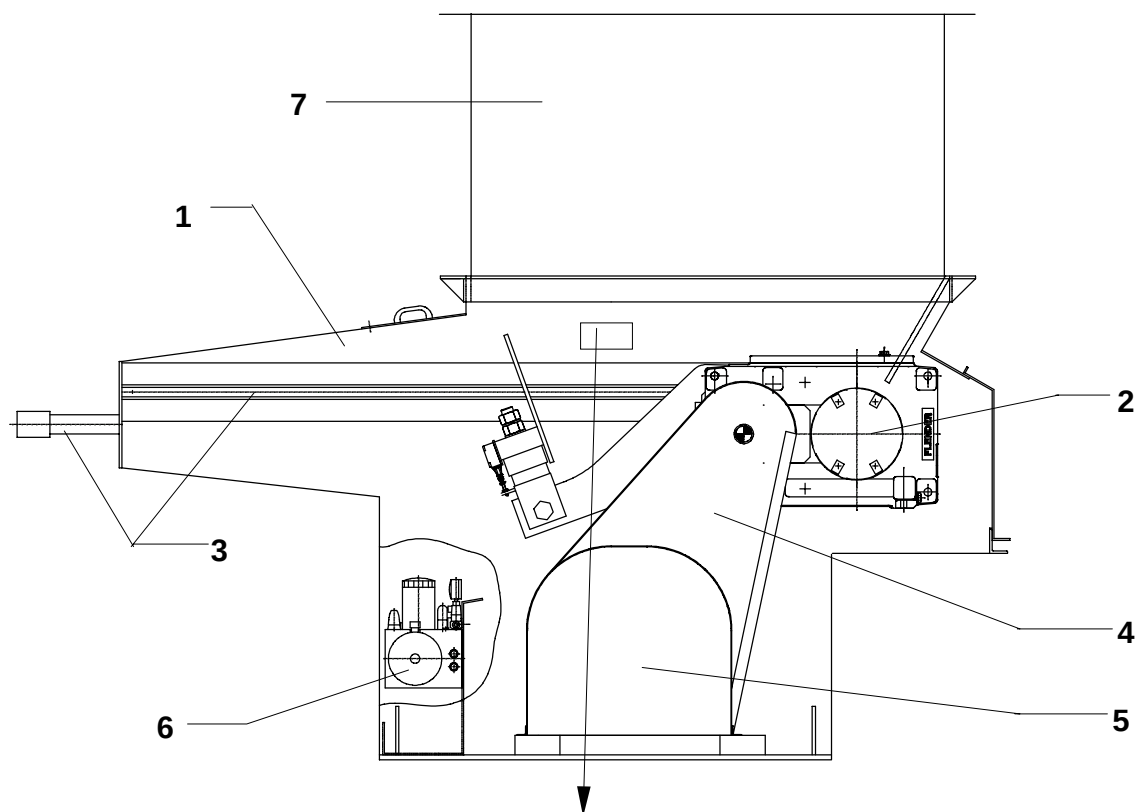
3 Characteristics

Project	:	
Operated by	:	
Order no.	:	
Machine no.	:	
Year of construction	:	
Dimensional drawing	:	05000120/0
installation drawing	:	-
Spare part list	:	see capitel „spare parts and service“ item 4
Weight approx.	:	3,7 t
Power of main drive	:	90 Horse Power

4 General Overview

The machine consists of the following modules:

module	nomination
1	machine body
2	rotor
3	feed unit
4	main drive
5	fluid coupling
6	hydraulic system
7	hopper



Vecoplan - Anlagen

Masch. -Nr.

Type

Baujahr

RG 52 / 100 SWU

type plate

Vecoplan LLC 5708 Uwharrie Road, Archdale, NC 27263 USA

Phone: (888) 738-3241

Telefax: (336) 431-6527

• rotor (module 2)

- diameter : 370 mm (effective)/ 14 inch
- length : 1299 mm / 51 inch
- speed : 142 RPM

• feed unit (module 3)

- rigid welded steel construction
- powered by hydraulic cylinder
- guided in low wear plastic slides
(optional: ram guide rails made of brass)
- lateral guide by hardened steel rollers

• main drive (module 4)

- design : – Electric motor with fluid coupling;
belt drive; two step spur gear
- ratio : – $i = 12,5$
- nom. motor power : – 90 HP
- nom. amp load : – 102,0 A
- motor speed : – 1780 RPM
- motor voltage : – 460 V
- frequency : – 60 Hz
- protection : – IP 54
- mounting position : – IM B 3
- pulley fluid coupling : – $d1 = 280 \text{ mm} / 11 \text{ inch}$
- Pulley gear box : – $d2 = 280 \text{ mm} / 11 \text{ inch}$
- No. of V-belts : – $Z = 5$
- V-belt profile : – $P = \text{SPB}$
- True length of V-belt : – $Lw = 2120 \text{ mm} / 83 \text{ inch}$
- Distance between pulleys : – $enom = 620,18 \text{ mm} / 24,42 \text{ inch}$
- Span length : – $L = 620,18 \text{ mm} / 24,42 \text{ inch}$
- Impression depth of belt : – $Ea = 16,33 \text{ mm} / 0,64 \text{ inch}$
- Test load on V-belt : – $F = 75 \text{ N}$

- **Fluid coupling (module 5)**

- hydro-dynamic coupling
- load free start-up of electric motor
- overload protection

- **hydraulic system (module 6)**

- aggregate with 2 operating speeds
- motor power : 4,24 / 5,06 HP
- max. operating pressure : 180 bar

pneumatic pickup (if delivered)

diameter D = inch
min. air speed v = 28 m/s

5 Torque Values for Screws

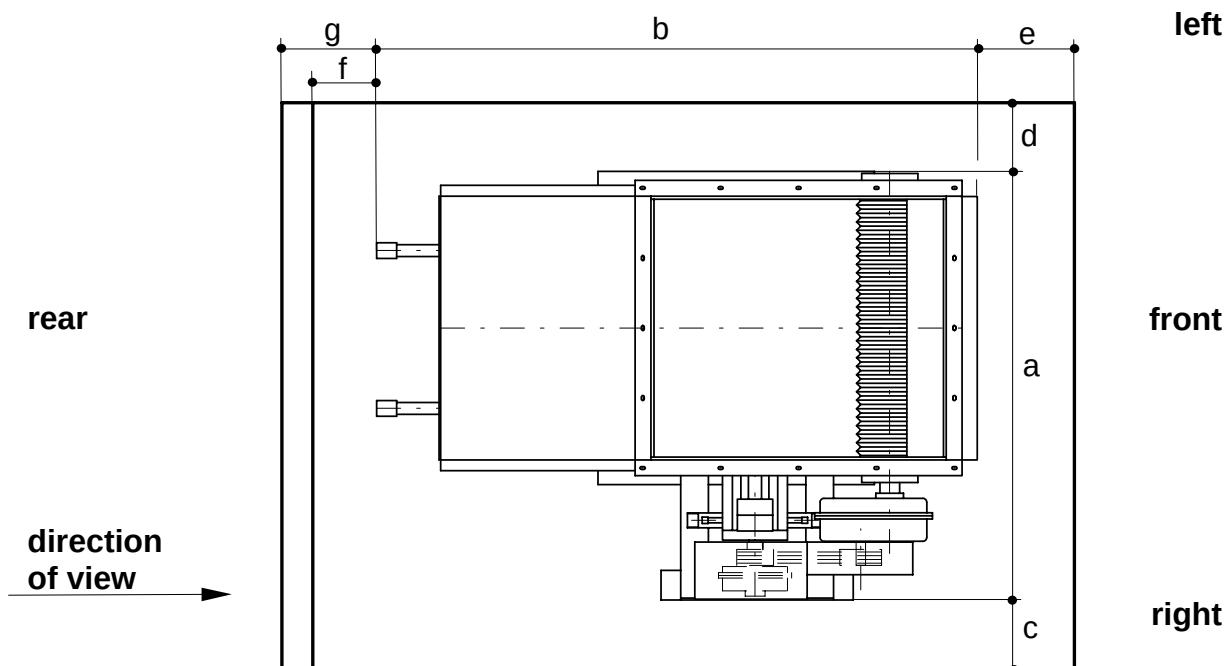
size	quality class 8.8
M 8	17 lb ft
M 10	37 lb ft
M 12	63 lb ft
M 14	92 lb ft
M 16	155 lb ft
M 20	291 lb ft
M 24	502 lb ft

For further torques of force of attraction refer to chapter „maintenance“ for each maintenance work.

6 Dimensions, required Space

Take care for minimum free space around the machine for easy access and maintenance.

All dimensions in inch!



RG - type	a max.	b	c	d	e	f	g	H
52	107	122	24	20	32	40	40	60

- a: width, over all
- b: length, over all
- c: required space for servicing and maintenance
- d: required space for servicing and maintenance
- e: required space for servicing and maintenance
- f: required space for dismantling the hydraulic cylinder
- g: required space for dismantling the feed unit
- H: height without hopper

Caution: machine and hopper must have removable joint !

7 Electrical Connection

USA

Voltage : 460 V / 60 Hz

CAUTION: On position direkt ! (No star – delta starting)

Main drive USA unit [kW]	main drive USA Horse Power unit [HP]	main fuse protection unit / [A]	cross section BRD lead unit mm ²	cross section USA lead AWG/circ mills
26,4	35,9	100	4 x 35	2
36	48,9	125	4 x 50	1/0
44,4	60,4	160	4 x 70	2/0
54	73,4	200	4 x 95	4/0
66	89,8	250	4 x 120	250 MCM
90	122,4	250	4 x 150	300 MCM
108	146,9	315	4 x 185	350 MCM
132	179,5	400	4 x 240	500 MCM
158	214,9	500	4 x 300	600 MCM
192	261,1	500	4 x 300	600 MCM

protection control cabinet unit / A	cross section BRD and motor unit mm ²	cross section USA and motor AWG/circ mills
80	4 x 10	8
100	4 x 16	6
125	4 x 25	4
160	4 x 35	2
200	4 x 50	1/0
200	4 x 70	2 /0
250	4 x 95	4/0
315	4 x 120	250 MCM
400	4 x 150	300 MCM
400	4 x 185	350 MCM

Way of installation: B2 multiple core cable in electrical installation pipe or channel on the wall or on the floor! Increase of protective values by omission of star-delta! Cable cross sections for 30 degrees ambient temperature, fuses >> use of inert NH-fuses.

Important: The indication of cross sections of electric supply is only to be considered as a rough estimate because of several to VECOPLAN unknown facts! (external protection / type of fuse / length of cables / kind of installation / type of cable / ambient temperature / guidelines for short-circuit currents / additional user in switchgear cabinet / loads / etc.)

As mentioned above the cable cross sections therefore are to be considered as a rough estimate.

The cable cross sections from switchgear cabinet to motor have to be checked on eventually exceedings of limiting values.

8 Dust Extraction

If the material transport is effected by a pneumatic extraction system which is directly connected to the pneumatic pickup of the machine the Retech-Grinder's emission of wood dust is below the legislative limited values. If required ask for a dust emission test record.

9 Noise Emission

The noise emission of the Retech-Grinder has been measured according to DIN EN 31201 - 31204 and ISO 7960 with the following results.

$L_{pA} = 79 \text{ dB (A)}$ operating noise

Constant precision factor $K = 4 \text{ dB (A)}$

The sound intensity level according to DIN EN 23744 - 23746 is

$L_{WA} = \dots \text{ dB (A)}$ operating noise

Nomination of L_{WA} is not necessary if $L_{pA} \leq 85 \text{ dB (A)}$

Specific conditions for measuring:

hopper filled to 50% of stock volume with wood waste of different size

Position of microphone

Height 60 inch

Distance to hopper 20 inch on the lateral machine side

The values of noise emission are mainly depending on the kind of reduced material and on the design and construction of the machine hopper.

If further noise reduction measurement is required, VECOPLAN recommends the use of a 'sandwich - hopper', a lid to cover the hopper during operation or a special noise proof cabin.

10 Grease Spots

Use standard lithium- soap grease for all grease spots.

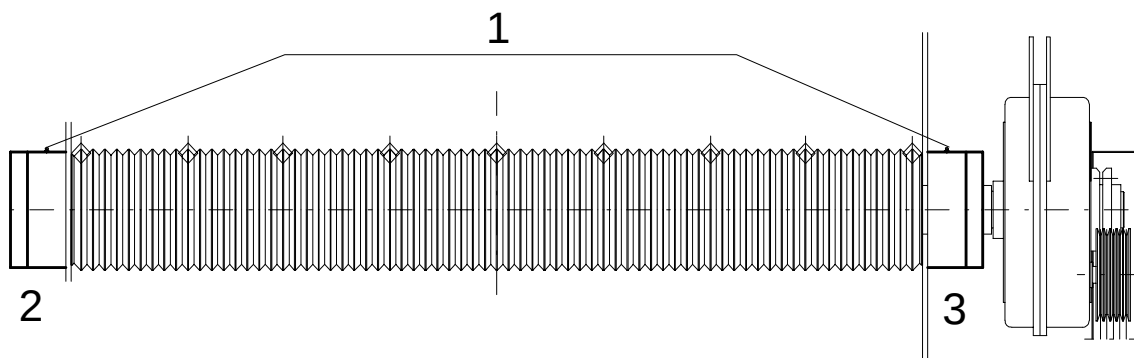
Vecoplan use **Shell Retinax EP2**.

pos. no.:	total amount of grease (g)	re- grease with (g)	re- grease after (h)	interval for inspection (h)
1	200	35	100	2000
4	2	0,5	500	2000

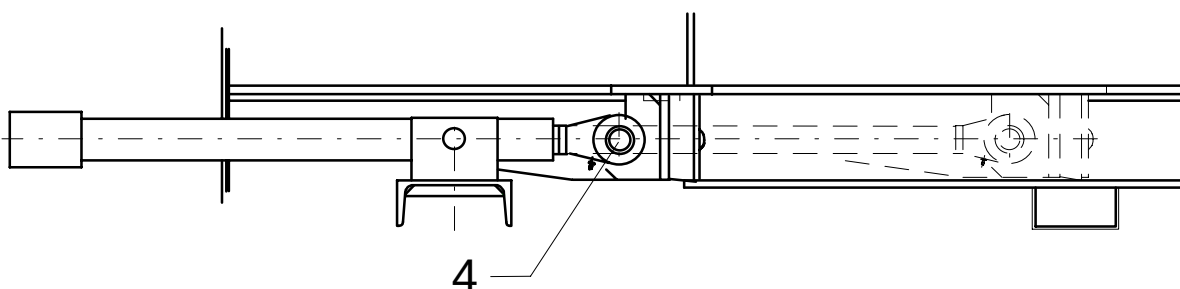
Details:

- 1 = grease fittings
- 2 = bearing
- 3 = bearing
- 4 = grease fittings

Rotor



Hydraulic cylinder(s) of ram



Contents		Page
1	Packing	1
2	Sensibility	1
3	Intermediate storage	2
4	Extent of delivery	2

1 Packing

The type of packing is determined by the mode of transportation.

The marks on the packing must be observed, i.e.

Legend:

1 = Upper side

2 = Handle with care

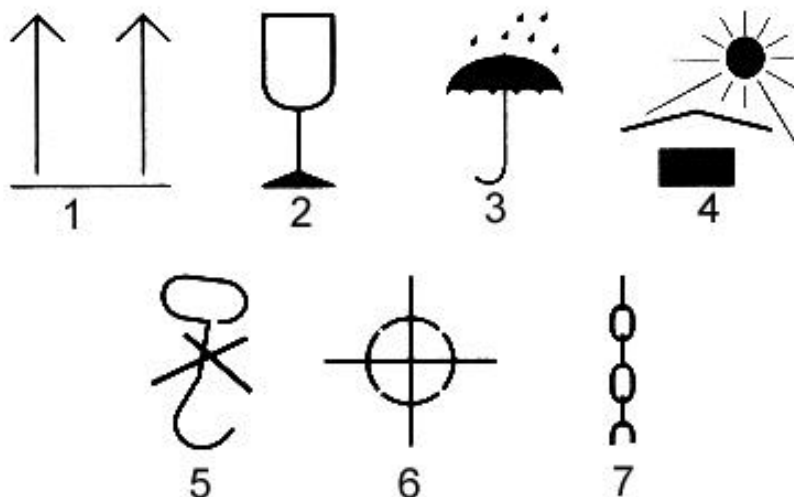
3 = Keep dry

4 = Keep cool

5 = No hook

6 = Gravity centre

7 = sling here



2 Sensibility

The machine / system has to be handled with care during the transportation in order to avoid damages by shock or inexpert handling.



Only sling the machine / system at the marked positions

Type and duration of the transport determine the safety provisions.

Avoid during the transport shocks and condensation of water by important temperature fluctuation.

The machine / system has to be handled with care.

3 Intermediate storage

In case the machine / system or the modules will not immediately be mounted after delivery, they have to be stored in a protected location without vibrations. They have carefully to be covered in order to avoid the penetration of dust and humidity.

If the machine / system is stored in the open air, it must be placed on a wooden basement. Never place the machine / system directly on the ground.



The outdoor- storage of electrical parts like switch boards, motors, etc., is not allowed.

In case of intermediate storage, protect bright work against corrosion.

4 Extent of delivery

The content of the delivery is listed in despatch notes. The completeness of delivery has to be verified at the receipt. Transportation damages and / or missing positions must immediately be claimed in written form.

Contents	Page
1 General Description	1
2 Machine Construction	2
3 Safety of Operation	5
4 Assemblage and Test Run	5
5 Installation	6
6 Left-over Risk	6

1 General Description

The **VECOPLAN** Retech-Grinder (RG) is designed for economic and smooth reduction of various residual products such as:

- wood waste
- pallets and crates
- chip- and fibreboard
- paper and cardboard *
- plastics *
- etc. *

* = special equipment recommended

A most frequent application is the reduction of wood wastes or pallets to combustible chips.

The new generation of **VECOPLAN** Retech-Grinders is based on many years of experience and the results of continual research and development.

Highest safety in operation, low energy consumption, low maintenance costs and, due to the compact design, small required floor space are only some of the essential features showing the superior economic efficiency of the **VECOPLAN** Retech-Grinder.

The **VECOPLAN** Retech-Grinder is available in different standard sizes:

RG-Type	Effective rotor diameter	Inlet length	Inlet width
RG 32	10"	40"	32"
RG 42	10"	49"	43"
RG 52	15"	58"	52"
RG 62	15"	80"	63"
RG 98	15"	58"	99"

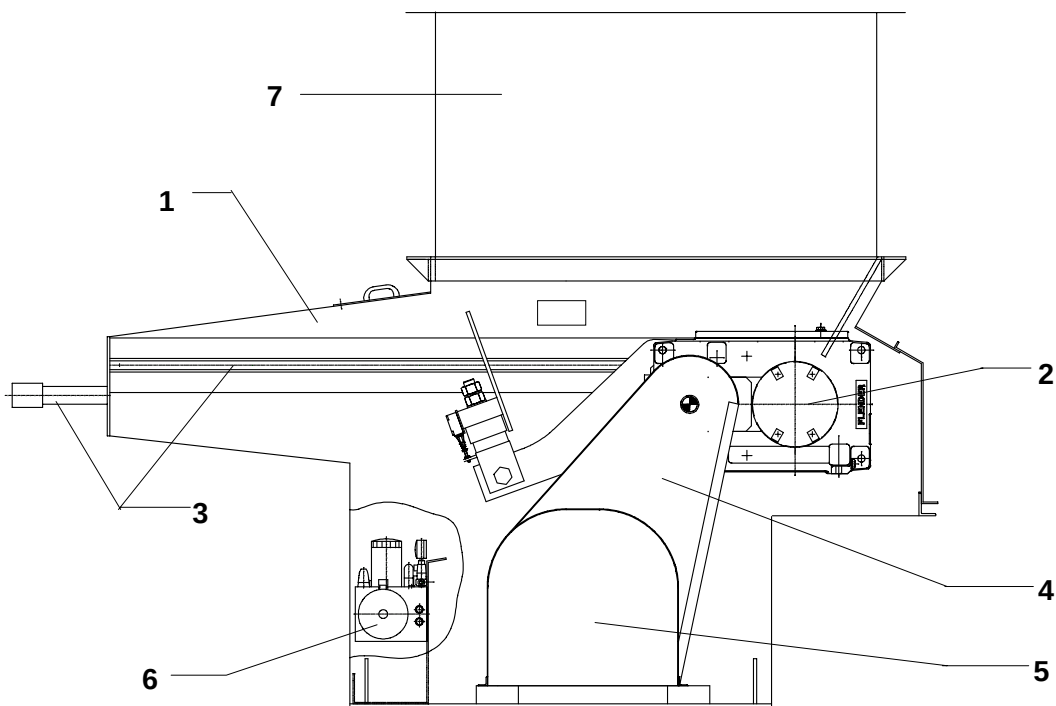
The standard delivery of the Retech-Grinder includes

- Automatic Protection System with quick cut- off- power- function to avoid bigger damages of rotor and main drive initiated by foreign bodies.
- Manual grease lubrication

Depending on the type the Retech-Grinder can be optionally equipped with

- Automatic cut off when machine is empty
- Slewable screen
- Fully automatic control device with PLC
- Counter knife bar mounted on air springs
- Hydraulic bridge breaker (vertical ram pusher)
- Special profiled bottom plate of reduction chamber (comb bottom plate)
- Ram guide system with brass slide
- Rotor speed control
- Automatic grease lubrication
- Main drive with fluid coupling

2 Machine Construction



Legende:

1 = machine body

2 = rotor

3 = feed unit

4 = main drive

5 = fluid coupling

6 = hydraulic system

7 = hopper

- **Machine Body (module 1)**

- Rigid gas- shield welded steel frame structure

- **Screen Unit (module 1.1)**

- Exchangeable screen unit.
- The chip size is mainly determined by shape and size of the screen plate holes and can be varied within certain limits.

- **Counter Knife (module 1.2)**

- Counter knife made of special hardened and wear- resistant steel.
- Special comb shape of cutting edges corresponding to the rotor profile for high efficient reduction.

- **Rotor (module 2)**

- Profiled steel rotor.
- Wear- resistant exchangeable cutting tools with form- closed fixing.
- Tools can be used on four sides (depending on wear).
- Easy tool exchange.
- Rotor bearing by robust double row spherical roller bearing in solid steel housing.

- **Feed Unit (module 3)**

- Feeding of material by hydraulic driven ram.
- Load depending controlled rate of feed.
- Ram beared on low wear plastic slides.
- Ram sealed by spring loaded plastic elements.
- Adjustable rollers for lateral support of ram.

- **Main Drive (module 4)**

- Electric motor with fluid coupling.
- Belt drive.
- Elastic support of slip-on typ gear box.
- Rigid two-step spur gear unit.
- Form- closed fixing on the rotor shaft.
- Low rotor speed for quit running.

- **Fluid coupling (module 5)**

- Hydro-dynamic operation.
- No wear due to hydro-dynamical power transmission.
- Protected against overheating by melting plug.
- Protects drive unit against shock load and blocking.
- Eliminates peak load, change of load and torque resonance vibrations.

- **Hydraulic System (module 6)**

- Compact design hydraulic unit as drive of the feed unit.
- Two speed motor.
- Low-level protection.
- High-temperature protection.

3 Safety of Operation

To avoid greater damage of the rotor system and the main drive in case of hitting a hard foreign body the Retech-Grinder is equipped with an overload cut off device. If the rotor blocks the elastic suspension of the gearbox will damp the impact. At the same time the limit switch no. 1 is operated by screw no. 2 which is fixed on the torque support.

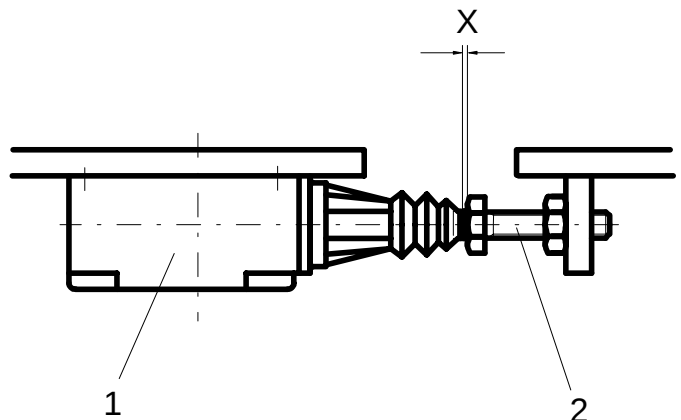
Details:

1 = limit switch

2 = limit switch adjusting screw

X = 0,06 inch travel to actuate the contacts of the switch.

Use thickness gauge 0,06 inch and adjust screw no. 2 that switch contacts are close.



Make sure that the machine is cleaned and that it does not contain further hard bodies before restarting it.

CAUTION To restart the machine without removing the foreign body can cause expensive damage of rotor, rotor shaft, main drive and counter knife..

A Programmable Logical Controller (PLC) is continuously monitoring the load on the rotor and regulates the feed of material to the reduction tools.

This guarantees a high throughput rate and a smooth operation at the same time.

In case of constant high load the rotor will automatically reverse.

The main drive motor is equipped with a PTC motor control to avoid blowing the winding by overload.

The Retech-Grinder is completely wired up to the terminal box and ready to operate. This reduces the risk of electrical faults on site and keeps installation costs low.

4 Assemblage and Test Run

The Retech-Grinder has been completely assembled in the factory. All functions have been tested during a test run of several hours.

5 Installation

The Retech-Grinder must be fixed on a concrete foundation or on a rigid steel frame. Fixing bolts for concrete foundation are not included in the delivery. Bolts for fixing the reducer to a steel frame are included as far as the steel frame is supplied together with the reducer.

6 Left-over Risk

The machine is equipped with all necessary protective devices in accordance with the today's state of the art and legislative regulations.

Nevertheless there could still be some risks , if

- the machine is operated without protective devices
- maintenance work at rotor or ram e.g. is effected from the inside of the hopper
- material is ejected out of the hopper.

Contents	Page
1 General Remark	1
2 Conditions for Installation	1
3 Hoisting Equipment	2
4 Installation	2
4.1 Installing the Retech-Grinder	3
4.2 Installing the Electrical Control	3
5 Dismantling the Retech-Grinder	4

1 General Remark

VECOPLAN recommends the use of the qualified **VECOPLAN** fitting crew. **VECOPLAN** does not take guarantee for damage due to incorrect fitting.



To hoist the Retech-Grinder it must not be fastened to others than the marked points.

The pictures on the following pages may be simplified.

2 Conditions for Installation

For easy service and maintenance keep enough free space around the Retech Grinder. Other machines in line should be placed accordingly.

Before fitting check the delivery to be complete. All parts have to be unpacked workmanlike.

Fundamental rules for fitting:

- Only employ workmen who possess sufficient technical knowledge and the required equipment.
- The machine has to be placed in a roofed room. Special measurements are required when installed outdoors. Please contact the **VECOPLAN** Service Department. **VECOPLAN** does not guarantee for damage due to atmospheric conditions such as moisture or ice.
- Observe installation instructions of **VECOPLAN** in any case.
- Fitting has to correspond to the common technical rules.
- To prevent overheating of electrical control units, hydraulic system or main drive elements take care of sufficient ventilation. Ambient temperatures over 86° F can cause failures. In this case it may be necessary to use cooling ventilators or cooling systems.

Special measurements are required for ambient temperatures below 30° F.

For operation at temperatures below –50° F special heater elements for the hydraulic system are required

Please contact the **VECOPLAN** Service Department for more information.

- Observe national laws and regulations of official authorities.

See Chapter "Technical Data" for Information on

- required space for installation
- loads and weights
- torque rates for nuts and bolts.

3 Hoisting Equipment

- Use only approved equipment.
- Never exceed the permissible load.
- Use only marked lifting points to fasten the machine or machine parts.



Never stay under hoisted loads !

4 Installation

The installation is done according to the VECOPLAN Installation Drawing (if necessary).

Especially pay attention to the following aspects:

- Use a water level for correct alignment of the machine.
- Ground surface must be even and of sufficient load- carrying capacity.
- Do not cock the machine.

Before beginning with installation

- check and fix all axis
- check all niveaus

4.1 Installing the Retech-Grinder

Set the Retech-Grinder on its foundation. Align the machine with feeding or discharging conveyors. The machine has to be well fixed to the foundation.

VECOPLAN recommends to use dowels of the type **Hilti HST**.

- Check all bolted connections to be tight.
- Close doors, lids and covers.
- Attach all protectors and safety devices.
- Clean inside of Retech-Grinder and all other machines or transport devices in the line from foreign bodies as tools or steel parts.

4.2 Installing the Electrical Control



Machines with defective electrical equipment must not be operated.

The control cabinet should be placed as close as possible to the main drive of the Retech-Grinder. If this is not possible and the Retech-Grinder can not be seen from the position of the cabinet it is necessary to attach an additional emergency stop switch on the machine itself.

The control cabinet must be placed in a roofed and well ventilated room. it has to be protected extreme sunshine, dust and moisture.

The main power supply must be separately fuse protected. The wire cross section must be sufficient for all driven motors and has to be laid in a pipe or cable tunnel.

Wiring and electrical connections must correspond to national laws and regulations and to special customer specifications.

- Check oil level in hydraulic system by the sight glass or the dipstick.
- Check direction of rotation of motors main drive motor and motor of hydraulic system in both speeds. (See arrow on ventilator hood).

CAUTION

The hydraulic pump will be destroyed within short time if the motor turns in the wrong direction.

5 Dismantling the Retech-Grinder

For dismantling the machine after having reached its life time or for moving reverse the procedure of installation.

Observe the safety at work regulations. Refer to chapter "Safety".

Contents	Page
1 General Remarks	1
2 Before Commissioning	1
3 During the Commissioning	2
4 Idle Running, Test of Control Interlocks	2
4.1 Idle Running Test	2
4.2 Test of Control Interlock and Electrical Communication	3
5 Test with Material	3

In case a **VECOPLAN** engineer has commissioned the machine he will ask for your signature in his commissioning report to state that commissioning was successful.

VECOPLAN can not be held responsible for any damage due to improper fitting or commissioning by other persons.

Always observe the safety rules!

The Waste Reducer must not be operated if

- not all of it's function are working properly. It may be dangerous for the operating staff. You also risk severe damage.
- the installation, due to the scene or due to other machines, does not correspond to the safety regulations.

1 General Remarks

The correct commissioning has a great influence on the trouble free operation and the durability of the Retech Grinder.

For this reason we recommend to employ the **qualified VECOPLAN crew** for commissioning. Commissioning by **VECOPLAN** means insuring your right of warranty and has other advantages as:

- The Retech Grinder is checked for eventual transport damages or faults of fitting.
- Throughput is measured and the Retech Grinder's functions are optimised.
- Operation staff is well instructed.
- Additional advice is given concerning operation, maintenance and repair.

2 Before Commissioning

Check the following points before commissioning:	Yes	No
• The values for voltage and frequency on the type plates of motors, solenoids and other electrical devices match with the values of the local power supply.	☐	☐
• All securing elements for transport and all lifting hooks are removed.	☐	☐
• The electrical wiring is correct and protected by fuse or trip switch.	☐	☐
• All safety devices are installed.	☐	☐
• The screws of knives and counter knives are well tightened.	☐	☐
• The settings of motor overload protectors must match with the nominal amp load indicated on the motor's type plates.	☐	☐
• The oil level of gearboxes and hydraulic systems is correct.	☐	☐
• No persons are in the dangerous zone of the machine.	☐	☐

3 During the Commissioning

Check the following points:

- Direction of rotation of the hydraulic system's motor (see arrow on ventilator hood).

CAUTION

The hydraulic pump will be destroyed within short time if the motor turns in the wrong direction.

- Direction of rotor (see arrow on housing of rotor bearing).
- After starting the machine the hydraulic ram moves backwards for app. 4 seconds, then changes direction and moves towards the rotor. See No. 3.2 of chapter "Operation" if reverse operation is detected.
- Observe temperatures of rotor bearings and amp load of motors.
- Check the machine's fixing to the foundation during operation.

4 Idle Running, Test of Control Interlocks

CAUTION

The Retech Grinder must be empty for first start.

4.1 Idle Running Test

After fitting the Retech Grinder and other machines in the line before and/ or after the Retech Grinder all components have to run an idle test to prove all their functions to be correct.

The idle running test is finished when all components are operating in automatic mode without manual intervention.

4.2 Test of Control Interlock and Electrical Communication

After the idle running test has been completed the installation is ready for checking the control interlocks and function of all exchanged signals for the communication between the different electrical control devices.

Starting up a Retech Grinder installation has always to follow this order:

- Start of the chip transport systems
- Start of the Retech Grinder
- Start of the feeding system

The installation is stopped in the opposite order.

Also check the function of all limit switches. The Retech Grinder and the feeding system must stop if the limit switch at the gear box torque arm is operated or if the front lid (screen cover) of the machine is opened.



For safety reasons do not carry out any mechanical work during this test.

The electrical interlocks control the co-operation of different machines in a line. If one of the machines in line fails it must be sure that all other machines before stop immediately or, if required, with delay.

For having realistic conditions during the test all motors and drives should operate. Simulation is not required.

5 Test with Material

After having passed the Idle Running Test and the Test of Interlocks the Waste Reducer is now operated with material.



No persons in the dangerous zones of the machine(s)!

Proceed in the following order:

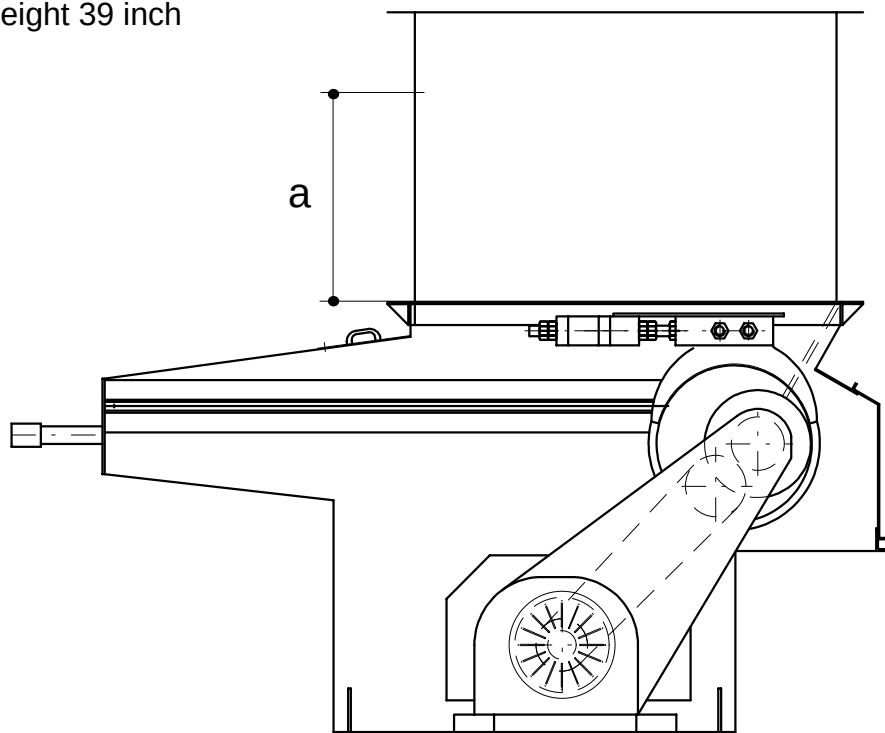
- Push the START - button of the chip transport section. If a start warning device exists: wait for clearance.
(In most cases the chip transport elements do not have to be started separately but start together with the Retech Grinder.)
- Check if all chip transport devices are working.
- Push START - button of Retech Grinder.
- If the Retech Grinder does not operate refer to chapter "Operation", Pt. 3.2.
- If exist: start the feeding elements.

We recommend to proceed the following way:

- Begin with little amount of material to see if the automatic functions are working properly.
- Check temperatures of rotor bearing (up to 158° F is normal) and Amp- load of electric motors (refer to type plates).
- Check for abnormal noise.
- Fill hopper with material. Maximum filling height: 39 inch from top of machine body.

Details:

a = max. filling height 39 inch



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VECOPLAN can not be held responsible for any damage due to improper fitting or commissioning by other persons.

Always observe the safety rules!

The Retech Grinder must not be operated if

- not all of it's function are working properly. It may be dangerous for the operating staff. You also risk severe damage.
- the installation, due to the scene or due to other machines, does not correspond to the safety regulations.

Contents	Page
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2 Shut down of the Retech Grinder	1
3 Instructions in Case of Failures	1
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3.2 Failure Elimination	1
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4 Measures prior to and after longer Periods of Stand - still	5
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5 Failure during Warranty Period	5

1 Normal Operation

The normal switching on and operation of the Retech Grinder does not differ with the proceeding described in the operational instructions "commissioning".

2 Shut down of the Retech Grinder

The shut down shall be realised as follows:

- switch off material feed
- before longer stand- still - mainly in winter - take care that the Retech Grinder is empty
- switch off the drive group of the Retech Grinder
- switch off the chip transport device after being empty

Vecoplan recommends: For fire prevention, shredders and conveyors should be cleared out at the end of the shift or before longer stoppages.

3 Instructions in Case of Failures

Independently of the following instructions, the Retech Grinder must be operated in conformity with local security with the local security regulations.

3.1 Security switch - off

We urgently recommend a lockable repair switch in order to avoid an unintended setting into operation in case of repair or failure. Furthermore, we attract the attention to the respective rules for prevention of accidents of the correspondent employer's liability insurance associations.

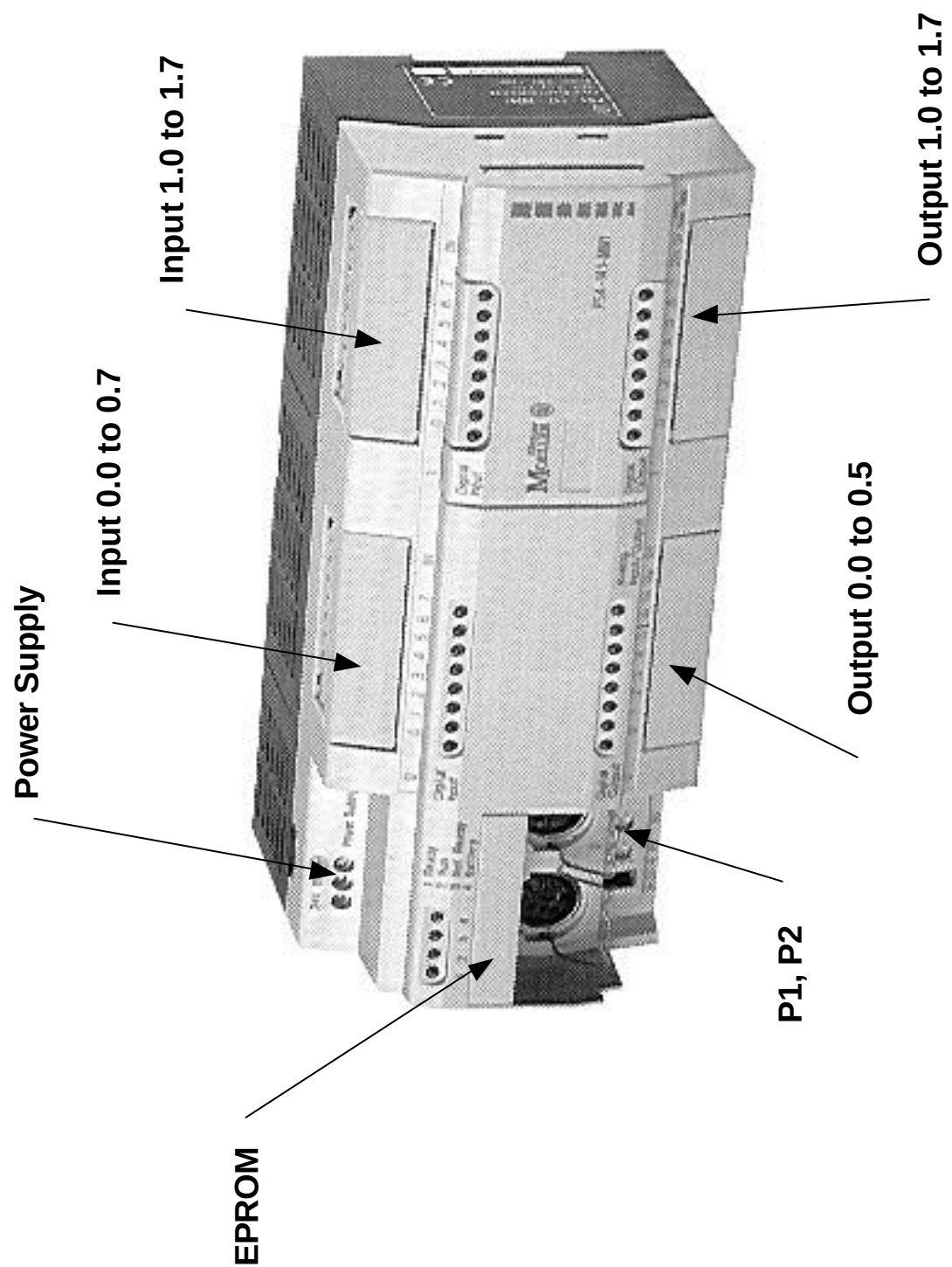
3.2 Failure Elimination

Characteristics	Reason	Actions
machine has strong vibration	machine is cocked due to uneven foundation	align machine with a spirit level ground plate must be absolutely even
unbalanced fluid coupling	transport damage or failure of fitting	replace fluid coupling
motor shaft is bent	transport damage or failure of fitting	replace motor
pulley is damaged	transport damage or failure of fitting	replace pulley

Characteristics	Reason	Actions
temperature of rotor bearing too high > 176° F	insufficient lubrication or over- greased dirt and dust false assemblage of bearing	check lubrication replace felt seal, clean bearing, insert with grease check assemblage of bearing unit
abnormal noise	foreign body near the rotor	stop machine, clean hopper carefully and remove all foreign bodies
chip size too large	diameter of screen holes too big gap between cutters and counter knife too big (wear of reducing tools)	replace screen for smaller screen size turn or replace cutters replace counter knife
rotor stalls	foreign body near the rotor	stop machine, clean hopper carefully and remove all foreign bodies
main drives often turns reverse	cutters are worn counter knife is worn	turn or replace cutters replace counter knife
ram lifts up in front end position	guide rails are worn	replace guide rails
material under the ram	seal at the front of ram is worn	replace plastic seal element
ram remains in one end- position, does not change direction	setting of pressure switch incorrect pressure switch defective guide rails jammed up with dirt	check setting of pressure switch replace pressure switch clean guide rails
ram only moves in one direction or ram has no function	solenoid of hydraulic valve defective socket of valve defective	replace solenoid replace socket

RG – Control with Klöckner Moeller PS 4-141

PLC Input			PLC Output				
Channel	Connection	Condition	Description	Channel	Connection	Condition	Description
0.0	Start VAZ	☐	default	0.0	Rotor forward	☒	Rotor turns forward (default)
0.1	Stop VAZ	☒	"START" Button is energized	0.1	Rotor reverse	☐	default
0.2	Automatic Cut - Off	☐	default	0.2	Star / Delta	☒	Rotor turns reverse
0.3	Ram reverse	☐	"STOP" Button is energized			☐	Main Motor STAR
0.4	Torque Switch	☐	Constant Operation	0.3	Ram slow	☒	Main Motor Delta (default)
0.5	Thermistor Protection of Main Motor	☒	Machine cuts off automatically			☒	Hydraulic Motor in low Speed
0.6	Oil Temperature and Level	☐	default	0.4	Ram fast	☐	
0.7	Pressure Switch Ram	☒	"RAM REVERSE" Button is energized			☒	Hydraulic Motor in high Speed
1.0	Motor Protection Relais for Hydraulic Motor and aux. Motors	☐	default	0.5	Ram forward	☒	Ram moves towards the Rotor
1.1	Motor Size Coding	☒	Torque Switch is energized			☐	
1.2	Motor Size Coding	☐	default	1.0	Ram reverse	☒	Ram moves away the Rotor
		☒	Overload on hydraulic Motor or aux. Motors			☐	
		☐		1.1	Operation Light in START Button	☒	Machine ON
		☒				☐	Machine OFF
		☐		1.2	Release for feeding Conveyor	☒	Conveyor ON
		☒				☐	Conveyor OFF
		☐		1.3	Release for evacuating Conveyor	☒	Conveyor ON
		☒				☐	Conveyor OFF
		☐		1.4	Warning Light Troque Switch	☐	default
		☒				☒	Rotor stalled by Tramp Metal
1.3	Release Signal from external Source	☒	default	1.5	Error Indicator	☐	
1.4	Rotor reverse	☐	Release Signal missing	1.6	Error Indicator	☐	
1.5	Proximity Switch for Ram-Slow Function (optional)	☒	default	1.7	Error Indicator	☐	
1.6	Not used	☐	Rotor reverse (For Service Purpose only!)			☒	
1.7	Short- Stroke Function	☐	default			☐	
P1	Delayed Stop of Evacuation 0 – 10 min.	☒	Short- Stroke Function is energized			☐	
P2	Delay of Pressure Switch 0.5 – 5 sec.	☐	Default Setting: Minimum			☐	
		☐	Default Setting: Minimum			☐	
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3.3 Re - start after Failure

(see operational instructions "commissioning", item 5)

4 Measures prior to and after longer Periods of Stand - still

4.1 Preparation for Storage

- Empty and clean Retech Grinder
- Store Retech Grinder in dry and ventilated location
- Treat gear box as described in separate documentation (see chapter "annex, item 2")
- Protect electric motors and hydraulic equipment against humidity, heat, dust and impact
- Protect bright parts of the Retech Grinder with Tectyle 506 or similar means of preservation

4.2 Re- commissioning

- Prepare gear box as described in separate documentation (see chapter "annex, item 2")
- Remove protective covers against humidity, heat, dust and impact

5 Failure during Warranty Period

In case of a failure arising during the warranty period and not being caused by inexpert handling, let the machine stay in this condition and inform the VECOPLAN Service Department. The Service Department will then take the relevant action in accordance with the user of the machine. Our engineers must be allowed to take pictures of the system without special authorisation.

