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The RENK AG has been granted approval under DIN EN ISO 9001

Refer to protection notice ISO 16016

Operating instructions for gear unit type

KPBV 160

Mill LMR 60/29- Raw

Code name / country of installation	IRSAB / Iran
Polysius AG - Order No.:	3370 5777
RENK AG - Order No.:	80 127657

Year of manufacture of the gear unit	2006

Issue of the Operating Instructions:

Issue	Number and language Polysius AG + RENK AG	Issue date	Employee responsible Dept. / Name
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1st amendment	Chapt. 8: Spare parts list Gear Unit changed Chapt. 9: Assembly drawing 2065873/0 index A	2006.06.08	GTI / Santic

List of Contents

Table of Contents

1 GENERAL OPERATING AND SAFETY INSTRUCTIONS

1.1 General operating instructions

1.2 Introduction

These instructions are an essential help for successful and safe gear unit operation. These instructions contain important hints to safely, properly and economically operate the gear unit. Your consideration helps to avoid risks, to reduce repair cost and standstill times and to increase the reliability and the gear unit service life.
Disregard of this instructions leads to the loss of the guarantee.

Theses instructions must be permanently available at the gear unit and must be read and used by any person charged with jobs on the gear unit, e. g.:

- Assembly and alignment,
- Operation, including elimination of malfunctions in the work sequence,
- Waste disposal of fuels and oils and auxiliaries or
- Repair (maintenance, care, repair).
- These operating instructions must be carefully observed to avoid any damage and hence standstill periods of the gear unit.
- A non-consideration of these operating instructions may lead to a loss of the guarantee.
- The additional operating instructions exceeding this description applicable for devices and aggregates not belonging to the RENK system must be adhered to as well. Also the safety-relevant definitions and accident prevention regulations are to be kept.
- The operating instructions of the entire propulsion system must be considered as well.
- The safety relevant determinations and the rules for the prevention of accidents must be adhered to.
- Every person dealing with assembly, putting into service, handling, repair or gear unit disassembly must have read and understood the complete operating instructions and in particular chapter 1 “ GENERAL OPERATING AND SAFETY INSTRUCTIONS“.
- The operating instructions have been issued according to product-specific and application-related requirements consisting of laws, regulations, rules, technical standards, guidelines and contracts.

2. SAFETY REGULATIONS

It is essential that **ALL DIRECTIONS IN THESE OPERATING INSTRUCTIONS ARE COMPLIED WITH** in respect of transport, installation, commissioning, operation, maintenance and repair.

2.1 Symbols and their Meaning

- **Safety symbol**

You will find this symbol in all safety instructions in this operating manual, on the gear unit and on the oil system where there is danger to life and limb. Please observe the safety instructions, and take particular care in these cases. Please also pass on all safety instructions to all other users as well.

You will find this symbol in all safety instructions in this operating manual, on the gear unit and on the oil system where there is danger due to electrical current. Please observe the safety instructions, and take particular care in these cases.

You will find this symbol on the gear unit and on the oil system where severe injuries are possible due to hot oil spraying out under high pressure.

This symbol means danger to persons when touching hot surfaces !

DANGER !

This symbol is used in these operating instructions alternatively instead of other safety symbols. Please observe the safety instructions, and take particular care in these cases.

- **Warning symbol:**  or **WARNING !**

  This symbol indicates the risk of damage to machines and/or machine parts or to malfunctions in the system. It is characteristic for safety insructions to protect machines and environment.

- **Caution symbol:** **ATTENTION !**

  This notice indicates those passages in these operating instructions which are of particular importance for ensuring that the guidelines, regulations, instructions and the correct method of working are adhered to, and that damage to the gear unit and/or other items of the plant is prevented and/or to ensure the effectiveness and condition of the plant in operation.

- **Note:** **Note !**

  This refers to a procedure or to a circumstance of special interest or importance. Within the interest of the proper application of the gearbox as intended, all the stated measures and notes shall be carefully fulfilled and observed.

- **Other alerting signs:** **IMPORTANT !**

  Observe !

Wear protective gloves!

Observe operating instructions!

IMPORTANT !

Please also pass on all safety instructions to all users as well. In addition to the instructions in this operating manual, all applicable national safety and accident prevention regulations of the host country must also be observed.

These regulations must be available to the operator.

3. PROPER USE

- The construction of the gear unit is state-of-the-art, and the unit is operationally reliable.
- The gear unit must only be used for the purpose for which it was made, as indicated in the technical data. Any other use shall be deemed improper. The manufacturer shall not be liable for any resultant injury, damage or loss, which risk shall be borne by the user.
- Proper use also includes complying with the assembly, dismantling, commissioning, operating and maintenance instructions of the manufacturer.
- No alterations may be made to the gear unit without the express approval of RENK, Augsburg. In particular the addition or removal of parts is not permitted.
- **The operating values of the technical data of the gear unit and the oil system are binding.**

4. GENERAL SAFETY REGULATIONS

- The local safety and accident prevention regulations applicable in the country in which the gear unit is installed must be complied with.
- The safety regulations of suppliers of accessories or power units must be complied with.
- The gear unit may only be operated, maintained and repaired by suitably trained and instructed personnel.
- The transmission unit must only be operated when functioning correctly in accordance with the specification.

Proper functioning of the oil unit needed for lubricating the transmission must be ensured at all times.

- There must be no fire or naked flame in the vicinity of the gear unit.

Risk of fire!

- **Caution – Danger due to electrical current!**

Authorised electricians are only allowed to work on the electrical equipment.

Components of the plant on which inspections, maintenance or repair works have to be carried out, have to be de-energised. Devices used tor this purpose have to be secured against uninterntional or self-acting switching-on (lock away fuses, bock circuit breakers, etc.). Voltageless components have to be checked whether they are dead, then have to be earthed and short-circuited. Neighbouring parts that are still alive have to be insulated.
The definition of the denomination specialist electrician is given in the Standards DIN VDE 0105 and IEC 364.

- **Caution – Warning of Over-Pressure!**

Severe injuries are possible due to hot oil spraying out under high pressure.
The lube oil system has to be de-pressurised before any work is carried out at the piping or components of the lube oil system.

- **Danger – Warning of Hot Surface!**

Burning of hands and arms is possible

- at all accessible housing parts,
- at the piping and vessels of the hydraulic system and
- through the lube oil itself.

Higher ambient temperatures also lead to increased temperatures on the housing surface of the gearbox.

- Parts of the gear unit (housing, pipework etc.) can become hot in places in prolonged operation.

DANGER ! when touching!

Wear protective gloves at all sides of access to the gearbox.

- At all exposed shaft exits, make sure that no moving parts are touched.

DANGER ! Safety guards may not be removed when the gear unit is running

- The inspection hole cover in the gear unit housing must not be opened when the gear unit is running.

DANGER ! Do not reach into the running gear unit, or poke any object into it.

- No threaded pipework joints or flange connections may be slackened when the unit is running. This is particularly hazardous in the case of high-pressure hydraulics.

Warning from oil emission.

- The condition of pipings, screwed connections and hoses has to be checked regularly

- Switching points on monitoring and control instruments such as vibration pick-ups, temperature or pressure switches, thermostats and level switches, valves, throttles, etc. set by the manufacturer must not be changed.

WARNING ! Any modification of the operating values without the agreement of RENK may lead to a malfunction of lubrication and to destruction of the gear unit!

- Rotating and moving parts are guarded in compliance with machine guarding legislation.

DANGER ! Guards must be in place when the unit is running.

The auxiliary drive is not rated for continuous operation! The operation longer than 24 hours is not allowed!

To prevent any damage due to current passage through the gear unit an appropriate connection to ground must be provided in case of welding jobs on the mill system. For this purpose can be used the grounding cables if is contained in the scope of supply. The suitability of the cross section and the contact must be guaranteed.

- The alarms triggered in the gear unit and in the oil system must not be ignored or suppressed. These alarms indicate a failure in the lubrication system.
- Benzine must not be used for cleaning purposes.

Fire risk!

- ***Never leave*** the apertures on gear unit or oil tank open unintentionally***.***
- ***Never connect*** a tank heating system without oil in the tank. The heating elements must fully immerse in the lube oil.
- The gear unit must not be connected again without eliminating the cause of the safety disconnection.