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1.3	Recommended Hydraulic Oil Type 3
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2.11	Maintenance rotor - flanged bearing 22
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1 Maintenance and Servicing

1.1 General Advice

- Always work in accordance with the safety instructions given in chapter "Safety". Observe national safety regulations.
- Failures due to insufficient or unqualified maintenance can cause expensive repair and long standstill of the Retech Grinder. Frequent maintenance and servicing by qualified staff is absolutely necessary.
- The safety of operation and the life time of the Retech Grinder are depending, among other important factors, on proper maintenance.
- The following schedule contains the periods for different checks and maintenance work for operation under normal conditions.
- The time periods base on a continuous operation of 8 hours per day. If the machine has shorter run times the servicing periods can be extended correspondingly. Regardless of individual operation a total revision is required every three years.
- Due to the fact that the servicing intervals are based on experience under normal operation and that the individual operational conditions of your machine can be different it can be necessary to adapt the servicing intervals accordingly.
- The **VECOPLAN** service department can help you with further advises.
- For all maintenance work the Machine has to be stopped and disconnected from the electrical supply.
- Use only matching tools of good quality.
- For repair or maintenance of electrical components they have to be disconnected from power.
- If welding at the Retech Grinder or in its surroundings is necessary the earth cable must be fixed close to the welding spot to avoid current flowing through roller bearings or other sensitive parts.
Remove EPROM from PLC controller.
Cover the lenses of optical sensors.

1.2 Hydraulic System

Valves and pressure regulating elements are adjusted as described in the hydraulic diagram.

If the oil is exchanged to an oil type of different viscosity this can eventually cause functional problems. A modified adjustment is necessary in this case.

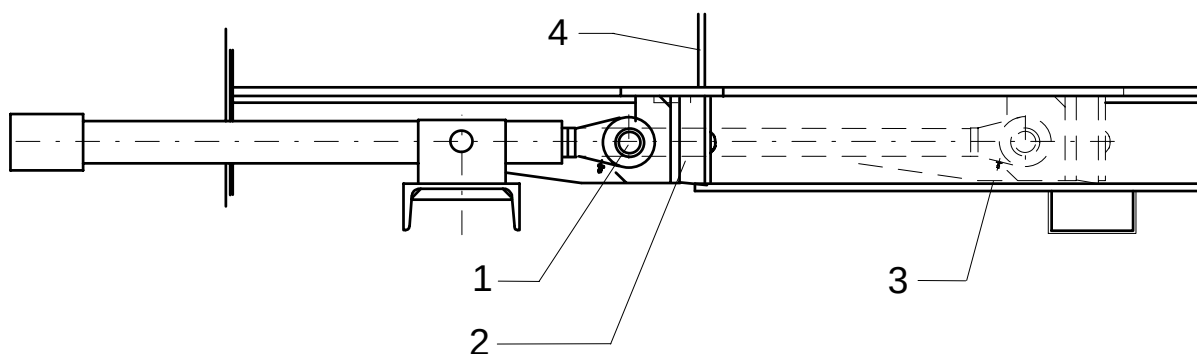
The hydraulic system is factory filled with hydraulic oil **Shell TELLUS 46**

The proper function has been approved during a test run in the factory under normal conditions.

Check the oil level with the dipstick, especially after the first hour of operation. The level may have sunk due to air in pipes or cylinders.

Fill up hydraulic oil before the level reaches the minimum mark.

For filling up the tank the ram must be in the rear end position.



Details:

- 1 = bolt, hydraulic cylinder
- 2 = ram rear end position
- 3 = ram front end position
- 4 = back wall



Keep the surrounding of the machine clean from oil and grease to avoid accidents.

In case of repair: the inside of the tank, the suction pipes and the filter must be absolutely clean before filling the tank with new hydraulic oil.



Observe the local requirements for disposing used oil.

Dirty or milky oil has to be exchanged immediately.

The oil gets milky if water has come into the tank or if pump hoses or suction pipes are leaking. The cause must be found and repaired.

Complete oil change is required after 2000 operation hours or at least once per year.

The wear parts are listed in the Spare Parts List at the capital Spare Parts and Service.

1.3 Recommended Hydraulic Oil Type

VECOPLAN recommends the use of **Shell TELLUS 46**.

Under extreme conditions (very low or high ambient temperatures) it may be necessary to use hydraulic oils with different characteristics. Ask the **VECOPLAN** service department.

1.4 Maintenance Check List

Object	Description	First time after ... operation hours	Frequently after ... operation hours
Check condition of knives, turn or exchange if necessary	"Maintenance", page 13	40	40
Check oil level of hydraulic system, add oil if necessary	"Maintenance", page 2	2	40
Check oil level of gear box, add oil if necessary	"Appendix"	2	40
Check oil level of fluid coupling refill if necessary		2	200
Control hydraulic pipes, hoses and fittings for leakage		2	40
Check area under the hydraulic ram and remove waste material		40	40

Object	Description	First time after ... operation hours	Frequently after ... operation hours
Grease rotor bearings with app. 35 g lithium grease		100	100
check belt drive	"Maintenance", page 10	4 - 5	100
Check all hydraulic pipes, hoses and fittings for corrosion, cracks and leakage, exchange if necessary		40	2000 or exchange at latest after 6 years
Condition of screen	"Maintenance", page 17	200	200
Condition of ram guide rollers	"Maintenance", page 18	40	100
Seal on back wall	"Maintenance", page 21	200	200
Seal on ram front	"Maintenance", page 20	200	200
Slides of ram	"Maintenance", page 18	200	200
Condition of counter knife, exchange if necessary	"Maintenance", page 16	200	200
All screws to be tight		200	200
Exchange hydraulic oil (Shell Tellus HLP 46; 209 l total filling amount)	"Maintenance", page 1		2000 or at latest annually
Exchange oil filter	always when oil is exchanged	150	2000
Exchange all hoses of hydraulic system			12000 or exchange at latest after 6 years
Check seals of hydraulic cylinders, replace if necessary			2000

CAUTION

Observe separate documentation for gear motor (see "Appendix").

1.5 Lubrication

- The Retech Grinder is factory filled with all necessary lubricants.
- Regular lubrication, especially of the roller bearings, is important for a trouble free operation of the Retech Grinder and can avoid expensive repairs.
- The lifetime of roller bearings is badly reduced if they are not greased properly. Destroyed bearings can cause further damage.
- See chapter "Technical Data, Pt. 10" for detailed instruction on lubrication points, recommended lubricants, time intervals and individual amounts of lubricant.
- If not available, other than the described lubricants can be used if they are of identical characteristic.
- For lubrication of gearbox see separate documentation in chapter "Appendix".

1.5.1 Storage of Lubricants

- Oil and grease should only be hold in clean and closed containers. Store cool and dry.

2 Repair

2.1 General Remarks

- **VECOPLAN** recommends to employ the qualified **VECOPLAN** service crew for repair. This is the opportunity to get your operation staff well trained.
- This manual treats only repairs which are necessary within normal maintenance and servicing, such as exchanging wear parts.
- If the machine is serviced and repaired by your own operation staff, it is strongly recommended to observe the following advice and to proceed in steps as described.
- To avoid unnecessary standstill it is recommended to have a stock of wear parts and also of the most important spare parts. These parts are specially marked in the spare parts list, see chapter "Appendix".
- Standardised elements, such as screws, nuts, split pins etc., should only be exchanged by parts of identical size and quality.
- Before beginning of any repair or maintenance work the Retech Grinder has to be protected against unintentional start. The main power switch or a separate repair switch (if exists) have to be turned off and locked.
- The drawings on the following pages may be simplified.

2.2 Adjusting the Hydraulic System

The hydraulic system is delivered in ready- to- start condition. Due to repair it may be necessary to re-adjust the system. Proceed as described:

Relief valve (pre- adjustment for setting of pressure switch)

- Check oil level via sight glass or dip stick, add oil if required.
- Start Retech Grinder. Check for correct direction of rotation of every motor (see arrow on ventilator hood).

CAUTION

The hydraulic pump will be destroyed within short time if the motor turns in the wrong direction.

- If exists, open valve (1) to pressure gauge.
- Pull of plug from the electronical pressure switch.
- Wait until ram is in one of it's end positions.
- Loosen check nut of the relief valve.
- Adjust the relief valve to 160 bar by turning the cylinder screw.
Caution: Up to the series RG 52 the relief valve is factory set and can not be adjusted.
- Pin up plug again

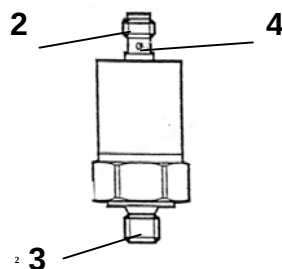
Electronical pressure switch

- Please observe separate instruction manual of IFM for electronic pressure switch (specification of type)!
- The electronic pressure switch is pre-adjusted ex works!.
- Pre-adjustment is effected by Vecoplan – in case of replacement or foreign supply of this switch the specified parameter values have to be adjusted with indicator unit through a programmer. **Please observe PP 2000!**
- Please ask for Vecoplan technicians or order pre-assembled EDS (electronic pressure switches) at Vecoplan.
- Deviations or foreign intervention may lead to malfunction and to exclusion of the warranty.
- Check change-over pressure (LED on pressure switch) as well as the corresponding PLC input variable on switchgear cabinet while hydraulic is operating!
- If the pressure switch actuates, the PLC input variable shines.
- Pull of plug from the pressure switch again and adjust the final operation pressure.
- Add basic values / characteristic values list !

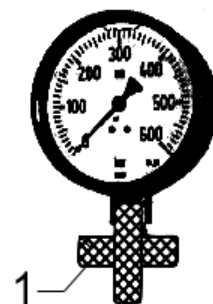
Relief valve (final adjustment)

- Turn the cylinder screw of relief valve to the right until the pressure gauge reads 180 bar.
- Recconnect electrical plug to pressure switch.
- Stop the machine and close valve (1) under pressure gauge.

Pressure switch



Pressure gauge



Details:

- 1 = shut-off valve
- 2 = connection measuring cable
- 3 = connection aggregate
- 4 = LED

2.3 V - belt pulley and V - belts

2.3.1 V - belts

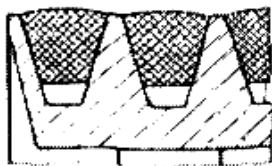
2.3.1.1 General

The V - belt drive is laid out to transmit the required power of the machine. Any attempt to transmit a higher power by increasing the belt tension will damage the belts and also the bearings of motor and driven shaft.

Insufficient belt tension causes slip. This leads to high temperature of belts and pulleys and a dramatically reduced life time.

Both, too high and too low tension of the belts, reduces the efficiency of the drive and therewith of the complete machine.

Temperatures over 158°F reduce the life time and the performance of the belt drive.



The grooves of the pulleys and the belts must be free of oil, grease, rust and dirt and must show no signs of damage.

Do not use belt wax or similar substances to increase the friction coefficient; this only damages the belts.

In order to ensure optimum power transmission the belt drive must be periodically checked and serviced.

Note the following:

- Only replace complete sets of belts, even if only one belt is worn or damaged. Old and new belts do not work together on the same drive.
- When starting up the machine with a new set of belts the belt tension should be checked and corrected after the first 4-5 hours of operation (see 1.2: Maintenance Check List).
- The tension of the belts have to be checked and corrected periodically. Belts and pulleys have to be replaced if worn or damaged (see 1.2: Maintenance Check List).

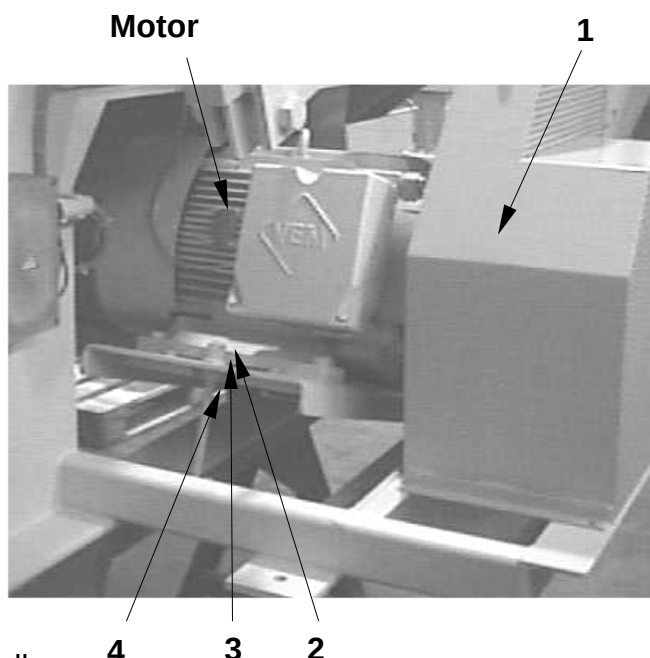
2.3.1.2 Tensioning and Replacing of V - belts



For all maintenance work the machine has to be stopped and the electrical supply disconnected and locked out.



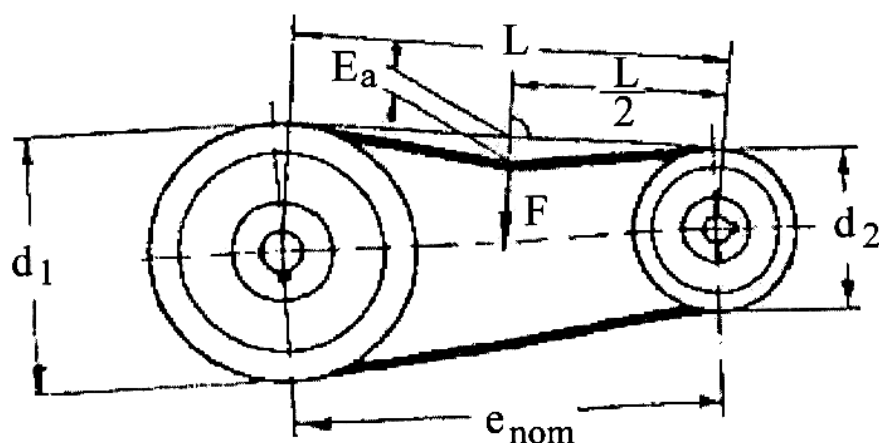
Wear working gloves. Risk of injury!



- Remove belt guard.
- Loosen locknut (2).
- Loosen tensioning screws (3) - remove worn out belts.
- Gently insert the belts by hand into the grooves of the pulleys. Do not apply force, do not use tools.
- Tighten the belts with the tensioning screws (3) to the appropriate belt tension according to values noted in chapter "Technical Data" item 4.
- Check the grooves of the drive pulley and of the driven pulley to be in line.
- Tighten the nut (4) and the locknut (2).
- Install belt guard.



Fire risk at too low V-belt tension and dirty V-belt drive!



E_a = impression depth of the belt (inch)

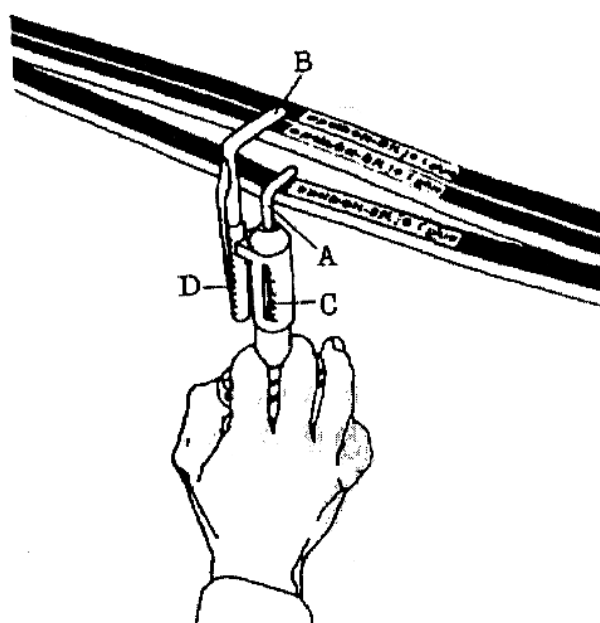
L = free length of belt (inch)

F = test load (N)

e_{nom} = distance between axles (inch)

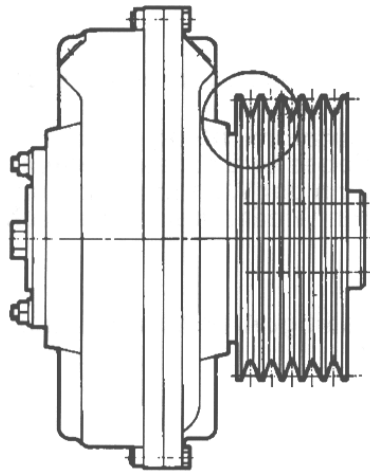
values noted in chapter "Technical Data" item 4

How to check the belt tension with a belt tension gauge:

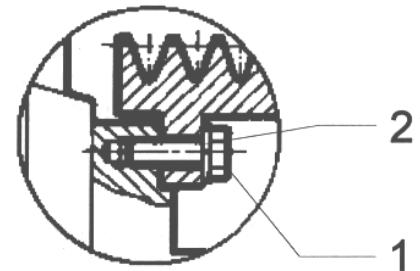


- Place hook A in the middle of the belt.
- Hook B must be on the next belt.
- Pull gauge downwards until scale C shows test load F accordingly to values noted in chapter "Technical Data" item 4
- Read impression depth E_a on scale D and compare with required values. Adjust belt tension if necessary.

2.3.2 Dismantling and assembly of fluid coupling pulley



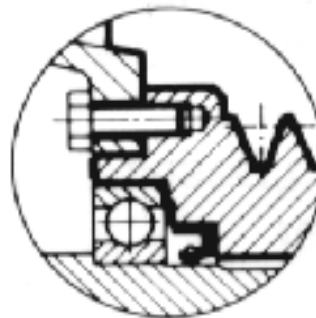
Type KSD...



- Remove fluid coupling from motor shaft by means of a suitable pulling device
- Loosen Hexagon screws (1) with lock washer (2)
- Remove pulley from fluid coupling

Re-assembly in opposite order

Type KSI...



Dismantling of pulley not possible. Send complete coupling to factory.

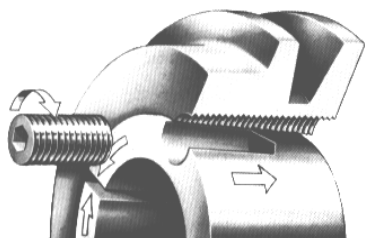
2.3.3 Dismantling and assembling of V - belt pulley



For all maintenance work the machine has to be stopped and the electrical supply disconnected and locked out.



Wear working gloves. Risk of injury!

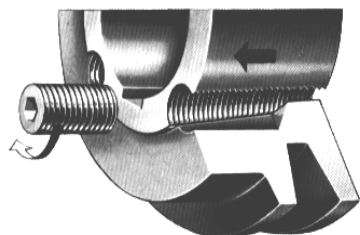


Mounting the pulley

Clean and remove grease and dirt from all bright surfaces. Insert tapered bush into pulley. Align the holes and insert screw loosely.

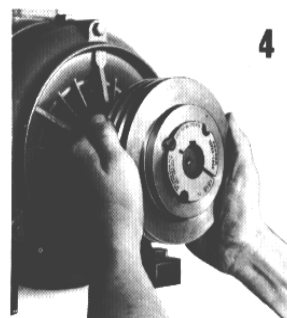


Place the pulley and bush onto the shaft, align it with the key way and the shaft end. Tighten the screws evenly and firmly.



Removing the pulley

Remove the screws. Using one as a forcing screw, screw it half way into the hole and tighten it. This will release the taper - lock bush.



Now remove the loosened pulley - unit by hand from the shaft. Take care not to knock it or to damage the shaft.

2.4 Exchanging Cutters



For all maintenance work the machine has to be stopped and the electrical supply disconnected and locked out.



Wear working clothes. Risk of injuries.



**Worn cutters may heat up the rotor and the material to reduce.
Risk of fire!**

Attention

For mounting and dismounting of the chipping knives, it is not permitted to use an air pressure screwdriver!

Due to their special shape the cutters are easy to replace and can be used on four edges.

- Loosen hexagon screw (2). Take out cutter (1) together with screw (2) and washer (3).
- Check cutters (1) for cracks and broken edges. Damaged cutters must be replaced.
- Clean mounting surfaces of cutters and holders *I* and in the rotor grooves *II*. (see picture IH15)
- Check the mounting surface of holders for being flat.

A holder with deformed or - due to wear - round surface must be replaced. Otherwise it can cause expensive break down because the screws (2) can come loose or the cutter itself can break.

Holders can deform if the rotor hits hard foreign bodies.

Holders will wear excessively if the cutters are not turned or replaced in time.

- Replace cutter (1) or turn by 90 degrees. Never mount the cutter with it's worn surface showing to the holder

- It is extremely important that the two cutters on both ends of the rotor have sharp cutting edges showing to the machine side walls. (See picture **IH15"X"**). Otherwise risk of fire and excessive wear on side walls.
- Replace damaged bent or lengthened hexagon screws and washers (92 lbf / ft).

Hold the cutter in position. (Insert hexagon nut (4) when using cast iron Fx/lbs cutters.) Insert cylinder screw(2) and washer (3) and tighten firmly.

Make sure that the cutters are mounted flat to the holder's surfaces.

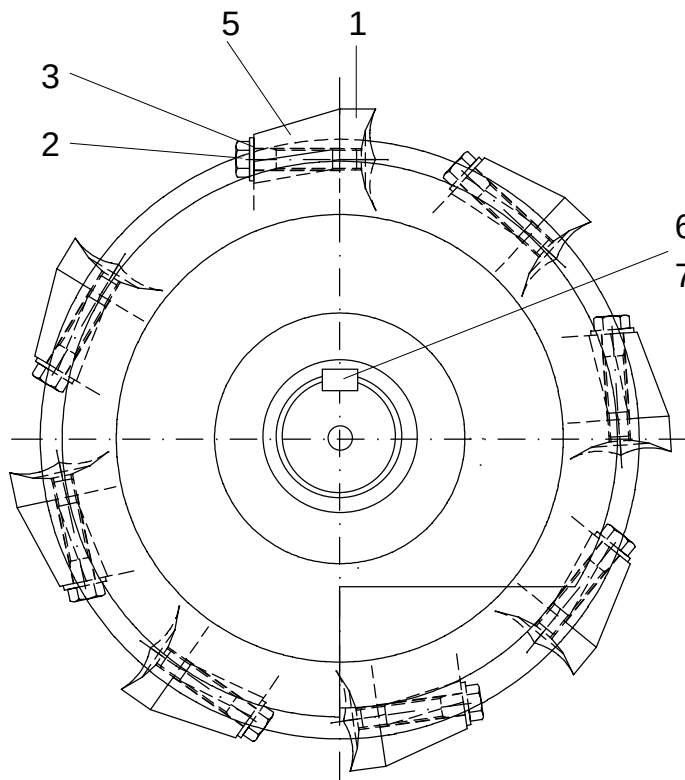
Use exclusively cylinder screws of **quality class 10.9**.

Wear parts are not included in the warranty.

Caution: Cutters have to be turned or replaced **before** the back of the holders are beginning to wear down.

Details:

- 1 = cutter
- 2 = hexagon screw
- 3 = washer
- 4 = hexagon nut
- 5 = knife holder
- 6 = key
- 7 = cylinder screw

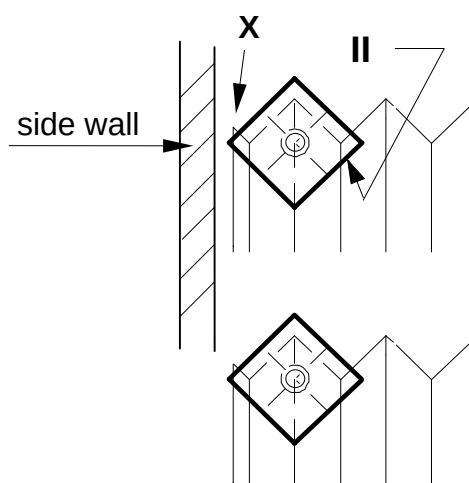
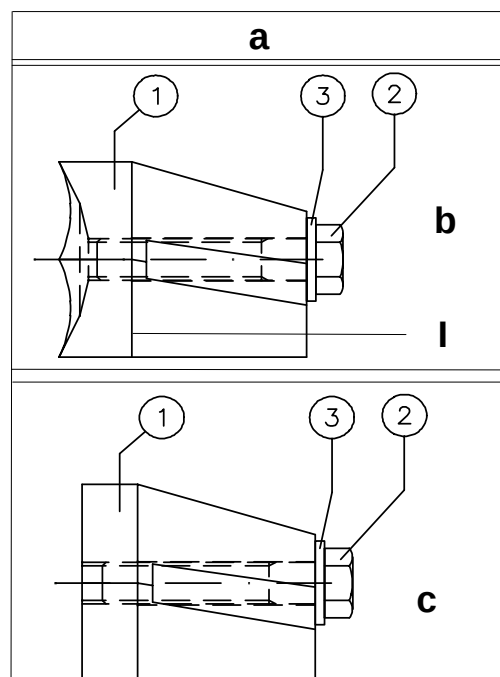


Details:

a = set of cutters
(without .(5)
knife holder)

I = mounting
surface, holder

II = mounting
surface, rotor
groove



2.5 Replacing the counter- knife



For all maintenance work the machine has to be stopped and the electrical supply disconnected and locked out.



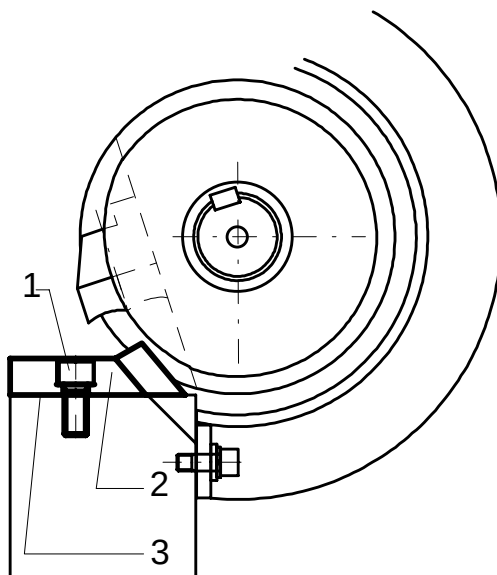
Wear working gloves. Risk of injuries !

Details:

1 = cylinder screw

2 = counter knife

3 = mounting surface



- Loosen cylinder screw (1).
- Take out counter knife (2).
- Clean mounting surface (3).
- Put new counter knife in position.
- Insert cylinder screws (1) and tighten firmly. Use torque wrench adjusted to 185 lbft. Replace damaged screws by those of same quality and size.
- After having replaced the counter knife make sure that the cutters do not hit the counter knife. Turn the rotor by hand for one or two revolutions by turning the fan wheel of the main motor.

Wear parts are not included in the warranty.

2.6 Replacement of Screen



For all maintenance work the machine has to be stopped and the electrical supply disconnected and locked out.



Wear working clothes. Risk of injuries.

Details:

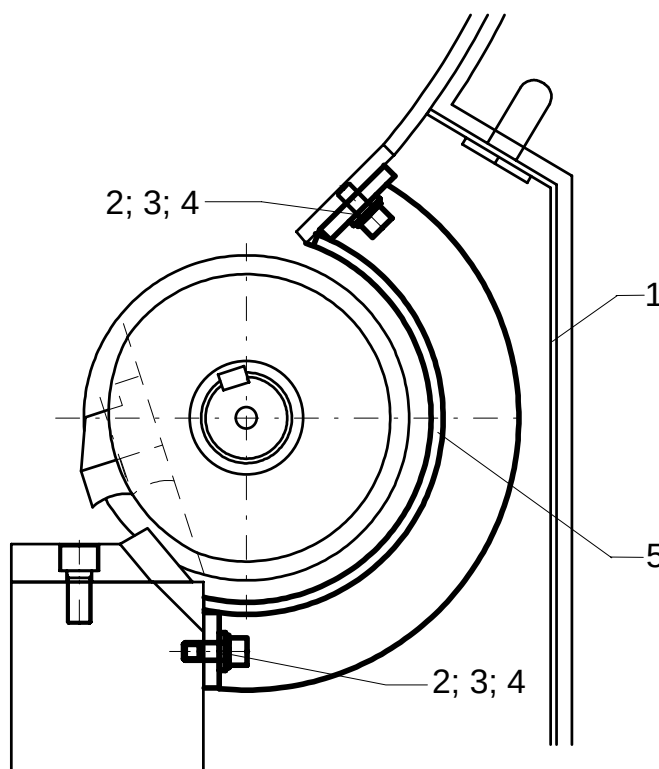
1 = lid

2 = cylinder screw

3 = washer

4 = lock washer

5 = screen unit



- Open lid (1).
- Loosen cylinder screw (2). take off screws together with washers (3) and lock washers (4).
- Remove screen unit (5).

Insert new screen unit in opposite order.

Wear parts are not included in the warranty.

2.7 Ram guides, replacing of guide rollers

The guide rollers have to be inspected every 200 operation hours. Adjust or replace the guide rollers if necessary.

The ram may cock and plastic slides as well as the ram sealing elements (see pictures on following pages) can loose their function if the machine is operated with defective guide rollers.



For all maintenance work the machine has to be stopped and the electrical supply disconnected and locked out.

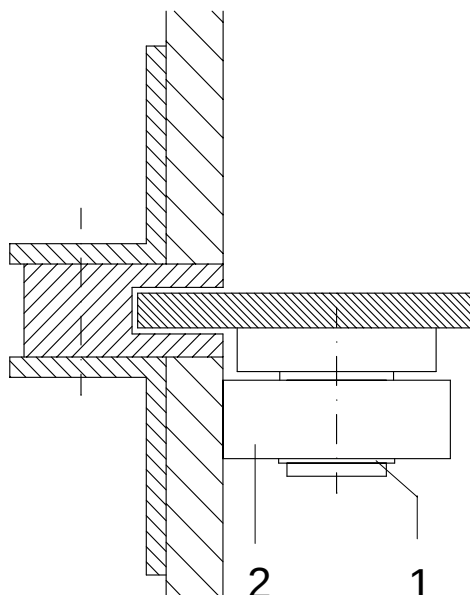
Replacing the guide rollers:

- Remove snap ring (1) and take off guide roller (2).
- Put new guide roller in place.
- Insert new snap ring.

Details:

1 = snap ring

2 = guide roller



Wear parts are not included in the warranty.

2.8 Replacing the Guide Rails

The guide rails have to be checked for wear every 200 operation hours. Replace if necessary.

The ram may cock if the slots of the guide rails are worn out.
Also the ram sealing elements (see on following pages) may loosen function..



For all maintenance work the machine has to be stopped and the electrical supply disconnected and locked out.

Replacing the guide rails (in pairs):

- Support the ram towards the machine bottom plate so that the Guide rails are free from load.
- Loosen cylinder screws (1) with washers (3) and lock washers (2) of upper angle (4).
- Loosen hexagon nuts (8) and remove cylinder screws (5) together with washers (6) and lock washers (7).
- Take out guide rails (9).
- Insert new guide rails and tighten cylinder screws (1) of upper angle (4) again.
- Line up the guide rails in correct position (they must flush with the inner side of the machine side wall) and secure with screw clamps.
- Use a 0,41 inch drill to make bores into the guide rails by boring through the existing holes in the angles (4).
- Insert cylinder screws (5) with washers (6), lock washers (7) and hexagon nuts (8) and tighten firmly.

Details:

1 = cylinder screws

2 = lock washer

3 = washer

4 = upper angle

5 = cylinder screws

6 = washer

7 = lock washer

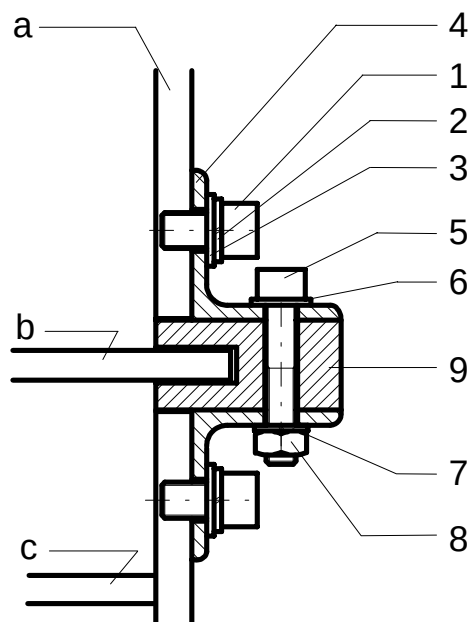
8 = hexagon nut

9 = guide rails

a = machine side wall

b = ram

c = machine bottom plate



Caution: Wear parts are not included in warrantee.

2.9 Replacing the Seals at the Ram Front



For all maintenance work the machine has to be stopped and the electrical supply disconnected and locked out.



Wear working clothes and eye protection.
Risk of injury by loaded springs.

Details:

1 = hexagon nut

2 = washer

3 = spring

4 = bushing

5 = cup square bolt

6 = front plate

7 = seal element

8 = spring

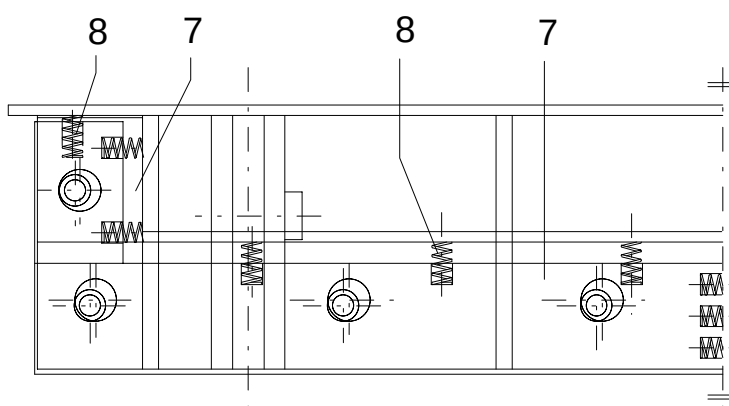
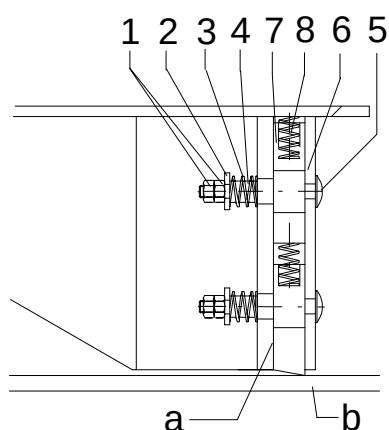
a = contact surface

b = machine bottom plate

- Loosen hexagon nuts (1).
- Remove washers (2), springs (3) and bushings (4).
- Remove carefully front plate (6) together with cup square bolt (5).

Extreme caution: Springs (8) can jump up!

- Take out seal element (7) cautiously.
- Remove springs (8).
- Clean contact surfaces.



Use new seal element and re- assemble in opposite order.

Caution: Wear parts are not included in warrantee.

2.10 Replacing the Seal at the Back Wall

For all maintenance work the machine has to be stopped and the electrical supply disconnected and locked out.

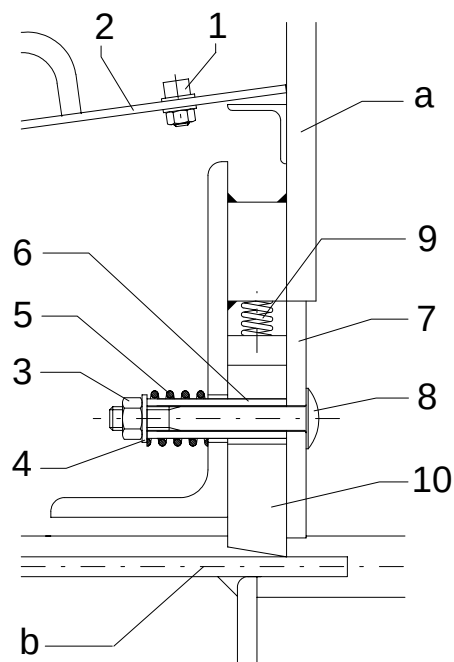


Wear working clothes and eye protection.
Risk of injury by loaded springs.

- Loosen screw connection (1).
- Remove cover (2).
- Loosen hexagon nuts (3).
- Remove washers (4), springs (5) and bushings (6).
- Remove carefully front plate (7) together with cup square bolt (8).
Extreme caution: Springs (9) can jump up!
- Take out seal element (10) cautiously.
- Remove springs (9).
- Clean mounting surface.

Details:

- 1 = screw connection
- 2 = cover
- 3 = hexagon nut
- 4 = washer
- 5 = spring
- 6 = bushing
- 7 = front plate
- 8 = cup square bolt
- 9 = spring
- 10 = seal element
- a = back wall
- b = ram



Use new seal element and re- assemble in opposite order.

Caution: Wear parts are not included in warrantee.

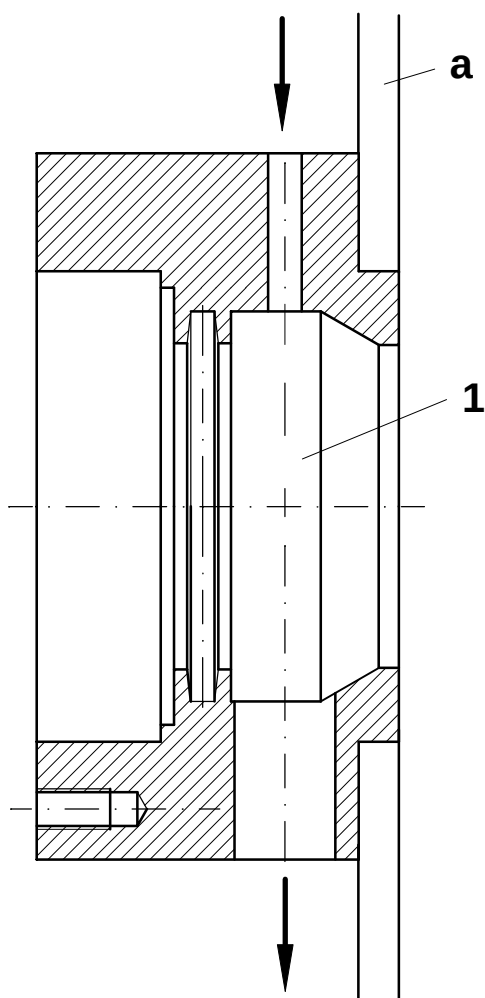
2.11 Maintenance rotor - flanged bearing



For all maintenance work the machine has to be stopped and the electrical supply disconnected and locked out.



Wear working clothes and eye protection.



Details:

a = side wall
machine body

1 = dirt bag

Clean dirt bag (1) by
compressed air to
prescribed direction!

2.12 Repair of the Rotor

For all repairs to the rotor as replacing bearings, removing the gear box, removing and re assembling the rotor itself **VECOPLAN** recommends to use qualified and experienced **VECOPLAN** engineers.

Contents		Page
1	Stocking of spare parts	1
2	Our representatives for spare parts and service	2
3	Spare parts list for RG 52 / 100 (SWU)	3

1 Stocking of spare parts

Stocking the major spare and wear parts is an basic requirement for a high reliability and constantly safe operation of your machine / plant.

For ordering parts please use the detailed spare part lists of this manual (see Chapter "Appendix").

VECOPLAN can only be held liable for original **VECOPLAN** parts.

Please note that parts, equipment and accessories which are not supplied by **VECOPLAN** are not approved and released by the **VECOPLAN** engineering department. Putting in and / or using parts of foreign manufacturers or unknown origin may change basic design and functional characteristics and may decrease active and passive safety. **VECOPLAN** is not liable for any damage or injury as a result of the use of foreign parts, equipment and accessories.

Original **VECOPLAN** parts, manufactured to our strict quality specifications, are always according to the latest state of development and also to actual legislative regulations.

Please give the following information when ordering spare parts.

- order no.
- nomination
- part no.
- machine no.
- Position - no. in spare parts list
- no. of required parts

2 Adresses for spare parts and service

The Vecoplan spare parts department:

VECOPLAN LLC
5708 Uwharrie Road
Archdale, N.C. 27263

USA

Phone: 001-336-861-6070

Telefax: 001-336-861-4329

3 Spare parts list for Retech Grinder RG 52 / 100 SWU**Machine body (module 1)**

page/pos.	no. of	denomination
IH17/5	1	screen unit, complete
IH21	1	seal at back wall, complete
IH21/10	1	seal element, back wall
IH21/7	1	front sheet (seal at back wall)
IH21/9	6	spring (seal at back wall)
IH21/5	6	spring (seal at back wall, mushroom head screw)
IH21/8	6	mushroom head screw (seal at back wall)
IH21/4	6	washer (seal at back wall)
IH21/3	12	hexagon - nut (seal at back wall)
IH16	1	set of counter knife, complete
IH16/2	2	counter knife, hardened
IH16/1	16	cylinder screw (counter knife)

Rotor (module 2)

page/pos.	no. of	denomination
IH 14	1	rotor, complete
IH 14	1	rotor shaft
IH 14/5	74	knife holder
IH 14	74	set of cutting tools
IH 14/1	74	cutter
IH 14/2	74	cylinder screw (cutter)
IH 14/3	74	washer (cutter)
IH 14/6	1	key (gear box)
IH 14/7	2	cylinder screw (key)
TE 8/	1	bearing housing; axial fixed
TE 8/	1	bearing housing; axial free
TE 8/	2	bushing
TE 8/	1	cover of bearing, close
TE 8/	1	cover of bearing, open

page/pos.	no. of	denomination
TE 8/	1	felt seal
TE 8/	2	felt seal
TE 8/	2	roller bearing, self aligning type 22224 CCK / W33
TE 8/	2	sleeve H 3124
TE 8/	12	cylinder screw
TE 8/	12	cylinder screw
TE 8/	1	lock nut, type KMTA
TE 8/	2	grease fitting

Feed Unit (module 3)

page/pos.	no. of	denomination
IH21	1	ram complete
IH21/ 6	1	front sheet of ram
IH21/ 7	1	seal element, ram left
IH21/ 7	1	seal element, ram right
IH21/ 5	8	mushroom head screw (seal element)
IH21/ 1	8	hexagon nut (seal element)
IH21/ 1	8	hexagon nut (seal element)
IH21/ 2	8	washer (seal element)
IH21/ 3	10	spring (mushroom head screw)
IH21/ 8	8	spring (seal element)
IH19/ 9	2	guide rail (ram)
IH20/ 2	4	guide roller (ram)
IH20/ 1	4	snap ring (guide roller)
IH 2/ 1	2	bolt, hydraulic cylinder
IH 2/ 1	2	adjustable ring, hydraulic cylinder
IH 2/ 1	2	cylinder screw, hydraulic cylinder
IH 2/ 1	2	lock washer, hydraulic cylinder

Main Drive (module 4)

<u>page/pos.</u>	<u>no. of</u>	<u>denomination</u>
AW 5/ 1	1	limit switch (torque support)
TE 2	12	disc spring
TE 2	2	elastic bush
G 1/	1	gear
IH 9/	1	electric motor 90 HP 1780 RPM; 575 V; 60 Hz
IH 9/	1	pulley gear box Ø 11,02; 5 grooves; profile SPB
IH 9/	1	TAPER LOCK - bushing, no. 3525; Ø 1,97
IH 11/	1	pulley fluid coupling Ø 11,02; 5 grooves; profile SPB
IH 10/	5	V-belts, profile SPB 83,46

Hydraulic System (module 6)

<u>page/pos.</u>	<u>no. of</u>	<u>denomination</u>
HY 1/ 1	1	Hydraulic - Unit
IH 2/	2	Hydraulic Cylinder

Contents**Page**

1

List of separate Documentation

1

1 List of separate Documentation

- GM - Doc. gear box
- TK - Doc. fluid coupling
 - Doc. electrical Control (see inside control panel)
- HY - Doc. hydraulic equipment

1 Maintenance Tools and Accessories

The delivery of the Retech granulator contains the following basic maintenance tools and accessories:

- 1 tool box
- 1 torque wrench, 500 mm long, 1/2 "
- 1 extension 1/2"
- 1 pin spanner, 6 mm, DIN 911, no. 80
- 1 pin spanner, 8 mm, DIN 911, no. 80
- 1 pin spanner, 10 mm, DIN 911, no. 80
- 1 wrench 17 mm DIN 3113
- 1 wrench 19 mm DIN 3113
- 1 socket spanner 1/2 " 10 mm
- 1 socket spanner 1/2 " 19 mm
- 1 melt plug for KSD 12; 175°C / 3 slots up to 22 kW
- 1 tin with original paint, ½ litre

2 List of separate Documentation

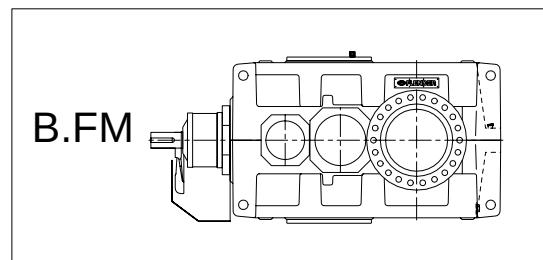
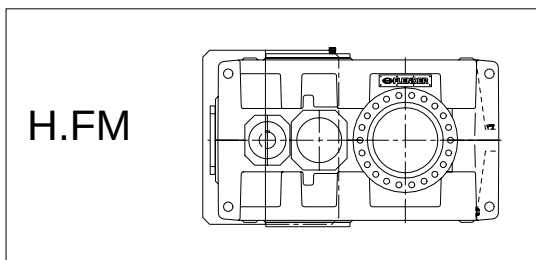
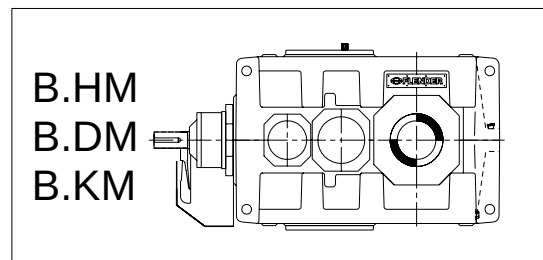
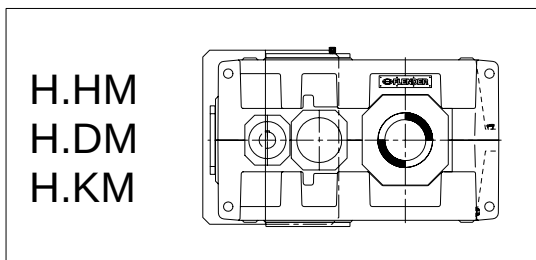
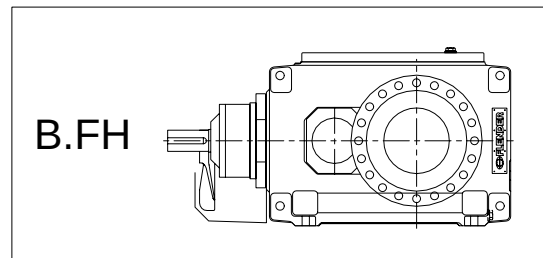
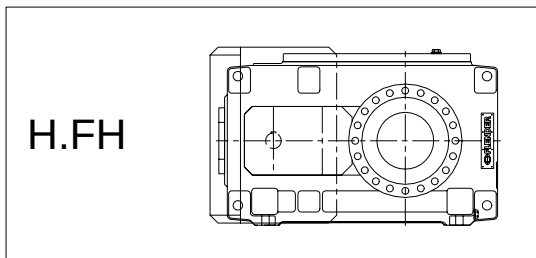
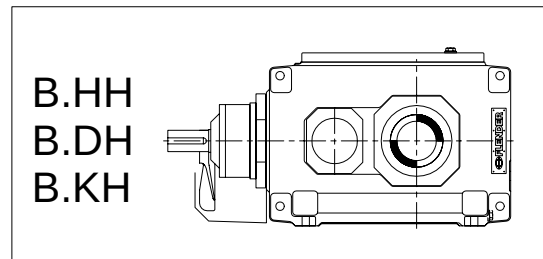
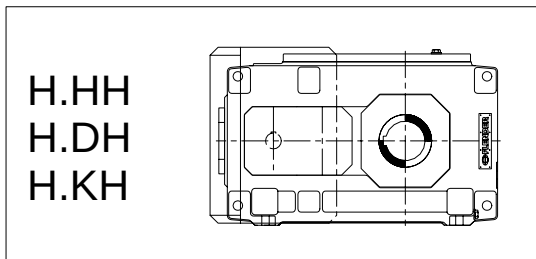
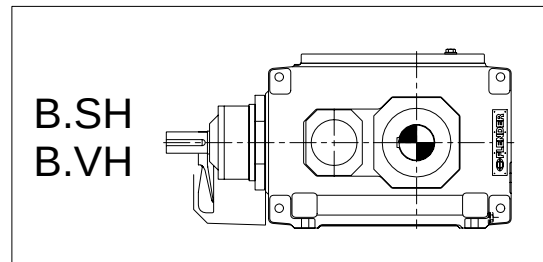
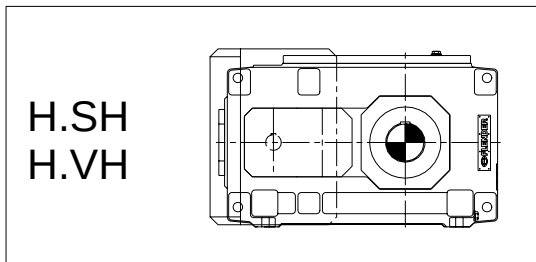
- GM - Doc. gear box
- TK - Doc. fluid coupling
 - Doc. electrical Control (see inside control panel)
- HY - Doc. hydraulic equipment

Operating Instructions

BA 5010 EN 08.98

Gear Unit Types

H.SH, H.VH, H.HH, H.DH, H.KH, H.FH, H.HM, H.DM, H.KM, H.FM
B.SH, B.VH, B.HH, B.DH, B.KH, B.FH, B.HM, B.DM, B.KM, B.FM
Sizes 1 to 26



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1. Technical data

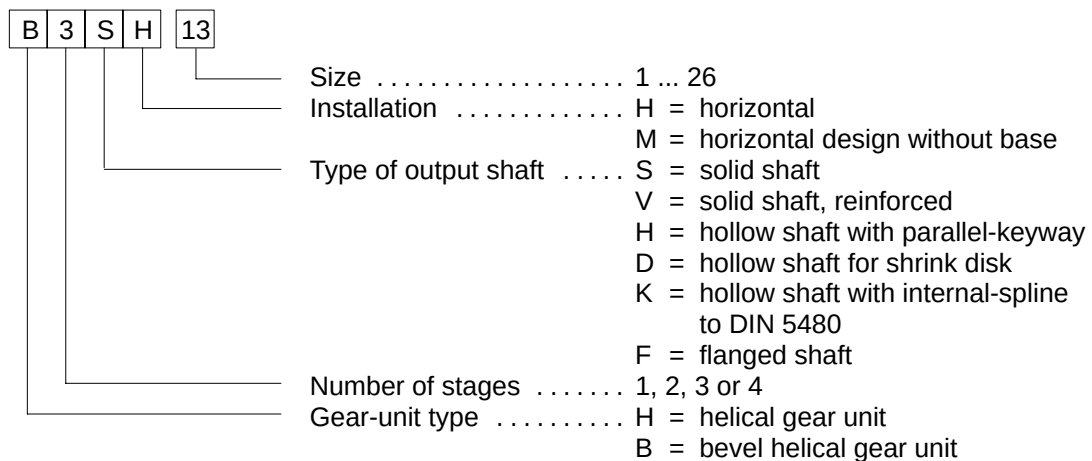
1.1 General technical data

The most important technical data are shown on the rating plate. These data along with the contractual agreements on the gear unit determine the limits of its proper use.

①		
②		
③		
④	⑤	
⑥	⑦	
⑧	⑨	⑩
⑪		
⑫		

- | | |
|--|---|
| ① Company logo and production location | ⑦ Speed n_2 |
| ② Special information | ⑧ Type of oil |
| ③ Order no. - item - serial no. | ⑨ Viscosity of oil in VG class |
| ④ Type / Size *) | ⑩ Quantity of oil in litres for main gear housing |
| ⑤ Power rating P in kW or T_2 in Nm | ⑪ Number of operating instruction(s) |
| ⑥ Speed n_1 | ⑫ Special information |

e.g. *)



Data on weights and measuring surface sound levels of the various gear types are given in sections 1.1.1 and 1.1.2.

For further technical details, refer to the drawings in the gear-unit documentation.

1.1.1 Weights

Type	Approx. weight (kg) for size											
	1	2	3	4	5	6	7	8	9	10	11	12
H1SH	55	–	128	–	302	–	547	–	862	–	1515	–
H2.H	–	–	115	190	300	355	505	590	830	960	1335	1615
H2.M	–	–	–	–	–	–	–	–	–	–	–	–
H3.H	–	–	–	–	320	365	540	625	875	1020	1400	1675
H3.M	–	–	–	–	–	–	–	–	–	–	–	–
H4.H	–	–	–	–	–	–	550	645	875	1010	1460	1725
H4.M	–	–	–	–	–	–	–	–	–	–	–	–
B2.H	65	90	140	235	360	410	615	700	1000	1155	1640	1910
B2.M	–	–	–	–	–	–	–	–	–	–	–	–
B3.H	–	–	130	210	325	380	550	635	890	1020	1455	1730
B3.M	–	–	–	–	–	–	–	–	–	–	–	–
B4.H	–	–	–	–	335	385	555	655	890	1025	1485	1750
B4.M	–	–	–	–	–	–	–	–	–	–	–	–

Type	Approx. weight (kg) for size													
	13	14	15	16	17	18	19	20	21	22	23	24	25	26
H1SH	2395	–	3200	–	4250	–	5800	–	–	–	–	–	–	–
H2.H	2000	2570	3430	3655	4650	5125	5250	6550	7200	7800	10685	12030	13100	14900
H2.M	1880	2430	3240	3465	4420	4870	5000	6150	6950	7550	10000	11350	12600	14400
H3.H	2295	2625	3475	3875	4560	5030	5050	6650	6950	7550	9000	9400	12200	14000
H3.M	2155	2490	3260	3625	4250	4740	4750	6250	6550	7050	8400	8750	11500	13200
H4.H	2390	2730	3635	3965	4680	5185	5700	6400	7750	8350	10000	11200	13700	15700
H4.M	2270	2600	3440	3740	4445	4915	5300	5950	7250	7750	9350	10450	12800	14700
B2.H	2450	2825	3990	4345	5620	6150	–	–	–	–	–	–	–	–
B2.M	2350	2725	3795	4160	5320	5860	–	–	–	–	–	–	–	–
B3.H	2380	2750	3730	3955	4990	5495	6240	6950	8480	9240	10900	12400	15300	17500
B3.M	2260	2615	3540	3765	4760	5240	6050	6710	8190	8950	10500	12000	14800	16900
B4.H	2395	2735	3630	3985	4695	5200	5750	6450	7850	8400	10100	11300	13800	15800
B4.M	2280	2605	3435	3765	4460	4930	5400	6000	7350	7850	9400	10500	12900	14800

Table 1.1: Weights (approx. values only)

Note: All weights are for gear unit without oil charge or attachments. For the exact weights, refer to the drawings in the gear-unit documentation.

1.1.2 Measuring-surface sound level

The measuring-surface sound level for the gear unit at a distance of 1 m can be found in tables 1.1.2.1 to 1.1.2.4.

The measurement is carried out to DIN 45635 parts 1 and 23 using the sound-intensity method.

The workplace of the operating personnel is defined as the area on the measuring surface at a distance of 1 metre, in whose vicinity persons may be present.

The sound level applies for the warmed-up gear unit at input speed n_1 and input power P_1 stated on the rating plate. If several figures are given, the highest speed and power values apply.

The measuring-surface sound level includes attached lubrication units (if applicable). With outgoing and ingoing pipes, the interfaces are the flanges.

If repeat measurements on site do not produce conclusive results with regard to measuring technology, the measurement achieved on the FLENDER test bench will apply.

The sound level stated in the table was obtained by statistical calculation by our Quality Control Dept. The gear unit may be expected to comply with these sound levels with statistical probability.

1.1.2.1 Measuring-surface sound level for bevel helical-gear units (B...) with fan

Measuring-surface sound level L _{pA} in dB(A) for bevel helical-gear units with fan																												
Type	i _N	n ₁ 1/min	Gear-unit size																									
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
B2	5	3000	79	83	85	89	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	.	1500	65	70	73	76	79	81	83	84	85	87	88	89	91	92	94	—	—	—	—	—	—	—	—	—	—	—
	.	1000	1)	1)	67	71	73	74	77	78	79	80	82	83	84	85	87	89	90	—	—	—	—	—	—	—	—	—
	8	750	1)	1)	61	64	66	67	70	71	72	73	75	76	77	78	81	82	83	85	—	—	—	—	—	—	—	—
	9	3000	79	81	83	87	89	90	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	.	1500	65	67	70	73	75	76	78	81	82	83	84	85	86	87	88	90	—	—	—	—	—	—	—	—	—	
	.	1000	1)	61	63	67	68	70	73	74	75	77	79	80	81	82	83	84	86	87	—	—	—	—	—	—	—	
	14	750	1)	1)	1)	61	62	64	66	67	68	70	72	73	74	75	77	78	79	80	—	—	—	—	—	—	—	—
	16	3000	77	79	81	85	88	89	90	91	92	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	.	1500	63	65	67	71	74	76	78	79	80	81	83	84	87	88	89	90	—	—	—	—	—	—	—	—	—	
	.	1000	1)	1)	60	64	67	68	70	72	73	74	78	79	80	81	82	83	84	84	—	—	—	—	—	—	—	—
	22.4	750	1)	1)	1)	1)	61	63	65	67	68	69	71	72	73	73	74	74	75	76	—	—	—	—	—	—	—	—
B3	12.5	3000	—	—	82	86	87	88	90	92	93	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	.	1500	—	—	69	72	75	77	79	80	81	82	83	85	88	89	90	91	93	93	93	93	95	95	—	—	—	
	.	1000	—	—	62	65	68	69	71	72	73	74	77	78	80	82	83	83	84	85	86	86	88	88	89	90	91	
	31.5	750	—	—	1)	1)	63	64	66	68	69	70	71	73	74	75	76	77	78	78	79	79	81	81	82	84	85	
	35.5	3000	—	—	81	83	85	86	87	88	90	92	95	96	—	—	—	—	—	—	—	—	—	—	—	—	—	
	.	1500	—	—	67	69	72	73	74	75	77	79	82	84	86	87	88	89	90	91	92	92	93	93	—	—	—	
	.	1000	—	—	1)	63	65	66	67	69	71	72	73	75	77	78	79	80	81	82	83	84	85	86	86	87	88	
	56	750	—	—	1)	1)	1)	62	64	65	67	69	70	71	72	73	74	75	76	77	78	79	79	80	81	82	82	
	63	3000	—	—	80	82	84	85	87	88	90	92	94	95	—	—	—	—	—	—	—	—	—	—	—	—	—	
	.	1500	—	—	66	68	70	71	73	74	76	78	81	83	85	86	87	88	89	90	91	91	92	92	—	—	—	
	.	1000	—	—	1)	61	63	64	66	68	69	71	73	75	77	78	79	80	81	81	82	82	83	84	84	85	86	
	90	750	—	—	1)	1)	1)	61	63	64	66	67	68	70	71	72	73	74	75	75	76	77	77	78	79	79	80	

1) $L_{pA} < 60$ dB(A)

1.1.2.2 Measuring-surface sound level for bevel helical-gear units (B...) without fan

Measuring-surface sound level L _{pA} in dB(A) for bevel helical-gear units without fan																												
Type	i _N	n ₁ 1/min	Gear-unit size																									
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
B2	5	3000	75	81	84	88	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	.	1500	63	69	72	75	78	80	82	83	84	86	87	88	89	90	93	—	—	—	—	—	—	—	—	—	—	—
	.	1000	1)	1)	66	70	72	73	76	77	78	79	81	82	83	84	86	88	89	—	—	—	—	—	—	—	—	—
	8	750	1)	1)	1)	63	65	66	69	71	72	73	74	75	77	78	80	82	83	84	—	—	—	—	—	—	—	—
	9	3000	73	77	80	83	86	87	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	.	1500	61	64	67	71	74	75	77	79	80	81	83	84	85	86	87	89	—	—	—	—	—	—	—	—	—	
	.	1000	1)	1)	61	65	67	69	72	73	74	76	77	78	80	81	82	83	85	86	—	—	—	—	—	—	—	
	14	750	1)	1)	1)	1)	60	63	65	66	67	69	71	72	73	74	76	77	78	79	—	—	—	—	—	—	—	
	16	3000	69	72	76	79	81	83	85	86	87	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	.	1500	1)	60	63	66	69	71	72	74	75	77	78	80	81	82	85	85	—	—	—	—	—	—	—	—	—	
	.	1000	1)	1)	1)	61	63	65	67	68	69	71	72	74	75	77	79	80	81	81	—	—	—	—	—	—	—	
	22.4	750	1)	1)	1)	1)	1)	1)	60	62	63	64	66	67	68	70	72	73	74	75	—	—	—	—	—	—	—	
B3	12.5	3000	—	—	77	81	84	86	87	88	90	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	.	1500	—	—	65	68	71	74	75	76	77	79	81	83	84	85	86	87	87	88	89	90	91	92	—	—	—	
	.	1000	—	—	1)	63	66	68	69	70	72	73	75	77	78	80	80	81	82	82	84	85	86	86	88	89	90	—
	31.5	750	—	—	1)	1)	1)	61	62	64	65	66	68	71	71	73	73	74	75	75	77	78	79	79	81	82	83	84
	35.5	3000	—	—	72	77	80	82	83	84	84	86	89	92	—	—	—	—	—	—	—	—	—	—	—	—	—	
	.	1500	—	—	60	65	67	70	71	71	72	74	77	79	80	81	82	83	83	84	86	86	88	88	—	—	—	
	.	1000	—	—	1)	1)	62	65	65	66	66	69	71	73	75	76	76	77	77	78	80	81	82	83	84	85	86	87
	56	750	—	—	1)	1)	1)	1)	1)	1)	1)	62	65	67	68	69	70	70	71	72	74	74	75	76	78	80	80	80
	63	3000	—	—	69	73	76	84	80	80	81	83	84	88	89	90	—	—	—	—	—	—	—	—	—	—	—	—
	.	1500	—	—	1)	61	64	70	67	68	68	70	73	75	76	78	78	79	79	80	82	83	84	84	—	—	—	
	.	1000	—	—	1)	1)	1)	63	62	62	62	65	68	70	71	72	73	73	74	75	76	77	78	79	81	81	83	83
	90	750	—	—	1)	1)	1)	1)	1)	1)	1)	61	63	64	65	66	67	67	68	70	70	72	72	74	75	76	76	
B4	80	3000	—	—	—	—	76	77	79	81	82	85	87	89	90	91	92	—	—	—	—	—	—	—	—	—	—	
	.	1500	—	—	—	—	64	65	67	68	70	72	75	76	77	79	80	81	82	83	84	85	86	86	87	88	87	89
	.	1000	—	—	—	—	1)	1)	61	63	64	67	69	70	72	73	74	75	76	77	78	79	80	80	81	82	82	83
	125	750	—	—	—	—	1)	1)	1)	1)	1)	1)	62	64	65	66	68	68	69	71	71	72	73	74	74	75	75	76
	140	3000	—	—	—	—	72	74	76	77	78	81	84	85	86	87	89	89	90	92	—	—	—	—	—	—	—	
	.	1500	—	—	—	—	60	61	63	65	66	68	71	72	73	75	76	77	78	79	80	81	82	82	83	84	85	86
	.	1000	—	—	—	—	1)	1)	1)	1)	61	63	65	67	68	69	71	71	72	74	75	75	76	77	78	78	79	80
	224	750	—	—	—	—	1)	1)	1)	1)	1)	1)	1)	1)	61	62	64	65	66	67	68	69	69	70	71	72	73	73
	250	3000	—	—	—	—	69	70	72	74	75	77	80	81	82	84	85	86	87	88	89	90	91	—	—	—	—	
	.	1500	—	—	—	—	1)	1)	1)	62	63	65	67	69	70	71	73	73	75	76	77	77	78	79	80	80	81	82
	.	1000	—	—	—	—	1)	1)	1)	1)	1)	1)	62	63	64	66	67	68	69	70	71	72	73	73	74	75	76	77
	400	750	—	—	—	—	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)	61	62	63	64	65	66	66	67	68	69	70

1) $L_{pA} < 60$ dB(A)

1.1.2.3 Measuring-surface sound level for helical-gear units (H...) with fan

Measuring-surface sound level L _{pA} in dB(A) for helical-gear units with fan																												
Type	i _N	n ₁ 1/min	Gear-unit size																									
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
H1	1.25	3000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		1500	–	–	76	–	81	–	84	–	87	–	91	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		1000	–	–	71	–	76	–	79	–	81	–	83	–	85	–	–	–	–	–	–	–	–	–	–	–	–	–
		750	–	–	67	–	72	–	75	–	78	–	80	–	82	–	85	–	–	–	–	–	–	–	–	–	–	–
	2.24	3000	–	–	83	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		1500	–	–	73	–	79	–	82	–	84	–	89	–	90	–	–	–	–	–	–	–	–	–	–	–	–	–
		1000	–	–	68	–	74	–	77	–	79	–	82	–	84	–	87	–	–	–	–	–	–	–	–	–	–	–
		750	–	–	64	–	70	–	72	–	75	–	78	–	80	–	83	–	84	–	–	–	–	–	–	–	–	–
	3.55	3000	–	–	81	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		1500	–	–	70	–	77	–	81	–	83	–	86	–	89	–	93	–	–	–	–	–	–	–	–	–	–	–
		1000	–	–	65	–	71	–	75	–	77	–	80	–	82	–	84	–	85	–	87	–	–	–	–	–	–	–
		750	–	–	61	–	68	–	71	–	72	–	75	–	77	–	79	–	81	–	83	–	–	–	–	–	–	–
5.6	3000	–	–	81	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
	1500	–	–	70	–	77	–	81	–	83	–	86	–	89	–	93	–	–	–	–	–	–	–	–	–	–	–	
	1000	–	–	65	–	71	–	75	–	77	–	80	–	82	–	84	–	85	–	87	–	–	–	–	–	–	–	
	750	–	–	61	–	68	–	71	–	72	–	75	–	77	–	79	–	81	–	83	–	–	–	–	–	–	–	
H2	6.3	3000	–	–	–	85	87	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
		1500	–	–	–	75	76	77	80	81	82	84	85	86	88	90	92	94	96	96	–	–	–	–	–	–	–	
		1000	–	–	–	69	71	72	74	75	77	79	80	81	83	84	85	86	87	88	88	89	90	–	–	–	–	
		750	–	–	–	66	68	69	70	72	73	75	76	77	79	80	81	82	83	83	84	84	85	85	86	–	–	
	11.2	3000	–	–	–	84	86	87	91	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
		1500	–	–	–	73	75	77	79	80	81	82	85	88	90	91	92	93	95	95	–	–	–	–	–	–	–	
		1000	–	–	–	68	69	70	72	73	75	77	79	80	82	83	84	85	85	86	86	87	87	87	88	88	–	
		750	–	–	–	64	66	67	69	70	71	73	74	76	78	79	79	80	81	81	82	82	83	83	83	84	84	
	16	3000	–	–	–	84	86	87	91	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
		1500	–	–	–	73	75	77	79	80	81	82	85	88	90	91	92	93	95	95	–	–	–	–	–	–	–	
		1000	–	–	–	68	69	70	72	73	75	77	79	80	82	83	84	85	85	86	86	87	87	87	88	88	–	
		750	–	–	–	64	66	67	69	70	71	73	74	76	78	79	79	80	81	81	82	82	83	83	83	84	84	
18	3000	–	–	–	83	84	85	88	90	92	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–		
	1500	–	–	–	71	73	75	77	78	80	82	84	86	87	90	91	92	93	94	94	95	95	95	95	–	–		
	1000	–	–	–	65	67	68	71	72	73	75	77	78	80	81	82	83	83	84	85	85	86	86	86	87	87		
	750	–	–	–	62	64	65	67	68	69	71	73	74	75	77	78	79	79	80	80	81	81	81	82	82	83		
H3	22.4	3000	–	–	–	–	84	84	87	87	90	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
		1500	–	–	–	–	71	72	75	75	77	77	80	80	81	81	84	84	84	85	–	–	–	–	–	–	–	
		1000	–	–	–	–	65	66	69	70	71	72	74	75	75	75	78	78	78	79	–	–	–	–	–	–	–	
		750	–	–	–	–	62	62	66	67	67	68	70	70	71	72	74	74	75	76	–	–	–	–	–	–	–	
	35.5	3000	–	–	–	–	84	84	86	86	89	89	92	93	–	–	–	–	–	–	–	–	–	–	–	–	–	
		1500	–	–	–	–	70	71	73	74	76	76	79	79	80	80	83	82	83	83	–	–	–	–	–	–	–	
		1000	–	–	–	–	64	65	67	68	69	70	73	73	73	74	77	77	77	77	–	–	–	–	–	–	–	
		750	–	–	–	–	62	62	63	64	65	66	69	69	69	70	72	73	73	73	–	–	–	–	–	–	–	
	63	3000	–	–	–	–	83	83	85	85	89	89	92	92	92	92	–	–	–	–	–	–	–	–	–	–	–	
		1500	–	–	–	–	70	70	72	72	75	75	78	78	78	78	82	82	82	82	–	–	–	–	–	–	–	
		1000	–	–	–	–	64	64	65	66	68	69	71	72	72	72	75	75	75	76	–	–	–	–	–	–	–	
		750	–	–	–	–	61	61	62	62	64	65	67	67	68	68	71	71	71	72	–	–	–	–	–	–	–	
71	3000	–	–	–	–	83	83	85	85	89	89	92	92	92	92	–	–	–	–	–	–	–	–	–	–	–		
	1500	–	–	–	–	70	70	72	72	75	75	78	78	78	78	82	82	82	82	–	–	–	–	–	–	–		
	1000	–	–	–	–	64	64	65	66	68	69	71	72	72	72	75	75	75	76	–	–	–	–	–	–	–		
	750	–	–	–	–	61	61	62	62	64	65	67	67	68	68	71	71	71	72	–	–	–	–	–	–	–		

1) $L_{pA} < 60$ dB(A)

1.1.2.4 Measuring-surface sound level for helical-gear units (H...) without fan

Measuring-surface sound level L _{pA} in dB(A) for helical-gear units without fan																												
Type	i _N	n ₁ 1/min	Gear-unit size																									
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
H1	1.25	3000	78	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	.	1500	69	—	73	—	77	—	79	—	81	—	83	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	.	1000	64	—	69	—	72	—	75	—	76	—	78	—	80	—	—	—	—	—	—	—	—	—	—	—	—	—
	2	750	60	—	65	—	69	—	71	—	73	—	75	—	77	—	79	—	—	—	—	—	—	—	—	—	—	—
	2.24	3000	76	—	80	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	.	1500	66	—	70	—	75	—	77	—	79	—	81	—	83	—	—	—	—	—	—	—	—	—	—	—	—	—
	.	1000	62	—	66	—	70	—	72	—	74	—	76	—	78	—	80	—	—	—	—	—	—	—	—	—	—	—
	3.55	750	59	—	62	—	67	—	68	—	71	—	73	—	75	—	77	—	79	—	—	—	—	—	—	—	—	—
	4	3000	72	—	76	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	.	1500	63	—	67	—	72	—	74	—	76	—	78	—	79	—	82	—	—	—	—	—	—	—	—	—	—	—
	.	1000	1)	—	1)	—	67	—	70	—	71	—	73	—	75	—	77	—	79	—	81	—	—	—	—	—	—	—
	5.6	750	1)	—	1)	—	63	—	66	—	67	—	70	—	71	—	74	—	76	—	78	—	—	—	—	—	—	—
H2	6.3	3000	—	—	79	80	83	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	.	1500	—	—	70	71	74	75	76	77	79	79	80	81	81	82	84	85	85	86	—	—	—	—	—	—	—	
	.	1000	—	—	65	66	69	70	71	72	74	74	75	76	76	77	80	80	80	81	83	83	84	—	—	—	—	
	10	750	—	—	62	63	66	67	67	69	70	71	72	73	73	74	76	77	77	78	80	80	81	81	81	—	—	
	11.2	3000	—	—	77	78	81	82	83	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	.	1500	—	—	68	69	72	73	74	75	77	77	78	79	79	80	82	83	83	84	—	—	—	—	—	—	—	
	.	1000	—	—	63	64	67	68	69	70	72	72	73	74	74	75	77	78	78	79	81	81	82	82	83	83	—	
	16	750	—	—	1)	61	64	65	66	67	69	69	70	71	71	72	74	75	75	76	77	78	79	79	79	80	81	
	18	3000	—	—	75	75	78	79	80	81	83	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	.	1500	—	—	66	66	69	70	71	72	74	74	75	76	77	78	80	80	81	82	83	84	84	85	—	—	—	
	.	1000	—	—	60	61	64	65	66	68	69	69	70	71	72	73	75	75	76	77	78	79	79	80	80	81	81	
	28	750	—	—	1)	1)	61	62	63	64	66	66	67	68	69	70	72	72	73	73	75	75	76	76	77	77	78	
H3	22.4	3000	—	—	—	—	77	79	82	81	83	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	.	1500	—	—	—	—	68	69	73	74	74	75	77	77	78	79	81	81	82	83	83	84	85	86	86	87	—	
	.	1000	—	—	—	—	63	65	68	69	69	71	72	73	73	74	76	77	77	78	79	79	81	81	81	82	83	
	35.5	750	—	—	—	—	60	61	65	66	65	67	69	69	70	71	73	73	74	75	75	76	77	78	78	79	80	
	40	3000	—	—	—	—	74	76	79	80	80	82	83	84	—	—	—	—	—	—	—	—	—	—	—	—	—	
	.	1500	—	—	—	—	65	67	70	71	71	73	74	75	76	76	78	79	79	80	81	81	83	83	84	84	—	
	.	1000	—	—	—	—	1)	62	65	66	66	68	69	70	71	72	73	74	75	75	76	77	78	78	79	79	80	
	63	750	—	—	—	—	1)	62	63	63	65	66	67	67	68	70	71	71	72	73	73	75	75	76	76	77	77	
	71	3000	—	—	—	—	71	73	76	77	77	79	80	81	82	83	—	—	—	—	—	—	—	—	—	—	—	
	.	1500	—	—	—	—	62	64	67	68	68	70	71	72	73	74	76	76	77	78	78	79	80	81	81	82	83	
	.	1000	—	—	—	—	1)	62	63	63	65	66	67	68	69	71	71	72	73	73	74	75	76	76	77	77	78	
	112	750	—	—	—	—	1)	62	63	63	65	66	67	68	69	71	71	72	73	73	74	75	76	76	77	77	78	
H4	100	3000	—	—	—	—	—	75	76	77	78	79	80	81	82	84	84	—	—	—	—	—	—	—	—	—	—	
	.	1500	—	—	—	—	—	66	67	68	69	70	71	72	73	75	75	76	76	77	78	78	78	79	80	81	81	
	.	1000	—	—	—	—	—	62	63	63	64	65	66	67	68	70	70	71	72	72	73	73	74	74	76	76	77	
	140	750	—	—	—	—	—	1)	1)	1)	61	62	63	64	64	66	67	68	68	69	69	70	70	71	72	73	73	
	160	3000	—	—	—	—	—	73	74	75	75	77	78	78	79	81	82	82	83	—	—	—	—	—	—	—	—	
	.	1500	—	—	—	—	—	64	65	66	66	68	68	69	70	72	73	73	74	74	75	75	76	76	78	78	79	
	.	1000	—	—	—	—	—	1)	60	61	62	63	64	64	65	67	68	68	69	70	70	71	71	72	73	74	74	
	250	750	—	—	—	—	—	1)	1)	1)	1)	60	61	61	62	64	64	65	66	66	67	67	68	68	70	70	71	
	280	3000	—	—	—	—	—	70	71	72	73	74	75	76	77	78	79	79	80	81	82	82	82	—	—	—	—	
	.	1500	—	—	—	—	—	61	62	63	64	65	66	67	67	69	70	70	71	72	72	73	73	74	75	76	76	
	.	1000	—	—	—	—	—	1)	1)	1)	1)	60	61	62	63	64	65	66	66	67	68	68	68	69	70	71	72	
	450	750	—	—	—	—	—	1)	1)	1)	1)	1)	1)	1)	1)	61	62	62	63	64	64	55	65	65	67	68	68	

1) $L_{pA} < 60$ dB(A)

2. General notes

2.1 Introduction

These Operating Instructions (BA) are an integral part of the gear unit supplied and must be kept in its vicinity for reference at all times.

Caution!

All persons involved in the installation, operation, maintenance and repair of the gear unit must have read and understood these Operating Instructions and must comply with them at all times. We accept no responsibility for damage or disruption caused by disregard of these Instructions.

The “**FLENDER gear unit**” described in these Instructions has been developed for stationary use in general engineering applications. Possible areas of use for gear units of this type are (e.g.) sewage treatment, excavators, chemical industry, iron and steel industry, conveyor equipment, crane equipment, foodstuffs industry, paper machinery, cableways, cement industry etc.

The gear unit is designed only for the application described in section 1 “Technical data”. Possible use in any other area must be contractually agreed.

The gear unit described in these Instructions reflects the state of technical development at the time these Instructions went to print.

In the interest of technical progress, we reserve the right to make changes to the individual assemblies and accessories which we regard as necessary to preserve their essential characteristics and improve their efficiency and safety.

2.2 Copyright

The copyright to these Operating Instructions is held by **FLENDER AG**.

These Operating Instructions must not be wholly or partly reproduced for competitive purposes, used in any unauthorised way, or made available to third parties without our agreement.

Technical enquiries should be addressed to the following plants:

for gear sizes **1 ... 12**

A. FRIEDR. FLENDER AG
Getriebewerk Penig
Thierbacher Straße 24
D-09322 Penig

Tel.: 037381/60
Telex: 322661
Fax: 037381/80286

for gear sizes **13 ... 26**

A. FRIEDR. FLENDER AG

D-46393 Bocholt

Tel.: 02871/92-0
Telex: 813841
Fax: 02871/92-2596

or to our customer-service addresses. A list of our customer-service addresses is given in section 11 “Spare parts, customer-service addresses”.

3. Safety notes

3.1 Proper use

- The gear unit has been manufactured in accordance with the state of the art and is delivered in a condition for safe and reliable use. All changes to the gear unit on the part of the user which may affect its safety and reliability are prohibited. This applies equally to safety features designed to prevent accidental contact.
- The gear unit should be used and operated only within the context of the conditions laid down in the contract governing performance and supply.

3.2 Obligations of the user

- The user must ensure that all persons involved in the installation, operation, maintenance and repair of the gear unit have read and understood these Operating Instructions and comply with them at all times in order to:

- avoid injury or damage,
- ensure the safety and reliability of the unit,

and

- avoid disruptions and environmental damage through incorrect use.
- During transport, assembly, installation, dismantling, operation and maintenance of the unit, the relevant safety and environmental regulations must be complied with at all times.
- The gear unit should be operated, maintained or repaired by authorised, trained and qualified personnel.
- The gear unit must not be cleaned using high-pressure cleaning equipment.
- All work on the gear unit must be carried out with great care and with due regard to safety.
- All work on the gear unit must be carried out only when it is not in operation.
The drive assembly must be secured against being switched on accidentally (e.g. by locking the key switch or removing the fuses from the power supply). A notice should be attached to the ON switch stating clearly that work is in progress.
- No welding work should be done on the gear unit. The gear unit must not be used as an earthing point for welding operations. Delicate teeth and bearings may be irreparably damaged by welding.
- If any changes are noticed during operation (e.g. overheating or unusual noises), the drive assembly must be switched off immediately.
- Rotating drive components such as couplings, gearwheels, belt drives etc. must be protected against accidental contact.
- If the gear unit is intended for installation in plant or machinery, the manufacturer of such plant or machinery must ensure that the contents of these Instructions are incorporated in his own instructions.
- Notices attached to the gear unit, e.g. rating plate, direction arrows etc. must always be observed. They must be kept free from dirt and paint at all times.
- All spare parts must be obtained from FLENDER AG.

3.3 Environmental protection

- When changing oil, the used oil must be collected in suitable containers. Any spillage of oil must be removed immediately.
- Conservation agent should be stored separately from used oil.
- Used oil, conservation agent, oil-binding agents and oil-soaked cloths must be disposed of in accordance with environmental legislation.

3.4 Special dangers

- Depending on operating conditions, the surface of the gear unit may heat up considerably.
Danger of burns!
- When changing oil, take care to prevent scalding by hot oil.

3.5 Warnings and symbols used in these Instructions



This symbol indicates safety measures which must be observed to avoid **personal injury**.

Caution!

This symbol indicates safety measures which must be observed to avoid **damage to the gear unit**.

Note: This symbol indicates general **operating procedures** which are of particular importance.

4. Handling and storage

Note: Observe the "Safety notes" in section 3.

4.1 Scope of supply

The products supplied are listed in the dispatch papers. Check immediately on receipt to ensure that all the products listed have actually been delivered. Damaged or missing parts must be notified in writing immediately.

4.2 Handling

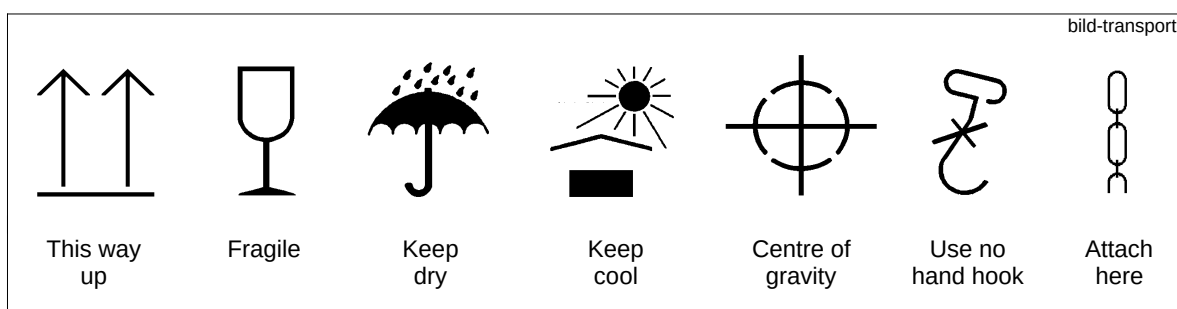


When handling FLENDER products use only lifting and handling equipment of sufficient load-carrying capacity!

The gear unit is delivered in the fully assembled state. Additional items (e.g. oil cooler, pipes and fittings) are delivered separately packaged.

Different forms of packaging may be used depending on the size of the unit and method of transport. Unless otherwise agreed, the packaging complies with the **HPE Packaging Guidelines**.

The symbols marked on the packaging must be observed at all times. These have the following meanings:



Caution!

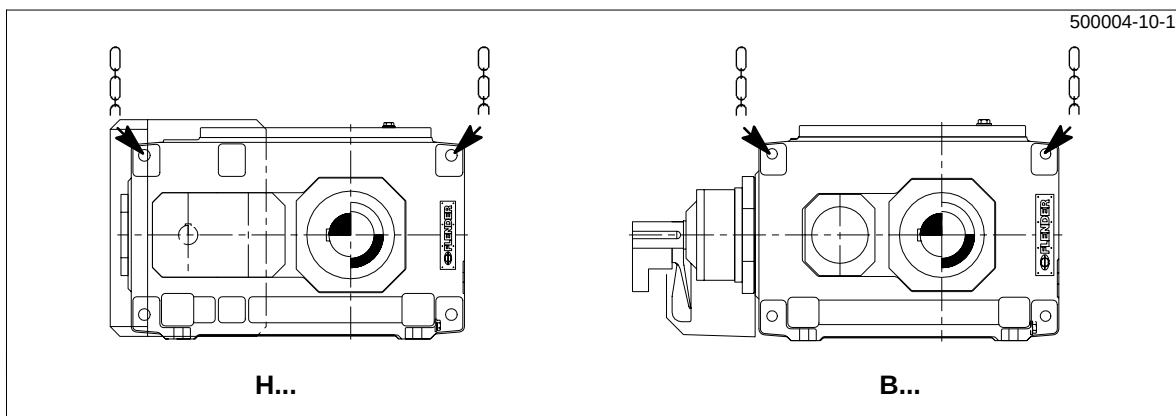
The gear unit must always be transported with due care to avoid danger to persons and property. Avoid bumping the ends of shafts as this may damage the gear unit.

Note:

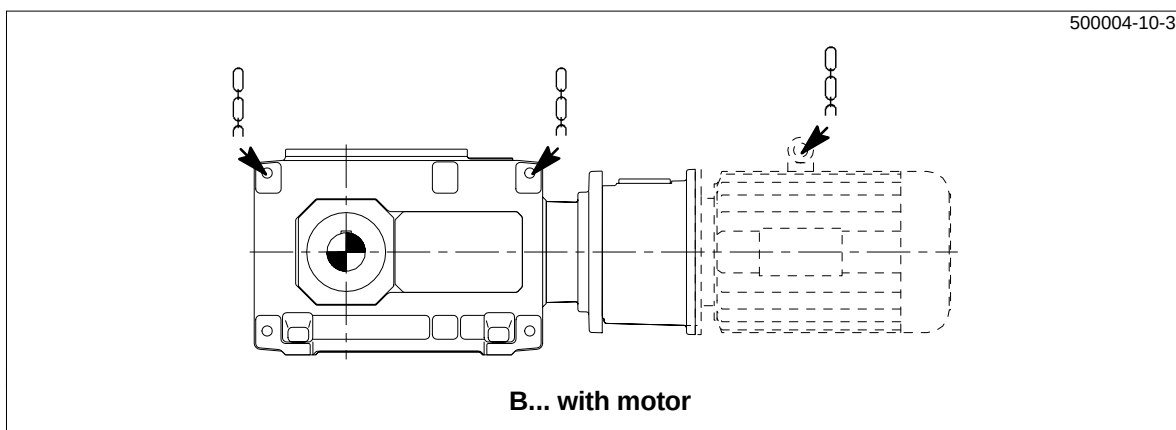
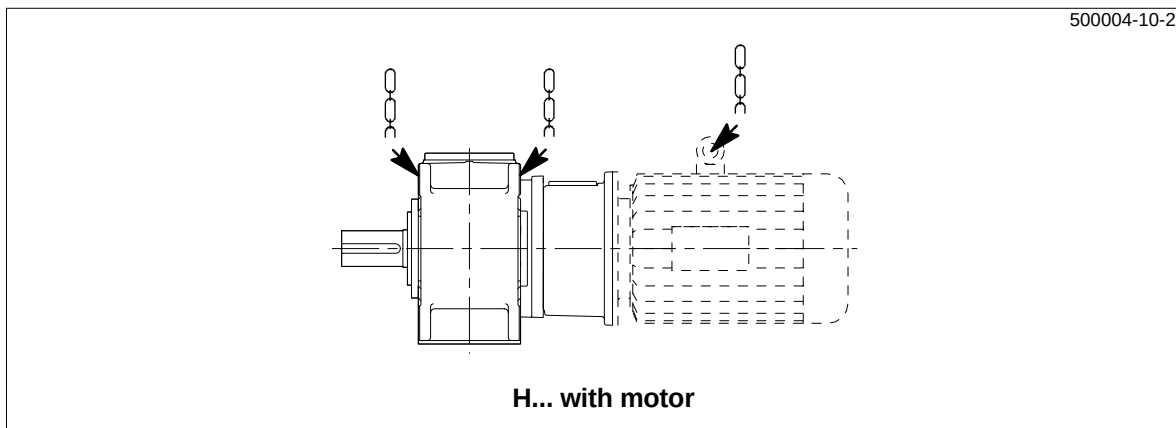
The gear unit must be transported using suitable equipment only. Never transport the gear unit with an oil charge.

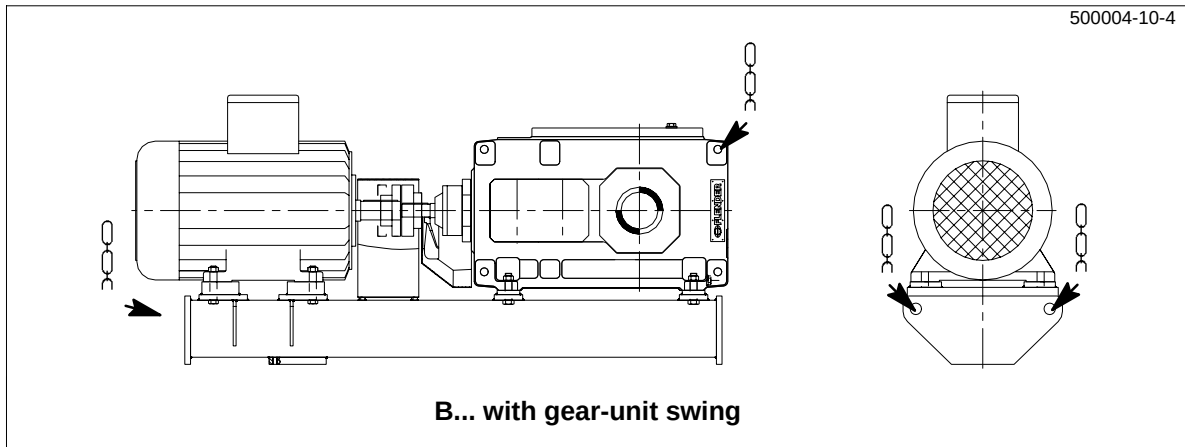
Caution!

Use only the 4 eyes provided for attaching lifting equipment to the unit. Do not use the front thread at the end of the shaft for attaching ring bolts for transport purposes.



For drive units, where additional components (e.g. motor, coupling etc.) are mounted on the gear unit, an additional attachment point may be required because of the shift in the centre of gravity.





For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

The position of the attachment points is shown in the documentation for each specific order.

4.3 Storage

The gear unit must be stored in the position of use in a sheltered place. It must be placed on a vibration-free wooden base and covered over.



Do not stack gear units on top of one another.

Caution!

If the gear unit is being stored out of doors, it must be covered with particular care. It must be ensured that neither moisture nor foreign material can collect on the unit.

Note: Provision for special environmental conditions during transport (e.g. transport by ship) and storage (climate, termites etc.) must be contractually agreed.

4.4 Standard corrosion protection

The gear unit is filled with conservation agent. The free shaft ends are painted for protection.

The outer paint coating is resistant to dilute acids, alkalis, oils and solvents. It is also resistant to sea water, tropical-climate conditions and temperatures up to 140 °C.

Note: Ensure that the paint is not damaged!
Mechanical damage (scratches), chemical damage (acids, alkalis) and thermal damage (sparks, welding beads, heat) cause corrosion which may cause failure of the exterior protective coating.

Note: Unless otherwise agreed, we grant a guarantee of 24 months on the interior corrosion protection, and 12 months on the protective coating on the free shaft ends. The guarantee period commences on the date of delivery.

For longer periods of storage (> 24 months) we advise regular checking and, if necessary, renewal of the interior corrosion protection (see section 7 "Start-up").

5. Technical description

Note: Observe the "Safety notes" in section 3.

5.1 General description

The gear unit is supplied as a single-, two-, three- or four-stage helical or bevel-helical gear unit. It is designed for installation in the horizontal position. If necessary, it can also be designed for installation in a different position.

It can be operated in both directions of rotation. The only exceptions are gear types with backstop or overrunning clutch. If rotation reversal is required for these types of unit, our Customer Service Dept. should be consulted beforehand.

A number of shaft configurations (types and rotation directions) are possible. These are shown in the following table as solid shafts:

Type	Configuration								
	A	B	C	D	E	F	G	H	I
H1SH									
H2SH H2HM H2HH H2DM H2DH H2KM H2KH H2FM H2FH									
H3SH H3HM H3HH H3DM H3DH H3KM H3KH H3FM H3FH									
H4SH H4HM H4HH H4DM H4DH H4KM H4KH H4FM H4FH									
B2SH B2HM B2HH B2DM B2DH B2KM B2KH B2FM B2FH									
B3SH B3HM B3HH B3DM B3DH B3KM B3KH B3FM B3FH									
B4SH B4HM B4HH B4DM B4DH B4KM B4KH B4FM B4FH									

The gear units are characterised by a low noise level. This is achieved by helical and bevel-helical gears with a high contact ratio and special sound-damping housings.

The good temperature characteristics of the gear unit are achieved by its high degree of efficiency, large housing surface and performance-related cooling system.

Note: Unless otherwise agreed by contract, the gear units must not be exposed to harmful environmental factors such as chemical products, high-air pollution and temperatures outside the range 0 to +20 °C.

5.2 Housing

The housings are of cast iron. If required, it may also be of steel.

Housings up to size 12 are made in one part. The exception is type H1SH, which has a two-part housing similar to those of sizes 13 - 26. The housing is rigid in design and due to its form has excellent noise and temperature characteristics.