5. SAFETY REGULATIONS FOR MAINTENANCE AND INSPECTION

- Interventions jeopardising the safety of the gear unit are not permissible.
- When working on the gear unit and parts fitted to it, normal safety clothing such as hard hat, safety goggles, safety gloves and safety shoes must be worn.
- Only trained personnel may work on the electrical system of the gear unit. Electrical components, especially terminal compartments, may only be opened when the power has been switched off.

Danger of electric shock!

The power section of the frequency inventer may still be live up to 5 minutes **after disconnection from the mains**. Inventer terminals, motor supply cables, and motor terminals may be dangerously live, too!

CAUCION! DANGER FOR LIFE!

Touching exposed or unconnected terminals, cables, or parts of the device may lead to serious injuries or even death!

Caucion, certain setting configurations may cause the inventer to start up automatically when it is connected to the mains.

Before starting work on a gear unit, its drives and attachments must be secured against being unintentionally switched on.

- When carrying out repairs, suspend or support all parts before removing them from the gear unit.

Do not walk under suspended loads during transport operations.

The capacity of the lifting gear installed must be sufficient to bear at least the weight of the heaviest individual part.

- The environment protection regulations must be observed when discharging oil.
- When using solvents and other aggressive materials, the manufacturer's instructions on the products must be complied with.

- Before any work is carried out on the gear unit that requires opening or partially opening the unit, it is necessary to ensure from the plant side that it is impossible for the gear unit to rotate. All work on the gear unit (main unit and auxiliary unit) must only be carried out when the unit is at rest.
- Guards may only be removed when the gear unit is at rest and secured. All electrical components must be switched off before dismantling.
- Repairs may only be carried out with original manufacturer's parts. Any use of components of other manufacturers that are not expressly sanctioned by the gear unit manufacturer is impermissible.

Before switching the gear unit back on after maintenance or inspection work, check whether all the guards removed have been refitted.

6. IMPROPER OPERATION

- The gear unit may only be operated when it is in perfect condition as per the technical data.
- Any changes in the gear unit that may affect safety (increased noise level, higher temperatures than normal, etc.) must be immediately investigated, the cause determined and the fault or faults rectified. Any such change must also be notified to the user of the plant, and the operating personnel must be duty-bound to do so.
- The equipment must not be operated without the safety guards in place.
- The gear unit may only be started or driven by a gear motor or by an auxiliary gear unit when it is full of oil and with the lubricant pumps switched on.
- The operational integrity of the oil system needed to lubricate the gear unit must be guaranteed.
- The maximum permissible oil temperature for the mineral oil used of 80°C (measured in the oil sump at thermometer (5) – see Oil circuit shema) in continuous operation must not be exceeded.
- The minimum oil pressure in the lubricant line of 0.7 bar at the gear unit inlet must be maintained at all times.
- The auxiliary drive is not rated for continuous operation! The operation longer than 24 hours is not allowed!

7. HAZARDS ARISING FROM FAILURE TO OBSERVE THE SAFETY REGULATIONS

- There is danger to life and limb for untrained personnel if they use the gear unit improperly or for uses for which it was not intended.
- Serious damage and injury can be caused by rotating parts and/or the energy they release when they suddenly stop.
- Extended downtime and high costs of repair for damaged gear components can arise from failure to observe the safety regulations.
- Residual hazards for the user see Section 9.

8. SAFETY DATA SHEET

- The user must clearly assign responsibility and establish binding guidelines in respect of safety, so that responsibility for installation, commissioning, operation, maintenance and dismantling is clearly assigned and can be complied with.

- The user must ensure cleanliness and tidiness by means of suitable instructions and supervision at the site where the gear unit is installed.

- You are urgently recommended to keep an operating log in which all significant work and milestones, operating results and special events are recorded. When there is a change of personnel, the successors should be able to continue operation properly on the basis of these documents. The operational log also permits trend analysis and tracing or prevention of operational breakdowns.

9. RESIDUAL HAZARDS FOR THE USER, AND PROTECTIVE MEASURES

- Ensure that no moving parts can be touched at any shaft exits.

  DANGER ! Guards must not be removed while the gear unit is running.

- Parts of the gear unit (housing, pipework, etc.) can become hot in places in continuous operation.

  DANGER ! Wear safety gloves when touching.

- Before any work on the gear unit that requires opening or partially opening it, it must be ensured from the plant side that it is impossible for the gear unit to rotate. All work on the gear unit (main and auxiliary gear units) must be carried out only with the units at rest.

1.1 Technical data gear unit

1.1.1 Power data (main gear unit)

Continuous gear unit power	P	=	4 100	kW
Input speed	n_1	=	990	r.p.m
Output speed	n_2	=	22.10	r.p.m
Ratio	i	=	44.79	
Load on axial bearing	F_{stat}	=	10 300	kN
Load on axial bearing (intermittent - 1670 mm from centre)	F_{dyn}	=	18 750	kN

1.1.2 Power data (auxiliary gear unit)

Type	K3 - 360			
Gear unit power	P	=	110	kW
Input speed motor gear unit	n_{inp}	=	1 486	r.p.m
Output speed aux. gear unit	n_{outp}	=	21.1	r.p.m
Ratio	i	=	70.404	
Mill speed (auxiliary gear unit)	n	=	0.47	r.p.m

1.1.3 Weights

Total weight of the gear unit (without Oil)	abt.	76 400	kg
Auxiliary gear unit	abt.	1 600	kg
ELCO coupling	abt.	1 013	kg
Rotary switch	abt.	440	kg
Oil supply system (without oil)	abt.	4 480	kg

Weigths of individual gear unit components

Casing	abt	31 765	kg
Annulus carrier w. annulus 1 and 2 + guide bearing	abt.	9 043	kg
Pressure plate with labyrinth ring	abt.	13 770	kg
1st stage planet carrier, wheels, bolts and coupling shaft+ sun pinion	abt.	3 581	kg
2st stage planet carrier, wheels, bolts and coupling shaft+ sun pinion	abt.	5 494	kg
Bevel wheel shaft, complete	abt.	1 886	kg
Input shaft, complete	abt.	2 386	kg
Thrust bearing, 16 circular blocks	abt.	3 936	kg

1.1.4 Axial bearing

The axial bearing comprises 16 round pads which are designed to the latest state of the respecting the highest possible shock load. 4 round pads are proved with a resistance thermometer each. All 16 round pads are provided with pockets to build up a hydrostatic oil film

1.1.5 Delivery condition

The main gear unit is packed in accordance with Packaging Grades VMKA (see Chap. 2, Table 1).
The auxiliary gear units, the oil plant and the partial components were packed in accordance with SF 12. For the storage time see Chap.2, preservation, Table 1.

Note: No storage of main gear unit, immediate use (max. 3 months as from date of packing), otherwise the corrosion protection there is no longer effective.

Oil system for KPBV 160 **"IRSAB / Iran"**
for oil circuit scheme 2067184/0

Table 1: Monitoring and switching devices with set points and switching functions

Parameter	Device	List-no.	Set point	Switching function
Oil temperature in the oil pressure line at gear unit inlet	Resistance thermometer	13	25° C ↑	Start of the HP-pumps 31/1 to 4; Start of the maintenance circuit pump 51, after 10 minutes start release of gear unit input motor
			40° C ↑	Activation of filter contamination monitorings 3b and 53b
			60° C ↑	**Alarm**
			70° C ↑	**Stop gear unit input motor**
	Remote-Thermometer	29		Operating temperature range 10 to abt. 70° C
Oil temperature in the oil tank 14	Temperature limiter	17b/1 17b/2	80° C ↑ hysteresis ↓	Immersion heaters 17a/1 to 4 "off" "on" by hand via reset button
	Temperature switch	18	35° C ↑ hysteresis ↓	Immersion heaters 17a/1 to 4 "off" Immersion heaters 17a/1 to 4 "on"
	Temperature switch	48	20° C ↑	Start of the oil pump 1
	Remote-Thermometer	5		Operating temperature range 10 to abt. 81° C
Temperature in the gear unit axial plain bearing	Resistance thermometer	21/1 to 21/4	70° C ↑	**Alarm**
			75° C ↑	**Stop gear unit input motor**
Oil pressure downstream of the oil pump 1	Pressure gauge	9		Operating pressure range 1.4 to 10 bar
Oil pressure in the oil pressure line at gear unit inlet	Pressure switch	15	0.9 bar ↓	**Alarm**
	Pressure switch	16	0.7 bar ↓	**Stop gear unit input motor** HP-pumps 31/1 to 4 "off"
	Pressure gauge	20		Operating pressure range 0.7 to abt. 3.5 bar