The housing is fitted with adequately dimensioned lifting eyes, inspection or assembly covers.

It is also fitted with a dipstick for checking the oil level, a draining screw for oil change and a venting screw.

Colour codes for venting, oil inlet, oil level and oil drainage:

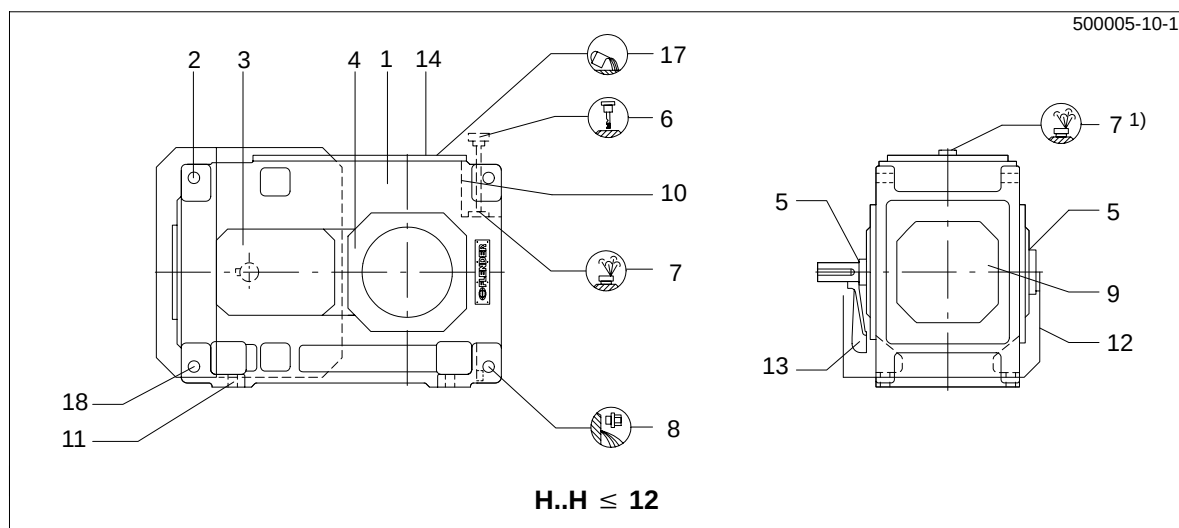
Venting: yellow 

Oil inlet: yellow 

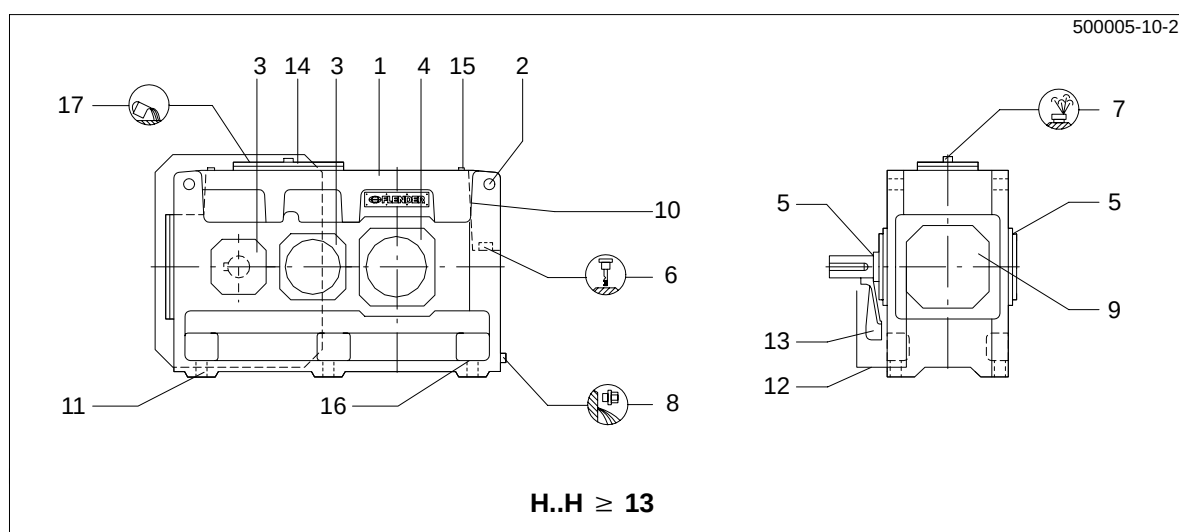
Oil level: red 

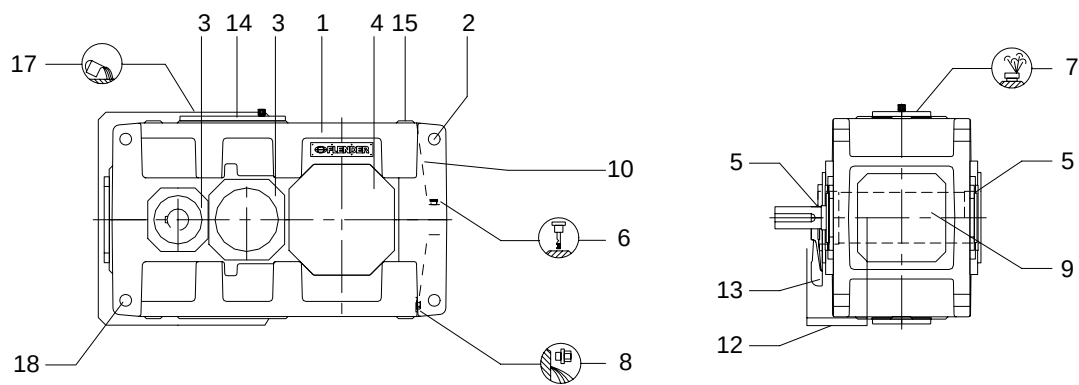
Lubrication points: red

Oil drain: white 

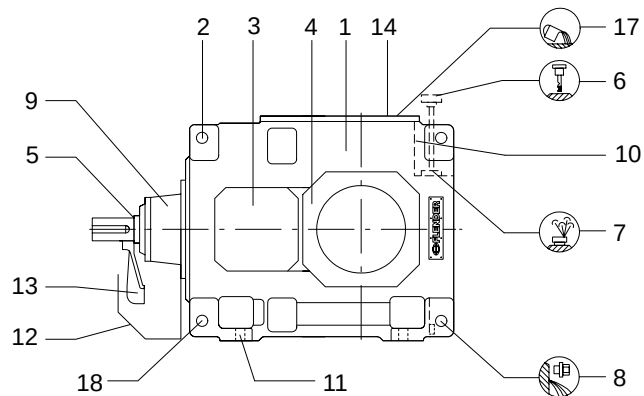


1) for H1SH only

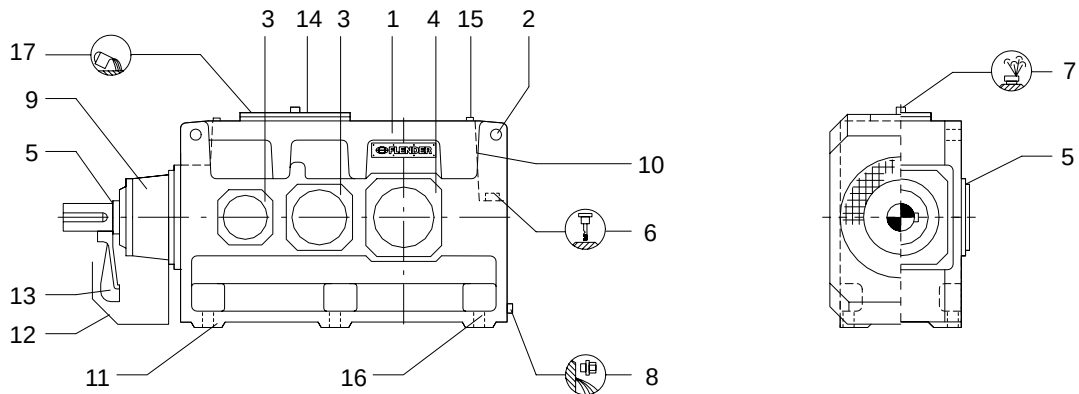




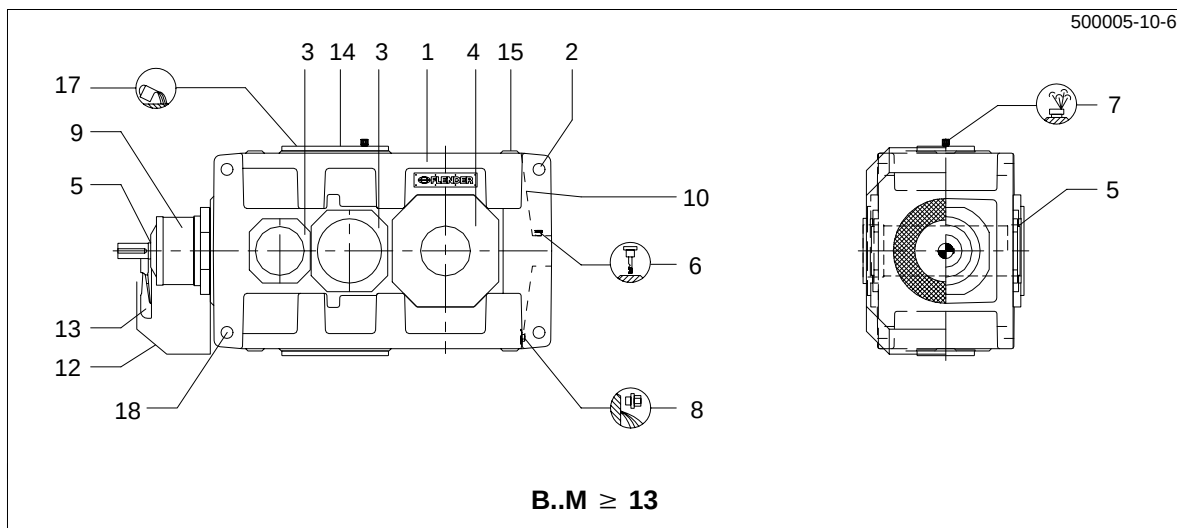
H..M ≥ 13



B..H ≤ 12

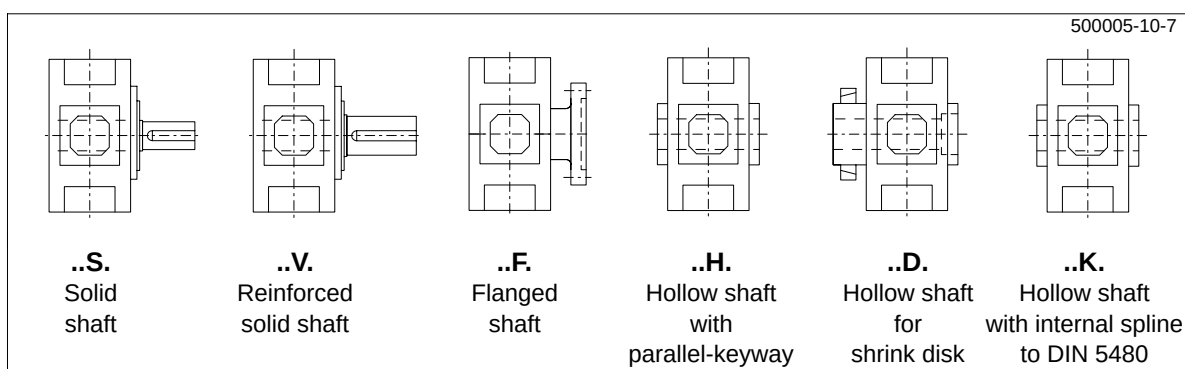


B..H ≥ 13



- | | |
|----------------------------|---------------------------------|
| 1 Housing | 10 Rating plate |
| 2 Lifting eyes | 11 Gear-unit fastening |
| 3 Cover | 12 Fan cowl |
| 4 Cover | 13 Fan |
| 5 Shaft seals | 14 Inspection or assembly cover |
| 6 Oil dipstick | 15 Alignment surfaces |
| 7 Housing ventilation | 16 Alignment thread |
| 8 Oil drain plug | 17 Oil inlet |
| 9 Cover or bearing journal | 18 Fastening for torque arm |

Output types



For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

5.3 Toothed components

The toothed components of the gear unit are case hardened. Helical-gear teeth are ground. Bevel helical-gear teeth are lapped, ground or gear cut. The high quality of the teeth lead to a significant noise reduction and ensure safe and reliable running.

The gear wheels are joined to the shafts by interference fitting and parallel keys. These types of joints transmit the torques generated with adequate reliability.

5.4 Lubrication

5.4.1 Splash lubrication

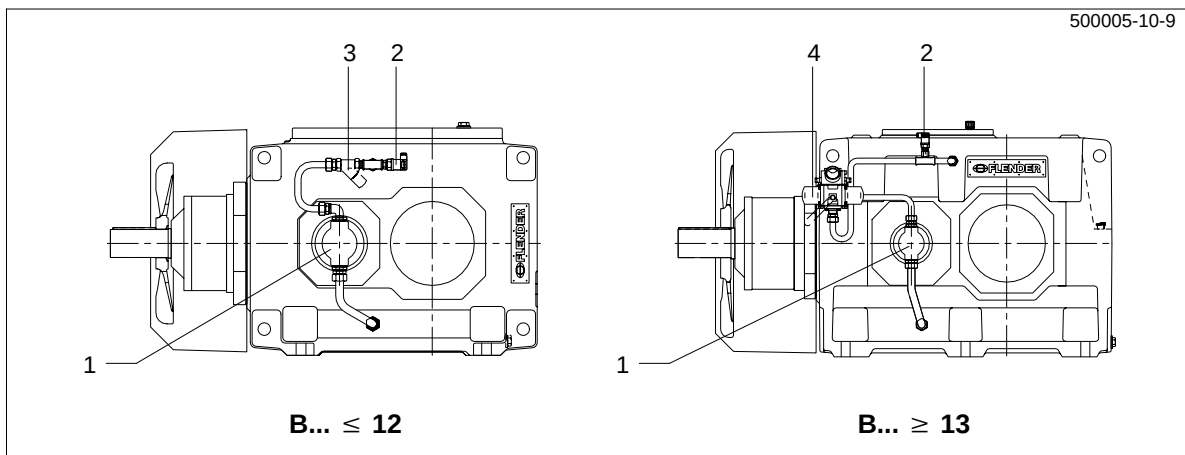
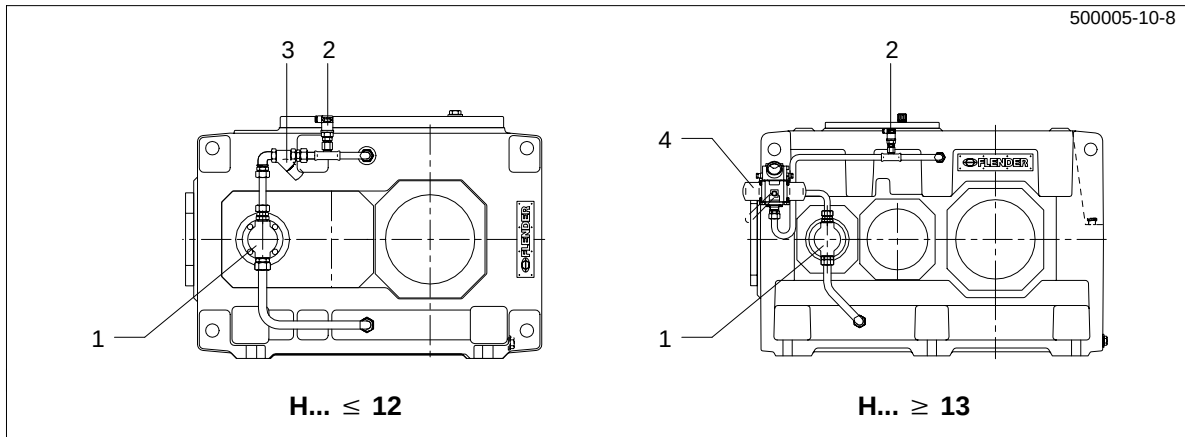
Unless otherwise stated in the order documentation, the teeth and bearings are adequately supplied with oil by means of splash lubrication by the gearwheels. This means that the gear units require very little maintenance.

5.4.2 Pressure lubrication through added oil-supply unit

In non-horizontal positions, high bearing speeds or peripheral velocities on the teeth, the splash lubrication system may be replaced or supported by a pressure lubrication system.

The oil-supply unit is permanently attached to the gear unit and consists of a flange pump, a coarse filter, a pressure-monitoring device and pipework. In gear units of sizes 13 - 26, the coarse filter is replaced by a switchover filter.

The direction of flow from the flange pumps is independent of the direction of rotation.



- 1 Flange pump
- 2 Pressure monitor

- 3 Coarse filter
- 4 Switchover filter

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

Caution!

With gear units with added oil-supply unit, the pressure monitor must always be connected before starting the unit up.

Depending on the order specification and application, the flange pump may be replaced by a motor pump.

Note:

The operation and maintenance of the pump, pressure monitor, coarse filter or switchover filter are described in instructions included (where applicable) with the products.

For technical details, refer to the order-specific equipment list.

5.5 Bearings

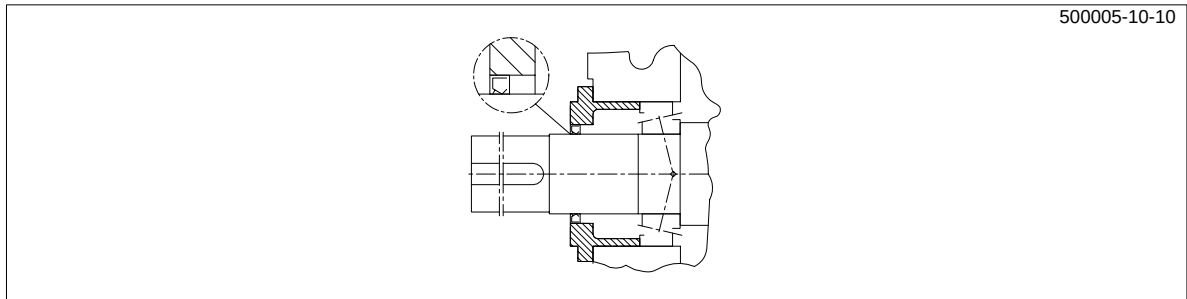
All shafts are mounted on anti-friction bearings.

5.6 Shaft seals

Depending on requirements, radial shaft sealing rings, labyrinth seals or Taconite seals are mounted at the shaft exits to prevent oil from leaking from the housing and dirt from entering it.

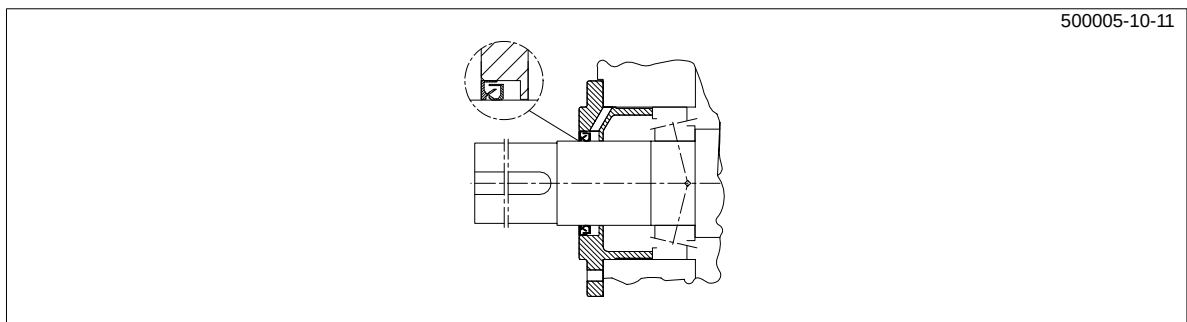
5.6.1 Radial shaft sealing rings

Radial shaft sealing rings are the standard type of seal. They are fitted with an additional dust lip to protect the actual sealing lip from external contamination.



5.6.2 Labyrinth seals

Labyrinth seals are contact-free and avoid wear to the shaft. They therefore require no maintenance and ensure favourable temperature characteristics.

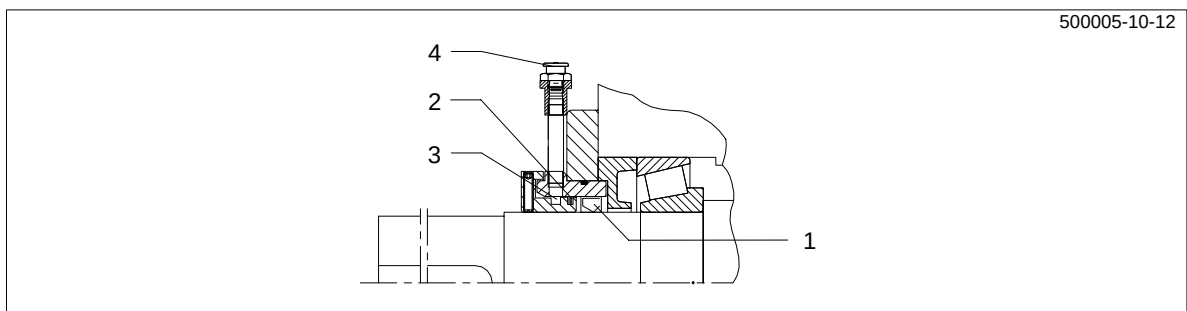


Caution!

For reliable operation, this type of seal requires horizontal positioning in a splash-free environment with very little dust.

5.6.3 Taconite seals

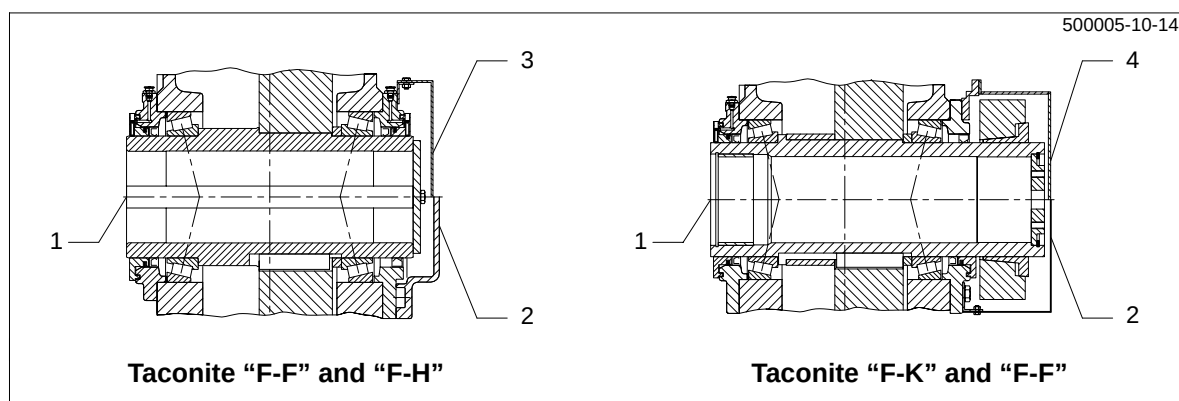
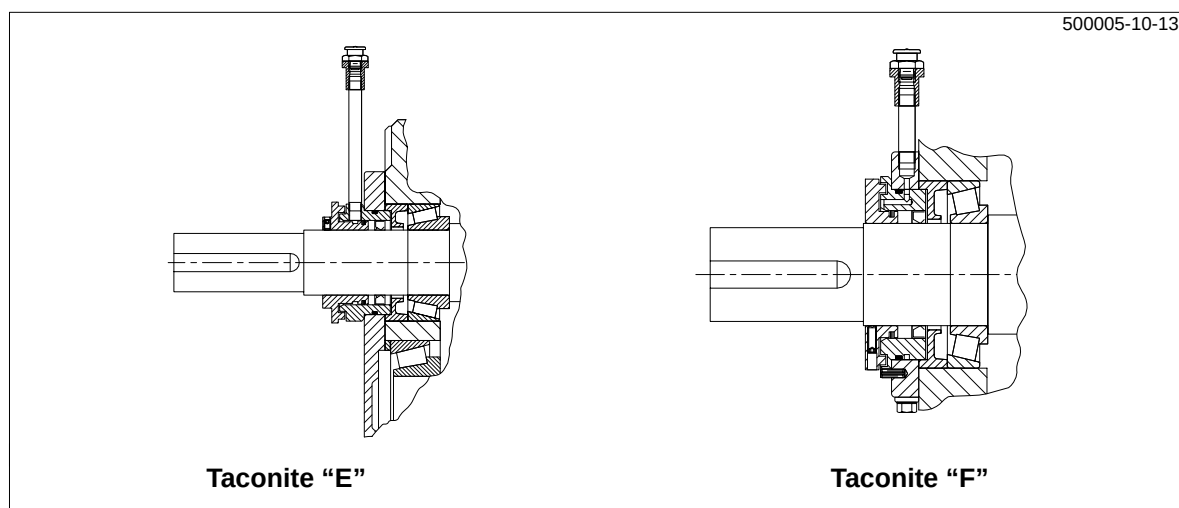
Taconite seals were specially developed for use in a dusty environment. The penetration of dust is prevented by a combination of seal elements (radial shaft sealing ring, lamellar seal and grease-charged labyrinth seal).



- 1 Radial shaft sealing ring
- 2 Lamellar seal

- 3 Grease-charged labyrinth seal (re-chargable)
- 4 Flat grease nipple AM10x1 to DIN 3404

Taconite seals are divided into the following types:



- 1 Output
2 Taconite "F-F"

- 3 Taconite "F-H"
4 Taconite "F-K"

Taconite type	Application	Remarks
"E"	All input shafts with or without fan	Re-chargeable labyrinth
"F"	Output shaft Type S (solid shaft) Type F (flanged shaft)	
"F-F"	Output shaft Type H (hollow shaft with parallel-keyway) Type K (hollow shaft with internal spline to DIN 5480) Type D (hollow shaft for shrink disk)	Labyrinth re-chargeable on both sides, incl. cowl to prevent contact on gear side facing away from output
"F-H"	Output shaft Type H (hollow shaft with parallel-keyway) Type K (hollow shaft with internal spline to DIN 5480)	Re-chargeable labyrinth on output side; dustproof cowl on opposite side
"F-K"	Output shaft Type D (hollow shaft for shrink disk)	

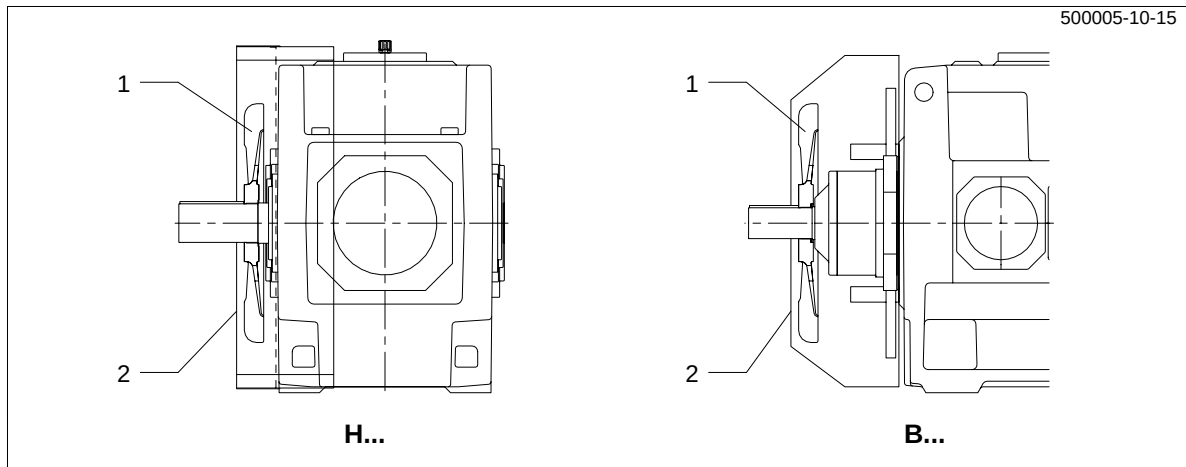
Note: For re-charging the labyrinth seals with grease, the specified frequency must be observed (see section 10 "Maintenance and repair").

5.7 Cooling

Depending on requirement, the gear unit is fitted with a fan, a cooling coil, water or air oil-cooling systems or separate oil-supply units. In the case of separate oil-supply units, the specific instructions for these units must be observed.

5.7.1 Fan

The fan is mounted on a high-speed shaft of the gear unit and is protected from accidental contact by a cowl. The fan sucks air through the grid on the cowl and blows it along the air ducts on the side of the gear housing, thereby dissipating a certain amount of heat from the housing.



1 Fan

2 Fan cowl

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

Caution!

For gear units fitted with a fan, a sufficient amount of space must be allowed for air intake when mounting the safety guards for the coupling or other components.

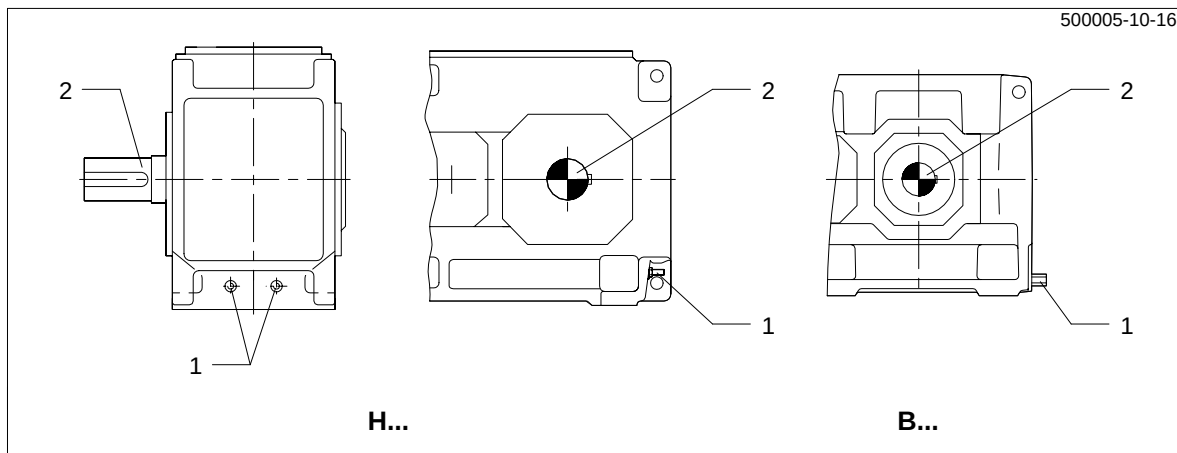
The correct distance is given in the dimensional drawing in the gear-unit documentation.

Note:

The cooling effect is considerably reduced if the fan or the gear housing are dirty (see section 10 "Maintenance and repair").

5.7.2 Cooling coil

The cooling coil is located in the oil sump of the gear unit and is supplied with cooling water via a connection to be provided by the user. Either fresh water, sea water or brackish water can be used for cooling purposes. When water is flowing through the coil, heat is transferred from the oil to the water and thereby removed from the system.



1 Cooling-water connection

2 Output shaft

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

Caution!

The water can flow through the gear unit in either direction. The pressure of the cooling water must not exceed 8 bars.

If the gear unit is being withdrawn from service for a longer period or if there is a danger of the water freezing, it must be drained off. Remove any remaining water with compressed air.

Note: To avoid excess pressure, the water inlet must be fitted with a flow-control device, e.g. a pressure reducer or stop valves.

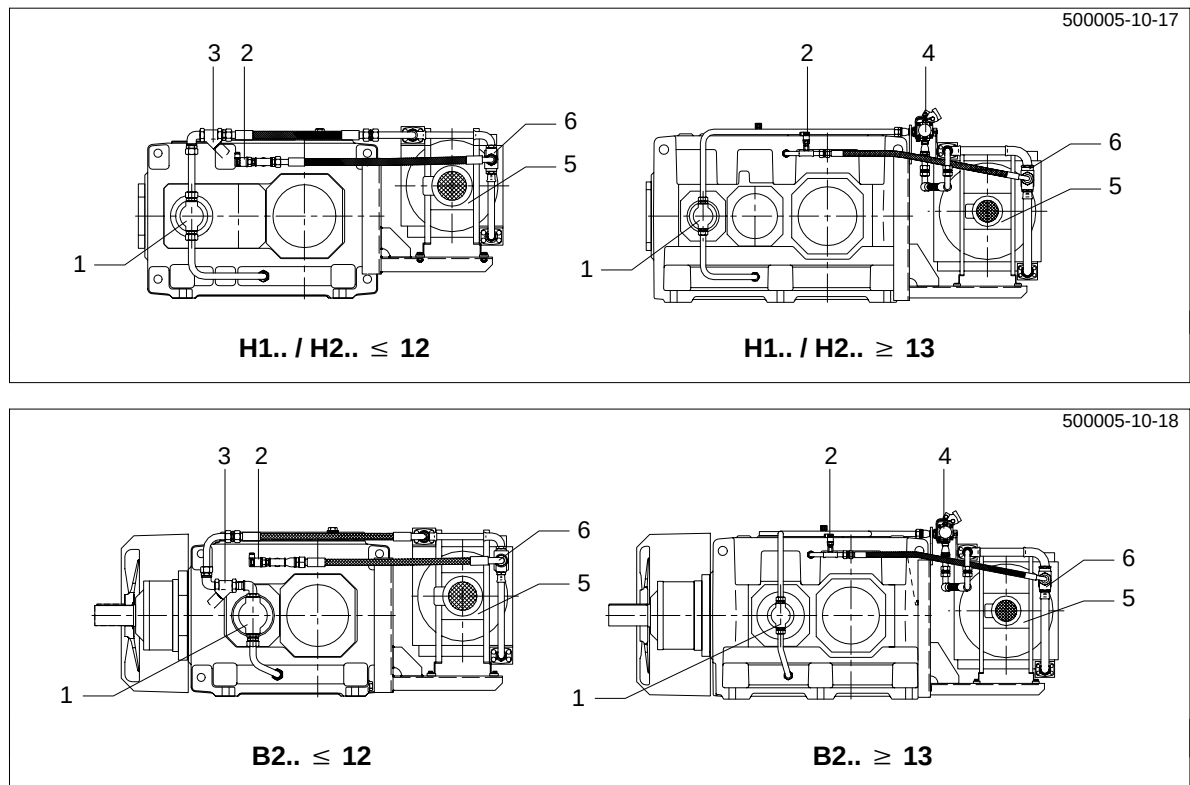
Note: For technical details, refer to the order-specific equipment list.

5.7.3 Built-on air oil-cooling units

For types H1.., H2.., and B2.., an air oil-cooling unit may be added if required. This unit is permanently mounted on the gear unit and consists of a flange pump, a coarse filter, a pressure monitor, a temperature-control valve, the actual air oil-cooling unit and the necessary pipework. For gear units of sizes 13 - 26, the coarse filter is replaced by a switchover filter.

The air oil-cooler is designed to cool the gear oil by means of air from the surrounding atmosphere. Depending on the volume flow, the oil passes through the cooler in one or several streams and through current of air blown in by the fan. For cold starts, a bypass pipe with a temperature-control valve are provided.

The direction of flow from the flange pumps is independant of the direction of rotation.



- | | |
|--------------------|-----------------------------|
| 1 Flange pump | 4 Switchover filter |
| 2 Pressure monitor | 5 Air oil-cooler |
| 3 Coarse filter | 6 Temperature control valve |

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

Caution!

When installing gear units with added air oil-cooling units, it must be ensured that the air circulation is not obstructed. The required minimum distance from adjacent components, walls etc. is given in the drawings in the unit documentation.

Note:

For operation and maintenance, always observe the instructions given in the order-specific appendix.
For technical details, refer to the order-specific equipment list.

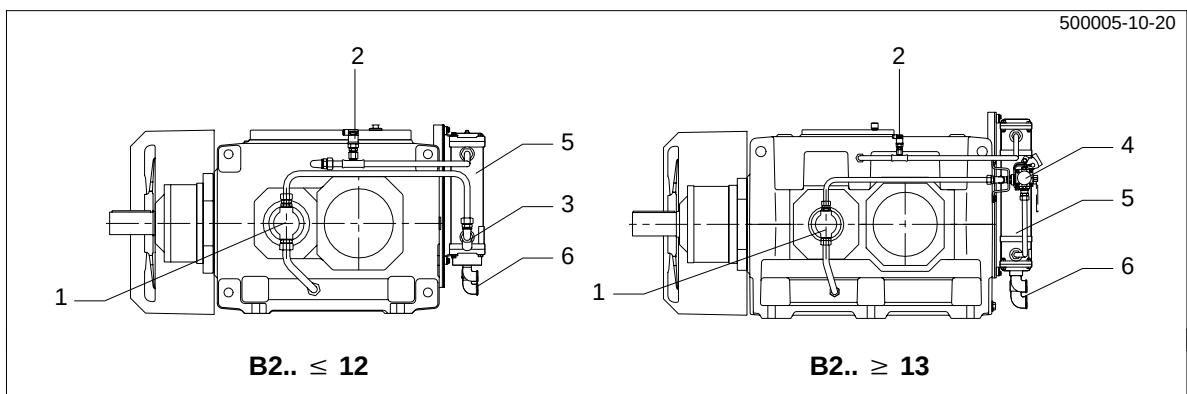
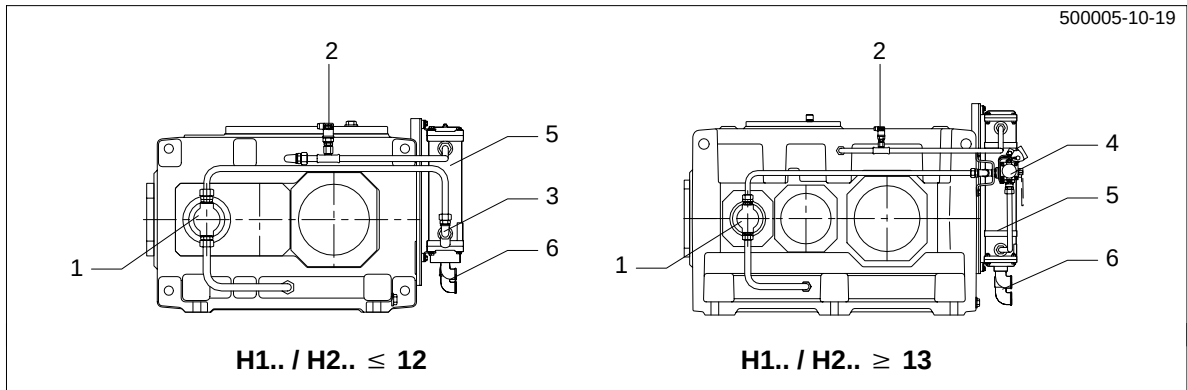
The cooling effect is considerably reduced if the cooler or the gear housing are dirty (see section 10 "Maintenance and repair").

5.7.4 Built-on water oil-cooling units

For types H1.., H2.., and B2.., a water oil-cooling unit may be added if required. This oil-cooling unit is permanently mounted on the gear unit and consists of a flange pump, a coarse filter, a pressure monitor, the actual water oil-cooling unit and the necessary pipework. For gear units of sizes 13 - 26, the coarse filter is replaced by a switchover filter.

The direction of flow from the flange pumps is independent of the direction of rotation.

The required water connection must be provided by the user.



- 1 Flange pump
- 2 Pressure monitor
- 3 Coarse filter

- 4 Switchover filter
- 5 Water oil-cooler
- 6 Cooling water inlet and outlet

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

Caution!

To ensure optimum cooling performance, the specified direction of flow in the cooling unit must be observed. The cooling-water inlet and outlet must not be reversed.

The pressure of the cooling water must not exceed 8 bars.

If the gear unit is being withdrawn from service for a longer period or if there is a danger of the water freezing, it must be drained off. Remove any remaining water with compressed air.

Depending on the order specification and application, the flange pump may be replaced by a motor pump.

Note:

For operation and maintenance, always observe the instructions given in the order-specific appendix.

For technical details, refer to the order-specific equipment list.

5.8 Couplings

Generally speaking, flexible couplings or hydraulic couplings combined with flexible couplings should be provided for the input drive.

Note: For gear units with fan, the hydraulic unit of the hydraulic coupling should be located on the motor shaft to ensure that a sufficient area is available for intake of cooling air (see point 5.7.1).

For gear units fitted with solid output shafts (types ..S. and ..V.) flexible couplings are also provided in most cases.

If rigid couplings or other input or output elements are used, which create additional radial or axial forces, (e.g. gear wheels, belt pulleys, disk flywheels, hydraulic couplings), these must be agreed by contract.

Caution!

Couplings with peripheral velocities on the outer diameter of up to 30 m/s, must be statically balanced. Couplings with peripheral velocities over 30 m/s, must be dynamically balanced.

For maintenance and operation of the couplings, refer to the specific operating instructions for the coupling.

Note: When installing the drive system, the individual components must be very precisely aligned with one another in order to minimise restoring forces caused by angle and shaft offset, and avoid premature wear to flexible coupling components.

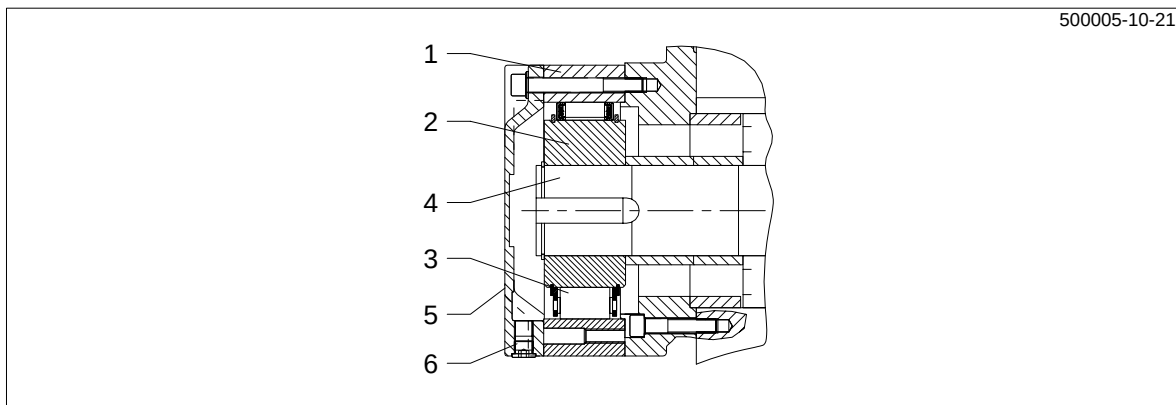
For gear units with hollow output shafts or flange output shafts, the coupling on the output side is not required. Gear units with hollow output shafts should be mounted on the shaft of the customer's machinery. Gear units with flange output shafts should be mounted on the customer's shaft via a mating flange.

5.9 Backstop

For certain requirements, the gear unit can be fitted with a mechanical backstop. This permits only the correct direction of rotation during the operation of the unit. The direction of rotation is marked by an arrow on the input side of the gear unit.

The backstop is mounted free of oil leakage on an adapter flange on the gear unit and is integrated in its oil-circulation system.

The backstop is fitted with centrifugally operated grippers. When the gear unit is running in the correct direction, the inner ring and the cage with the grippers also rotates while the outer ring remains stationary. At a certain rotation speed, the grippers lift off and the backstop now operates without any wear.



- | | | | |
|---|---------------------|---|---------------------------------|
| 1 | Backstop outer ring | 4 | Shaft (adapter flange) |
| 2 | Backstop inner ring | 5 | Cover |
| 3 | Cage with grippers | 6 | Residual-oil drain for backstop |

Note: The stop direction can be changed by turning the cage around. If a change in stop direction is required, FLENDER should be consulted beforehand.

Caution!

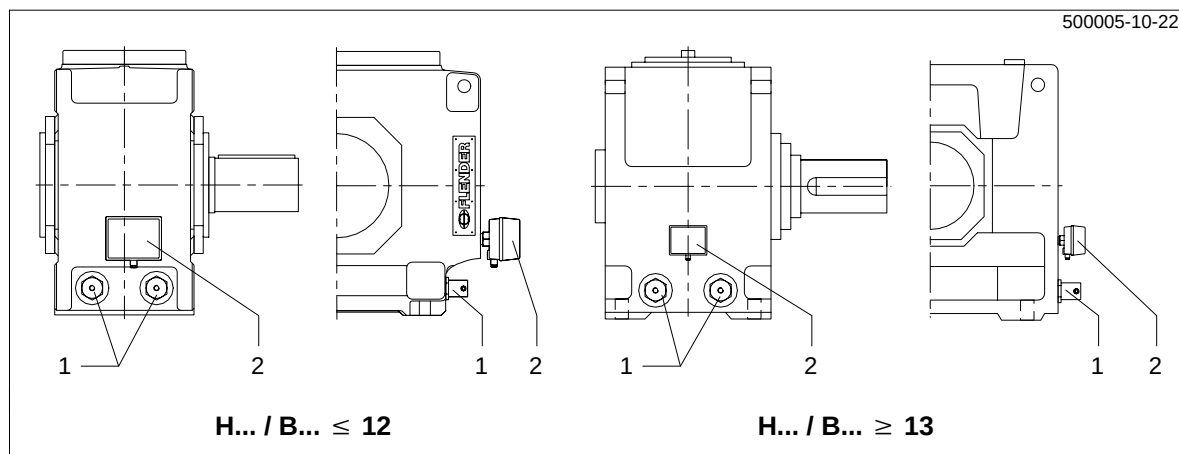
To avoid damaging the backstop or the gear unit, the motor should not be run in the locked direction of the gear unit. Observe the sign fixed to the gear unit.

5.10 Heating element

At low temperatures, it may be necessary to heat the gear oil before switching on the drive unit, or even during operation. In such cases, one or two such heating elements may be provided if required. These convert the electrical energy into heat which is conducted to the surrounding oil. The heating elements are located in protective tubes inside the housing thus making it possible to replace them without draining off the oil.

The heating elements must be fully immersed in the oil bath. Due to the higher oil level required for radial shaft seals, only seals of this type are suitable for use with heating elements.

The heating elements are controlled by a temperature monitor which provides a signal when maximum and minimum temperatures are reached. The signal requires amplification.



1 Heating element

2 Temperature monitor

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

Caution!

Never switch the heating element on unless it is fully immersed in the oil bath as there is a serious risk of fire.