Revision:

"Refer to protection notice ISO 16016"

Parameter	Device	List-no.	Set point	Switching function
Oil pressure in the high pressure lines at oil supply unit outlet	Pressure transmitter	34/1 to 34/16	11.0 ± 1.5 bar ↓ (= 4.6 – 4.8 mA)	**Alarm** if the pressure at a bearing pad decreases below the set value **Stop gear unit input motor** if either at two directly adjacent bearing pads or if the pressure at one or more bearing pads than those supplied by one HP-pump decreases below the set value
Oil pressure in the high pressure lines upstream of the bearing pads at the measuring connections 36	Pressure gauge (2 pieces, to be mounted if needed)	37		Operating pressure range 5 to 170 bar
Oil pressure downstream of the maintenance circuit pump 51	Pressure gauge	54		Operating pressure range 0.4 to 7 bar
Differential pressure (Filter contamination) in the oil filter 3a and 53a	Differential pressure switch	3b	1.75 bar ↑	**Alarm** (70 % red, 30 % blue)
				Display colour changes from blue to red
	Differential pressure switch	53b	3.15 bar ↑	Pre alarm (70 % red, 30 % blue)
			4.5 bar ↑	**Alarm** (100 % red)
				Display colour changes from blue to red
Oil level in the oil tank 14	Level control	19	200 mm ↓	**Alarm** Immersion heaters 17a/1 to 4 "off"
	Oil level indicator			see mark
Oil level in the gear unit axial plain bearing	Oil level indicator	22		see mark
Switching position of the shutoff valve 56 in the suction line of the maintenance circuit line	Limit switch (approximate sensor)	56	Valve “open“	Release of automatic operation of the maintenance circuit pump 51
Switching position of the shutoff valve 58 in the pressure line of the maintenance circuit line	Limit switch (approximate sensor)	58	Valve “open“	Release of automatic operation of the maintenance circuit pump 51
Vibration control Bearings and toothings	Acceleration sensor	510/1 to 510/6		Condition of the gear unit

List-no.	Component	Data

1 **Oil pump** (gear type oil pump) (1 piece) *(2055063/4)*

Oil flow quantity	720 l/min + 10 %
Input speed (rated speed)	1000 r.p.m.
Normal pressure	abt. 4 bar (at operating temperature)
Operating temperature	abt. 61° C
Minimum running temperature	min. 10° C

2 **Motor** (1 piece) *(2068895/4)*

Power	30 kW (at + 50° C max. abt. 27.6 kW)
Rated speed	1000 r.p.m.
Rated current	abt. 61 A (at + 50° C max. abt. 57 A)
Starting current	abt. 405 A (at + 50° C max. abt. 370 A)
Type of construction	V 1 with protection hood

for further information see last page of these technical data

3 **Duplex oil filter** (1 piece) *(2049639/4)*
with optical and electrical dirt indication

a) Duplex filter switchable
with pressure equalizing valve and magnetic screw (on the dirt side)

Mesh width	0.040 mm nominal
Filter surface	each, abt. 12 500 cm²
Filter material	stainless steel wire mesh, cleanable

b) Optical and electrical dirt indication (1 piece)

Set points and switching functions see table 1
electrical values see table 2

4 **Oil cooler** (1 piece) *(2068898/4)*

Cooling capacity	215 kW
<u>Shell side</u>	Oil: ISO VG 320
Oil flow quantity	720 l/min = 43.2 m³/h
Oil inlet temperature	abt. 60.4° C
Oil outlet temperature	abt. 50° C
<u>Tube side</u>	Water: fresh water (however sea water resistant)
Cooling water flow quantity	500 l/min = 30 m³/h
Cooling water inlet temperature	max. 34° C
Cooling water outlet temperature	max. abt. 40.2° C
Cooling water pressure	max. 6 bar (calculated pressure: 10 bar)

5 **Remote-Thermometer** (electronical digital-remote-thermometer) (1 piece) *(2062410/4)*
with thermowell

Indicating range (dual scale)	0 to 120° C
Normal temperature when operating	abt. 61° C

6

7 **Non return valve** (1 piece) *(2055405/4)*

Size	DN 80

8 **Pressure limiting valve** (1 piece) *(2054661/4)*
with integrated relief valve

Main valve set to	7 bar (initial opening)
Relief valve stationary set to	10 bar

at operating temperature valve completely closed

9 **Pressure gauge** (1 piece) *(6967800104) (2044725/4)*
with shutoff valve and vent

Indicating range (double scale)	0 to 16 bar and 0 to abt. 225 PSI
Normal pressure at operating temp.	abt. 4 bar

10

11

12 **Non return valve** (1 piece) *(6721008650) (2055818/4)*

Size	DN 50

installed to ensure the oil level during run-down of the plant in case of standstill and/or current supply failure

13 **Resistance thermometer** (1 piece) *(2044726/4)*
with thermowell

the measuring transducer, contact and indicator instruments are not RENK - supply

Set points and switching functions see table 1
electrical values see table 2

14 **Oil tank** (1 piece)

Oil contents (effective contents)	abt. 3150 l (max. 6300 l)	
Dimension	length	= 3200 (3250) / 3000 mm
	width	= 2200 / 2000 mm
	height	= 1100 mm (h_{max} = 2800 mm)

with oil level indicator, cleaning cover, oil drain valve, magnetic screw, filling and air vent filter

15 **Pressure switch** (1 piece) *(2059146/4)*
with shutoff valve and check connection and vent

Set points and switching functions see table 1
electrical values see table 2

16 **Pressure switch** (1 piece) *(2059146/4)*
with shutoff valve and check connection and vent

Set points and switching functions see table 1
electrical values see table 2

17 **Immersion heater** (4 pieces) *(2052323/4)*
with temperature limiter (2 pieces)

a) **Heaters** (4 pieces)

Power	4 heaters each 3000 W total rating 12 kW
Rated current (per phase)	4 x abt. 4.3 A Total rated current per phase abt. 18 A
Installation length	2450 mm
Oil heating (oil quantity)	abt. 5 °C/h (6600 l)
Design	with pipe jacket and exchangeable ceramic heating insert, therefore no oil drainage necessary before disassembly

electrical values see table 2

b) **Temperature limiter** (2 pieces) *(2057323/4)*
with reset button and thermowell

Set points and switching functions see table 1
electrical values see table 2

18 **Temperature switch** (1 piece) *(2057324/4)*
with thermowell

Set points and switching functions see table 1
electrical values see table 2

19 **Level - control** (1 piece) *(2059607/4)*
mounted from above

Length dimensions	l = 1100 mm

Set points and switching functions see table 1
electrical values see table 2

20 **Pressure gauge** (1 piece) *(6967800103) (2044725/4)*
with shutoff valve and vent

Indicating range (double scale)	0 to 6 bar and 0 to abt. 85 PSI
Normal pressure at operating temp.	abt. 1.5 bar

21 **Resistance thermometer** (4 pieces) *(2026328/4)*

the measuring transducer, contact and indicator instruments are not RENK - supply

Set points and switching functions see table 1
electrical values see table 2

22 **Oil level indicator** (1 piece) *(6975900514)*

Size	SK 84 ZAN 15 320

23 **Air vent** (1 piece) *(6948000203)*

Size	BR 3/4 ZAN 15 317

24 **Oil drain valve** (ball valve) (1 piece) *(2048244/4)*
with plug

Size	G 2 (DN 50)