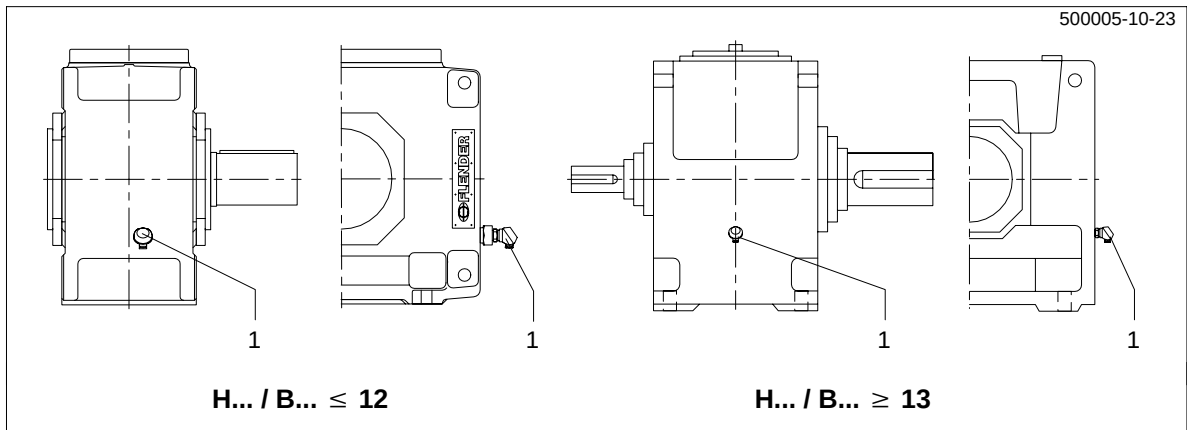
Note:

For operation and maintenance, always observe the instructions given in the order-specific appendix.
For technical details, refer to the order-specific equipment list.

5.11 Oil-temperature measurement

Depending on the order specification, the gear unit may be fitted with a resistance thermometer PT100 for monitoring the oil temperature in the sump. In order to measure the temperatures or temperature differences, the resistance thermometer PT100 should be connected to a suitable instrument provided by the customer. The thermometer has a connection head (protection type IP54) for the wiring. A two-conductor circuit is fitted by the manufacturer. However, the customer may fit his own three or four-conductor circuit if required.

Note: A certain level of oil is necessary for reliable temperature measurement. For this reason, the resistance thermometer is not suitable for use with labyrinth seals.



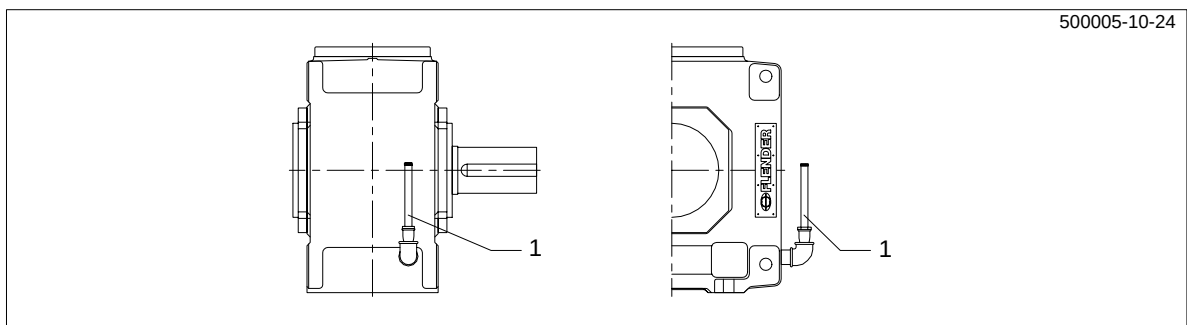
1 Resistance thermometer PT 100

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

Note: For operation and maintenance, always observe the instructions given in the order-specific appendix.
For technical details, refer to the order-specific equipment list.

5.12 Indication of oil level

The gear unit may also be fitted with an oil-level indicator to monitor the oil level visually when the unit is at a standstill. When the oil is cool, the level can be checked by means of the markings MIN and MAX on the indicator sight glass.

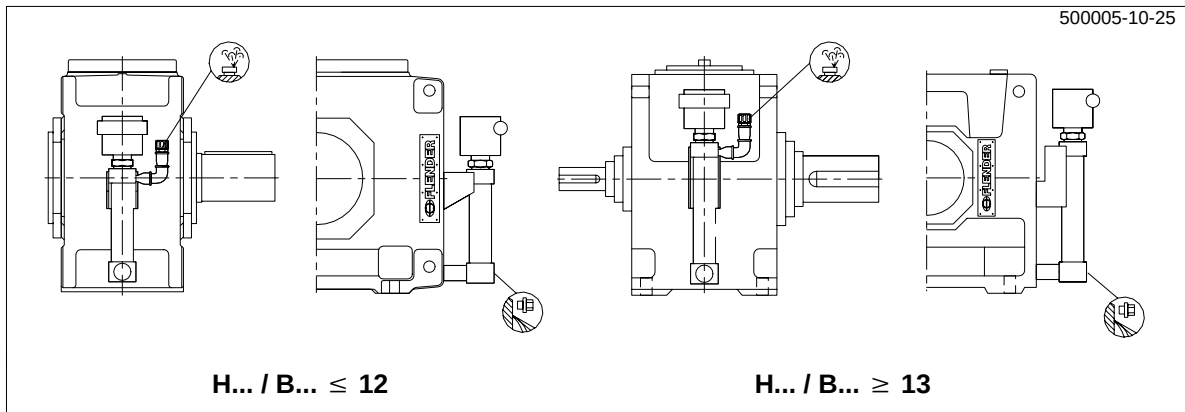


1 Oil-level indicator

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

5.13 Oil-level monitoring system

Depending on the order specification, the gear unit can be fitted with an oil-level monitor in the form of a level limit switch. This device monitors the level of the oil when the unit is at a standstill i.e. before it is started up. When the signal "oil level too low" is given, it should be wired in such a way that the drive motor cannot switch on and an alarm is given. During operation, any signal should be bridged.



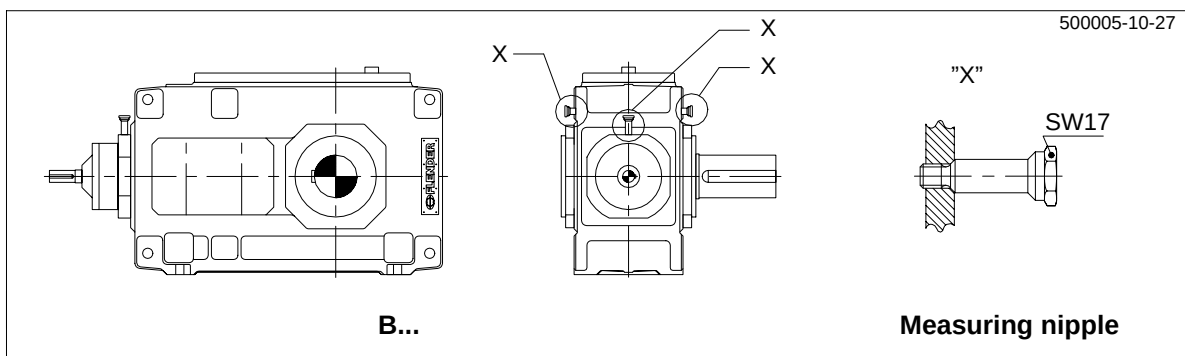
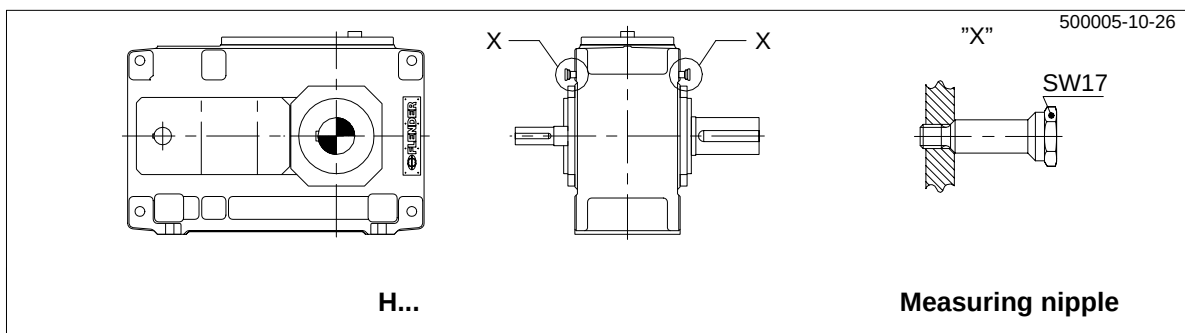
For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

Note: For operation and maintenance, always observe the instructions given in the order-specific appendix.
For technical details, refer to the order-specific equipment list.

Note: When the oil-level monitoring device is in use, the gear unit must be installed horizontally.

5.14 Bearing monitoring system

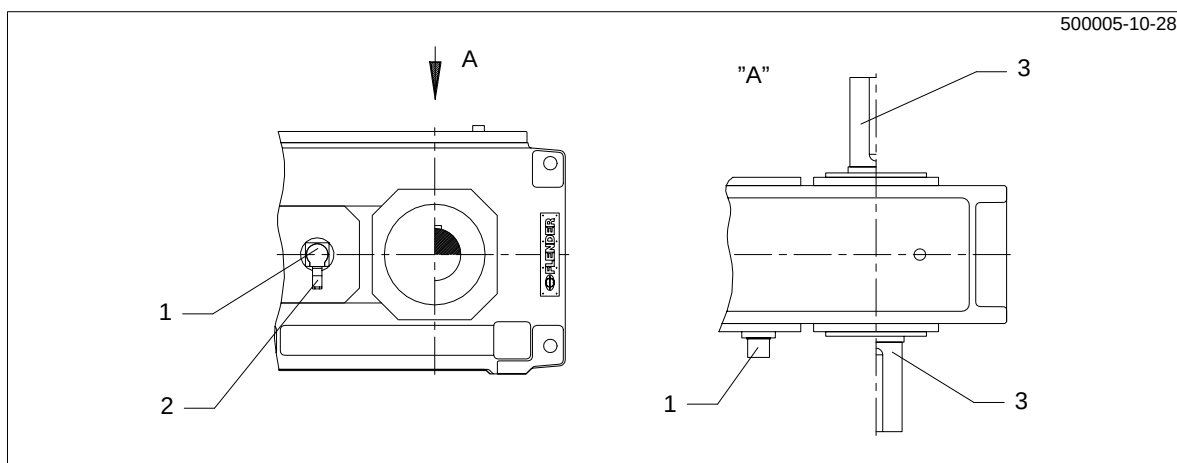
Depending on order specification, the gear unit can be designed with measuring nipples for an SPM-instrument bearing-monitoring system (system 43). These nipples are intended for attachment of the shock-pulse sensor with rapid-action coupling and are located in the vicinity of the bearings to be monitored.



For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

5.15 Speed transmitter

Depending on order specification, an incremental speed transmitter can be mounted on the second last shaft. Wiring and evaluation instrument should be provided by the customer.



- 1 Incremental transmitter 2 12-pole brass plug 3 Output shaft

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

Note: For operation and maintenance, always observe the instructions given in the order-specific appendix.
For technical details, refer to the order-specific equipment list.

6. Assembly

Note: Observe the "Safety notes" in section 3.

6.1 General information on installation

Assembly and installation work must be done with great care by trained and qualified personnel. The manufacturer cannot be held liable for damage caused by incorrect assembly and installation.

During the planning phase, sufficient space should be allowed around the gear unit for subsequent care and maintenance work.

If the gear unit is fitted with a fan, there should be sufficient space for air intake.

Caution!

Exposure to direct sunlight may cause overheating. Protective features such as covers, roofing etc. should be provided as required.

Sufficient lifting equipment should be available before beginning the installation and assembly work.

Caution!

**No welding work should be done on the drive.
The drives must not be used as an earthing point for welding operations.
Delicate teeth and bearings may be irreparably damaged by welding.**

Caution!

All the fastening points provided by the design of the unit should be used.

To ensure proper lubrication, the installation position specified in the order must always be observed.

6.2 Installation of gear unit on housing base

6.2.1 Foundation

The foundation must be horizontal and level.

It should be designed in such a way that no resonance vibrations are created and that no vibrations are transmitted from adjacent foundations. The structure on which the unit is to be mounted, must be rigid. It must be designed according to the weight and torque, taking into account the forces acting on the gear unit.

When fastening the gear unit to concrete foundations by means of foundation blocks, suitable recesses should be made in the foundation.

Hexagon bolts and nuts should be tensioned to the specified torque. For the correct torque, refer to point 10.2.11. We recommend bolts of strength class 8.8.

Slide rails should be correctly aligned and embedded in the concrete foundation.

Note: For dimensions, space requirement, arrangement of supply connections (e.g. with separate oil-cooling units), refer to the drawings in the gear-unit documentation.

6.2.2 Description of installation work

- Remove the anti-corrosion paint on the shafts with benzine.

Caution!

Do not allow the benzine to contact the shaft sealing rings.



**Ensure adequate ventilation.
Do not smoke when working with benzine!**

- Mount and secure input and output drive elements (e.g. coupling components) on shafts. These should be heated before mounting. For the correct joining temperatures, refer to the dimensional drawings in the coupling documentation.

Unless otherwise instructed, the components may be heated inductively, with a burner or in a furnace.



Take precautions to avoid burns from hot components!

Caution!

Protect shaft sealing rings from damage and heating over +100 °C. Use heat-protection screens to reduce radiant heat.

Caution!

**The coupling components should be fitted using suitable equipment to avoid possible damage to the shaft bearings through axial joining forces.
Always use suitable lifting equipment.
When fitting the components, ensure that the shaft sealing rings and running surface are not damaged.**

The components should be pushed smartly onto the shaft, up to the position specified in the order specific dimensional drawing.

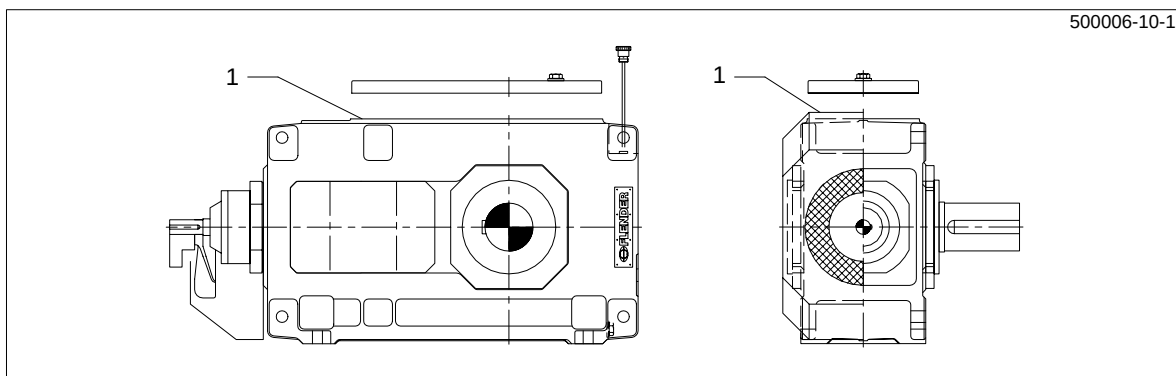
Caution!

Fit the coupling using suitable fitting equipment. Never use force or knock the couplings into position, as this will cause irreparable damage to the gearwheels, anti-friction bearings, retaining rings etc.

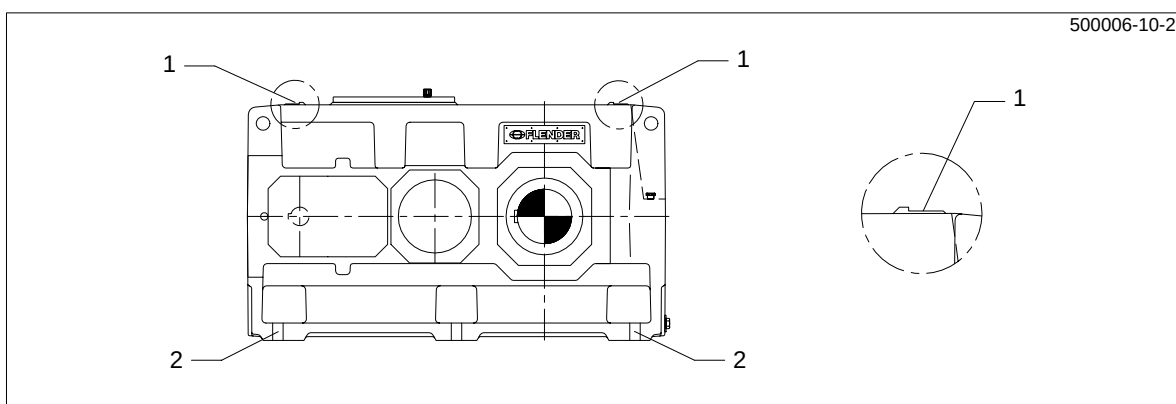
Note: Gear units whose weight requires the use of lifting gear must be attached at the points shown in section 4 "Handling and storage". When additional components are mounted on the gear unit, appropriate attachment points should be provided in accordance with the order-specific dimensional drawing.

6.2.2.1 Aligning surfaces, aligning thread

For preliminary alignment of the gear unit (sizes 1 - 12) in the horizontal direction, use the machined surfaces on the top of the housing with the inspection or assembly cover removed.



Gear units of sizes 13 - 26 have special aligning surfaces on the top of the housing. To facilitate alignment of gear units of these sizes, alignment threads are provided on the housing base.



1 Alignment surfaces

2 Alignment thread

The final fine alignment with the assemblies on the output side must be carried out accurately to the shaft axes using:

- rulers
- spirit level
- dial gauge
- feeler gauge etc.

The gear unit can now be fixed in its position.

Note: The accuracy of the alignment process is an important factor in determining the life span of shafts, bearings and couplings. If possible, the deviation should be zero. For the special requirements for the couplings, refer to the specific operating instructions.

6.2.2.2 Mounting on a foundation frame

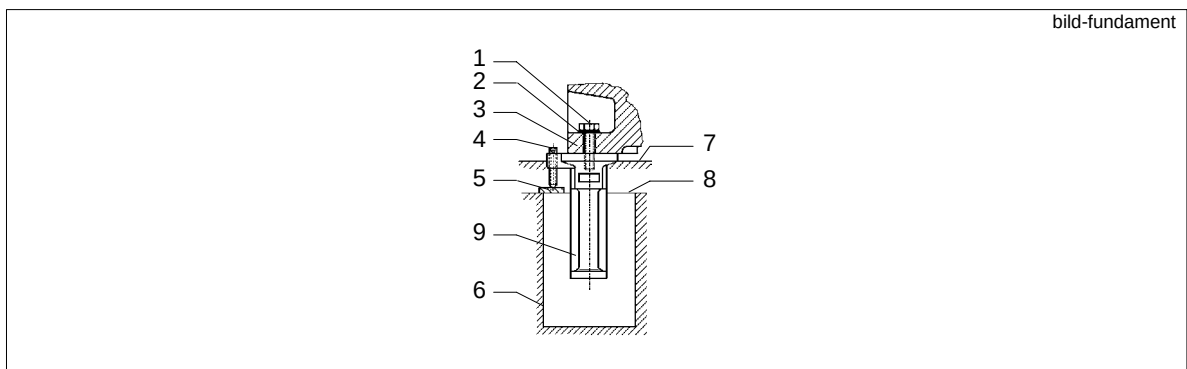
- Clean the lower surfaces of the gear-unit base.
- With suitable lifting gear, place the gear unit on the foundation frame.
- Tighten the foundation bolts to the specified torque (see point 10.2.11). If necessary use stops to prevent shifting.

Caution!

The gear unit must not be twisted when tensioning the fastening bolts.

6.2.2.3 Mounting on a concrete foundation

- Clean the lower surfaces of the gear-unit base.
- Hook the foundation blocks with washers and fastening bolts into the foundation fastening points on the housing and tighten the fastening bolts (see diagram below).



- 1 Fastening bolt
- 2 Washer
- 3 Gear-unit base
- 4 Set screw
- 5 Flat steel plate

- 6 Foundation
- 7 Final foundation height
- 8 Prepared foundation height
- 9 Foundation block

- Using suitable lifting gear, place the gear unit on the concrete foundation.
- Align the gear unit horizontally by the input and output shafts using foundation blocks (and set screws, if applicable).
- If applying considerable force, use stops to prevent the unit from shifting.
- Pour concrete into the recesses for the foundation blocks.

Note:

Before pouring the concrete foundation, fill up the openings in the foundation blocks with polystyrene.

When the concrete has set, tighten the fastening bolts of the foundation blocks to the **specified torque** (see point 10.2.11).

With types **H1** and **H2**, remove the air-conducting cowl before tightening the foundation bolts and then bolt it back into position.

Caution!

The gear unit must not be twisted when tensioning the fastening bolts.

6.3 Assembly of a shaft-mounting gear unit with hollow shaft and parallel-keyway

6.3.1 Assembly

- Remove the anti-corrosion paint from the hollow shaft and machine shaft with benzene.

Caution!

Do not allow the benzene to contact the shaft sealing rings.



**Ensure adequate ventilation. Do not smoke when working with benzene!
Danger of explosion.**

- Check the hollow and machine shafts to ensure that seat and edges are not damaged. If necessary, rework the parts with a suitable tool and clean them again.

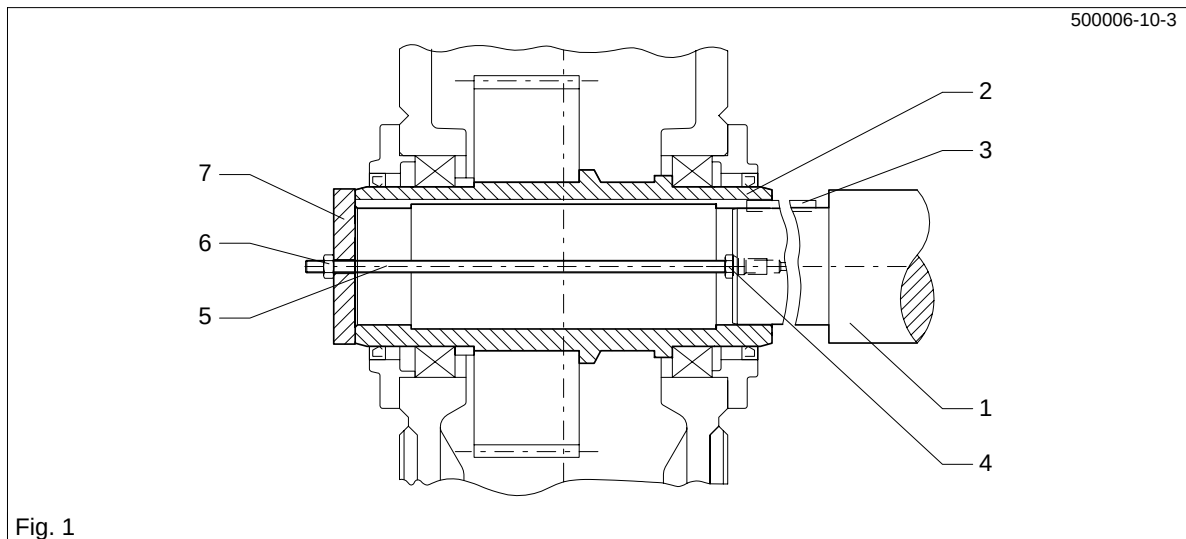
Coat with a suitable lubricant (e.g. Calypsol grease type H 443 HD88) to prevent frictional corrosion of the contact surfaces.

6.3.1.1 Fitting

- Fit the gear unit by means of nut and threaded spindle. The counter force is provided by the hollow shaft.

Caution!

The hollow shaft must be exactly aligned with the machine shaft to avoid canting.



- 1 Machine shaft
2 Hollow shaft
3 Parallel key

- 4 Nut
5 Threaded spindle
6 Nut

- 7 End plate

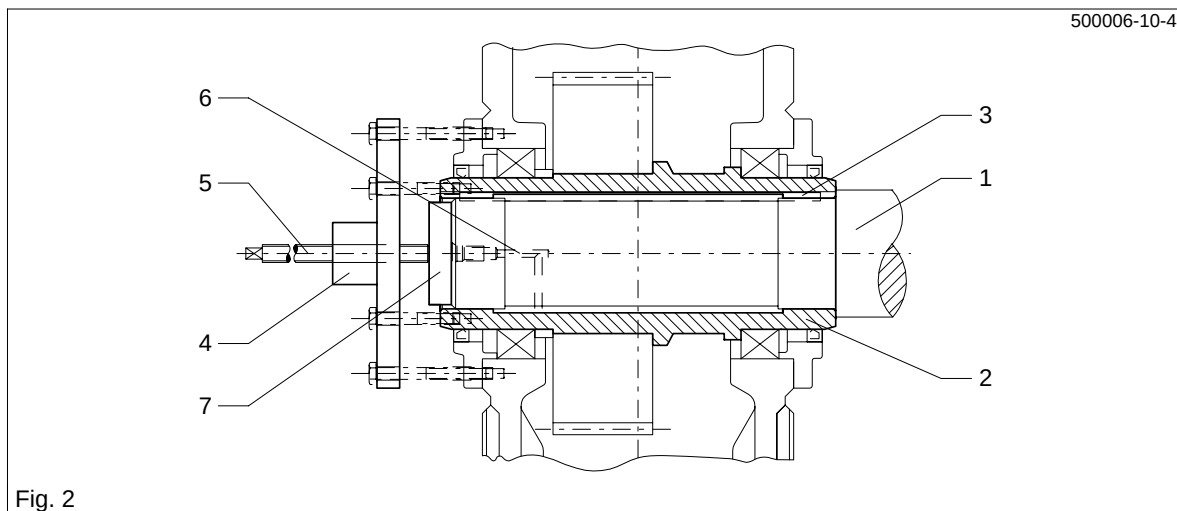
Instead of the nut and threaded spindle shown in the diagram, other types of equipment such as a hydraulic lifting equipment (type Lucas) may be used.

6.3.1.2 Axial securing device

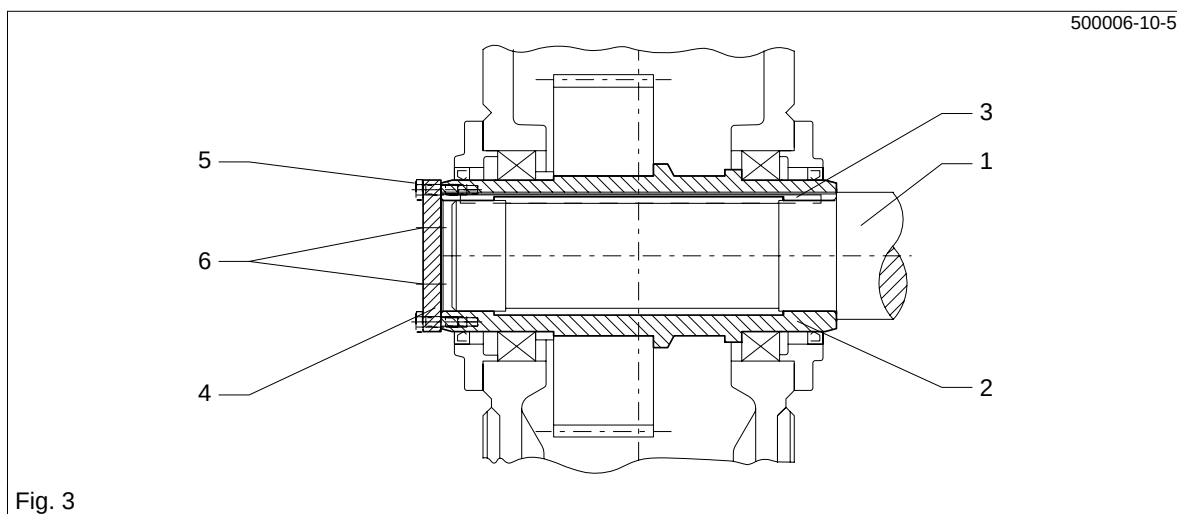
Depending on type, secure the hollow shaft axially on the machine shaft (e.g. with circlip, end plate, set screw etc.).

6.3.2 Dismantling

- Remove the axial securing device from the hollow shaft.
- If frictional corrosion has formed on the seating surfaces, press rust-releasing or other agent (e.g. with a pump) into the bore cavity to reach the seats. The rust releaser is forced in through the bores in the machine shaft (see fig. 2) or end plate (fig. 3).
- Depending on the facilities available, the gear unit can be forced off the shaft on site using forcing screws in an end plate (see fig. 3), a central threaded spindle or a Lucas hydraulic lifting unit.
- When the rust-releasing agent has taken effect, pull the gear unit off with the device as shown in figs. 2 or 3.



- | | |
|--------------------------|---------------------------------|
| 1 Machine shaft | 5 Threaded spindle |
| 2 Hollow shaft | 6 Bore for rust-releasing agent |
| 3 Parallel key | 7 Plate for forcing out |
| 4 Hydraulic lifting unit | |



- | | |
|-----------------|---------------------------------|
| 1 Machine shaft | 4 End plate |
| 2 Hollow shaft | 5 Seal |
| 3 Parallel key | 6 Bore for rust-releasing agent |

Caution!

Avoid twisting or canting when pulling the unit off.

Caution!

If the counter force is provided not only by the hollow shaft, but by the housing also, as shown in fig. 2, the forces used must not exceed the values given in the following table.

Gear-unit size	Maximum force N	Gear-unit size	Maximum force N
2	11700	11	97200
3	15200	12	113600
4	22600	13	140000
5	33000	14	160000
6	37500	15	193000
7	50000	16	215000
8	56000	17	240000
9	65000	18	266000
10	82000	19 ... 26	On request

Table 6.1: Maximum press-off forces

Caution!

If the above figures are exceeded, the hollow-shaft bearings or other gear components may be irreparably damaged. Before replacing the gear unit on the machine shaft, always check the bearings for any signs of damage.

Note:

When using forcing screws or threaded spindles, the head of the thread pushing against the working machine should be rounded and well greased to reduce the risk of seizing at this point.

6.4 Shaft-mounting gear unit with hollow shaft and internal spline to DIN 5480

6.4.1 Assembly

- Remove the anti-corrosion paint from the hollow shaft and machine shaft with benzine.

Caution!

Do not allow the benzine to contact the shaft sealing rings.



**Ensure adequate ventilation. Do not smoke when working with benzine!
Danger of explosion.**

- Check the hollow and machine shafts to ensure that seats, teeth or edges are not damaged. If necessary, rework the parts with a suitable tool and clean them again.

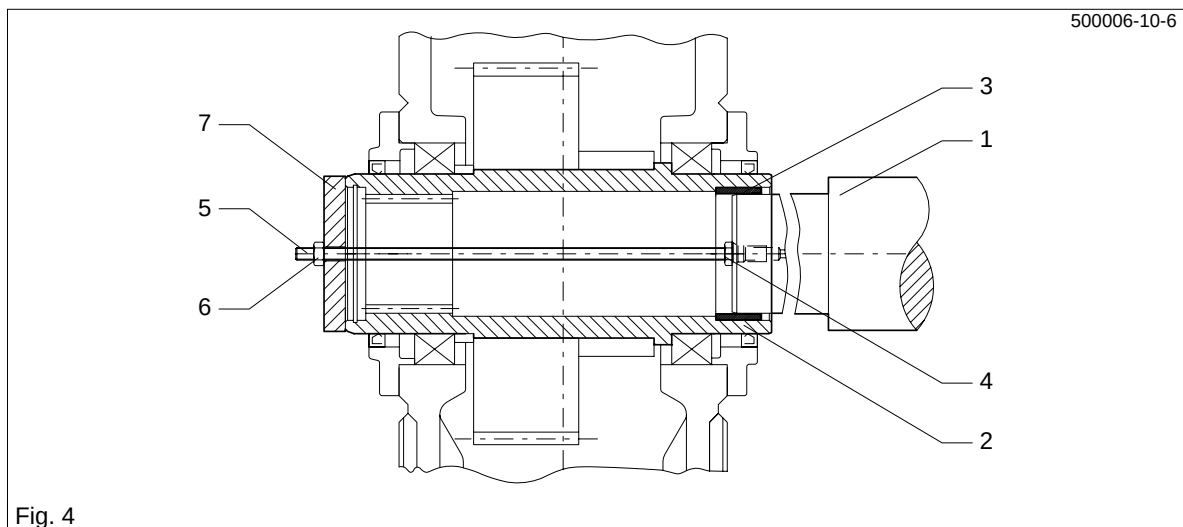
Coat with a suitable lubricant (e.g. Calypsol grease type H 443 HD88) to prevent frictional corrosion of the contact surfaces.

6.4.1.1 Fitting

- Fitting with integrated DU bush
- Fit the gear unit by means of nut and threaded spindle. The counter force is provided by the hollow shaft.

Caution!

The hollow shaft must be exactly aligned with the machine shaft to avoid canting. When fitting, ensure that the position of the teeth between the machine shaft and hollow shaft is correct. The correct position can be determined by turning the input shaft or by swivelling the gear unit lightly around the hollow shaft.



- | | | |
|-----------------|--------------------|-------------|
| 1 Machine shaft | 4 Nut | 7 End plate |
| 2 Hollow shaft | 5 Threaded spindle | |
| 3 DU bush | 6 Nut | |

- Fitting with loose DU bush

The loose DU bush is pushed onto the machine shaft, fixed rigidly in position with a locating tie and then pulled into the hollow shaft along with the machine shaft (see fig. 4).

Caution!

The hollow shaft must be exactly aligned with the machine shaft to avoid canting. When fitting, ensure that the position of the teeth between the machine shaft and hollow shaft is correct. The correct position can be determined by turning the input shaft or by swivelling the gear unit lightly around the hollow shaft.

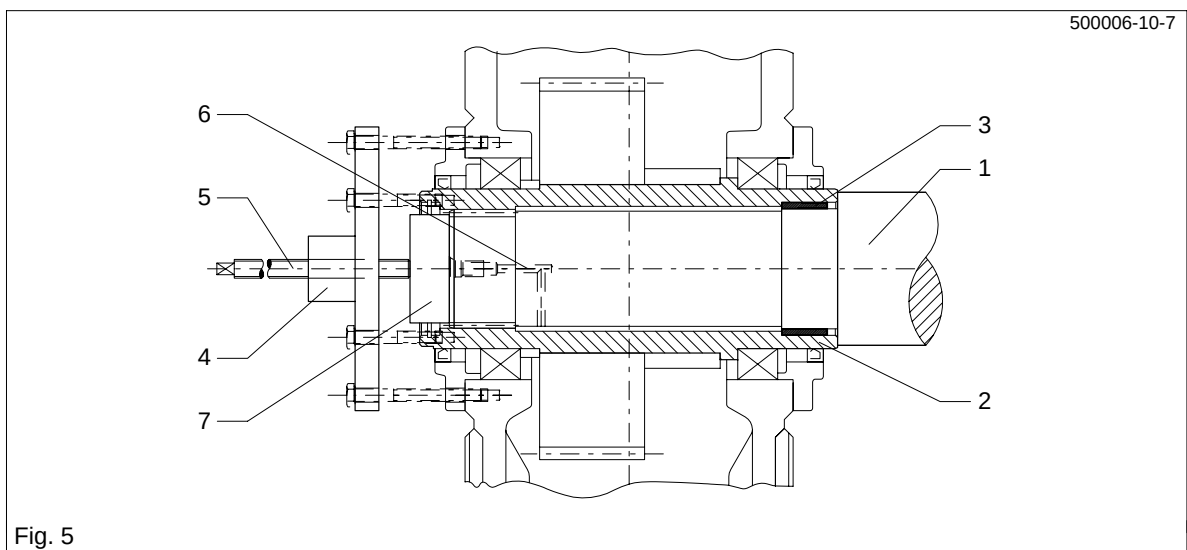
Instead of the nut and threaded spindle shown in the diagram, other types of equipment such as a hydraulic lifting equipment (type Lucas) may be used.

6.4.1.2 Axial securing device

Depending on type, secure the hollow shaft axially on the machine shaft (e.g. with circlip, end plate, set screw etc.).

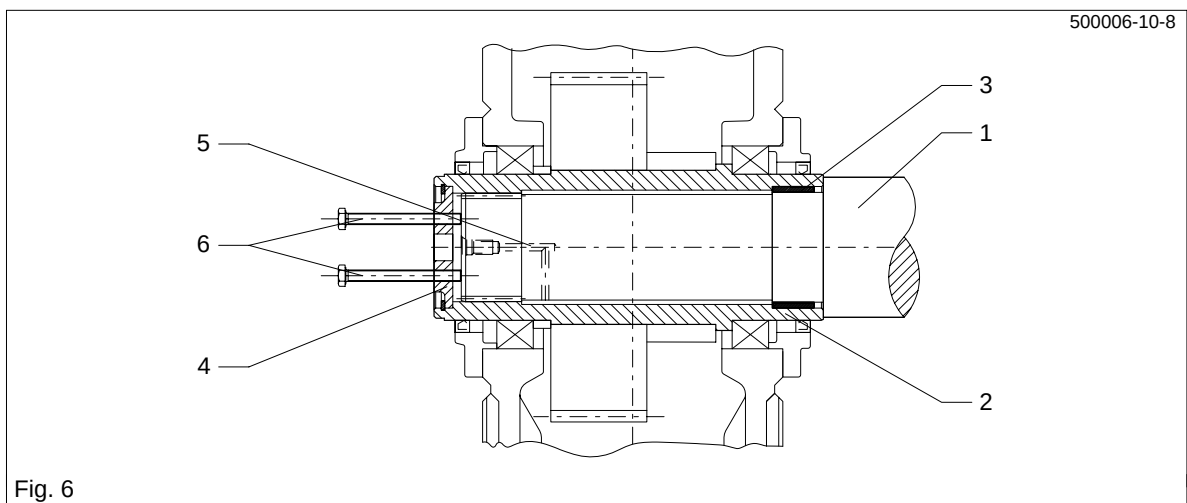
6.4.2 Dismantling

- Remove the axial securing device from the hollow shaft.
- If frictional corrosion has formed on the seating surfaces, press rust-releasing or other agent (e.g. with a pump) into the bore cavity to reach the seats. The rust releaser is forced in through the bores in the machine shaft (see fig. 5) or end plate (fig. 6).
- Depending on the facilities available, the gear unit can be forced off the shaft on site using forcing screws in an end plate (see fig. 6), a central threaded spindle or a Lucas hydraulic lifting unit.
- When the rust-releasing agent has taken effect, pull the gear unit off with the device as shown in figs. 5 or 6.



- 1 Machine shaft
- 2 Hollow shaft
- 3 DU bush
- 4 Hydraulic lifting unit

- 5 Threaded spindle
- 6 Bore for rust-releasing agent
- 7 Plate for forcing out



- 1 Machine shaft
- 2 Hollow shaft
- 3 DU bush

- 4 End plate
- 5 Bore for rust-releasing agent
- 6 Forcing screws

Caution!

Avoid twisting or canting when pulling the unit off.

Caution!

If the counter force is provided not only by the hollow shaft, but by the housing also, as shown in fig. 5, the forces used must not exceed the values given in the following table.

Gear-unit size	Maximum force N	Gear-unit size	Maximum force N
2	11700	11	97200
3	15200	12	113600
4	22600	13	140000
5	33000	14	160000
6	37500	15	193000
7	50000	16	215000
8	56000	17	240000
9	65000	18	266000
10	82000	19 ... 26	On request

Table 6.2: Maximum press-off forces

Caution!

If the above figures are exceeded, the hollow-shaft bearings or other gear components may be irreparably damaged. Before replacing the gear unit on the machine shaft, always check the bearings for any signs of damage.

Note:

When using forcing screws or threaded spindles, the head of the thread pushing against the working machine should be rounded and well greased to reduce the risk of seizing at this point.

6.5 Shaft-mounting gear unit with hollow shaft and shrink disk

6.5.1 Assembly

- Remove the anti-corrosion paint from the hollow shaft and machine shaft with benzene.

Caution!

Do not allow the benzene to contact the shaft sealing rings.



**Ensure adequate ventilation. Do not smoke when working with benzene!
Danger of explosion.**

- Check the hollow and machine shafts to ensure that seat and edges are not damaged. If necessary, rework the parts with a suitable tool and clean them again.

Caution!

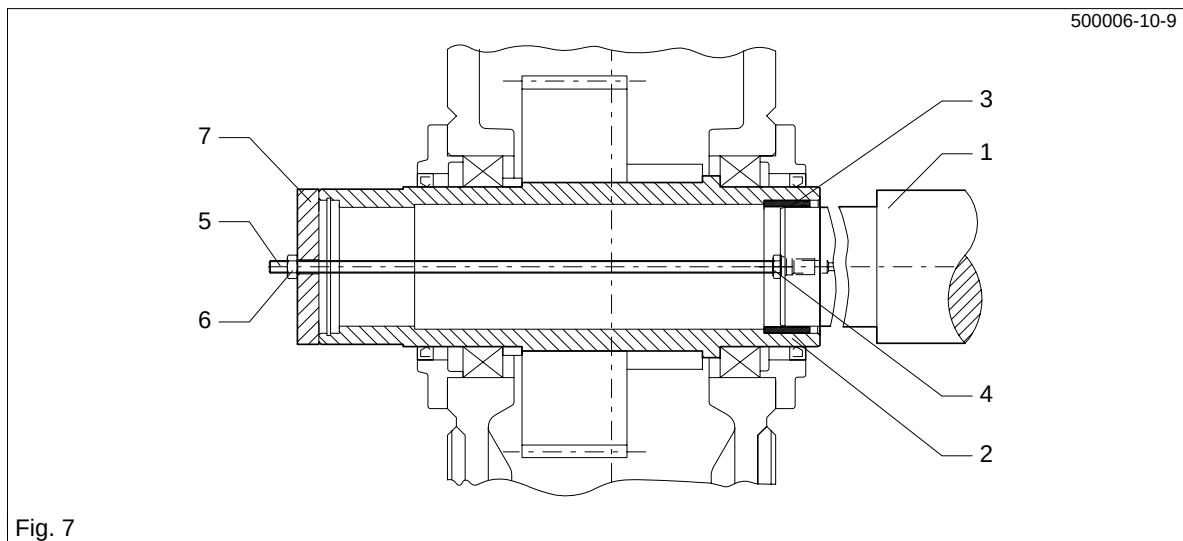
**The bore of the hollow shaft and the machine shaft must be absolutely free of grease in the area of the shrink-disk seat.
This is essential for safe and reliable torque transmission.
Do not use contaminated solvents or dirty cloths for removing grease.**

6.5.1.1 Fitting

- Fitting with integrated DU bush
- Fit the gear unit by means of nut and threaded spindle. The counter force is provided by the hollow shaft.

Caution!

The hollow shaft must be exactly aligned with the machine shaft to avoid canting.



- 1 Machine shaft
- 2 Hollow shaft
- 3 DU bush

- 4 Nut
- 5 Threaded spindle
- 6 Nut

- 7 End plate

- Fitting with loose DU bush

The loose DU bush is pushed onto the machine shaft, fixed rigidly in position with a locating tie and then pulled into the hollow shaft along with the machine shaft (see fig. 7).

Caution!

The hollow shaft must be exactly aligned with the machine shaft to avoid canting.

Instead of the nut and threaded spindle shown in the diagram, other types of equipment such as a hydraulic lifting equipment (type Lucas) may be used.

6.5.1.2 Axial securing device

If the shrink disk is fitted according to instructions, the gear unit is fixed securely in the axial direction. Additional securing is not required.

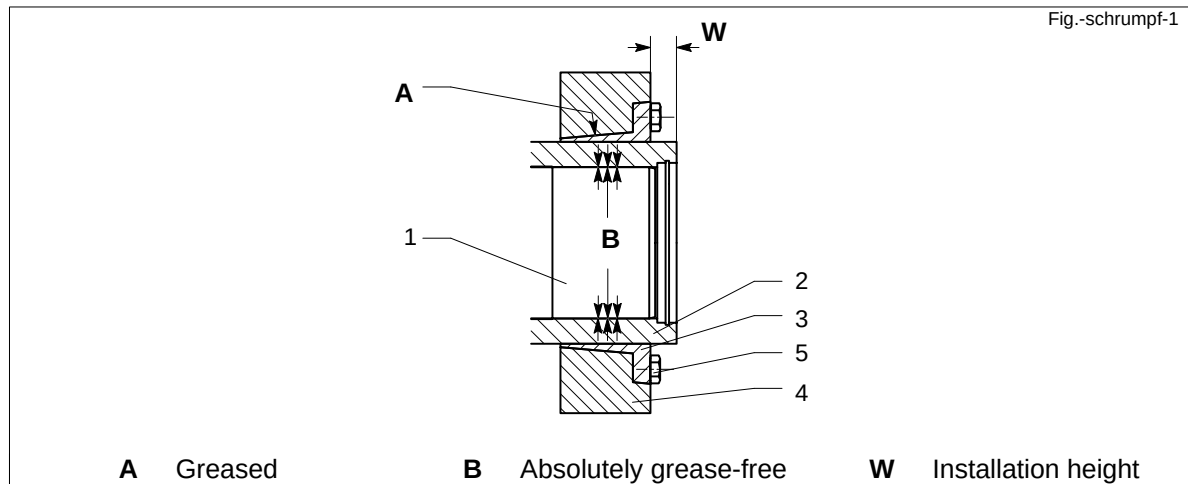
6.5.2 Shrink disk type HSD

6.5.2.1 Assembly of shrink disk

The shrink disk is delivered ready for installation.

Caution! It must not be dismantled before tensioning for the first time.

Caution! The bore of the hollow shaft and the machine shaft must be absolutely free of grease in the area of the shrink-disk seat. This is essential for safe and reliable torque transmission. Do not use contaminated solvents or dirty cloths for removing grease.



1 Machine shaft
2 Hollow shaft

3 Inner ring
4 Outer ring

5 Tensioning bolt

For the exact installation height (W) of the shrink disk, refer to the dimensional drawing (see section 1 "Technical data")

Note: The outer surface of the hollow shaft may be greased in the area of the shrink-disk seat.

Caution! Do not tighten the tensioning bolts until the machine shaft is installed.

Tighten all the tensioning bolts gradually one after the other, working round several times.

Caution! Do not tighten diametrically opposite bolts one after the other.

Tighten the tensioning bolts until the front surfaces of the inner and outer rings are aligned.

Note: This allows the tension state to be checked visually.

Caution!

To avoid overloading the individual bolts, the maximum tensioning torque (see table) must never be exceeded. The alignment of the front surfaces has priority. If they cannot be aligned by tightening, consult the manufacturer.