25 **Air vent** (1 piece) *(6948000203)*

Size	BR 3/4 ZAN 15 317

26 **Oil drain valve** (ball valve) (1 piece) *(2049634/4)*
with blind flange

Size	DN 50, PN 16

27 - 28

29 **Remote-Thermometer** (electronical digital-remote-thermometer) (1 piece) *(2062409/4)*
with thermowell

Indicating range (dual scale)	0 to 120° C
Normal temperature when operating	abt. 50° C

30

31 **Four-bank high-pressure oil pump** (radial piston pump) (4 pieces) *(2047143/4)*

Oil flow quantity	4 x 8.3 l/min
Input speed (rated speed)	1500 r.p.m.
Calculated pressure before lifting	abt. 131 bar (at F_{stat})
Pressure after lifting	abt. 58 bar (at F_{stat})
Operating temperature	abt. 50° C
Minimum running temperature	min. 25° C

32 **Motor** (4 pieces) *(2068896/4)*

Power	15 kW (at + 50° C max. abt. 13.8 kW)
Rated speed	1500 r.p.m.
Rated current	abt. 28 A (at + 50° C max. abt. 26 A)
Starting current	abt. 185 A (at + 50° C max. abt. 170 A)
Type of construction	V 1 with protection hood

for further information see last page of these technical data

33

34 **Pressure transmitter** (16 pieces) *(2057493/4)*
with shutoff valve and check connection and vent

the contact and indicator instruments are not RENK - supply

Set points and switching functions see table 1
electrical values see table 2

35 **Non return valve** (16 pieces) *(2060926/9)*

Size	RHZ 16 - SR - ED - CF
Function	prevents return of high-pressure oil from the pocket of the relevant bearing pad

36 **Measuring connection** (16 pieces) *(1105183)*

Size	GMA 3 / 16 – PS

37 **Pressure gauge-measuring box** (1 piece) *(2801095/4)*
with 2 pressure gauges and measuring hoses (supplied as loose items)

Indicating range (double scale)	0 to 250 bar and 0 to 3556 PSI

for pressure measuring in the relevant high pressure oil lines take a pressure gauge and the test hose out of the measuring box and connect it with test couplings at the respective measuring connections 36

38 **Pressure limiting valve (relief valve)** (16 pieces) *(2044728/4)*

set to	170 bar (initial opening)

39

40 **Temperature regulating valve** (1 piece) *(2055868/9) (2055865/4)*
(„oil regulation“)
with manual override and leakholes dia. 2.0 mm (each control element)

Size	DN 80
Rated temperature	46° C
Temperature range	abt. 40° C to 50° C
Normal temperature	45 to 50° C

41 - 47

48 **Temperature switch** (1 piece) *(2057324/4)*
with thermowell

Set points and switching functions see table 1
electrical values see table 2

49 - 50

51 **Oil pump** (gear type oil pump) (1 piece) *(2062335/4)*

Oil flow quantity	110 l/min + 10 %
Input speed (rated speed)	1500 r.p.m.
Normal pressure	abt. 4 bar (at operating temperature)
Operating temperature	abt. 61° C
Minimum running temperature	min. 25° C

52 **Motor** (1 piece) *(2068897/4)*

Power	4 kW (at + 50° C max. abt. 3.6 kW)
Rated speed	1500 r.p.m.
Rated current	abt. 9 A (at + 50° C max. abt. 8 A)
Starting current	abt. 55 A (at + 50° C max. abt. 50 A)
Type of construction	V 1 with protection hood

for further information see last page of these technical data

53 **Oil filter** (maintenance circuit) (1 piece) *(2054666/4)*
with optical and electrical dirt indication

a) Line filter (simplex filter)

Filter fineness	0.010 mm ($beta_{10} \geq 300$)
Filter surface	abt. 14 550 cm²
Filter material	Glass fibre fleece, non cleanable

b) Optical and electrical dirt indication (1 piece)

Set points and switching functions see table 1
electrical values see table 2

54 **Pressure gauge** (1 piece) *(6967800104) (2044725/4)*
with shutoff valve and vent

Indicating range (double scale)	0 to 16 bar and 0 to abt. 225

55

56 **Shutoff valve** (butterfly valve) (1 piece)
((2055850/9) (2055817/4) + 1 piece - (2060053/4))
with 1 limit switch

Size DN 65

Set points and switching functions see table 1
electrical values see table 2

57

58 **Shutoff valve** (butterfly valve) (1 piece)
((2052577/9) (2052576/4) + 1 piece - (2060053/4))
with 1 limit switch

Size DN 40

Set points and switching functions see table 1
electrical values see table 2

59 **Pressure limiting valve** (1 piece) *(2062341/4)*

set to 7 bar (initial opening)

at operating temperature valve completely closed

510 **Acceleration sensor** (6 pieces) *(2064999/4)*

Switching functions see table 1
electrical values see table 2

LP - spare oil pump unit list-no. 1 and 2 (1 piece) *(2068778/4)*

delivered separately as loose item

Table 2: Electrical values

Device	List-no.	Make	Type	Protecti-on type	Contact type	Electrical limit values
Dirt indication	3b	Internormen	OE1.2,5. G.1.P.-.2	IP 65	Changer	230 V / AC, 0.5 A, 10 W 175 V / DC, 1.0 A, 20 W
Resistance thermometer	13	Herth	4.05.169	IP 65		2 x Pt 100 DIN 43760 Temperature measuring range -200 to 600° C
Pressure switch	15	Danfoss	MBC 5100 - 2031 - 1 CB04	IP 65	Changer	250 V / AC - 15, 0.5 A 125 V / DC - 13, 12 W
Pressure switch	16	Danfoss	MBC 5100 - 2031 - 1 CB04	IP 65	Changer	250 V / AC - 15, 0.5 A 125 V / DC - 13, 12 W
Immersion heater	17a/1 to 17a/4	Helios	O 245/52	IP 65		400 V, 50 Hz, 3-phases specific surface load 0.75 W/cm²
Temperature limiter	17b/1 17b/2	Danfoss	KPS 79	IP 67	Changer	440 V / AC - 1, 10 A 220 V / DC - 13, 12 W
Temperature switch	18	Danfoss	KPS 77	IP 67	Changer	440 V / AC - 1, 10 A 220 V / DC - 13, 12 W
Level control	19	Endress + Hauser	Liquiphant M FTL 51-A GR2 BB4 G5A	IP 66	Electronic switch, two poten-tial free double-throw con-tacts	Supply voltage 19 to 253 V, AC / max. 6 A 19 to 30 V, DC / max. 6 A 31 to 55 V, DC / max. 0.2 A at 125 V / DC Power input max. 1.3 W
Resistance thermometer	21/1 to 21/4	Herth	2026328	IP 65		2 x Pt 100 DIN 43760 Temperature measuring range -200 to 600° C
Pressure transmitter	34/1 to 34/16	Danfoss	MBS 3050 - 3411 - 6 GB04	IP 65		Measuring range: 0 to 250 bar Output signal: 4 to 20 mA Supply voltage: 9 to 34 V, DC
Temperature switch	48	Danfoss	KPS 77	IP 67	Changer	440 V / AC - 1, 10 A 220 V / DC - 13, 12 W
Dirt indication	53b	Internormen	OE2.4,5. G.1.P.-.2	IP 65	2 changers, separate circuits	230 V / AC, 0.5 A, 10 W 175 V / DC, 1.0 A, 20 W
Limit switch (approximate sen-sor) for shutoff valve	56	Turck	Bi15U-CP40-FDZ30X2	IP 68	1 normally closed or 1 normally open programmable	Supply voltage 20 to 250 V, AC or 10 to 300 V, DC Switching frequency ≤ 60 Hz Design operating current AC: ≤ 400 mA DC: ≤ 300 mA

Device	List-no.	Make	Type	Protection type	Contact type	Electrical limit values
Limit switch (approximate sensor) for shutoff valve	58	Turck	Bi15U-CP40-FDZ30X2	IP 68	1 normally closed or 1 normally open programmable	Supply voltage 20 to 250 V, AC or 10 to 300 V, DC Switching frequency ≤ 60 Hz Design operating current AC: ≤ 400 mA DC: ≤ 300 mA
Acceleration sensor	510/1 to 510/6	PCB / IMI	M 625 B 21 / M 010 BZ	IP 68		Sensitivity 100 mV/g (± 5 %) Measuring range ± 50 g Frequency range 0.2 to 10500 Hz (± 3 dB) Supply voltage 18 to 28 V, DC

Further information for all motors

Voltage, frequency	400 V, 50 Hz, 3-phases
Protection type	IP 55
Insulation class	F, utilized to B tropical insulation
Voltage variation	± 5 %
Frequency variation	± 2 %
Starting, wiring	direct, delta
Sense of rotation	anticlockwise, with view to the shaft
Ambient temperature	min. + 10° C, max. + 48° C (Design temperature: + 50° C)
Altitude above sea level	10 m
Atmospheric humidity	max. 73 %, min. 61 %, average …… %
Product prescription	ABB

Customer´s connections (not installed by RENK)

901 / 902	**Cooling water connections**	Oil cooler 4 Flange connection (2 pieces) SAE 2 ½“ (PN 16) with counter flanges as blind flanges
905	**Current supply**	Immersion heaters 17a/1 - 17a/4 400 V, 50 Hz
911	**Current supply**	Pump motor 2 400 V, 50 Hz
921	**Current supply**	Pump motor 52 400 V, 50 Hz
931	**Current supply**	Pump motor 32/1
932	**Current supply**	Pump motor 32/2
933	**Current supply**	Pump motor 32/3
934	**Current supply**	Pump motor 32/4 400 V, 50 Hz
951	**Oil - filling connection**	Flange DN 65, PN 16 acc. to DIN 2527
952	**Oil - drain connection**	Flange DN 40, PN 16 acc. to DIN 2527

Control voltage	230 V, AC 24 V, DC

1.3 Energy and Media Requirement
(only RENK supply)

Oil

Gear unit

Mineral oil ISO VG 320 to DIN 51519

Oil capacity oil supply system, total	abt.	6 600	l
thereof in the oil collecting tank	abt.	3 150	l
in the gear unit bottom part	abt.	1 150	l
in the axial bearing space	abt.	1 450	l

Auxiliary gear unit

Mineral oil ISO VG 220 to DIN 51519

Oil capacity auxiliary gear unit, total	abt.	108	l

Current 400 V, 50 Hz, 3-phases

Power:

Heating (4 x 3 000 W)	P_{tot}	=	12	kW
Lubricating oil pump motor	P	=	30	kW
High-pressure oil pump motors (4x15 kW)	P_{tot}	=	60	kW
Maitenance circuit pump motor	P	=	4	kW

Water Oil cooler (Cooling capacity 215 kW)

Cooling water with t_{max} = 34 °C (inlet temperature)

Cooling water flow quantity 30 m^3/h

Pressure max. 6 bar (calculated pressure 10 bar)

Table of Contents

2 Description of the gear unit

2.1 Gear unit arrangement

The gear unit drives a roller mill. To reduce the speed of the motor, there are one bevel wheel and two planetary stages (vertical arrangement).

The planet wheels are spherically on their axis, supported in self-aligning roller bearings so that they can adapt to the load pattern of their teeth.

Even the plant carrier is floating, i.e. can be set freely. The torque is transmitted on the inner central wheel of the 2nd planetary stage which is fixed via the coupling teeth mounted at the upper end or the coupling shaft (hollow shaft). The coupling shaft (hollow shaft) is connected rigidly at its lower end with the planet carrier.

The planetary carrier is supported vertically, i.e. its weight is carried by a fixation flange accomodated in the planetary carrier of the 2nd stage flange via the tie rod, which is supported in anti-friction bearing.

The torque introduced into the sun pinion of the 2nd planetary stage is distributed on 6 planet gears. An even torque distribution is ensured by planet gears arranged in pairs and by an unsupported freely adjusting sun pinion. The planet carrier is led in a radial plain bearing. A further task of the radial bearing is to lead the thrust plate, which is rigidly connected with the planetary carrier.

Both annuli with inner toothings are rigidly connected with the casing via the common annulus carrier.

The sensitivity to disturbance of the complete upper gear unit is therefore reduced to a minimum because of the free movement.

Wobbling movements of the grinding bowl and/or the thrust plate due to unbalance of the bowl with the milling goods or shocks by the milling rolls cannot affect the teeth.

The input shaft is accomodated in 2 with amply dimensioned antifriction bearings. On the input side, there is a bevel roller bearing pair in X-arrangement serving as axial bearing, on the bevel wheel side there is self-aligning roller bearing.

Bevel gear and planetary gear shafts are equipped with sufficiently dimensioned anti-friction bearings too. A bevel roller bearing pair in X-arrangement was used as axial bearing bevel gear side. The thrust plate is led in a radial plain bearing. Input, bevel wheel and planetary wheel shafts are equipped with amply dimensioned antifriction bearings. On the input side, there is a bevel roller bearing pair in X-arrangement serving as axial bearing, on the bevel wheel side there is a self-aligning roller bearing. The 3 planet wheels are supported in self-aligning roller bearings.

To absorb the axial mill pressure as well as the weight of the grinding material and grinding bowl, a special axial plain bearing (tilting round pads for fully hydrostatic lubrication), is installed in the output side in the casing top part.

The input shaft and the output side axial thrust bearing are sealed by no-contact labyrinth seals.

The round pads can be inspected by means of inspection covers.

2.2 Materials

The casing is of welded steel St 37 / St 52.

Bevel pinion (shaft), bevel wheel rim, sun pinion and planet wheels are of case-hardening steel. The teeth are case-hardened and ground.

The annuli are of highly through-hardened steel.

The bevel wheel stage has spiral teeth; the planet stages have straight teeth.

The operating surface of the round pads consist of babitt metal, therm V 80 and/or therm 89.

The output flange of the gear unit, the pressure plate consist of spheroidal cast iron. Its high precision operating surface has good emergency running characteristics.

2.3 Construction

The casing is rugged, torsionally rigid, and well ribbed. Due to the circle-symmetric casing shape, the forces influencing the axial plain bearing are directly transmitted to the foundation.

The bevel wheels have Klingelnberg-Zyklo-Palloid-teeth.

The planet teeth are machined on precision machines according to the hobbing method to DIN 867. The shape of the tooth was designed as per up-to-date aspects.

2.4 Lubrication

The gear unit has a pressure flow lubrication. Each bearing is lubricated by oil from supply pipes, each gear mesh is lubricated by means of a tooth spray.

The special axial thrust bearing is submerged in an oil bath whose level is kept constant at about 40 mm above the operating surface both by a continuous supply of fresh oil and a discharge of the surplus oil. If emergency oil is needed, e.g. in case of power failure the oil level drops by max. 20 mm so that a minimum oil level of 20 mm over the running race will result.

The fresh oil is supplied via a ring spray which ensures that each round pad receives cooled oil.

The oil required for the lubrication and cooling is supplied by a separately mounted motor driven gear-type oil pump.

To increase the anti-friction service life and the service life of the gear unit oil an additional fine filtering of the lube oil via a maintenance circuit is envisaged. A separately mounted gear-type oil pump driven by a motor supplies the oil via the maintenance circuit fine oil filter.

In addition, high-pressure oil is supplied to each round pad by means of separate line, to produce a hydrostatic lubricating film. This oil which is required to form a hydrostatic lube film in the special axial thrust bearing is supplied by several separately mounted motor-driven four-bank radial piston pumps.

2.5 Bearings and teeth monitoring/oscillation monitoring (optional)

By means of the oscilation pick-ups provided on the gear teeth, on the bearings of input and bevel gear shaft as well as on the 2 annuli incurring teething or bearing damages can be noticed early. (The cabling connections see Chapter 10).

Note:

The corresponding measuring ans measuring and indicating instrument is usually not included in the RENK scope of supply.

Attention:

Prior to disassembly of the annulus carriers the two acceleration pick-ups (item 510) screwed-in must be removed!

2.6 Input speed monitoring (optional)

By means of the impulse transmitter - motion detector provided at the input gear shaft, the speed of the gear unit can be remote controlled.

Note:

The corresponding measuring ans measuring and indicating instrument is usually not included in the RENK scope of supply.