Tensioning-bolt thread	Max. tensioning torque per bolt (with $\mu = 0.1$)	
	Strength class 10.9 Nm	Strength class 12.9 Nm
M 6	12	14.5
M 8	29	35
M 10	58	70
M 12	100	121
M 14	160	193
M 16	240	295
M 20	470	570
M 24	820	980
M 27	1210	1450
M 30	1640	1970
M 33	2210	2650
M 36	2850	3420

Table 6.3: Maximum torques for tensioning bolts

Replace the protective cowl.

6.5.2.2 Removing the shrink disk

The loosening process is similar to that of tightening.

Loosen the tensioning bolts gradually one after the other, working round several times.

If the outer ring does not release from the inner ring, several tensioning bolts can be removed and then screwed into adjacent forcing threads.

The rings can then be released without difficulty.

Pull the shrink disk off the hollow shaft.

6.5.2.3 Cleaning and greasing the shrink disk

Shrink disks do not have to be dismantled and re-greased before being re-installed.

The shrink disk should only be dismantled and cleaned if it is dirty.

Caution!

Following cleaning, only the inner sliding surfaces of the shrink disk should be re-greased.

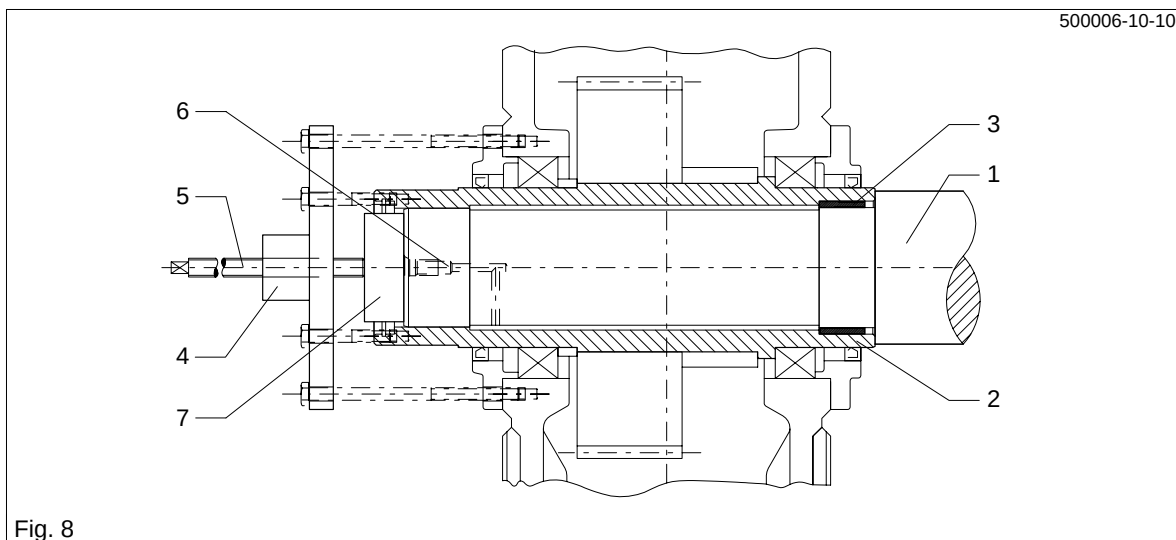
Use a solid grease with a coefficient of friction of $\mu = 0.04$ as shown in the following table.

Grease	Form	Manufacturer
Molykote 321 R (lubricating paint)	Spray	DOW Corning
Molykote Spray (powder spray)	Spray	DOW Corning
Molykote G Rapid	Spray or Paste	DOW Corning
Aemasol MO 19 P	Spray or Paste	A. C. Matthes
Molykombin UMFT 1	Spray	Klüber Lubrication
Unimoly P 5	Powder	Klüber Lubrication

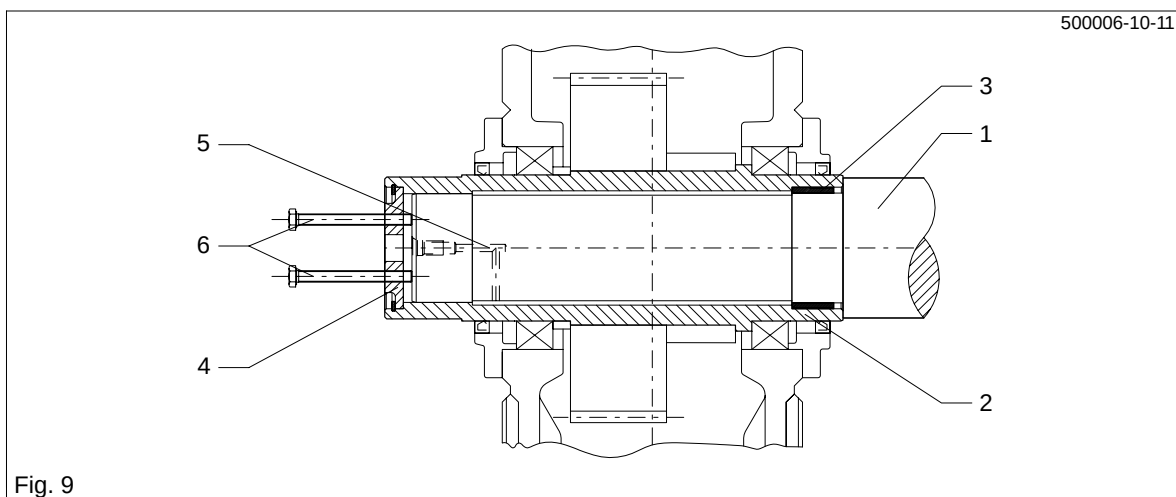
Table 6.4: Lubricants for shrink disk after cleaning

6.5.3 Dismantling

- If frictional corrosion has formed on the seating surfaces, press rust-releasing or other agent (e.g. with a pump) into the bore cavity to reach the seats. The rust releaser is forced in through the bores in the machine shaft (see fig. 8) or end plate (fig. 9).
- Depending on the facilities available, the gear unit can be forced off the shaft on site using forcing screws in an end plate (see fig. 9), a central threaded spindle or a Lucas hydraulic lifting unit.
- When the rust-releasing agent has taken effect, pull the gear unit off with the device as shown in figs. 8 or 9.



- | | |
|--------------------------|---------------------------------|
| 1 Machine shaft | 5 Threaded spindle |
| 2 Hollow shaft | 6 Bore for rust-releasing agent |
| 3 DU bush | 7 Plate for forcing out |
| 4 Hydraulic lifting unit | |



- | | |
|-----------------|---------------------------------|
| 1 Machine shaft | 4 End plate |
| 2 Hollow shaft | 5 Seal |
| 3 DU bush | 6 Bore for rust-releasing agent |

Caution!

Avoid twisting or canting when pulling the unit off.

Caution!

If the counter force is provided not only by the hollow shaft, but by the housing also, as shown in fig. 8, the forces used must not exceed the values given in the following table.

Gear-unit size	Maximum force N	Gear-unit size	Maximum force N
2	11700	11	97200
3	15200	12	113600
4	22600	13	140000
5	33000	14	160000
6	37500	15	193000
7	50000	16	215000
8	56000	17	240000
9	65000	18	266000
10	82000	19 ... 26	On request

Table 6.5: Maximum press-off forces

Caution!

If the above figures are exceeded, the hollow-shaft bearings or other gear components may be irreparably damaged. Before replacing the gear unit on the machine shaft, always check the bearings for any signs of damage.

Note:

When using forcing screws or threaded spindles, the head of the thread pushing against the working machine should be rounded and well greased to reduce the risk of seizing at this point.

6.6 Shaft-mounting gear unit with flanged shaft

Caution!

The front area of the flanged shaft must be absolutely free of grease. This is essential for safe and reliable torque transmission. Do not use contaminated solvents or dirty cloths for removing grease.

Caution!

Tighten diametrically opposite tensioning bolts to full torque.

- Tightening torque of flange bolts for gear units:

Gear-unit size	Strength class		Tightening torque
	Bolt DIN 931	Nut DIN 934	
5 ... 6	10.9	10	610 Nm
7 ... 10	10.9	10	1050 Nm
11 ... 16	10.9	10	2100 Nm
17 ... 20	10.9	10	3560 Nm
21 ... 26	10.9	10	5720 Nm

Table 6.6: Tightening torques for flange connections

Note:

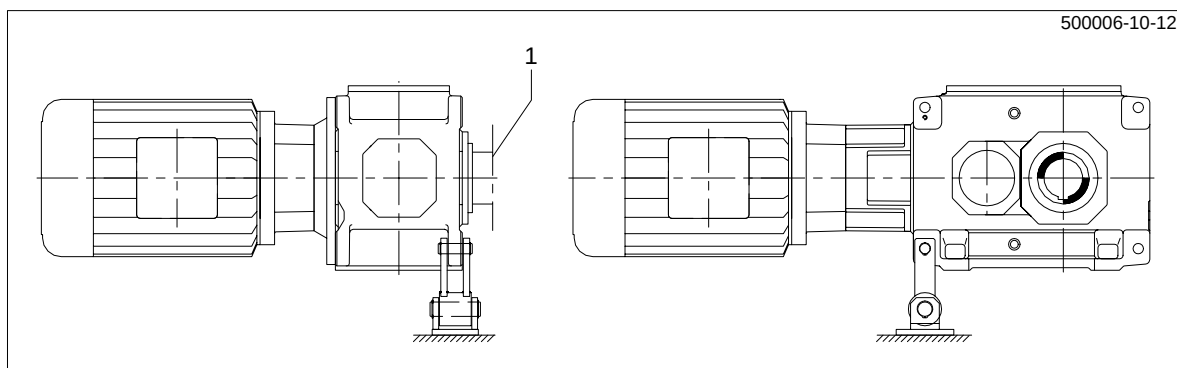
Damaged bolts should be replaced with new ones of the same type and strength class.

6.7 Mounting the torque arm for gear housing

6.7.1 Attaching the torque arm

Caution! The torque arm must be mounted stress-free on the machine side

For helical-gear units with fan, the torque arm is mounted opposite the fan.



1 Machine side

Gear-unit size	Max. standard-motor size					
	Gear type			Gear type		
	H2	H3	H4	B2	B3	B4
1	–	–	–	112	–	–
2	–	–	–	132	–	–
3	180	–	–	180	180	–
4	200	–	–	200	200	–
5 ... 6	225	225	–	225	225	160
7 ... 8	280	280	180	280	280	200
9 ... 10	280	280	225	280	280	225
11 ... 12	315M	315M	250	315M	315M	280
13 ... 14	–	355	315M	355	355	315M
15 ... 16	–	355	315	–	355	355M
17 ... 18	–	355	355M	–	355	355
19 ... 26	On request					

Table 6.7: Motor types and torque arms

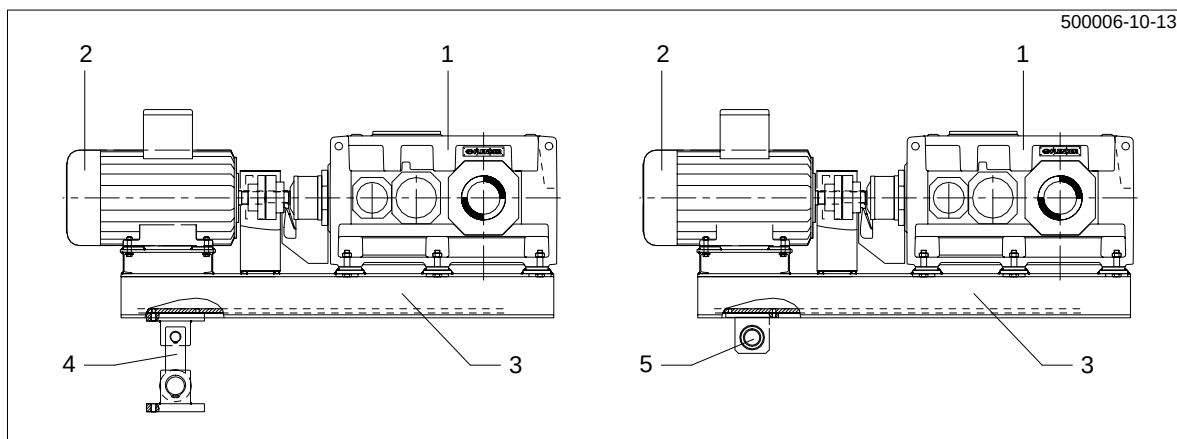
Note: Larger motors should be used only with the consent of FLENDER.

- Foundation type for fastening torque arm, see point 6.2.1 "Foundation".

6.8 Mounting supports for gear-unit swings

6.8.1 Attaching the support

Caution! The support for the swing must be mounted free of stress.



- 1 Gear unit
- 2 Motor
- 3 Gear-unit swing

- 4 Torque arm
- 5 Flexible support block

Gear-unit size	Max. standard-motor size		
	Gear type		
	B2	B3	B4
1	On request	—	—
2		—	—
3		160	—
4		200	—
5 ... 6		225M	160
7 ... 8		280M	200
9 ... 10		315	225M
11 ... 12		355	280S
13 ... 14		400M	315M
15 ... 16		400M	315
17 ... 18		400M	355L
19 ... 26		On request	

Table 6.8: Motor and gear-unit swing

Note: Larger motors should be used only with the consent of FLENDER.

- Foundation type for fastening torque arm, see point 6.2.1 "Foundation".

6.9 Gear unit with cooling coil

- Before connecting the cooling coil remove the plugs from the connection bush of the cooling coil and flush the coil well to remove any dirt.
- Install the cooling-water in- and outflow pipes (for exact position of connections, see dimensional drawing).

Note: To avoid excess pressure, the water inlet must be fitted with a flow-control device, e.g. a pressure reducer or suitable stop valve.

6.10 Gear unit with air oil-cooler

- Connect the pressure monitor and indicator for switchover filter (for gear sizes ≥ 13) electrically
- Connect the fan motor electrically

6.11 Gear unit with water oil-cooler

- Before connecting the water oil-cooler remove the plugs from the water connection and flush the cooler well to remove any dirt.
- Install the cooling-water in- and outflow pipes. The direction of flow is of no importance. (for exact position of connections, see dimensional drawing).
- Connect pressure monitor electrically

6.12 Gear units with heating element

- Connect temperature monitor electrically
- Connect heating elements electrically

6.13 Gear units with oil-temperature measurement

- Connect resistance thermometer with evaluating instrument (to be provided by customer) electrically

6.14 Gear units with oil-level monitoring

- Connect oil-level monitor electrically

6.15 Gear units with speed transmitter

- Connect speed transmitter electrically

6.16 General note on add-on components

Note: For operation and maintenance of the components described in points 6.10 to 6.15, observe the instructions in the order-specific appendix.
For technical details, refer to the order-specific equipment list.

7. Start-up

Note: Observe the "Safety notes" in section 3.

7.1 Procedure before start-up

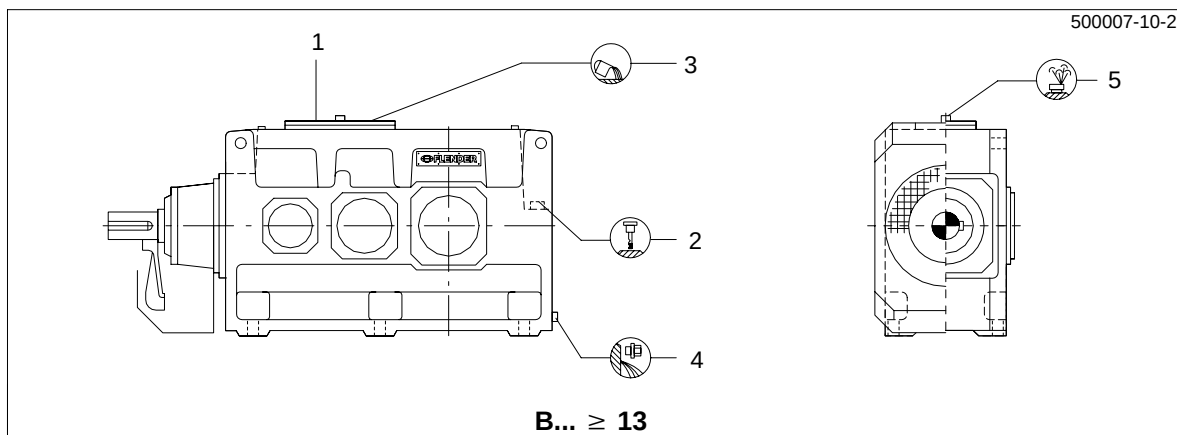
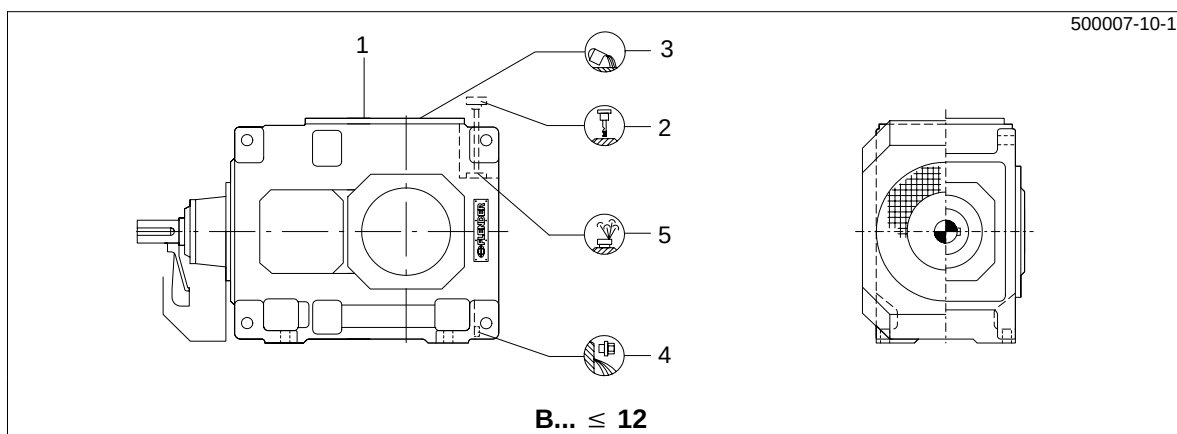
7.1.1 Removal of conservation agent

- Unscrew the oil drain plug or open the draining valve, allow the conservation agent or run-in oil to drain into a suitable container and dispose of it in accordance with regulation. Any residual-oil draining screws should also be opened e.g. in the case of gear units with backstop). The location of the oil draining point is marked by the symbol in the dimensional drawing in the unit documentation.



Remove any oil spillage immediately with an oil-binding agent.

- Replace the oil drain plug



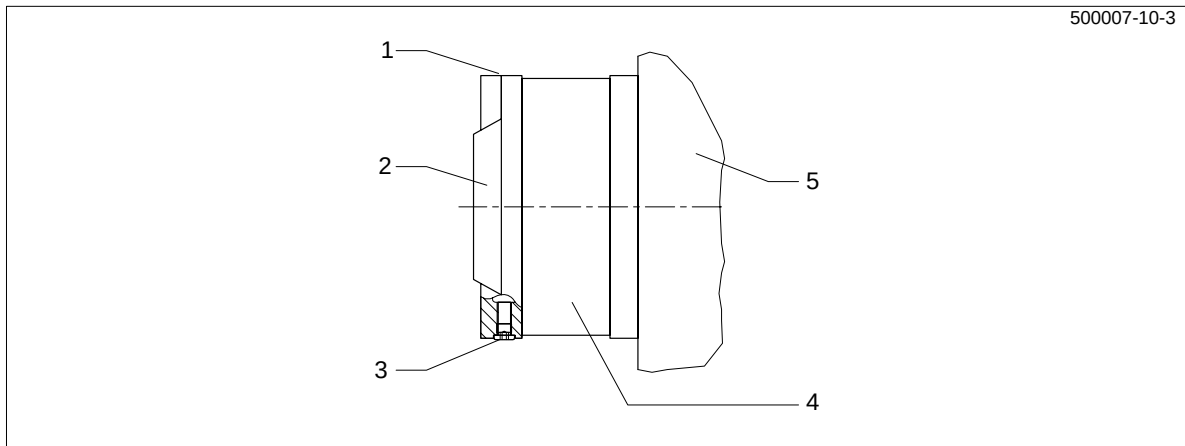
1 Inspection
or assembly cover

2 Oil dipstick
3 Oil inlet

4 Oil drain plug
5 Venting or plug screw

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

Gear unit with backstop:



- | | |
|-------------------------------------|-------------|
| 1 Plug screw for oil inlet | 4 Backstop |
| 2 Cover for backstop | 5 Gear unit |
| 3 Plug screw for residual-oil drain | |

Caution!

Before start-up, replace the yellow plastic plug with venting screws with cap (see notice on gear unit).

7.1.2 Charging with lubricant

- Release the fastening bolts on the inspection or assembly cover and remove the cover (including seal) from the housing. Do not discard the seal.
- With gear units with added backstop, release the plug screw on the backstop cover and pour in approx. 0.5 l fresh oil of the total oil quantity via a filter (max. mesh 25 µm)
- Replace the plug screw

Caution!

Fill the gear unit with fresh oil using a filter (max. mesh 25 µm) up to the MAX marking on the oil dipstick. Remember to fill the oil pockets above the bearings and (with bevel-gear units) at the input shaft on the inside.

Note: For the correct type of oil (of various brands) to be used refer to the operating instructions BA 7300 EN supplied separately. Information on the type, viscosity and quantity of the oil is given on the rating plate on the gear unit. The quantity of oil stated on the rating plate is an approximation only. The markings on the oil dipstick must **always** be observed.

Note: With gear units fitted with pressure lubrication or oil-cooling systems, the oil circuit must also be charged. To do this, briefly start up the gear unit with added pump as described in section 8.

- Check the oil level in the gear housing with the oil dipstick

Note: The oil level must be at the upper mark on the oil dipstick.



Remove any oil spillage immediately with an oil-binding agent.

- Place the inspection or assembly cover (including seal) on the housing and replace and tighten the fastening bolts (see point 10.2.11).

7.1.2.1 Oil quantities

Type	Oil quantity (approx.) in litres for size											
	1	2	3	4	5	6	7	8	9	10	11	12
H1SH	2.5	–	7	–	22	–	42	–	68	–	120	–
H2.H	–	–	6	10	15	16	27	30	42	45	71	76
H2.M	–	–	–	–	–	–	–	–	–	–	–	–
H3.H	–	–	–	–	15	17	28	30	45	46	85	90
H3.M	–	–	–	–	–	–	–	–	–	–	–	–
H4.H	–	–	–	–	–	–	25	27	48	50	80	87
H4.M	–	–	–	–	–	–	–	–	–	–	–	–
B2.H	2	4	6	10	16	19	31	34	48	50	80	95
B2.M	–	–	–	–	–	–	–	–	–	–	–	–
B3.H	–	–	6	9	14	15	25	28	40	42	66	72
B3.M	–	–	–	–	–	–	–	–	–	–	–	–
B4.H	–	–	–	–	16	18	30	33	48	50	80	90
B4.M	–	–	–	–	–	–	–	–	–	–	–	–

Type	Oil quantity (approx.) in litres for size													
	13	14	15	16	17	18	19	20	21	22	23	24	25	26
H1SH	175	–	190	–	270	–	390	–	–	–	On request			
H2.H	135	140	210	215	290	300	320	340	320	340				
H2.M	110	115	160	165	230	240	300	320	350	370				
H3.H	160	165	235	245	305	315	420	450	470	490				
H3.M	125	130	190	195	240	250	390	415	515	540				
H4.H	130	140	230	235	290	305	360	380	395	420				
H4.M	120	125	170	175	225	230	310	330	430	450				
B2.H	140	155	220	230	320	335	–	–	–	–				
B2.M	120	130	180	190	260	275	–	–	–	–				
B3.H	130	140	210	220	290	300	380	440	370	430				
B3.M	110	115	160	165	230	235	360	420	420	490				
B4.H	145	150	230	235	295	305	480	550	540	620				
B4.M	120	125	170	175	230	235	440	510	590	680				

Table 7.1: Approximate figures for required oil quantities in horizontal gear units with **radial shaft seals and Taconite seals**

Type	Oil quantity (approx.) in litres for size																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
H1SH	2.3	–	5.5	–	19	–	36	–	60	–	106	–	155	–	156	–	225	–	230
H2.H	–	–	4.5	7	11	12	21	23	33	34	58	60	120	130	190	200	260	270	–
H3.H	–	–	–	–	14	15	26	28	41	43	–	–	–	–	–	–	–	–	–
B2.H	–	–	–	–	14	15	28	29	38	40	65	71	125	140	195	205	280	300	–
B3.H	–	–	5	8	13	14	23	25	37	39	62	67	–	–	–	–	–	–	–

Table 7.2: Approximate figures for required oil quantities in horizontal gear units with **labyrinth seals**

7.2 Start-up

- Check the oil level in the housing with the oil dipstick

Note: When the oil is cool, the level should be at the upper oil dipstick mark. When the oil is warm it may slightly exceed this mark. It must not be allowed to fall below the mark. If necessary, top up to the correct level.

Gear unit with cooling coil or water oil-cooling systems:

- Fully open the stop valves in the coolant in- and outflow pipes.

Note: For technical details, refer to the order-specific equipment list.

Gear units with backstop:

Before start-up, check whether the backstop can be turned manually in the free-running direction without exerting undue force. Observe the direction arrows on the housing.

Caution!

**To avoid damaging the backstop or the gear unit, the motor should not be run in the locked direction of the gear unit.
Observe the sign fixed to the gear unit.**

Before connecting the motor, determine the direction of rotation of the three-phase current supply using a phase-sequence indicator, and connect the motor in accordance with the pre-determined direction.

Note: The unit can be started up once the amount of oil stated on the notice has been poured into the oil-inlet screw of the backstop.
Always use oil of the same type and viscosity as for the gear unit.

7.3 Removal from service

- To take the gear unit out of service, first switch off the drive assembly.



**Secure the drive assembly to prevent it from being started up accidentally.
Attach a warning notice to the start switch.**

- With gear units fitted with cooling coil or water oil-coolers, close the stop valve on the water inflow and outflow pipes. To prevent freezing, drain the water from the cooling coil or the water oil-cooler.
- During longer periods of disuse, start the unit up briefly at intervals of approx. 3 weeks. If it is to remain out of service for longer than six months, fill it with conservation agent (see point 7.3.1).

7.3.1 Interior conservation during longer disuse

Depending on the type of lubrication or shaft sealing, the following types of internal corrosion protection can be used.

7.3.1.1 Interior conservation with gear oil

Gear units with splash-lubrication systems and contacting shaft seals can be filled with the correct type of service oil up to a point just below the venting screw.

7.3.1.2 Interior conservation with special conservation agent

Before longer periods of storage, gear units with pressurised lubrication systems, oil-circuit cooling or non-contacting shaft seals should be allowed to idle with a charge of conservation agent.

Duration of protection	Conservation agent	Special measures
less than 24 months	Castrol Alpha SP 220 S	Close gear unit, replace venting screw or air filter with a yellow plug screw, (replace the original parts before start-up)
For storage periods longer than 24 months, renew the conservation agent. For storage periods over 36 months, FLENDER should be consulted.		

Table 7.3: Conservation procedure when using mineral oil or PAO-based synthetic oil

Duration of protection	Conservation agent	Special measures
less than 36 months	Special anti-corrosion oil TRIBOL 1390 1)	Close gear unit, replace venting screw or air filter with a yellow plug screw, (replace the original parts before start-up)
For storage periods over 36 months, FLENDER should be consulted.		

Table 7.4: Conservation procedure when using PG-based synthetic oil

1) Resistant to tropical conditions and sea water. Max. ambient temperature 50 °C

7.3.1.3 Interior conservation procedure

- Switch the gear unit off and drain the oil as described in section 10 "Maintenance and repair".
- Pour in the conservation agent given in Table 7.3 or 7.4 through the venting hole or the opening in the inspection or assembly cover until it reaches the top mark on the oil dipstick.
- Close the venting hole or the opening in the inspection or assembly cover.
- Start the gear unit and allow it to idle for a short time.
- Unscrew the oil drain plug and allow the conservation agent to drain into a suitable container and dispose of it according to regulation.



**The conservation agent emerging from the gear unit may be hot.
Wear gloves to avoid scalding.**

- Replace the oil drain plug.

Caution!

**Before re-starting the gear unit, replace the plug screw with the venting screw or air filter.
See also point 7.1.1**

7.3.2 Exterior conservation

Duration of protection	Conservation agent	Layer thickness	Remarks
less than 12 months	Tectyl 846 K19	approx. 50 µm	Long-term wax-based conservation agent, resistant to sea water and tropical conditions, soluble in benzine

Table 7.5: Exterior protection of shaft ends and other bare surfaces

7.3.2.1 Exterior conservation procedure

- Clean the surfaces
- Apply grease to shaft-sealing rings to protect the sealing lips from conservation agent
- Apply conservation agent

8. Operation

Note: Observe the "Safety notes" in section 3.

8.1 General operating data

During operation, the unit must be monitored for:

- overheating (In continuous operation, the gear unit is designed for a temperature of 90 °C with mineral oil. For higher temperatures, synthetic oils must be used. The maximum short-term operating temperature is 100 °C. See also section 10.)
 - changes in running noise
 - possible oil leakage at the housing and shaft seals
- and
- correct oil level (see section 7 "Start-up")

Note: To check the oil level, stop operation of gear unit. When the oil is warm it may slightly exceed the top mark of the oil dipstick. It must not be allowed to fall below the lower mark. If necessary, top up to the correct level.

Caution!

If any irregularities are noticed during operation, or if the pressure monitor in the oil-cooling system (if installed) triggers the alarm, switch the drive assembly off at once. Determine the cause of the fault using the table in section 9.

This table contains a list of possible faults, their causes and suggested remedies.

Should it not be possible to identify the cause, or the unit cannot be repaired with the facilities available, you are advised to contact one of our customer-service offices for specialist assistance. See section 11.

9. Disturbances, reasons and remedy

Note: Observe the "Safety notes" in section 3.

9.1 General information on faults and malfunctions

Note: Faults and malfunctions occurring during the guarantee period and which require repair work on the gear unit, must be carried out only by Flender Customer Service. In the case of faults and malfunctions occurring after the guarantee period, and whose cause cannot be precisely identified, we advise our customers to contact our Customer Service.

Caution!

FLENDER will not be bound by the terms of the guarantee or otherwise be responsible in cases of improper use of the gear unit, modifications carried out without the consent of FLENDER, or use of spare parts not supplied by FLENDER.



To remedy faults and malfunctions, the gear unit must always be taken out of service.

Secure the drive assembly to prevent it from being started up accidentally. Attach a warning notice to the start switch.

9.2 Possible faults

Malfunctions	Causes	Remedy
Changes in gear noise	Damage to gear teeth	Contact Customer Service. Check teeth on all components, replace any damaged parts.
	Excessive bearing play	Contact Customer Service. Adjust bearing play.
	Defective bearing	Contact Customer Service. Replace defective bearing.
Loud noises in area of gear-unit fastening	Fastening has worked loose	Tighten bolts / nuts to prescribed torque. Replace damaged bolts / nuts.
Increased temperature at bearing points	Oil level in housing too low	Check oil level at room temperature, top up if necessary
	Oil too old	Check date of last oil change, change oil if necessary. See section 10.
	Mechanical oil pump defective	Check oil pump or replace if necessary
	Bearing defective	Contact Customer Service. Check bearings and replace if necessary
Gear unit is oily	Inadequate sealing of housing cover or joints	Seal joints
	Labyrinth seals oiled up	Check oil charge, clean labyrinth seals if necessary, incorrect transport position
Oil leakage from gear unit	Inadequate sealing of housing cover or joints	Check seals, replace if necessary, seal joints
	Radial shaft sealing rings defective	Check radial shaft sealing rings, replace if necessary

Malfunctions	Causes	Remedy
Water in oil	Oil froths in sump	Check oil state using test-tube method for water contamination. Have oil analysed by laboratory.
	Defective oil cooler or cooling coil	Repair or replace oil cooler or cooling coil. Fill with oil, find leaks and repair.
	Gear unit exposed to cold air from machine-room ventilator causing condensation	Protect gear unit with suitable insulation. Close air outlet or alter its direction.
Operating temperature too high	Oil level in housing too high	Check oil level and adjust if necessary
	Oil too old	Check date of last oil change, change oil if necessary. See section 10.
	Oil contaminated	Change oil. See section 10.
	Gear units with oil-cooling system: coolant flow too low	Fully open valves in inflow and outflow pipes. Check free flow through oil cooler.
	Coolant temperature too high	Check temperature and correct if necessary
	Oil flow through cooler too low through clogged filter	Clean oil filter. See section 10.
	Defective oil pump	Check function of oil pump, repair or replace oil pump if necessary
	Gear unit with fan: suction opening in cowl and/or housing clogged by dirt	Clean fan cowl and housing
Pressure monitor triggers alarm (gear units with pressurised lubrication, water oil-cooler, air oil-cooler)	Oil pressure < 0.5 bar	Clean or replace cooling coil. See section 10.
		Check oil level at room temperature, top up if necessary. Check oil pump, replace if necessary. Check oil filter, clean if necessary, see section 10.
Indicator on switchover filter triggers alarm	Switchover filter clogged	Switch filter over as instructed, remove clogged filter element and clean
Temperature at backstop too high. Locking function fails	Damage to backstop	Contact Customer Service. Check backstop and replace if necessary.
Fault in oil-supply unit		Consult operating instructions for oil-supply unit

Table 9.1: Faults, causes and remedies

10. Maintenance and repair

Note: Observe the "Safety notes" in section 3.

10.1 General notes on maintenance

Note: Maintenance and repair work should be done with great care by trained and qualified personnel only.

Caution!

The periods stated in table 10.1 depend on the conditions under which the gear unit is operated. For this reason only average figures can be given which refer to:

a daily operating time of 24 hours,
a duty factor of 100%,
an input-drive speed of 1500 1/min,
and a maximum oil temperature of 90 °C (mineral oil only)
100 °C (synthetic oil only)

Note: Under different conditions, the frequencies stated below should be adjusted accordingly.

Measures	Periods	Remarks
Check oil temperature	Daily	
Check for unusual gear unit noise	Daily	
Check oil level	Monthly	
Check gear unit for leaks	Monthly	
Test oil for water content	After 400 service hours, once per year at least	See point 10.2.1
First oil change after start-up	After 400 service hours	See point 10.2.2
Subsequent oil changes	Every 18 months or 5000 service hours ¹⁾	See point 10.2.2
Clean oil filter	Every 3 months	See point 10.2.3
Clean venting screw	Every 3 months	See point 10.2.4
Re-grease Taconite seals	Every 3000 service hours, every 6 months at least	See point 10.2.5
Clean fan, fan cowl and gear unit housing	Simultaneously with oil change	See point 10.2.6
Check cooling coil for deposits	Approx. every 2 years along with oil change	See point 10.2.7
Check condition of air oil-cooler	Simultaneously with oil change	See point 10.2.8
Check condition of water oil-cooler	Simultaneously with oil change	See point 10.2.9
Check tightness of fastening bolts	After first oil change, thereafter every second oil change	See point 10.2.11
Complete inspection of gear unit	Approx. every 2 years along with oil change	See point 10.2.12

Table 10.1: Maintenance and repair work

1) when using synthetic oils the periods can be tripled.

10.2 Description of maintenance and repair work

10.2.1 Test water-content of oil

For detailed information on testing the water-content of oil, apply to the lubricant manufacturer.

10.2.2 Changing the oil

Caution!

When changing the oil, always re-charge the gear unit with the same type of oil. Never mix different types of oil or oils made by different manufacturers. Never mix synthetic oils with mineral-based oils or with other synthetic oils. When changing from mineral-based oil to synthetic oil or from one type of synthetic oil to another, flush the gear unit well with the new type of oil beforehand.

When changing the oil, the housing must be flushed with oil to remove sludge, metallic particles and oil residue. Use the same type of oil as is used for normal operation. High-viscosity oils should be heated beforehand. Ensure that all residues have been removed before filling with fresh oil.

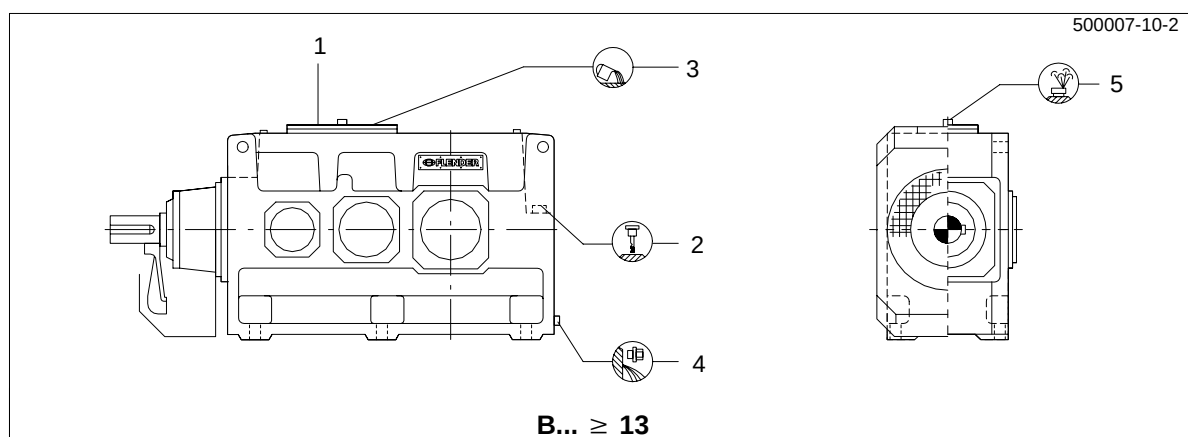
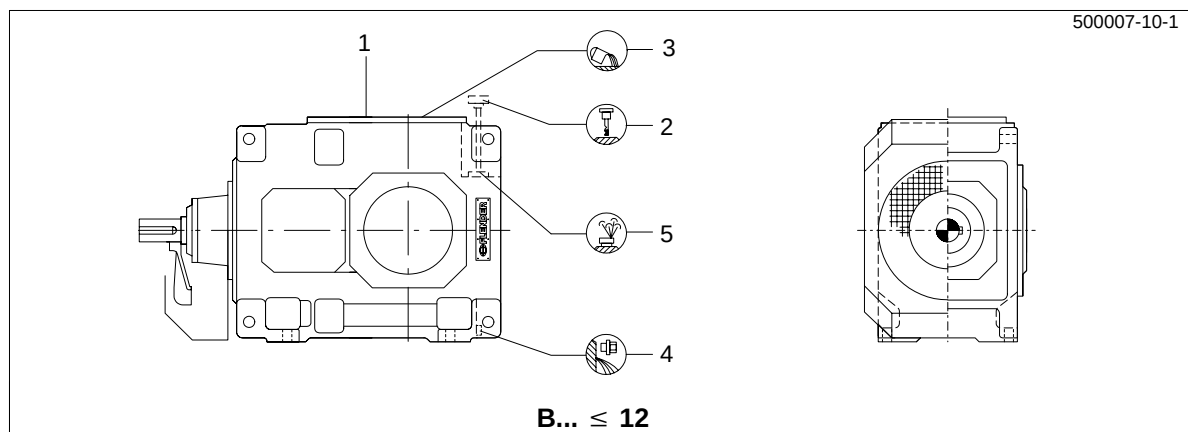
Note: Drain the oil while it is still warm, i.e. immediately after switching the machinery off.

- Stop the gear unit by switching off the drive assembly



Secure the drive assembly to prevent it from being started up accidentally. Attach a warning notice to the start switch.

- Close the stop valves in the coolant inflow and outflow pipes (gear units with cooling coil or water oil-cooling systems)



1 Inspection
or assembly cover

2 Oil dipstick
3 Oil inlet

4 Oil drain plug
5 Venting or plug screw

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

- Place a suitable container under the oil drain plug
- Remove the venting screw on the top of the housing
- Remove the oil drain plug and allow the oil to drain into the container



**The oil emerging from the housing is hot.
Wear gloves to prevent scalding.
Remove any oil spillage immediately with an oil-binding agent.**

- Clean the permanent magnet of the oil drain plug thoroughly
- Replace the oil drain plug

Note: Check the condition of the sealing ring (the sealing ring is vulcanised onto the oil drain plug). If necessary, use a new oil drain plug.

- Clean the oil filter in the oil-cooling system. See point 10.2.3 (gear units with oil-cooling system only)
- Release the fastening bolts on the inspection or assembly cover and remove the cover (including seal) from the housing. Do not discard the seal

Caution!

Fill the gear unit with fresh oil using a filter (max. mesh 25 µm) up to the MAX marking on the oil dipstick. Remember to fill the oil pockets above the bearings and (with bevel-gear units) at the input shaft on the inside.

Note: For the correct type of oil (of various brands) to be used refer to the operating instructions BA 7300 EN supplied separately. Information on the type, quantity and viscosity of the oil is given on the rating plate on the gear unit. The quantity of oil stated on the rating plate is an approximation only. The markings on the oil dipstick must **always** be observed.

Note: With gear units fitted with pressure lubrication or oil-cooling systems, the oil circuit must also be charged. To do this, briefly start up the gear unit with added pump as described in section 8.

- Check the oil level in the gear housing with the oil dipstick

Note: The oil level must be at the upper mark on the oil dipstick.



Remove any oil spillage immediately with an oil-binding agent.

- Place the inspection or assembly cover (including seal) on the housing and replace and tighten the fastening bolts (see point 10.2.11).

10.2.3 Cleaning the oil filter

Note: For operation and maintenance, always observe the instructions given in the order-specific appendix. For technical details, refer to the order-specific equipment list.

10.2.4 Cleaning the venting screw

Remove any dust which has collected on the venting screw. It should be cleaned at least every 3 months. To do this, the venting screw is removed, cleaned with benzine or similar agent and dried. It can also be cleaned by blowing out with compressed air.

10.2.5 Re-charging Taconite seals with grease

- Stop the gear unit by switching off the drive assembly



Secure the drive assembly to prevent it from being started up accidentally. Attach a warning notice to the start switch.

- Inject approx. 30 g lithium-based bearing grease into each of the lubrication points of the Taconite seal. The lubrication points are fitted with flat grease nipples type AM10x1 to DIN 3404.



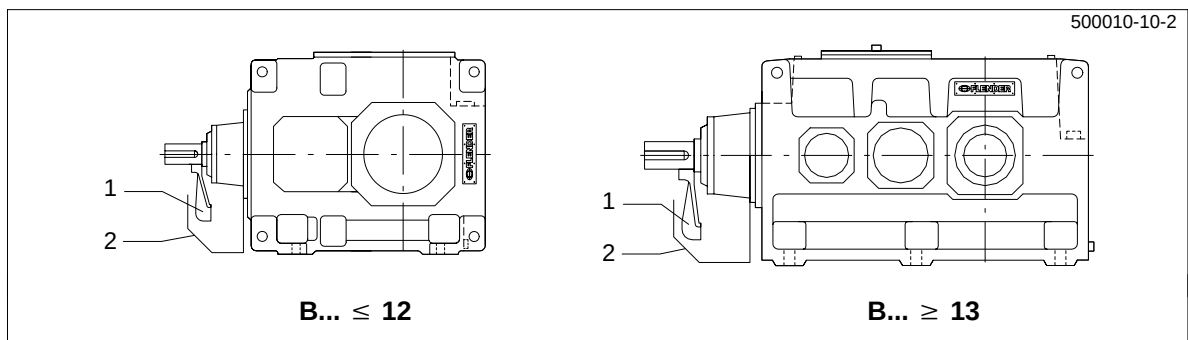
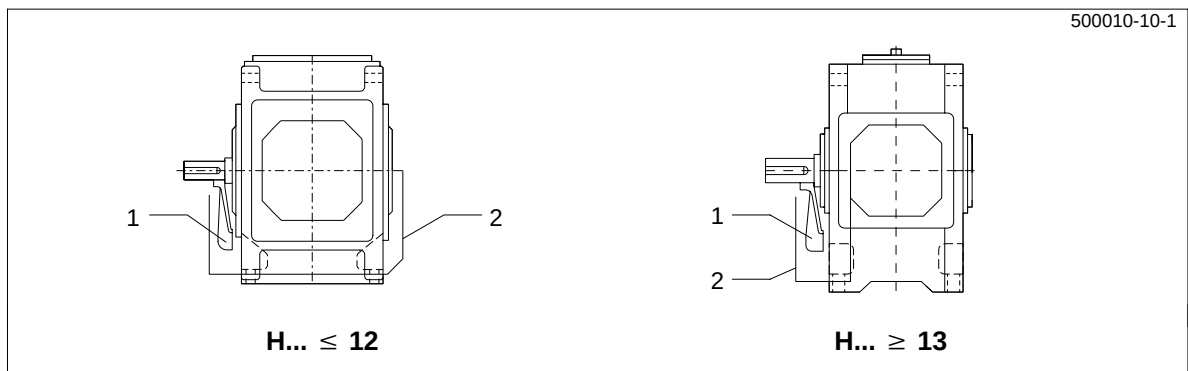
Remove and dispose of any old grease emerging from the seals.

10.2.6 Cleaning the fan and gear unit

- Stop the gear unit by switching off the drive assembly



Secure the drive assembly to prevent it from being started up accidentally. Attach a warning notice to the start switch.



1 Fan

2 Fan cowl

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

- Remove the fan cowl
- Using a stiff brush, remove any dirt adhering to the fan wheel, cowl or safety grid.
- Remove any corrosion.
- Screw safety grid back onto the fan cowl

Caution!

Never clean the gear unit with high-pressure cleaning equipment.

10.2.7 Check cooling coil

- Stop the gear unit by switching off the drive assembly



Secure the drive assembly to prevent it from being started up accidentally. Attach a warning notice to the start switch.

- Disconnect the water inflow and outflow pipes from the cooling coil
- Check the inside walls of the cooling coil and remove any deposits

Caution!

If the cooling coil is dirty, heat is no longer withdrawn effectively from the gear unit. Any dirt adhering to the inside of the coil should be removed by chemical cleaning or the coil replaced by a new one.

- If deposits have formed on the inside of the cooling coil, the cooling water (or the deposits themselves) should be chemically analysed. These analyses are carried out by companies specialising in chemical cleaning. They also supply the special cleaning agents required. Before using these agents, ensure that they will not damage the coil materials. Observe the manufacturer's instructions at all times.