2.7 Protecting the Gear Unit Against Corrosion

Prior to delivery of the completely mounted gear unit it will be preserved internally and externally. The packing grade specifies the degree of protection, to which the preservation and packing of the material must correspond, around damage during transport, the envelope and the storage by arising environmental condition and mechanical loads to be prevents (for packing grades see table 1).

2.7.1. Inner preservation

For the test run of the gear unit the preservation oil ARAL Konit ① soluble in operating oil is used at RENK. Therefore a corrosion protection oil is applied to all gear unit parts during the test run.

The preservative oil ARAL Konit is usually mixable with prescribed operating oils on the mineral oil base. For closer information please contact the oil supplier.

Attention:

The compatibility of the operating oil with preservative oil ARAL Konit is to be clarified with the oil suppliers!

The use of synthetic lubricants is permissible only after express written agreement of RENK.

2.7.2. Outer preservation

The outer preservation of the polished outer parts is effected independently of the inner preservation performed.
First the polished outer parts and individual parts are cleaned from dirt and grease by using Weral 560 ③, then they are dried.
Thereupon the preservation compound VALVLINE Tectyl 506 ② is sprayed on sufficiently or applied by using brushes.

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2.7.3. Condition upon delivery

The gear unit and the oil system are packed in accordance with Technical Data (see Chapter 1 as wheel as table 1: Packaging Grades)

2.7.4. Packaging Inspection at Storage Location

The packaging shall be inspected for damages by qualified personnel after arrival at the storage location. In case of packaging damage or packing goods damage respectively, the applied corrosion protection for the scheduled storage time is not given any more. The RENK shipping department shall be notified immediately in order to decide whether the packaging must be inspected by the packer or if a possible rectification by qualified personnel against payment is required.

①②③ for supplier see sheet 7

Table 1: Packaging Grades

Packaging grade	Component spectrum	Exterior preservation	Method / packing mean	Time of storage / storage location
VOK	Single compo-nents Subassembly	without	Packaging with cushioning and filler as required, on pallet, wooden frame, crate packing, case, perhaps cover with foil (only protection against dust and rain, no climatic protection)	No storage, immediate use
VMKA		Exterior preservation according to ZAN 40315 supplement 1, product group A		No storage, immediate use (max. 3 months as from date of packing)
VMKB	Gear unit	Exterior preservation according to ZAN 40315 supplement 1, product group B		max. 36 months as from date of packing in closed room
VS			Packaging with cushioning and filler as required, on pallet, wooden frame, crate packing, case, shrink-wrapping of the component with shrinking foil (only protection against dust and rain, no climatic protec-tion)	
SF12			Packaging with cushioning and filler as required, on pallet, wooden frame, crate packing, case, seal-weld in polythene, with desiccant / VCI carrier	max. 12 months as from date of packing out-door without roofing, with cover sheet
SR12	Single compo-nents Subassembly Gear unit	Exterior preservation according to ZAN 40315 supplement 1, product group A/B		max. 12 months as from date of packing in closed room
SR24	Gear unit	Exterior preservation according to ZAN 40315 supplement 1, product group B	Packaging with cushioning and filler as required, on pallet, wooden frame, crate packing, case, seal-weld in aluminium foil, with desiccant / VCI carrier	max. 24 months as from date of packing in closed room, open roofing (lean-to-roof), with cover sheet, protect against moistness and direct solar radiation
SL60	Single compo-nents Subassembly Gear unit	Exterior preservation according to ZAN 40315 supplement 1, product group A	Packaging with cushioning and filler as required, on pallet, wooden frame, crate packing, case, seal-weld in aluminium foil, with desiccant, humidity indicator, with humidity indicator monitoring according to ZAN 40315-3	max. 60 months as from date of packing in closed room, open roofing (lean-to-roof), with cover sheet, protect against moistness and direct solar radiation

2.7.5. Removal of preservation

Each time before putting the gear unit into service (also for test run) the corrosion protection compound of outer and inner preservation must be removed.

Removal of outer preservation
Preservation coumpound VALVOLINE Tectyl 506 ② must be removed from the external gear unit parts. (By cleaning with Weral 560 ③ or a similar solvent).
Removal of inner preservation
The corrosion protection oil ARAL Konit ① is usually becomes completely solved when putting into service if an operating oil as per RENK lubricant requirements (see chapter 6 of operating instructions) is used. For closer information please contact the oil supplier.

2.7.6. Suppliers:

① ARAL AG
Export Lubricants
Wittener Str. 45
44776 Bochum

② VALVOLINE OEL GmbH & Co.
Überseering 9
22297 Hamburg 60

③ WERA INDUSTRIE-CHEMIE GmbH
Riesstraße 82
80993 München

Appendix:

Supplement 1 to ZAN 40315-1

ZAN 40315-3

Corrosion Protection and Packaging
Marine gears, industrial gears and single components
Product Specification

Supplement 1 to ZAN 40315-1

with ZAN 40315-1,
ZAN 40315-2
and ZAN 40315-3

1 Scope

This standard specifies the products for corrosion protection of facilities and components for use with or for RENK AG.

If preservation according to this standard is specified in technical documents such as drawings, technical terms of supply, purchase orders, purchase order slips etc., one of the products released for the respective product group in section 2 shall be used.

Non-released products are not approved and shall be eliminated and replaced with costs if necessary.

2 Released Products

2.1 Product group A, interior / exterior preservation

The products of product group A are suitable for interior / exterior preservation:

complete gear units, bare spots
Single components, such as moving parts, sleeve bearings, planet carriers, couplings, hydraulic components, etc.

Table 1: Product group A

Preservative		
Preservative oil grade denomination	Viscosity class 1)	Load stage according to DIN 51354 2)
ARAL Oil KONIT SAE 10 W	SAE 10 W	11
ARAL Oil KONIT SAE 20 W 20	SAE 20 W 20	
ARAL Oil KONIT ISO VG 46	ISO VG 46	
ARAL Oil KONIT SAE 30	SAE 30	
Producible by mixing SAE 30 and SAE 50 if required	SAE 40	
ARAL Oil KONIT SAE 50	SAE 50	
SHELL ENSIS Motor Oil 20	SAE 20	6
SHELL ENSIS Oil VG 46	ISO VG 46	
SHELL ENSIS Motor Oil 30	SAE 30	
SHELL Oil S 7294	SAE 30 3)	12
HOFFMANN Multifunction Oil 4) WD-40 Spray	< 1 cSt	-----

1) SAE viscosity class according to DIN 51511
ISO viscosity class according to DIN 51519
2) Observe during test bed operation with load.
3) Only in special cases. Complies with SHELL-ENSIS series with EP additives.
4) Single components and pre-assembled units, in-plant corrosion protection

2.2 Product group B, exterior preservation

The products of product group B are suitable for exterior preservation:

complete gear units, bare spots

Table 2: Product group B

Preservative	Remark
VALVOLINE TECTYL 506,	Remove preservative by washing with Weral 560 or similar solvent, before commissioning of the gear units.
AVILUB METACORIN 822	
DINITROL PASTA only for wind energy	

Corrosion Protection and Packaging
Marine gears, industrial gears and single components
Inspection of Packagings with Packaging Grade SL 60

ZAN 40315-3

with ZAN 40315-1,
ZAN 40315-1 supplement1
and ZAN 40315-2

1 Scope

This standard is valid in addition to ZAN 40315-1 if packaging grade SL60 is expressly required in a purchase order.
It specifies the procedure to be observed when the packaging is stored at the consignee in order that the packing goods will maintain the applied protection for the prevailing environmental conditions and mechanical demands in the stated period.

2 Monitoring of Humidity Indicators in Case of Long-Term Packaging SL60

The implemented packaging grade SL60 is a desiccant packaging with climatic protection, i.e. inside of the climatic protection (= foil) there is a sufficient amount of desiccant calculated for the scheduled storage time.
This desiccant quantity absorbs the humidity diffusing through the foil. In addition, the climatic protection consists of one humidity indicator – in case of bigger packagings more than one - for reading from outside (see fig. 1).

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Fig. 1: Humidity indicator (Example)

In conjunction with the applied desiccant the humidity indicator is indicating the climate inside of the climatic protection, thus allowing to evaluate the degree of saturation of the desiccant and so also the condition of the packing goods. It allows a visual inspection of airtight packagings by detecting a change in relative humidity.

The humidity indicator is made of a specialty paper and it is impregnated with different chloride solutions in the 30%, 40% and 50% partitions.
It is changing its colour from blue (safe) to pink (unsafe, indicates the failure of the desiccant) if the relative humidity of the ambient air exceeds the imprinted values inside of the climatic protection, or the colour is changing from pink to blue if the relative humidity falls below the indicated values again.

Continuation page 2

TABLE OF CONTENTS

3 Description of the oil supply system

The entire oil system which is mounted on the oil collecting tank (list no. 14) is connected to the gear unit via flexible elements in the piping lines.

Via a largely dimensioned return line oil will be led into the separately arranged oil collecting tank (list no. 14) upstream of the casing which is designed as oil collecting reservoir. The oil tank is equipped with an aeration filter, a thermometer, an oil level indicator, an oil discharge valve with plug, a level monitoring switch as well as with a heating system with operating thermostat.

3.1 Low-pressure lubrication circuit

A gear-type oil pump (list no. 1) driven by a motor (list no. 2) sucks in the oil required for lubrication and cooling from this oil tank (list no. 14). The starter required for operation of the motor is not comprised in the RENK scope of supply. The oil pump is mounted in the oil collecting tank.

Downstream of the oil pump a check valve (list no. 7) is installed in the pressure line so that, if necessary, the oil pump aggregate can be dismounted without having to drain a larger quantity of oil. Moreover, the check valve prevents the return of the oil from the pipes and aggregates into the oil collecting tank.

The oil supplied by the gear-type oil pump flows to the change-over duplex oil filter (list no. 3a) and then to the oil cooler (list no. 4).

Under normal operating conditions of the oil system, i.e. when the maintenance circuit is activated, the duplex oil filter (list no. 3a) is merely acting as safety filter. Just a minor quantity of dirt particles will accumulate in this oil filter under normal conditions since the oil collecting tank is filled with extra fine-filtered oil exclusively. The duplex oil filter (list no. 3a) will only be contaminated by a cold start during which the maintenance circuit must be shut down and if the latter fails.

Normally the duplex oil filter (list no. 3a) must be connected such that the entire oil quantity is led through a filter pot and that the other filter pot is provided in cleaned condition.
During starting with cold and thus viscous oil the change over device can be brought into mid-position and be operated via both pots in order to reduce the pressure loss in the filter. When the operating temperature is achieved at the latest, however, normal operation is to be restarted.

The heat to be dissipated by the oil cooler and the cooling water quantity required are indicated in the enclosed technical data sheets.

Since the cooling power demanded by the cooler cannot be determined exactly due to changing ambient influences (the cooler, however, is rated according to the enclosed technical data), under normal conditions an oil temperature of below 50° C will be set at the oil outlet of the cooler and/or at the oil inlet into the gear unit. An oil inlet temperature into the gear unit between 40° C and 50° C is ideal for this type of gear unit design. An oil inlet temperature into the gear unit of 50° C up to the "alarm" temperature (see technical data) is still alright.

Oil temperatures below 40° C should only occur during the starting procedure of the plant. If the oil inlet temperature into the gear unit exceeds the "alarm" temperature, operation of the gear unit can only be accepted for few hours (see under item "monitoring"). If the oil inlet temperature furtheron increases in the meantime, the input motor is disconnected automatically when the max. admissible oil temperature is achieved (for setting values see technical data).

However, in order to keep the oil inlet temperature into the gear unit largely constant also with different load and different cooling water temperature and to achieve operating temperature during starting procedure as quickly as possible, a temperature regulating valve (list no. 40) is installed downstream of the oil cooler. Thanks to the regulating insert in the valve depending on the temperature the oil quantity is divided up such by the oil cooler "C" and by the by-pass line "B" around the oil cooler that a nearly constant oil temperature is achieved in outlet "A".

Upstream of the gear unit inlet, the pressure oil line is divided into several lines. One portion of the oil quantity is used for the lubrication and cooling of the teeth and antifriction bearings.
The other portion is supplied to the special axial thrust bearing as lube and cooling oil. A check valve (list no. 12) is installed in this supply line which prevents, in case of a pump failure, dropping of the oil level in the axial bearing area during slowing down phase of the plant.

For reasons of safety, a pressure limiting valve (list no. 8) is installed in the pressure oil line between oil pump and oil filter. This valve prevents the aggregates (filter, cooler, etc.) positioned downstream from excessive pressure with cold oil and the oil pump aggregate against overload.

The pressure limiting valve is rated such that in an emergency (entire pressure line blocking) the entire pump supply quantity is guided into the oil collecting tank via the valve.

Normally, a portion of the pump supply quantity will be led, in case of cold oil, into the gear unit lubrication system and only the rest will flow into the tank via the pressure limiting valve. Such quantity which is flowing back into the tank decreases with rising oil temperature. The pump motor power is converted into heat and consequently warms up the oil. At operating temperature the valve is completely closed.

The secondary valve which is additionally arranged in the main piston space will contribute to the operating safety of the pressure limiting valve. Without such secondary valve it might be possible that the pressure limiting valve does not open if the pilot valve is contaminated, thus leading to excessive pressure in the system. If the secondary valve responds, the pilot valve must be cleaned immediately so that the plant can start its operation. As already mentioned, the pressure limiting valve is closed at operating temperature and thus no oil will flow through the pilot valve. Consequently, a contamination of the pilot valve is only possible in the case of a cold start. Furthermore, the risk of contamination of the pilot valve is only minor after the initial start-up. Thanks to the additionally installed secondary valve a contaminated pilot valve will not influence the opening procedure of the pressure limiting valve; the safety function of the valve is thus guaranteed.

3.2 Monitoring low-pressure lubrication circuit

The pressure gauge (list no. 9) displays the pressure downstream of the lube oil pump upstream of the lube oil filter, and the pressure gauge (list no. 20) indicates the pressure downstream of the oil cooler at oil system outlet. The pressure ranges to be expected with operating temperature can be seen from the technical data. Please note that higher pressures are achieved when the oil is cold. Differential pressures derive in the first line from pressure loss of the filter and the cooler. An increasing differential pressure is an evidence for an increasing filter contamination (for cleaning of filter see section maintenance).

To monitor its contamination the filter has been fitted with an optical and electrical contamination display (list no. 3b).
Provided the filter is clean, just the blue scale can be seen on the display of the optical indicator. With the oil system being in operation, more and more of the red scale of the indicator becomes visible with increasing contamination.

When the specified differential pressure has been reached (for the setting value see technical data) the red scale covers approx. 70 % of the display (marking on the display) and the electrical contamination indicator releases an alarm signal. Thereupon the double filter must be changed-over, the contaminated filter element must be removed and cleaned.

Actuate the pressure compensation valve in accordance with the filter supplier’s instructions and remove the small vent pipe leading to the filter pot. However, the locking valve which has possibly been installed into the line must be closed before.

Changing-over of the filter can take place with the installation being in operation. It must be seen to it that the cleaned filter element is reinstalled as soon as possible in order to guarantee proper functioning of the entire installation.

As usually after cleaning of the filter elements a residual contamination remains, the cleaning intervals get shorter and shorter. Depending on the degree of contamination it is therefore recommendable to replace the filter elements after several cleaning procedures. The contaminated filter elements must then be properly disposed of.
Provided the filter elements of the fine filter are changed in accordance with regulations, the cleaning intervals are accordingly longer.

The oil pressure downstream of the oil cooler at oil system inlet in the gear unit is monitored by two pressure switches: pressure switch (list no. 15) releases an alarm signal when a specific adjusted pressure is reached; pressure switch (list no. 16) stops the gear unit input motor when the oil pressure drops to a minimum value (adjusted values are given in the technical data).

When the alarm signal is released, it is imperative to immediately look for the cause of the pressure alarm and to eliminate the same in order to prevent the input motor from being cut-off.

Attention:

All shut-off valves towards the pressure gauges and pressure switches must be necessarily opened during operation of the oil system, i.e. are in operating position. The shut-off valves may be brought out of operating position only temporarily during operation of the oil system (for check and/or exchange of an instrument).