To avoid burns when working with corrosive cleaning agents, always observe the instructions on safety and application provided by the manufacturer.

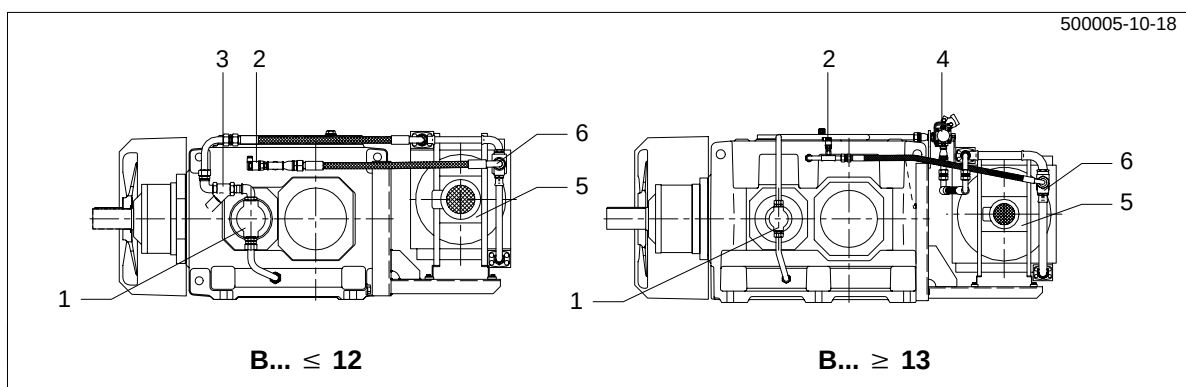
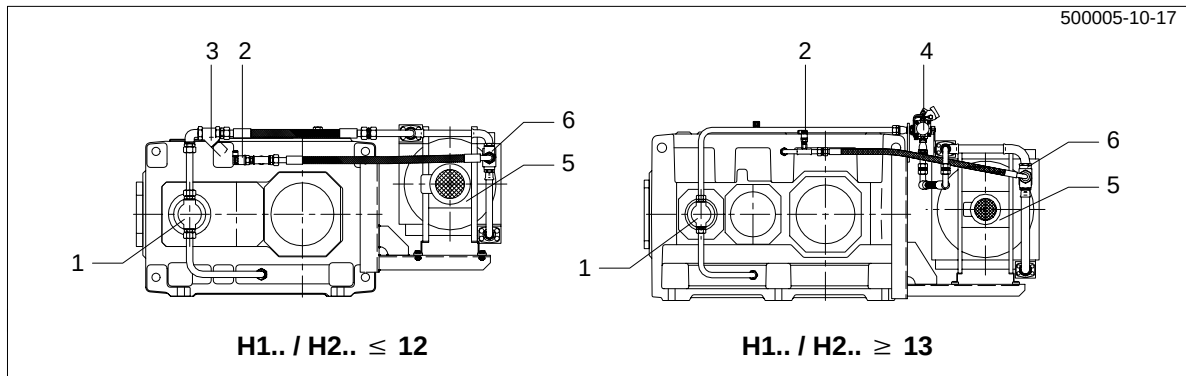
- Cooling coils which are seriously contaminated must be replaced. Consult our Customer Service.
- Re-connect the water inflow and outflow pipes.

10.2.8 Checking air oil-cooler

- Stop the gear unit by switching off the drive assembly



Secure the drive assembly to prevent it from being started up accidentally. Attach a warning notice to the start switch.



- | | |
|--------------------|-----------------------------|
| 1 Flange pump | 4 Switchover filter |
| 2 Pressure monitor | 5 Air oil-cooler |
| 3 Coarse filter | 6 Temperature control valve |

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

Note: For operation and maintenance, always observe the instructions given in the order-specific appendix.
For technical details, refer to the order-specific equipment list.

Note: Check the condition of screw connections and replace if necessary.

- Start the gear unit up briefly
- Stop the gear unit and check the oil level with the oil dipstick

Note: The oil level must be at the upper mark on the oil dipstick.

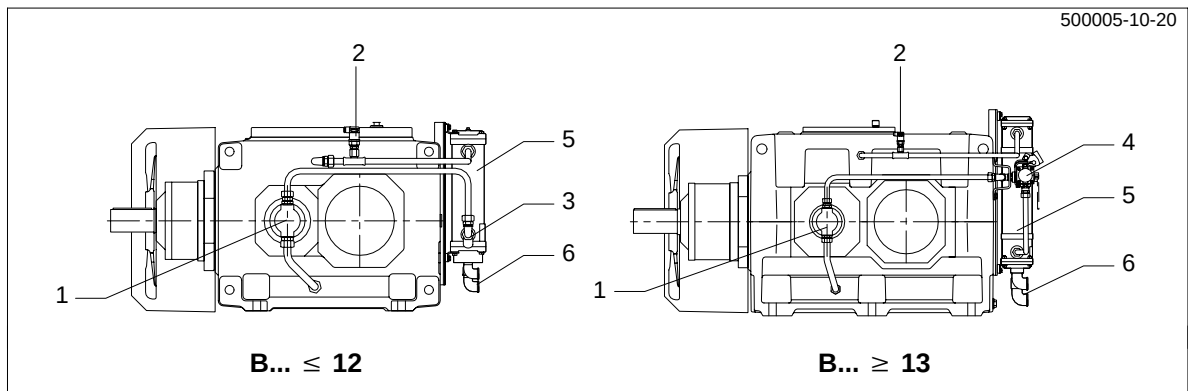
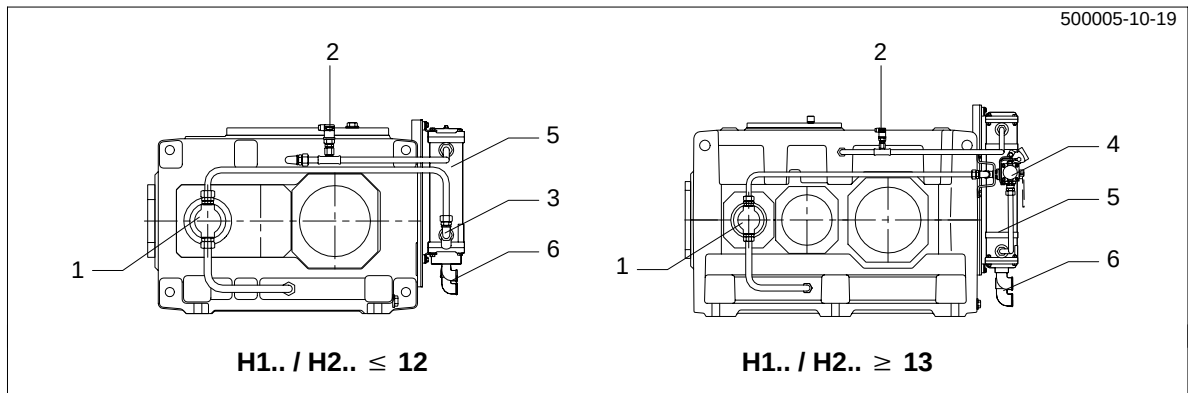
10.2.9 Checking water oil-cooler

- Stop the gear unit by switching off the drive assembly



Secure the drive assembly to prevent it from being started up accidentally. Attach a warning notice to the start switch.

- Close the stop valves in the coolant inflow and outflow pipes



- 1 Flange pump
- 2 Pressure monitor
- 3 Coarse filter

- 4 Switchover filter
- 5 Water oil-cooler
- 6 Water inlet and outlet

For a detailed illustration of the gear unit, refer to the drawings in the unit documentation.

Note: For operation and maintenance, always observe the instructions given in the order-specific appendix.
For technical details, refer to the order-specific equipment list.

Note: Check the condition of screw connections and replace if necessary.

- Start the gear unit up briefly
- Stop the gear unit and check the oil level with the oil dipstick

Note: The oil level must be at the upper mark on the oil dipstick.

10.2.10 Topping up oil

- Release the fastening bolts on the inspection or assembly cover and remove the cover (including seal) from the housing. Do not discard the seal

Caution!

Fill the gear unit with fresh oil using a filter (max. mesh 25 µm) up to the MAX marking on the oil dipstick. Remember to fill the oil pockets above the bearings and (with bevel-gear units) at the input shaft on the inside.

Note: Always top up with the same type of oil as already in the gear unit (see point 10.2.2). Information on the type, quantity and viscosity of the oil is given on the rating plate on the gear unit.

Note: With gear units fitted with pressure lubrication or oil-cooling systems, the oil circuit must also be charged. To do this, briefly start up the gear unit with added pump as described in section 8.

- Check the oil level in the gear housing with the oil dipstick

Note: The oil level must be at the upper mark on the oil dipstick.



Remove any oil spillage immediately with an oil-binding agent.

- Place the inspection or assembly cover (including seal) on the housing and replace and tighten the fastening bolts (see point 10.2.11).

10.2.11 Check tightness of fastening bolts

- Stop the gear unit by switching off the drive assembly



Secure the drive assembly to prevent it from being started up accidentally. Attach a warning notice to the start switch.

- Close the stop valves in the coolant inflow and outflow pipes (gear units with cooling coil or water oil-cooling systems)
- Check tightness of all fastening bolts with a torque wrench

Thread size	Strength class	Tightening torque (with $\mu = 0.20$)
M 10	8.8	60 Nm
M 12	8.8	105 Nm
M 16	8.8	255 Nm
M 20	8.8	500 Nm
M 24	8.8	870 Nm
M 30	8.8	1750 Nm
M 36	8.8	3050 Nm
M 42	8.8	4950 Nm
M 48	8.8	7400 Nm
M 56	8.8	11700 Nm

Table 10.2: Tightening torques

Note: Damaged bolts should be replaced with new ones of the same type and strength class.

10.2.12 General inspection of gear unit

The general inspection of the gear unit should be carried out by the FLENDER Customer Service as our engineers have the experience and training necessary to identify any components requiring replacement.

10.3 Lubricants

The oil selected for use in the gear unit must be of the viscosity (VG class) stated on the rating plate. The viscosity class applies for the contractually agreed operating conditions.

FLENDER must be consulted for any change in operating conditions.

Note: For the correct type of oil (of various brands) to be used refer to the operating instructions BA 7300 EN supplied separately.

We are familiar with the composition of these lubricants and, as far as we are currently aware, they possess the properties with regard to bearing capacity, corrosion resistance, micropitting-bearing capacity and compatibility with seals and interior paint coatings which are necessary for the type of gear unit in question.

We therefore advise our customers to select one of the lubricants stated in the instructions BA 7300 EN, taking into account the VG class given on the rating plate.

Note: This recommendation is in no way intended as a guarantee for the quality of the lubricant supplied. Each lubricant manufacturer is responsible for the quality of his own product.

Should you not wish to follow our recommendation, you assume responsibility for the technical suitability of the lubricant used.

11. Spare parts, service facilities addresses

11.1 Stocking spare parts

By stocking the most important spare and consumable parts on site, you can ensure that the gear unit is ready for use at any time.

To order spare parts, refer to the spare-parts list.

For further information, refer to the spare-parts drawing stated in the list.

We guarantee only the original list of spare parts supplied by us.

Caution!

Please note that spare parts and accessories not supplied by us have not been tested or approved by us. The installation or use of such products may therefore impair essential characteristics of the gear unit, thereby posing an active or passive risk to safety. FLENDER AG will assume no liability for damage caused by spare parts and accessories not supplied by FLENDER AG.

Please note that certain components often have special production and supply specifications and that we supply you with spare parts which comply fully with the current state of technical development as well as current legislation.

When ordering spare parts always state the following:

Order no.	Part no.	Quantity
-----------	----------	----------

11.2 Spare-part and service facility addresses

When ordering spare parts or the services of our specialist engineers, apply to FLENDER AG.

FLENDER Germany

Internet: <http://www.flender.com>

A. FRIEDR. FLENDER AG

D- 46393 Bocholt - Tel.: (0 28 71) 92-0 - Tx.: 813 841 - Fax: (0 28 71) 92 25 96

Shipping address: Alfred - Flender - Straße 77, D- 46395 Bocholt

FLENDER - HIMMELWERK GMBH

D- 72007 Tübingen - Tel.: (0 70 71) 7 07-0 - Tx.: 7 262 835 - Fax: (0 70 71) 70 74 00

Shipping address: Bahnhofstraße, D- 72072 Tübingen

A. FRIEDR. FLENDER AG - GETRIEBEWERK PENIG

Thierbacher Straße 24 - D- 09322 Penig - Tel.: (03 73 81) 60 - Tx.: 322 661 - Fax: (03 73 81) 8 02 86

LOHER AG

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● Subsidiary,
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□ Representative with Manufacturing
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○ Manufacturer's Agent

12. Declaration by the manufacturer

Declaration by the manufacturer

in accordance with EEC Engineering Guideline 89/392/EWG, Appendix II B

We hereby declare that the

Gear Unit Types

H.SH, H.VH, H.HH, H.DH, H.KH, H.FH, H.HM, H.DM, H.KM, H.FM

B.SH, B.VH, B.HH, B.DH, B.KH, B.FH, B.HM, B.DM, B.KM, B.FM

Sizes 1 to 26

described in these Operating Instructions are intended for incorporation in a machine, and that it is prohibited to put them into service before verifying that the machine into which they are incorporated complies with the EEC Guidelines (original edition 89/392/EWG including any subsequent amendments thereto).

This Manufacturer's Declaration takes into account all the unified standards (inasmuch as they apply to our products) published by the European Commission in the Official Journal of the European Community.

Bocholt, 03.08.1998

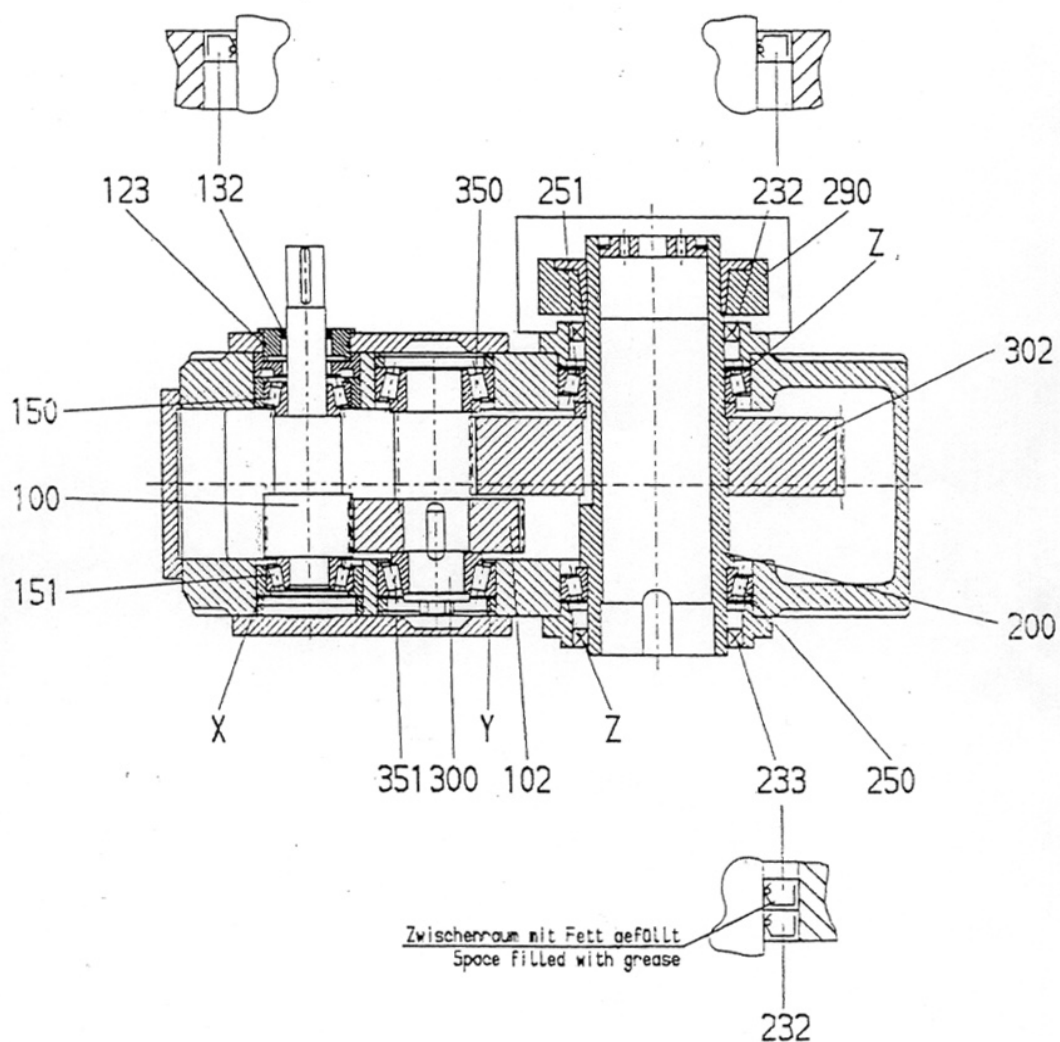


Signature (development manager EW2)

Bei Korrespondenz bitte angeben / Please quote in correspondence

EZ

VECOPLAN



Zwischenraum mit Fett gefüllt
Space filled with grease

232

Stückliste (SL)
Parts list / Liste de pièces / Lista de piezas / Lista pezzi / Lista peças

EL 186.703.303 - 001 - 1...15

Bei Korrespondenz bitte angeben / Please quote in correspondence / Pour toute correspondance prière d'indiquer /
Indique en toda correspondencia / Da indicare nella corrispondenza / Gentileza indicar em correspondencia

Bauart Type / Type / Tipo / Tipo / Tipo	Größe Size / Taille / Tamaño / Grandezza / Tamanho	Ist-Übersetzung Exact ratio / Rapport réel / Relación / exacta / Rapporto reale / I-eff.	Hierzu gehört Zeichnungs-Nr. Please refer to DWG No. / Plan correspondant N° / Véase plano n° / Riferito al disegno n° / Refere-se ao desenho N°	Datum Date / Date / Fecha / Data / Data
H2DH	6	12,397		21.03.1997

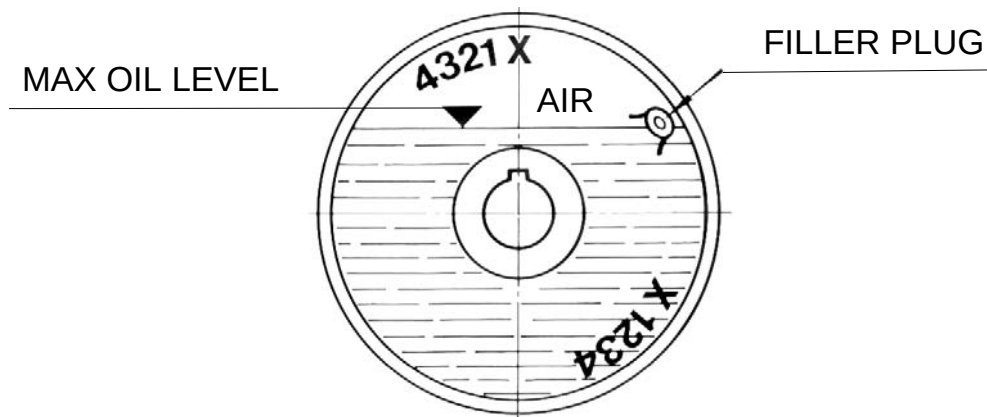
Menge No. of Nombre Cantidad Quantita Quantidade	Benennung Description Désignation Descripción Denominazione Denominação	Teil-Nr. Part No. N° de la pièce N° de la pieza N° del pezzo N° de peça	Sach-Nr. Ident Number Numero d'identification Numero de identificación Numero di codice Numero de referencia	Gewicht Weight Poids Peso (kg) Peso Peso
1	STRDWELLE D79,03X351 17CRNIMO6 ZF1A-BG PINION SHAFT	100	23.0872 67001/0	8,33
1	STIRNRAD D190,5 / 65X55 17CRNIMO6 ZF1A-BG GEAR WHEEL	102	24.0588 08420/0	10,40
1	O-RING OR84X3 DIN3770 72NBR872 O-RING	123	02.9000 75172/7	0,10
1	WDR 60X75X8 BAUMSL W5710 75FKM585 SHAFT SEAL	132	02.9000 84591/7	0,10
1	WAEZL 33212 DIN720 ST-KAEF ROLLING CONTACT BEARING	150	02.9000 73878/7	1,60
1	WAEZL 33212 DIN720 ST-KAEF ROLLING CONTACT BEARING	151	02.9000 73878/7	1,60
1	WELLE-HOHL D158/100X405 16MNCRS5 HOLLOW SHAFT	200	26.0872 40324/0	19,50
2	WDR 140X170X15 BAUM W5710 75FKM585 SHAFT SEAL	232	02.9000 80338/7	0,20
1	WDR 140X170X15 BAUM W5710 75FKM585 SHAFT SEAL	233	02.9000 80338/7	0,20
1	WAEZL 32928 DIN720 ST-KAEF ROLLING CONTACT BEARING	250	02.9000 73732/7	2,60
1	WAEZL 32928 DIN720 ST-KAEF ROLLING CONTACT BEARING	251	02.9000 73732/7	2,60
1	SCHB-SCHR HSD140-22X140 W3232 ST SHRINK DISC	290	02.9000 80571/7	10,00
1	STRDWELLE D85,9X230 17CRNIMO6 PINION SHAFT	300	23.0587 57754/0	6,37
1	STIRNRAD D370,5/145X80 17CRNIMO6 ZF1A-BG GEAR WHEEL	302	24.0587 57521/0	54,40
1	WAEZL 32311 B DIN720 ST-KAEF ROLLING CONTACT BEARING	350	02.9000 73564/7	2,50
1	WAEZL 32311 B DIN720 ST-KAEF ROLLING CONTACT BEARING	351	02.9000 73564/7	2,50

Fortsetzung
Seite
Continued page
Suite page
Continúa página

FILLING INSTRUCTIONS

Fill with oil until the level reaches to the filler hole. Move the coupling gently to the left and right to ensure all air can escape.

Turn the fluid coupling so the "X" mark on the housing is at the top. This ensures that the filler plug is in the correct position as shown in the picture below.



To ensure no oil leaks from coupling during it's operation, use thread sealant on filler plug threads.

With "X" fill (maximum), the fluid coupling will operate with minimal slip and maximum efficiency.

Recommended Oil:

Shell:	Naturelle HF-R (factory filled)
Agip:	OSO 32
Aral:	VITAM GF 32
BP:	ENERGOL HLP 32
Castrol:	HYSPIN AWS 32
Chevron:	HYDRAULIC OIL EP 32
Esso:	TEROSSO 32 O NUTO H 32
Mobil:	DTE OIL LIGHT (MEDIUM)
Shell:	TELLUS 32
Texaco:	RANDO HDA 32
Total:	AZOLLA 32

For extremly high or low ambient temperature ask service department for special oil qualitics.

Oil should be replaced after 4.000 hours operation.



melt plugs

347 Fahrenheit



Fluid Coupling Type KSD../ KSI..	Antriebsleistung HP	OIL Quantity [l] " X "
11	12	2,75
11	18	2,75
12	25	4,10
12	30	4,10
12	36	4,10
13	49	5,20
15	60	7,65
15	73	7,65
→ 15	90	7,65
17	122	11,70
17	147	11,70
19	180	14,20
19	216	14,20
21	261	19,00
21	327	19,00

TROUBLE SHOOTING

Maximum operation temperature should not exceed 194 Fahrenheit.

High oil temperature can be caused by:

- Insufficient oil filling.
- Absorbed power is higher than the motor rated power.
- High ambient temperature.
- Too many starts of machine.
- Long start-up period.
- Inadequate air ventilation to allow cooling of the coupling. If coupling is operating in a restricted space, adequate ventilation apertures should be provided.

After the first 20 days operation check the oil level. Check oil level only with cold coupling and oil.

Also check screws of motor and driven machines.

Repeat these checks every 6 months.

Fluid couplings are fitted with a standard melt plug 347 Fahrenheit

TRANSFLUID

trasmissioni industriali

INSTALLATION AND MAINTENANCE

BEFORE ASSEMBLING AND OPERATING THE FLUID COUPLING, CAREFULLY READ ALL THE SAFETY AND OPERATING INSTRUCTIONS REPORTED IN THIS MANUAL.

ALWAYS FOLLOW ALL THE INSTRUCTIONS AND ASSURE THAT ALL THE OPERATORS STANDING BY THE MACHINERY ARE WEARING ALL THE PROTECTIVE EQUIPMENT NECESSARY FOR THE JOB TYPE AND APPLICATION BEING PERFORMED.

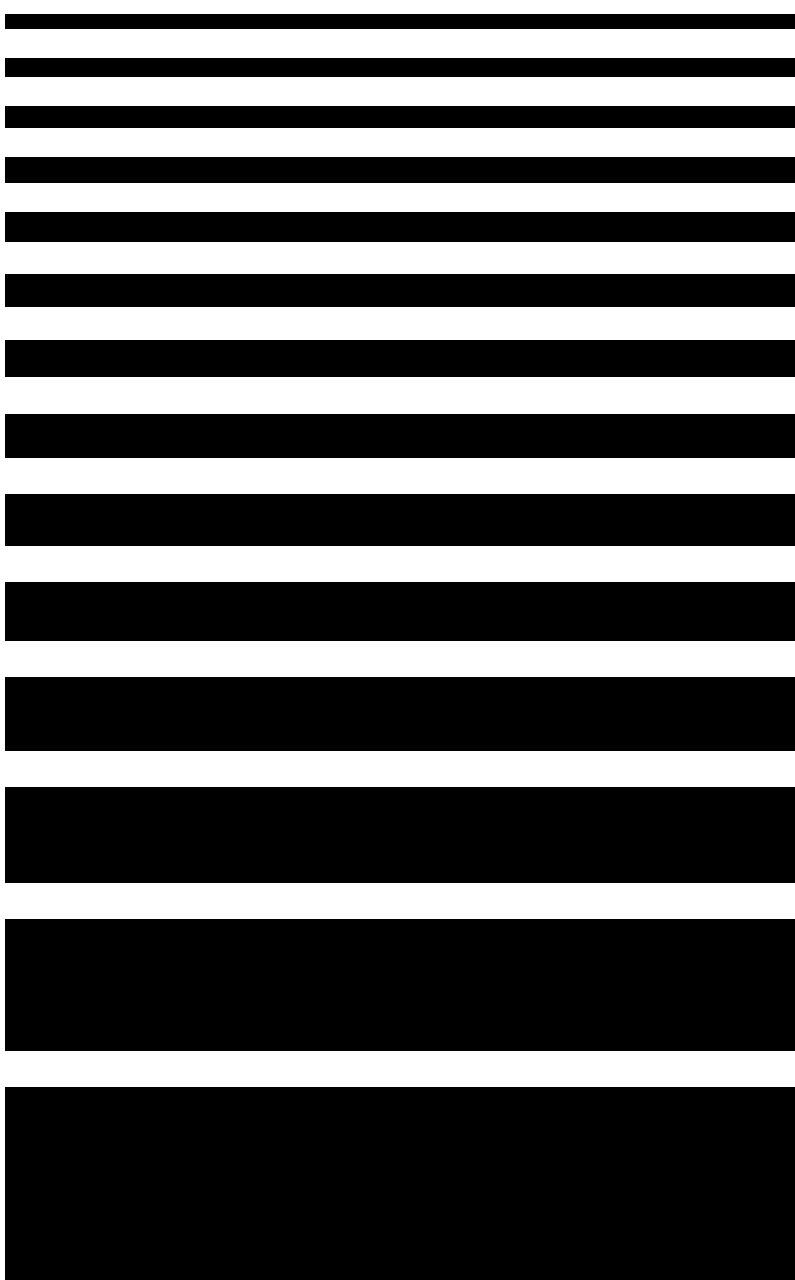
DO NOT USE THE MACHINERY IF YOU DO NOT UNDERSTAND THESE INSTRUCTIONS, AND IMMEDIATELY REFER TO THE MANUFACTURER OR THE CUSTOMER SERVICE DESK FOR ASSISTANCE.

THE COUPLING MUST BE PROTECTED BY A CONVENIENT COVER GUARD TO AVOID PERSONAL INJURY TO PEOPLE. AXIAL AND RADIAL VENTILATION OPENINGS SHOULD BE INCORPORATED IN THE GUARD FOR HEAT EXCHANGE.

IF THE COUPLING IS FITTED WITH FUSIBLE PLUGS, THE SAID OPENINGS SHOULD NOT BE DIRECTED TOWARDS OPERATORS OR ANY HOT OR ELECTRICAL INSTALLATION.

FLUID COUPLINGS
...KR... , ...KSD, EK

drive with us



1 - INSTALLATION

..KR.. - ..KSD series

- 1.1 For **KRG** model, remove half coupling G (item 29 – FIG. 4);
- 1.2 For **KRD** model, disassemble shaft D (item 31 – FIG. 1b). In case the fluid coupling is still filled with oil, drain it or, to avoid possible losses, position it vertically with the shaft D upwards; after disassembling the shaft D, block the bearing carrier (item 14) with at least 2 nuts and washers (item 11 and 12).
- 1.3 Check that the threaded hole at the end of the motor or gearbox shaft complies with DIN 332 (TAB. A1-A2 and FIG. 4).

a) without taper bushing

- 1.4.a Fit the coupling on the motor shaft by using a threaded bar with **S** dia. (TAB. A1 and A2) as shown in FIG. 1a, and using 2 wrenches (hold **a** to avoid shaft rotation, and turn **b** to draw the coupling on to the motor shaft).

- 1.5.a For a correct assembly, lubricate the connecting surfaces with oil or antiseizing paste. For hot mounting (not recommended), do not exceed a temperature of 90°C, which causes irreparable damages to oil seals.
N. B.: For 6K size, the axial fixing screw is not used because a retaining set screw locks on shaft (item 62 in FIG. 1a). We do not recommend to force coupling assembly on motor shaft, in order to avoid consequent difficulties during the disassembly phase.

- 1.7 For **KRG** series, fit half coupling (item 29 – FIG. 4) on driven shaft, taking care that the shaft end does not protrude beyond face X. Fit the fixing screw and the washer (items 25 and 26 for **KR** models; items 26 and 27 for **KSD** models) holding the motor or the gearbox shaft still; lock the fixing screw **with a torque wrench**, respecting the torque reported in TAB. A1 and A2.

Only for **13 / 15 KR... - KSD** models (FIG. 3): fit the allen screw (item **d**) with flat washer (item **e**). Holding the motor or gearbox shaft with a 38 mm wrench **b** on the end **c**, lock the allen screw with a torque wrench **a**, respecting the torque reported in TAB. A2.

N.B.: For a correct assembly with the taper bushing, strictly apply to the prescribed locking torque.

- 1.8 For **KRG** models, lock and peg the driven machine, positioning the motor as far as the gap **k** (FIG. 4) between the half couplings reaches the indicated values listed in TAB. C. The error on radius can be checked with a gauge and a straight-edge (FIG. 4); the angular gap with a feeler, by rotating the coupling at 4 points 90° apart: the errors should not exceed those listed in TAB. C.
- 1.9 For **KRD** model, reassemble shaft **D** using nuts and washers (items 11 and 12 – FIG. 1b) tightened at the prescribed torque (TAB. B).

b) with taper bushing

- 1.4. In case the bushing is not provided with keyway (item 50 or 51 – FIG. 1b), remove the key from motor or gearbox shaft (reverse mounting).

- 1.5.b Carefully clean all surfaces contacting the bushing by oil, grease, etc., possibly using solvent, whether they belong to motor, gearbox or fluid coupling.

- 1.6.b Fit the bushing on the motor or gearbox shaft, introducing a screwdriver into the axial cut to make mounting easier; assure that bushing goes as far as the shaft shoulder.

FIG. 1a

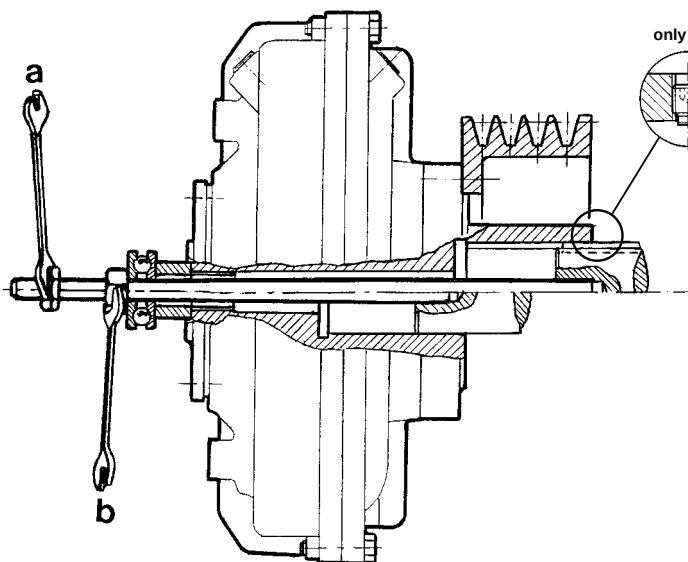


FIG. 2a (KSD)

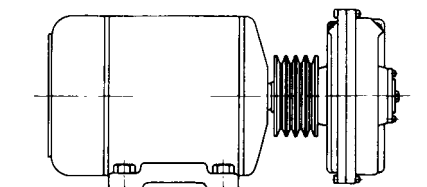


FIG. 2b (KRG)

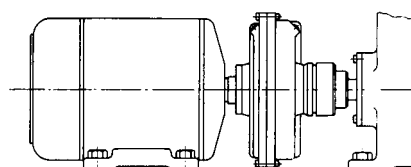
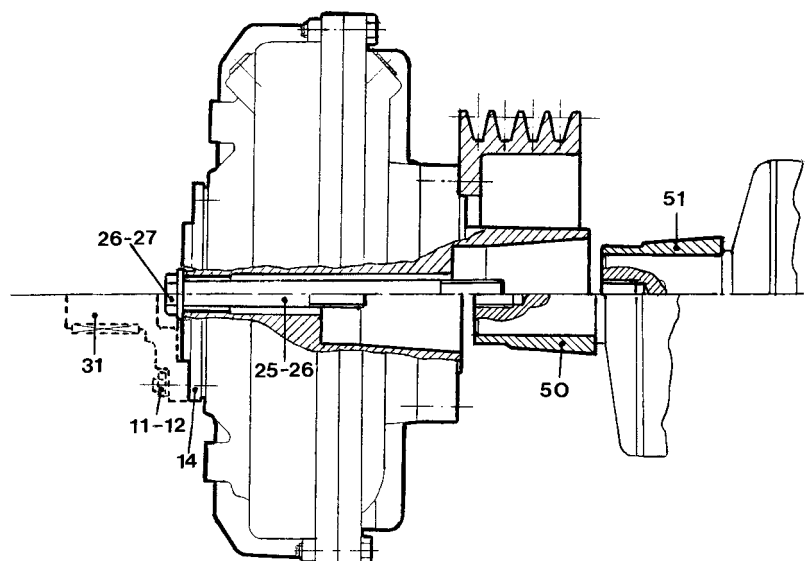


FIG. 1b



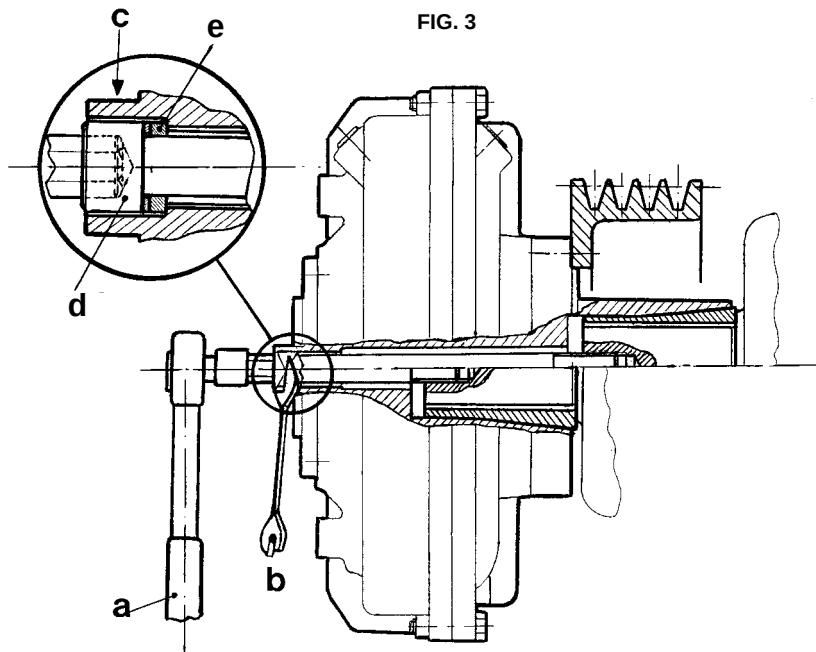


FIG. 3

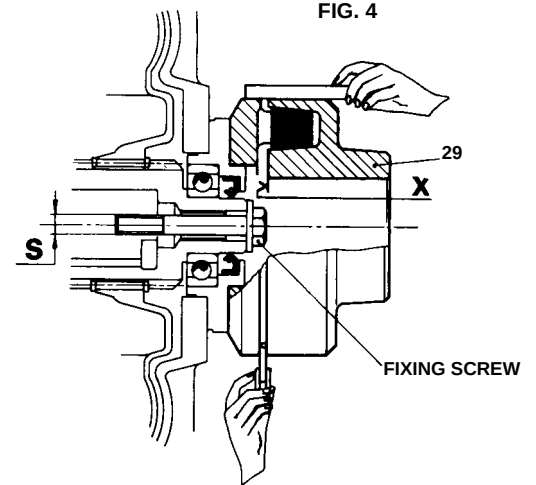
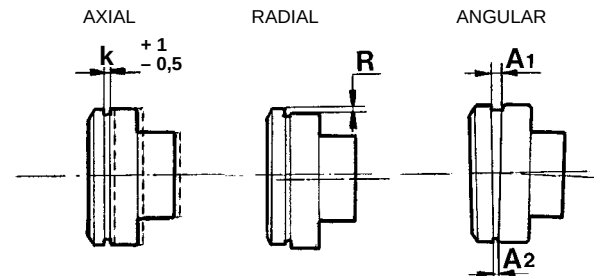


FIG. 4

MISALIGNMENT



TAB. A1 (without bushing)

K... CK../CCK..	FIX. SCREW S	Steel spec.	Torque (Nm)	
7 - 8	M6	8,8	10	
	M8		24	
	M10		50	
9 - 11 - 12	M12		85	
	M16		205	
13 - 15	M20		400	
17 - 19			690	
21 - 24				
27 - 29				
34	M24			1500
	M36			

TAB. A2 (with taper bushing)

K... CK../CCK..	FIX. SCREW S	Steel spec.	Torque (Nm)
7 - 8	M6	10,9	15
	M8		35
	M10	8,8	50
9 - 11 - 12	M10	10,9	70
	M12		85
13 - 15	M16	8,8	205
	M20		400

TAB. B

KRD CK../CCK..	nut 11-37	Torque (Nm)
7 - 8	M7	16
9 - 11 - 12	M8	24
13 - 15	M10	50
17 - 19		
21 - 24	M14	135
27 - 29	M16	205
34 CKRD		

TAB. C

..KRG	Fluid coupling	Dimensions in mm		
		k	R	A1- A2
6	BT	2	0,2	0,3
7 - 8			0,3	0,4
9 -11-12			0,35	
13		3	0,4	0,6
15	0,5			
17 - 19			0,8	
21 - 24	4			0,6
27 - 29		CT 80		
34	CT 90	5		

EK series (FIG. 5)

- 1.10 Assemble the flange A on the corresponding one of the motor (of the gearbox for 6EK) and tighten bolts D.
- 1.11 Fit bell housing B onto the gearbox flange (electric motor for 6EK) and tighten bolts E.
- 1.12 Fit the fluid coupling C on the motor shaft, hitting with a soft hammer on the shaft end X, as far as it reaches the limit of the travel.

- 1.13 For a correct fitting, it is important to lubricate surfaces with antiseizing paste.
- 1.14 Fit the coupling / motor assembly into the gearbox hollow shaft as far as the flange A is connected to the bell housing B, then fix the bolts F.
- 1.15 Fit the safe guard G.

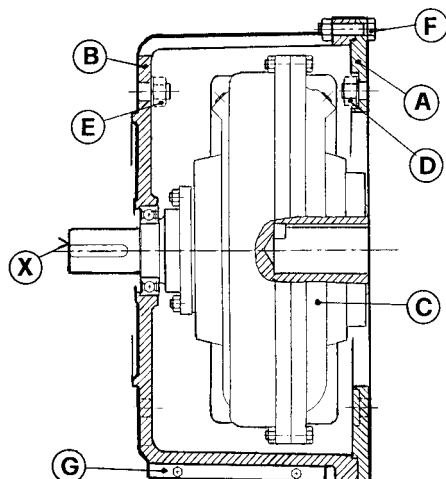
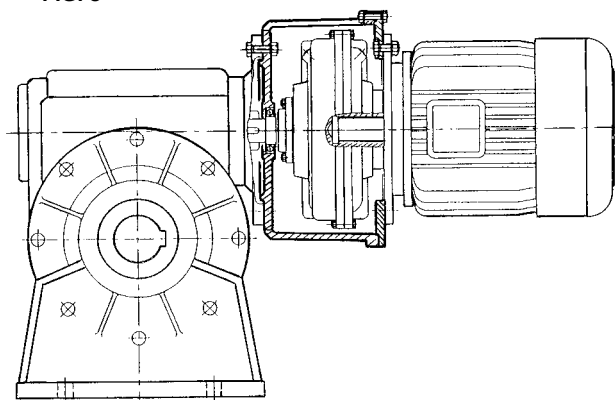


FIG. 5



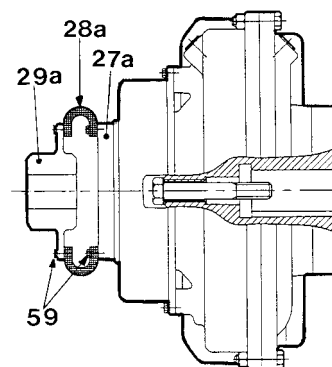
..KRM series (FIG. 4a)

- 1.16 Assemble fluid coupling as reported in par. 1.1 to 1.7
- 1.17 Fit the hub (item 29a) on the driven shaft, lock and peg the driven machine. Position the motor as far as dimension **S** between hub (item 29a) and flange (item 27a) is within the values reported in TAB. C1.
- 1.18 Check dimensions **U** and **R** with convenient gauges, by rolling the coupling and reading values at 90°. **Errors must not overcome the values reported in TAB. C1.**
- 1.19 Fit the elastic element (item 28a) with the screws (item 59), according to the locking torque reported in TAB. C1.

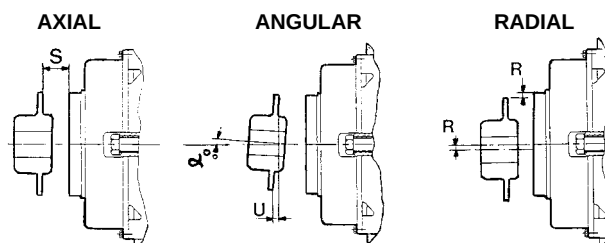
TAB. C1

..KRM	ELASTIC COUPLING MCF..F	Alignment tolerances (mm)				screw item 59	Locking torque Nm
		S	U	α°	R		
9 - 11 - 12	53	75 ±1	1,5	0,75	0,6	M6	10
13	55			0,5			
15	56			0,4			
17 - 19	58	116 ±1,5	2,0	0,5	1,0	M10	49
21 - 24	65			0,4			
27	66			0,3			
29	68						
34	610						

FIG. 4a



MISALIGNMENT



..KRA series (FIG. 4b)

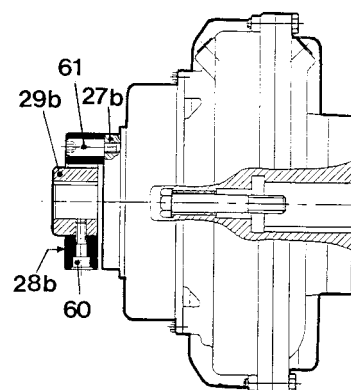
- 1.20 Assemble fluid coupling as reported in par. 1.1 to 1.7
- 1.21 Fit the hub (item 29b) on the driven shaft, lock and peg the driven machine.
- 1.22 Fit the elastic element (item 28b) on hub (item 29b). Lock screws (item 60) according to the locking torque reported in TAB. C2.
- 1.23 Set motor as far as surface **Z** touches surface **Y** (axial displacement **S** reported in TAB. C2).
- 1.24 Check dimensions **U** and **R** by rotating fluid coupling at 4 points 90° apart: **the errors detected should not exceed those listed in TAB. C2.**
- 1.25 Fit half coupling to fluid coupling with threaded pins (item 61).

N.B.: Radial screws (item 60) and axial threaded pins (item 61) must be locked at the prescribed torque reported in TAB. C2, by using a torque wrench.

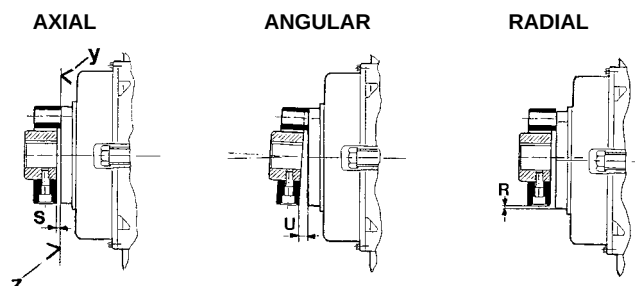
Insufficient locking torques will inevitably lead to the loosening of the screws during operation, and to the consequently rapid failure of the elastic element.

In case it is not already present on the fixing screws or pins, always use a thread sealant (medium type).

FIG. 4b



MISALIGNMENT



TAB. C2

..KRA	ELASTIC COUPLING	Align tolerance (mm)			screw item 60 - 61	Locking torque Nm		
		S	U	R				
7 - 8	1032-1S	4 ±1,5	1	0,6	M10	50		
9 - 11	1232-1S	6 ±2			1,5	M12	90	
12	1432-1S		8 ±2	2,0		1,0	M14	140
13 - 15	1642-1S	M16			220			
17 - 19	2142-1S						M20	500
21 - 24	2842-1S							

2 - FLUID COUPLINGS FILLING INSTRUCTIONS

KR... - KSD - EK SERIES

Transfluid fluid couplings are not supplied with oil.
Therefore it is necessary to achieve the following procedure:

- 2.1 Position the coupling axis horizontally (FIG. 6), turn it until the X mark cast into the housing gets at the top vertical (maximum fill), so that the oil plug (item 13) is inclined as shown in the picture.
- 2.2 Fill with oil until it overflows out of the filler hole. While filling, gently rock the coupling on its axis to make sure all air excess is vented out of the circuit, or, if possible, remove also the cap located in correspondence on the other rotor. The quantities to be introduced are those reported in TAB. D1.
- 2.3 Screw the cap (or both caps) at the prescribed torque (TAB. E) and make sure no leakages occur; otherwise use thread sealant on filler plug threads.
- 2.4 The fillings marked X-1-2-3-4 may be chosen by the operators to meet the best performance in terms of start-up and steady running operation.
With the maximum fill X a condition of minimum slip and maximum performance is achieved: the starting torque / nominal torque ratio gets higher (values generally comprised between 1.8 and 2.2); decreasing the oil quantity inside the coupling (fill 1-2-3-4), the opposite result is obtained.
- 2.5 High slip causes overheating of oil contained in the working circuit, with a consequent decrease in overall performance.
- 2.6 For normal operating conditions, use only **ISO HM 32** (or equivalent **SAE 10W**) oil types listed in TAB. D. At low ambient temperatures (near 0°C), it is recommended to use **ISO HM 10** (or equivalent **SAE 5W**) oil.
- 2.7 For vertical mounted applications, the couplings recommended oil fills are reported in TAB. D1.

CKR... / CCKR... - CKSD... / CCKSD... SERIES

Fluid couplings with delayed fill chamber (CK series) have the main purpose of reducing the starting torque / nominal torque ratio to values up to 1.6. This aspect is improved enlarging the delayed fill chamber further (CCK series) up to values of 1.3 the above ratio.

- 2.8 The starting torque limitation can be achieved by reducing the oil quantity into the working circuit (fill 2-3-4) without increasing the slip value at rated speed. In standstill position, the delayed fill chamber actually contains part of the oil fill that flows to the working circuit during start up.
- 2.9 The oil passes from the delayed fill chamber to the working circuit through **calibrated orifices** (FIG. 7) by centrifugal force. Starting from size **21K**, such orifices diameters can be modified even when the coupling is already assembled, simply by replacing a **calibrated bleed plug** (item b) screwed into the **valve** (item 57). When reassembling the valve, always remember to fit the copper seal (item 58) and make sure no leakages occur.
This technical solution allows a very simple and easy operation, to be achieved in a very short time and (what is more important) without disassembling the fluid coupling.
- 2.10 For each starting torque / nominal torque ratio, Transfluid can give the exact oil fill. The fluid couplings with a **delayed fill chamber** are generally foreseen with **fill 2** (TAB. D2), while the ones equipped with a **double delayed fill chamber** with **fill 3** (TAB. D3).
- As fluid couplings are supplied without oil, follow the instructions reported at par. 2.1 - 2.2 - 2.3 - 2.6.
- 2.11 For vertical mounted applications, the couplings recommended oil fills are reported in TAB. D2 and D3. Due to delayed fill chamber peculiarity, for vertical mounting the chamber must be downward.

TAB. D

RECOMMENDED OIL : ISO HM 32 (SAE 10W) CLASSIFICATION					
Agip	OSO 32	Chevron	HYDRAULIC OIL 32	Mobil	DTE 24
Aral	VITAM GF 32	Elf	ELFOLNA 32	Shell	TELLUS OIL 32
BP	ENERGOL HLP 32	Esso	NUTO H 32	Texaco	RANDO OIL HD 32
Castrol	HYSPIN AWS 32	IP	HYDRUS OIL 32	Total	AZOLLA ZS 32

TAB. D1

OIL QUANTITY (lt.)					
K...	X	1	2	3	4
6	0.505	0.480	0.455	0.425	0.390
7	0.920	0.860	0.800	0.730	0.650
8	1.510	1.405	1.295	1.190	1.080
9	1.950	1.820	1.690	1.550	1.400
11	2.750	2.550	2.350	2.100	1.850
12	4.100	3.875	3.575	3.250	2.900
13	5.200	4.850	4.450	4.050	3.600
15	7.650	7.150	6.600	6.000	5.400
17	11.70	10.90	10.00	9.100	8.200
19	14.20	13.30	12.30	11.20	10.00
21	19.00	17.80	16.40	15.00	13.50
24	28.40	26.50	24.60	22.60	20.50
27	42.00	39.00	36.00	33.50	31.50
29	55.00	51.00	47.00	44.00	41.50
34	82.50	76.60	70.60	66.20	62.50

TAB. D2

OIL QUANTITY (lt.)			
CK...	2	3	4
11	3.350	3.050	2.750
12	4.800	4.200	3.600
13	5.800	5.200	4.700
15	8.600	7.700	6.400
17	13.60	12.80	11.70
19	16.50	15.20	14.00
21	23.00	21.30	19.30
24	31.20	28.60	26.00
27	50.00	46.50	43.00
29	63.00	59.00	54.00
34	92.50	88.50	83.50

TAB. D3

OIL QUANTITY (lt.)		
CCK...	3	4
15	9.30	8.00
17	16.36	14.86
19	18.76	16.86
21	27.30	24.30
24	35.43	31.63
27	59.35	55.15
29	70.60	65.20
34	96.70	86.40

FIG. 6

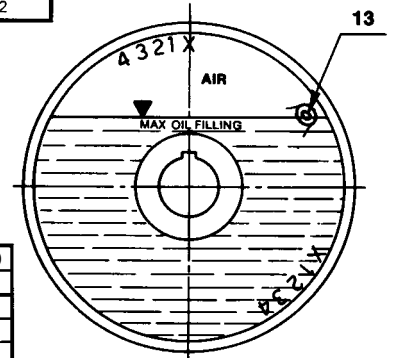
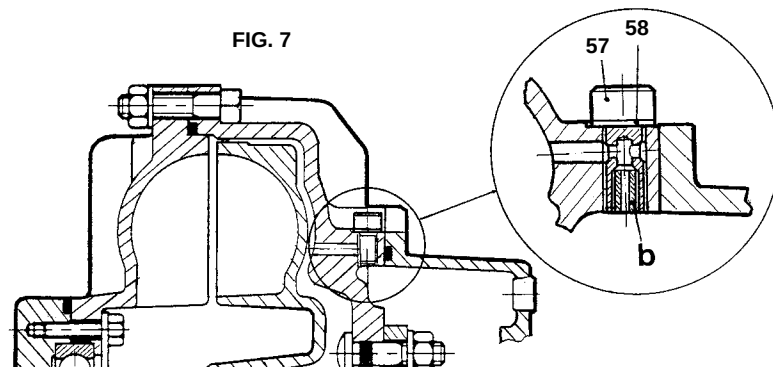


FIG. 7



TAB. E

SIZE	FUSIBLE PLUG N 7018... Torque (Nm)	D.nom.
6	AB 12	1/8"
7 - 8 - 9 11 - 12	BB 23	1/4"
13 - 15 17 - 19 21 - 24	CB 29	3/8"
27 - 29 34	DB 44	1/2"

3 - OPERATION AND MAINTENANCE

- 3.1 The normal operating procedures have to be carried on keeping balance and temperature under control.
To not damage the coupling seals, temperature must not exceed 90°C. For higher values, all the seals have to be made of a special material and the rotating ones in **Viton** (items 15 and 20).

As evidenced in TAB. F where the causes and the relative remedies are reported, a high temperature value may be caused by the following conditions:

- Insufficient oil fill
- Higher absorbed power than motor rated power
- High ambient temperature
- High starting frequency per hour
- Excessive starting time
- Too many consecutive start-ups
- Inadequate air ventilation due to cover guard.

TRANSFLUID can supply all operating data upon request.

- 3.2 After the first 20 days operation, check the oil fill (**this operation to be carried out with cold oil**), the tightening of the screws, the motor and the driven machine.

- 3.3 Repeat the above checks every 6 months – For the KRG models, check the gap **k** (TAB. C) of the elastic coupling. If the torsional gap is excessive (about 2°), replace the rubber elements.

- 3.4 Fluid couplings are supplied with fusible plug at 145°C (120°C, 175°C and 198°C settings are available upon request) as shown in FIG. 14.

If the fusible plug blows at regular intervals during normal service, then check a), f) in par. 3.1, and relative TAB. F should be considered.

- 3.5 In case the switching pin or the electronic overload controller are mounted, check that the distances shown in FIG. 9 and 11 are within the values imposed during the assembly phase.

- 3.6 Oil should be replaced after 4000 hours operation.

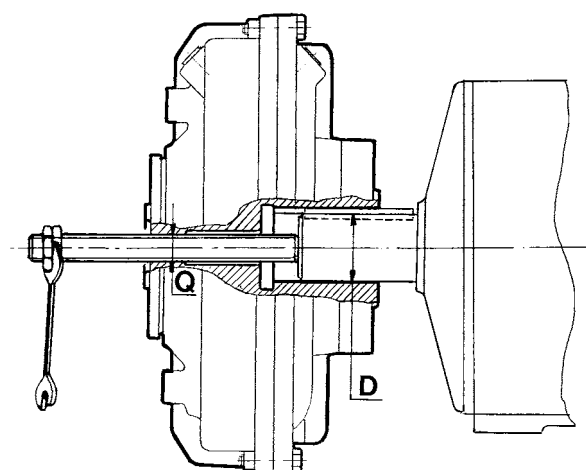
4 - DISASSEMBLY

- 4.1 Disassemble the fixing screw (item 25 for KR models; item 26 for KSD models), and set screw (item 62 for 6KR../KSD..).
- 4.2 Screw threaded bar into tapped hole at the end of the fluid coupling and proceed as shown in FIG. 8. The said threaded bar (dimensions **Q** reported in TAB. G) will push the coupling off the motor shaft.
- 4.3 For the couplings assembled with a taper bush, a very small displacement is sufficient to disengage the coupling from its seat. In case the taper bushing is to be removed too, a screwdriver may be used to push into the keyway cut.
Do not force the taper bushing to avoid damaging the contact surfaces which may compromise the correct reassembly of the part.

TAB. G

K../ CK..	D	Q	
		without bushing	with bushing
7 - 8	19	M12	M12
	24		
	28	M14	
	38		
9-11-12	38	M16	M20
	42	M20	
	48		
13 - 15	48	M27	M27
	55		
	60		
	65		
17 - 19	65	M27	M27
	75		
	80		
21 - 24	80	M36	---
	90		
	100		
27 - 29	100	M45	---
	120		
	135		
34	150		

FIG. 8



TAB. F

SYMPTOM	CAUSE	REMEDY
TOO HIGH TEMPERATURE	INSUFFICIENT OIL LEVEL	Check level and possibly top up
	TOO MANY CONSECUTIVE START-UPS	Wait for cooling before restarting, or reduce number of start-ups
	HIGHER ABSORPTIONS THAN SPECIFIED ON TAG	Remove causes and / or review dimensioning
	HIGH AMBIENT TEMPERATURE	Improve coupling ventilation
FUSIBLE PLUG INTERVENTION	JAMMED OR OVERLOADED DRIVEN MACHINE	Remove causes
	TOO NEAR HEAT SOURCE	Remove source or introduce a shield
	TOO CLOSE PROTECTION COVER	Introduce convenient air passages to improve heat exchange
PERFORMANCE DECREASE	OIL LEVEL	Check oil level and fill with the right type if necessary
	OIL TYPE SPECIFICATION	Replace if necessary (TAB. D at page 3)
		Verify whether responding to recommended oil specifications
INSUFFICIENT OPERATING SPEED AND/OR EXCESSIVE SLIP	AMBIENT TEMPERATURE LOWER THAN 0°C	Use correct oil type (see par. 2.6 at page 3)
	FAULTY MOTOR	Check motor rotating speed (if electric, check connections)
	STAR / DELTA INSERTION TIME	If required time is too long, reduce it to 3 s max
NOISE AND VIBRATION	JAMMED OR BRAKED DRIVEN MACHINE	Remove causes
	ALIGNMENT	Check alignment (page 1 par. 1.8)
	FAULTY BEARINGS	Disassemble, check, replace bearings (and relative seals)
WHISTLE	PROTECTION COVER	Avoid small air passages between cover and machine

5 - ACCESSORIES

Fluid couplings can be equipped, beyond the standard fusible plug, with similar safety devices avoiding oil to escape, and that, in the case of the electronic overload controller, can manage a few more parameters too.

The fusible plug is present as an element of further safety, though being set at a higher temperature value.

5.1 SWITCHING PIN directly fitted to the coupling cover plate (FIG. 9).

The electrical connection of the switch must have a lower voltage than 230 V and a max current of 6 A (electrical scheme details reported in FIG. 10).

Firmly position the cam mounted relay on its support, so that the distance from the end of the switching pin is 6 mm.

It is very important to be within such a distance because, in case the device is activated, the pin comes out due centrifugal force and intercepts the cam, switches it on and gives a convenient output signal (to be used as an alarm or a blocking impulse for the motor).

Notice that, in the configuration of an external driving impeller, the switching pin works in every condition; while, with an external driven impeller, it can be correctly switched on only in case of a slip increase due to overload or excessive load torque absorption.

FIG. 9

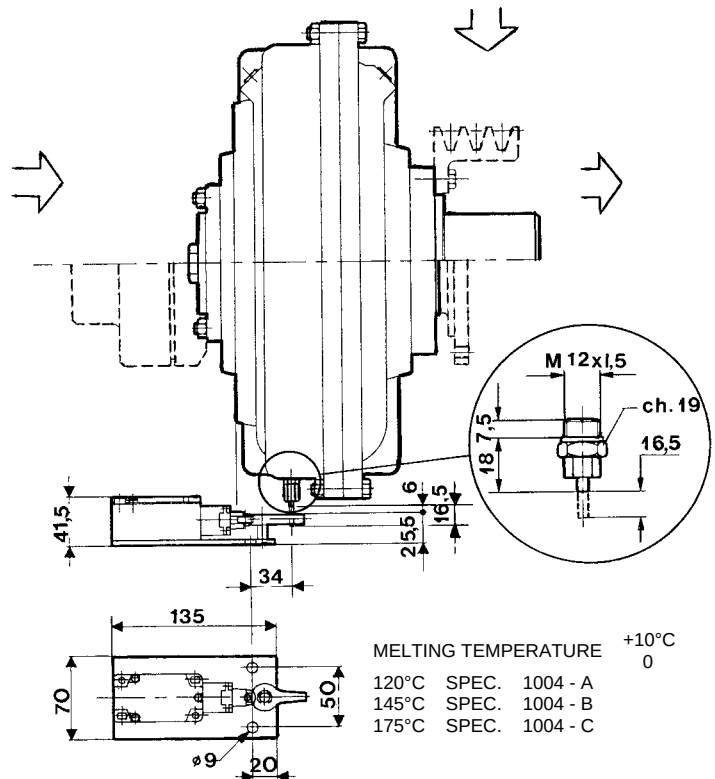
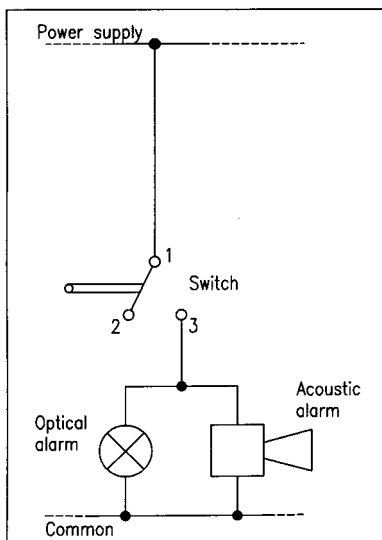


FIG. 10

ALARM ASSEMBLY SCHEME



MOTOR STOP ASSEMBLY SCHEME

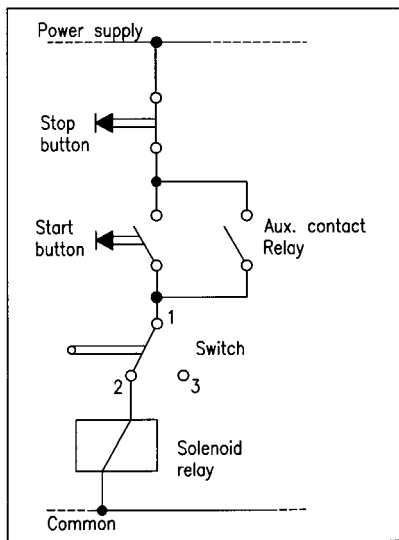
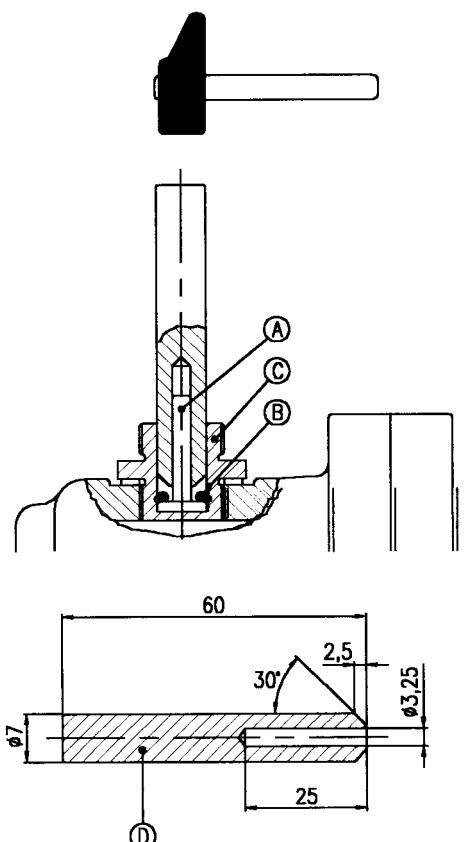


FIG. 10a



5a SWITCHING PIN REACTIVATION (FIG. 10a)

- 5a.1** Unscrew white cover and take pin A out together with the scraps of the melted material.
- 5a.2** Fit the fusible ring B on the pin, paying attention to the right choice of the temperature value of the fusible alloy.
- 5a.3** Insert pin with the fusible alloy into the cap C.
- 5a.4** By means of a tool D similar to that shown in the picture, bump the fusible ring in the bottom of its seat.
- 5a.5** Make sure that the pin is steady into its seat.
- 5a.6** Screw the white cover on cap again.

N.B.: The said operations must be performed when the fluid coupling is at ambient temperature.

5.2 **ELECTRONIC OVERLOAD CONTROLLER**, formed by a proximity sensor and a speed controller detects the output speed of the fluid coupling continuously. When the load torque increases, slip increases too and speed consequently decreases.

If the speed reduces down to the set threshold for a longer time than specified, this is signalled by the intervention of the internal relay.

The said electronic device can be mounted on all non installed O.E.M fluid. Only 2 bolts positioned at 180° around the external crown must be replaced (as shown in FIG. 11) with 2 special ones having a longer screw and nut.

As shown in FIG. 11, it is necessary to position the proximity sensor in line with the 2 bolts at 180°, at a lower distance than 5 mm, while the controller can be fitted in the most convenient place, chosen by the user, within a maximum distance of 20 m (making the proximity connecting wire adequately longer).

Before connecting to the electrical power supply, always verify the voltage.

The electrical connections must be made according to the schematic shown in the detailed instructions of the same electronic device, setting and/or adjusting all the functions on the control panel, as shown in FIG. 12.

- Blind time for starting **TC**, with a screw regulation up to 120 s, avoiding the intervention of the alarm during the starting phase.
- Speed range **DS**, by means of a Dip-Switch to be programmed on 5 and 8 positions, setting relay condition, proximity type, reset system, acceleration or deceleration.
- Speed threshold **SV** to be screw regulated from 1 to 10. The value 10 corresponds to full range set with dip-switch.
- Reset **R**, locally executable with a manual switch or remote connections.
- Delay time **T** setting screw regulation up to 30 s. This function delays possible alarms caused by sudden torque variations.

The function of the timers respect to the state of the relays is diagrammed in FIG. 13.

Leds (FIG. 12) permitting to keep some vital functions under control are also present on the panel:

- Speed level overtaken **SS** with a red light switching on as soon as the set threshold is overcome.
- Red alarm **A** lighting up when the internal relay switches on.
- Green supply led **ON** pointing out that the device is electrically supplied.

N.B.: For further details concerning electronic features and connections, refer to the specific instructions supplied with the device.

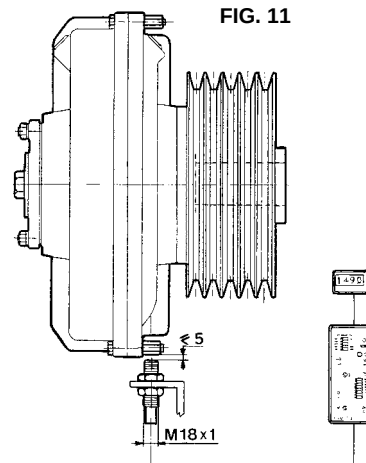


FIG. 11

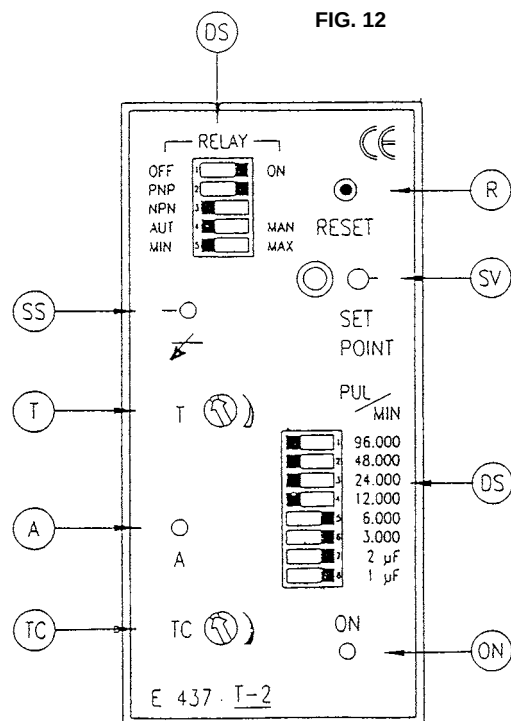


FIG. 12

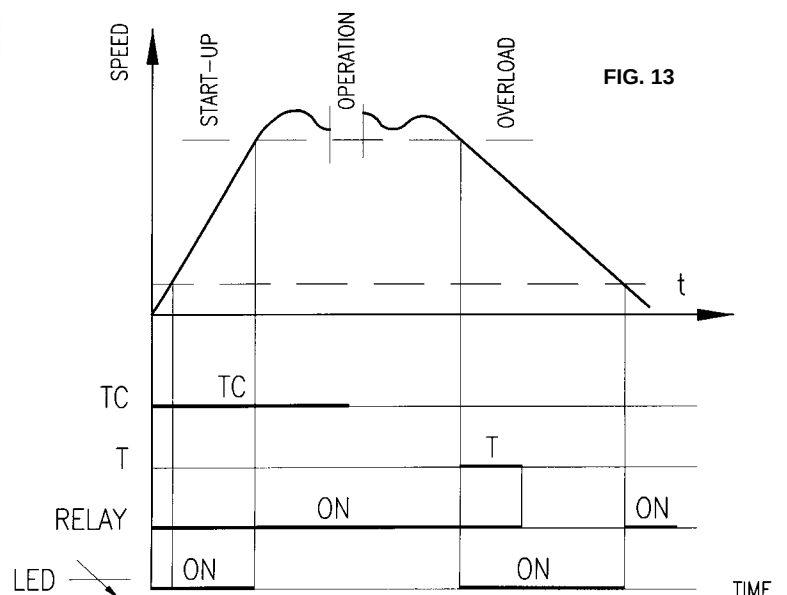


FIG. 13

6 - RECOMMENDED SPARE PARTS (FIG. 16 - 17)

When ordering spare parts, always specify model and spec. nr. marked in the positions shown in FIG. 15 (27K, 29K and 34K have got a plate reporting serial nr. too).

- 6.1 Seal kit for KR / KSD items 4-5 (5a for C.../CC...versions)-6-15-20-41 (items 15 and 20 in Viton, the others only upon request)
 6.2 Fusible plug item 13a
 6.3 Rubber element (for ...KRG only) item 28
 6.4 Code numbers are shown on TAB. H

TAB. H

SIZE	GASKET KIT		FUSIBLE PLUG			RUBBER BLOCK		
	1186 K...	1535 CK... CCK...	N 7018 120°C	145°C Std	175°C	N°	CODE	
6	AV	-	AA	AB	AC	8	BT-A	
7	BV		BA	BB	BC	12	BT-B	
8	CV						BT-C	
9	DV							
11	EV							
12KR	FV	BV				16	-	
12KSD	GV	CV					BT-C	
13	HV	DV	CA	CB	CC			
15	KV	EV						
17	LV	FV						
19	MV	GV						
21	NV	HV						
24	OV	KV	DA	DB	DC		BT-P	
27KR	QV	LV					CT-D/E350	
29KR	RV	MV					CT-D/E425	
34KR	SV	NV						

7 - O-RINGS AND BEARINGS REPLACEMENT (FIG. 16-17)

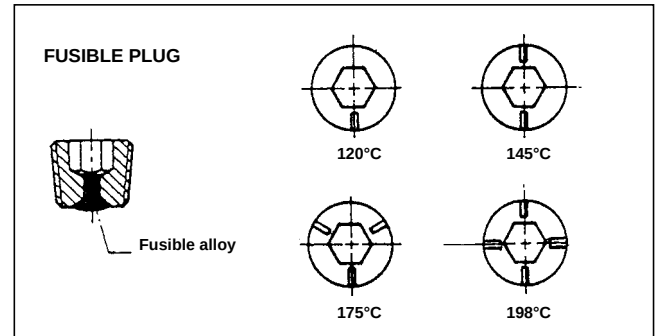
N.B.: To hit the surfaces described in the following, always use plastic hammers.

- 7.1 Drain oil from coupling by unscrewing the caps (item 13) on cover and delayed fill chamber, and item 13a.
 7.2 If the fluid coupling is supplied with a delayed fill chamber, remove it after unscrewing item 34.
 7.3 Unscrew nuts (item 11), insert 2 screw-drivers in the slot between bearing carrier (item 14) and cover (item 3), and act to push bearing carrier and seal (item 15) out.
 7.4 Unscrew bolts (items 8 – 10), tap over the cover (item 3) to remove it.
 7.5 Remove bearing (item 16) with an extractor, as well as the oil retainer (item 47).
 7.6 Remove the snap ring (item 18) and then the impeller (item 1).
 7.7 Remove screws item 9 and plate washer item 17. Bump on plane B of the shaft (item 24 for ..KR, item 25 for ..KSD) and slide the bearing carrier (item 23 for ..KR, item 24 for ..KSD) away with the seal (item 20).
 7.8 When reassembling, proceed inversely by replacing bearings and **all seals**. Use sealing paste between the plate washer (item 17) and the impeller (item 2).

N.B.: To lock all bolts and caps, refer to the listed torques:

TAB. K for items 9 – 10 – 34
 " B " 11 – 37
 " E " 13 – 13a

FIG. 14



TAB. K

K... CK... CCK...	LOCKING TORQUE					
	item 9		item 10		item 34	
	screw	Nm	screw	Nm	screw	Nm
6	M6	10	M5	6	--	
7 - 8			M6	10		
9 - 11	M8	24	M8	24	M8	24
12 - 13						
15-17-19	M10	50	M10	50	M10	50
21	M14	135	M12	85		
24			M14	115	M14	135
27				135		
29			M16	205		
34	M16	205	M20	400		

FIG. 15

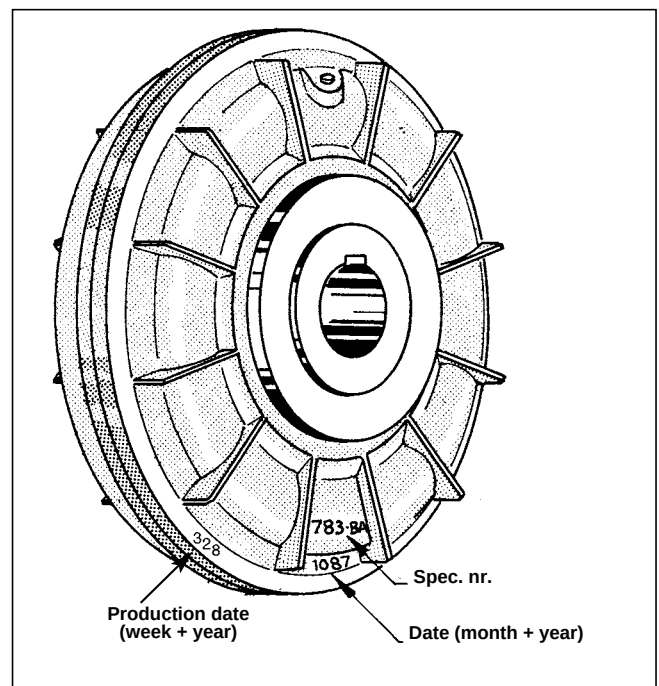
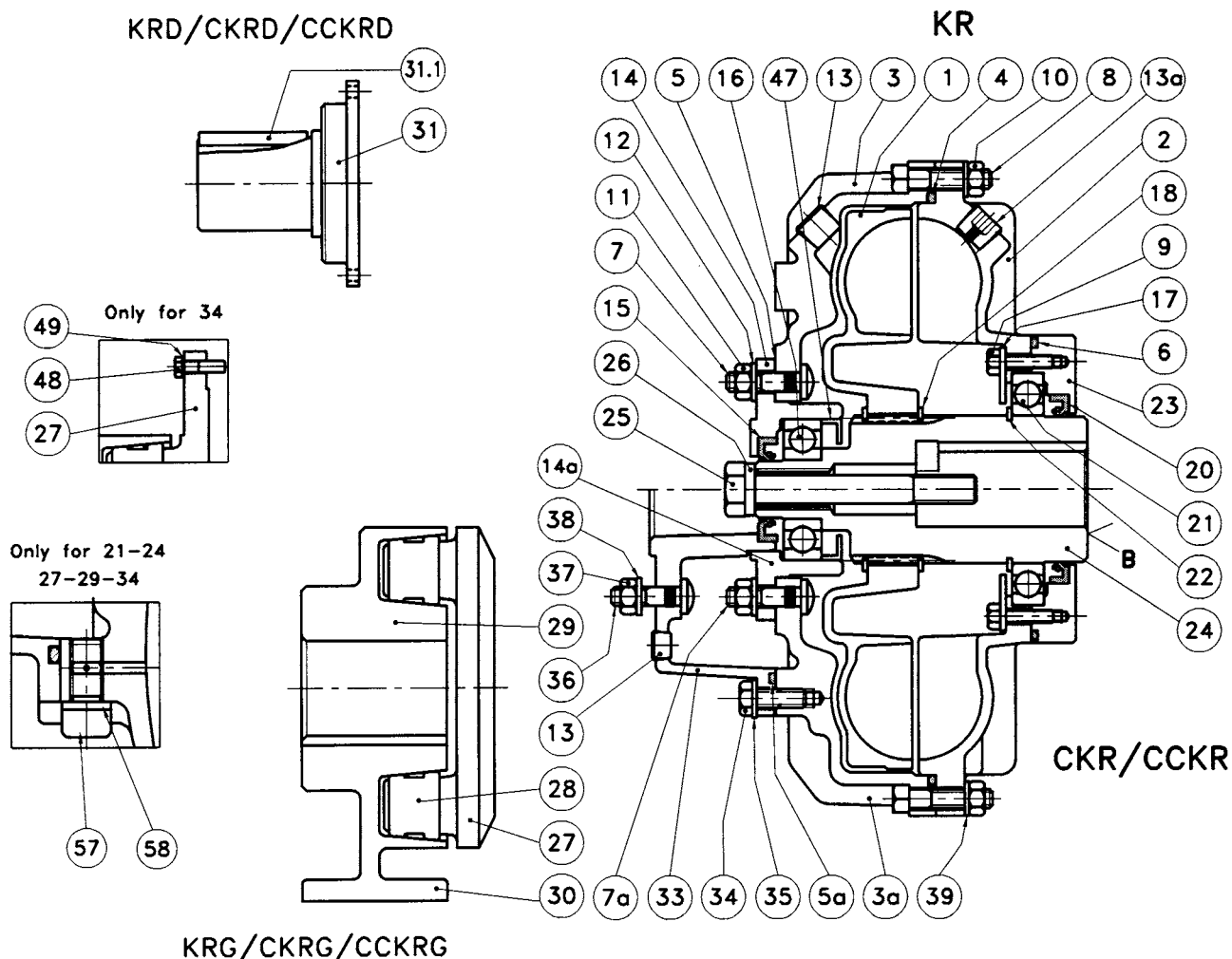


FIG. 16



POS.	NAME	POS.	NAME
1	IMPELLER (INNER)	25	FIXING SCREW
2	IMPELLER (OUTER)	26	WASHER
3-3a	COVER	27	FLANGE G
4	O-RING	28	RUBBER BLOCK
5-5a	GASKET OR O-RING	29	HALF JOINT G
6	GASKET OR O-RING	30	HALF JOINT B
7-7a	SCREW	31	SHAFT D
8	SCREW	31.1	KEY
9	SCREW	33	D.F. CHAMBER
10	NUT	34	SCREW
11	NUT	35	LOCK WASHER
12	LOCK WASHER	36	SCREW
13	PLUG	37	NUT
13a	FUSIBLE PLUG	38	LOCK WASHER
14-14a	BEARING CARRIER	39	LOCK WASHER
15	SEAL	40	PLATE
16	BALL BEARING	41	O-RING
17	PLATE	47	OIL RETAINER
18	SNAP RING	48	SCREW
19	SEAL CARRIER	49	LOCK WASHER
20	SEAL	57	VALVE ASSEMBLY
21	BALL BEARING	58	GASKET
22	SNAP RING	60	SCREW
23	BEARING CARRIER	61	LOCK WASHER
24	SHAFT	62	SET SCREW

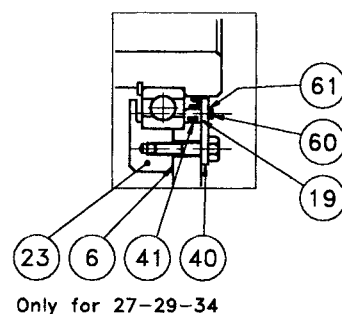
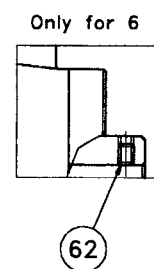
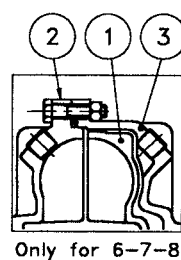
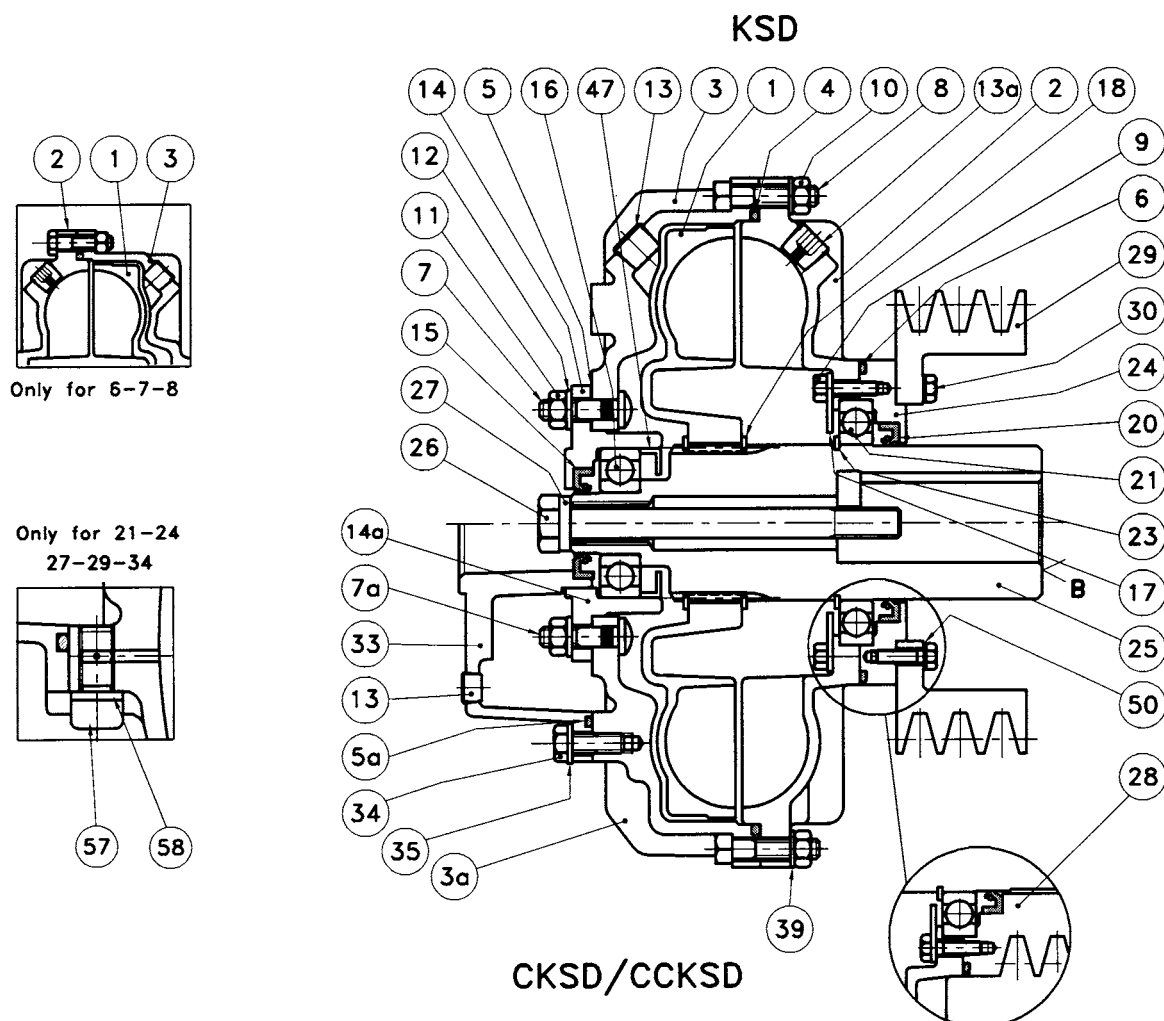
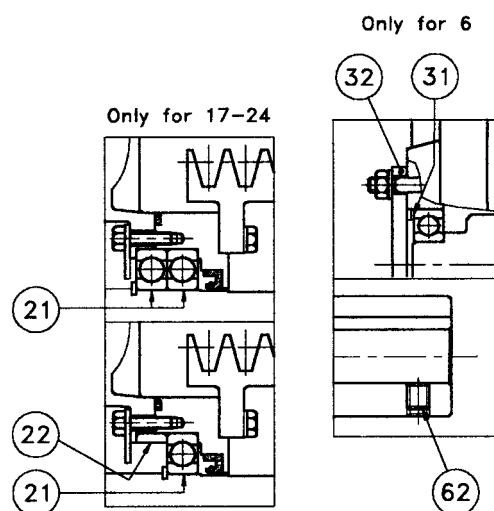


FIG. 17



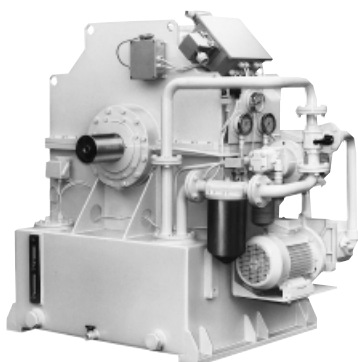
POS.	NAME	POS.	NAME
1	IMPELLER (INNER)	22	SPACER
2	IMPELLER (OUTER)	23	SNAP RING
3-3a	COVER	24	BEARING CARRIER
4	O-RING	25	SHAFT
5-5a	GASKET OR O-RING	26	FIXING SCREW
6	GASKET OR O-RING	27	WASHER
7-7a	SCREW	28	INTEGRAL SHEAVE
8	SCREW	29	BOLTED SHEAVE
9	SCREW	30	SCREW
10	NUT	31	WAVE SPRING
11	NUT	32	COVER
12	LOCK WASHER	33	D.F. CHAMBER
13	PLUG	34	SCREW
13a	FUSIBLE PLUG	35	LOCK WASHER
14-14a	BEARING CARRIER	39	LOCK WASHER
15	SEAL	47	OIL RETAINER
16	BALL BEARING	50	LOCK WASHER
17	PLATE	57	VALVE ASSEMBLY
18	SNAP RING	58	GASKET
20	SEAL	62	SET SCREW
21	BALL BEARING		

KSI/CKSI/CCKSI



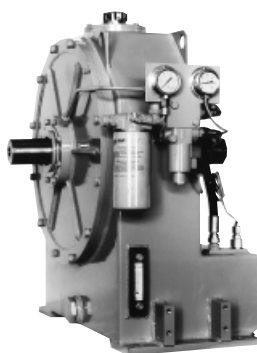
FLUID COUPLING KSL

Start up and variable speed drive up to 4000 kW



FLUID COUPLING KPT for electric motors

Start up and variable speed drive up to 1700 kW



FLUID COUPLING K for diesel engines

Up to 1300 kW



PNEUMATICI CLUTCH

Up to 1200 daNm



HYDRAULIC CLUTCH HYDRAULIC BRAKE SL

Up to 250 daNm
Up to 900 daNm



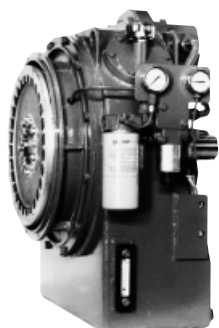
GEAR COUPLING T

Up to 500.000 daNm



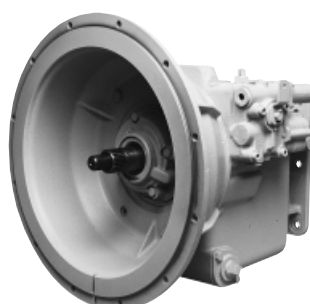
FLUID COUPLING KPT FOR INTERNAL COMBUSTION ENGINE

P.T.O. for pulley and cardan shaft up to 1700 kW



POWER SHIFT TRANSMISSION

With torque converter one or more gears manual or electric selector up to 75 kW

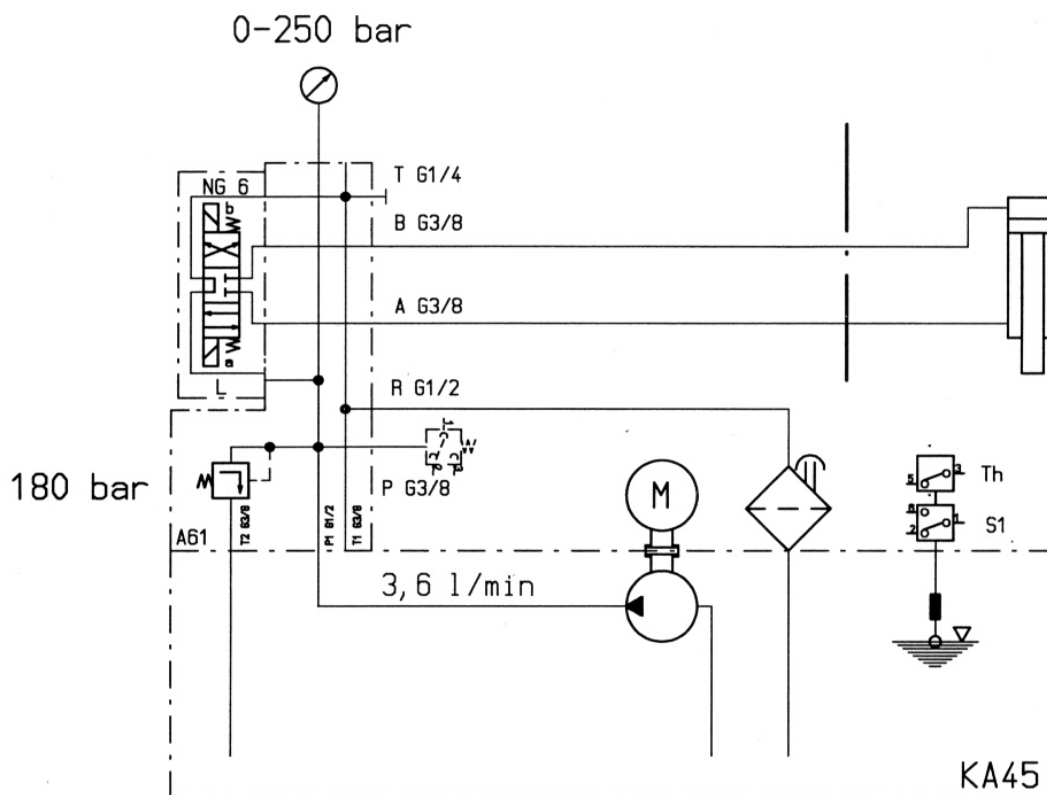


ELASTIC COUPLING RBD

For internal combustion engine up to 1000 daNm



1 Hydraulic diagram



Technical Data:

oil - volume	45 ltr.
oil - flow Q	3,6 l / min.
operating pressure p	180 bar
motor power P	4,24 / 5,06 HP
motor voltage V	575 / 60 V
frequency f	50 / 60 Hz
solenoid voltage	24 VDC V

2 Spare Part List Hydraulic Power System

pos. no.	description	quantity	part no.
1	oil container KA 45 kpl.	1	564150
2	cover of container	1	564318
3	cover of container	1	401414
4	oil filter	1	401415
5	ventilation filter	1	401416
6	fittings (kit)	1	564404
7	connecting block	1	630007
8	pressure valve	1	401527
9	spur gear pump	1	412269
10	pump mounting	1	404690
11	coupling	1	405710
12	electric motor 4,24 / 5,88 HP	1	411259
13	level control switch + thermocontact.	1	407344
14	control valve	1	406568
15	direct current magnet	1	406664
16	adapter	2	406469
17	pressure gauge	1	402573
18	pressure switch (20-210 bar)	1	412178
18.1	plug for pressure switch	1	412179
20	hydraulic diagram 10443/802013	1	802013
21	socket grey	1	402549
22	socket black	1	402550
25	motor flange seal	1	402735
26	pump sealing Abil	1	402726
27	connecting block sealing	1	402744