The start of the oil pump (list no. 1) is effected by means of a temperature switch (list no. 48) only if min. admissible oil temperature is achieved (for setting values see technical data).

The thermometer (list no. 5) shows the oil temperature in the oil tank. The oil temperature downstream of the oil cooler at oil system outlet is indicated at the thermometer (list no. 29). By comparing the two oil temperatures, it is possible to establish the down-cooling values of the oil cooler (for theoretical values see technical data).

The resistance thermometer (list no. 13) installed in the pressure line downstream of the oil cooler at oil system outlet is to transmit the major data for temperature measurement. The measuring transducer and the corresponding contact switch are not comprised in the RENK scope of supply.

The contact switch must be provided with 4 contacts and can, in addition, be used for remote temperature indication. The below-mentioned contact functions are necessary (for adjusted values see technical data):

1. Gear unit input motor stop at max. permissible oil temperature.

2. Alarm signal at high oil temperature.
   When the alarm signal appears, the reason of the temperature alarm is to be found immediately. After an alarm of max. 5 hours, the defect must have been found, if not, the gear unit input motor must be disconnected manually.

3. Activation of the filter contamination monitoring.
   With cold oil, the alarm signal would be released owing to the increased power loss in the filter which is prevented by this contact.

4. Start of the maintenance circuit pump and start of the high pressure oil pumps, when the minimum oil temperature has been measured at the sensor for 3 minutes. After 10 further minutes release of input motor start by means of timing relais.

   During these time delay all lubrication points are supplied with fresh oil and at low ambient temperature the cold oil from the gear unit is mixed with the warm oil from the oil tank.

Moreover, four resistance thermometers (list no. 21) installed in the special axial thrust bearing are used for temperature monitoring. The corresponding measuring transducers and the corresponding contact switches are not comprised in the RENK scope of supply.
The contact switches must be provided with two contacts each and can, in addition, be used for remote temperature indication. The below-mentioned contact functions are necessary (for adjusted values see technical data):

1. Gear unit input motor stop at max. permissible axial bearing temperature.

2. Alarm signal at high axial bearing temperature.
   When the alarm signal appears, the reason of the temperature alarm is to be found immediately. After an alarm of max. 5 hours, the defect must have been found, if not, the gear unit input motor must be disconnected manually.

The level control instrument (list no. 19) installed as well as in the oil tank prevents connecting of the immersion heaters (list no. 17a) in case of an inadmissibly low oil level and/or disconnects the immersion heater if the oil level drops underneath a prescribed mark and will release an alarm signal.

Attention:
When same alarm signal is released, it is imperative to immediately look for the cause of the alarm and to eliminate the same in order to prevent the input motor from being cut-off (max. permissible axial bearing or oil temperature, oil flow to low or oil pressure to low), or damage to the oil system (air-sucking" at low oil level in the oil collecting tank)!

Note:

For exact monitoring and switching functions please see Technical Data Oil System, chapter 1, table 1 and 2.

3.3. **Maintenance circuit** (extra fine-filtering)

To increase the service life of the anti-friction bearings and the endurance of the gear unit oil, the latter is additionally fine-filtered in a secondary oil circuit.

A gear-type oil pump (list no. 51) driven by an electric motor (list no. 52) sucks oil out of the oil collecting tank (list no. 14) which is supposed to be fine-filtered in the maintenance circuit. This oil quantity has been rated such that the entire oil content in the collecting tank, the gear unit and the piping system passes the fine-mesh filter abt. 2 times an hour. The starter required for operation of the motor is not comprised in the RENK scope of supply.

Attention:

The maintenance circuit must be always in operation. Only in exceptional cases (to maintenance work or at low ambient tem peratures) it may be stopped for a short time.

Upstream and downstream of the oil pump shut-off valve each with limit switch (list no. 56 and 58) is installed. These valves are used for filling or draining the oil recipient (list no 14). The limit switches of shut-off valves (list no. 56 and 58) serve as safety for the maintenance circuit pump (list no. 51) and for the release of automatic operation of the maintenance circuit pump (list no. 51).

Attention:

The control of the system must assure that the maintenance-circuit pump motor (list no. 52) must only be released for automatic operation if the locking valves (list no. 56 and 58) are fully opened. Contact making in the control system is effected via the limit switch mounted on the shut-off valve. The corresponding control is not included in the RENK scope of delivery.

Filling in of the oil into the oil collecting tank (list no. 14) or draining of oil from the oil collecting tank (list no. 14) via the care-circuit pump (list no. 51) can only be realised by a manual control of the pump motor (list no. 52).

To fill the oil recipient (list no. 14) the suction side shut-off valve (list no. 56) must be closed. The pressure side shut-off valve (list no. 58) must be opened.
After removal of the corresponding blind flange the oil supply line must be fitted on the filling flange (list no. 951). Now the oil can be sucked from the oil barrel via the maintenance circuit pump (list no. 51) and be pumped into the oil recipient via the oil filter (list no. 53a). Thus will be guaranteed that the oil to be filled in anew will be supplied into the system in fine filtered condition (16 µm absolute).
Thereupon the filling flange (list no. 951) must be closed again with the corresponding blind flange and the suction side shut-off valve (list no. 56) must be opened.

To drain the oil recipient (list no. 14) the pressure side shut-off valve (list no. 58) must be closed. The suction side shut-off valve (list no. 56) must be opened.

After removal of the corresponding blind flange the oil draining line must be mounted on the draining flange (list no. 952). Now the oil can be sucked from the oil recipient by means of the maintenance circuit pump (list no. 51).

Thereupon the draining flange (list no. 952) is to be closed again by using the respective blind flange and the pressure side shut-off valve (list no. 58) is to be opened.

After having completed the filling procedure of the oil collecting tank, the limit switch control of the shut-off valves (list no. 56 and 58) and/or the pump control must be actualized again in the control system.

For reasons of safety, a pressure limiting valve (list no. 59) is installed in the pressure oil line between oil pump and oil filter. This valve prevents the filter from excessive pressure and the oil pump aggregate against overload.

The pressure limiting valve is rated such that in an emergency (entire pressure line blocking) the entire pump supply quantity is guided into the oil collecting tank via the valve.

Attention:
To avoid any circulation of the oil within the oil pump (list no. 51) after a response of the installed pressure limiting valve (heating of the oil!), the maintenance circuit has to be shut down and the filter element of the pressure filter (list no. 53 a) has to be replaced as soon as the preliminary alarm and/or the alarm signal have been released via the contamination indication (list no. 53 b) of the maintenance circuit filter (list no. 53 a). (In the case of a preliminary alarm, take action within several days, in the case of an alarm, take action within several days, in the case of an alarm, take action within one hour!). The filter element can be replaced while the installation (mill) is running, however, the maintenance circuit pump has to be shut down. To achieve this, the small vent pipe leading to the filter pot has to be removed after having closed the locking valve which may have been installed.

Via the maintenance circuit filter (list no. 53 a) the oil quantity supplied by the gear-type oil pump flows back into the oil collecting tank (list no. 14).

3.4. Monitoring maintenance circuit

To monitor the maintenance circuit, a pressure gauge (list no. 54) is installed in the pressure line between oil pump (list no. 51) and the maintenance circuit filter (list no. 53a). Thanks to this pressure gauge it is possible to directly read the pressure prevailing in the maintenance circuit. The pressure range to be expected at operating temperature can be gathered from the technical data. A higher pressure signals an increasing filter contamination.

To monitor the filter contamination both an optical and electrical contamination display with 2 contacts (list no. 53 b) have been provided at the filter.

Provided the filter is clean, just the blue scale can be seen on the display of the optical indicator. With the oil system being in operation, more and more of the red scale of the indicator becomes visible with increasing contamination.
When the specified differential pressure has been reached (for the setting value see technical data) the red scale covers approx. 70 % of the display (marking on the display) and the electrical contamination indicator releases a preliminary alarm signal.

As soon as the preliminary alarm has been released, a change of the filter element of the maintenance circuit filter (list no. 53a) has to be prepared and carried out occasionally.

Cleaning of the filter element is not possible. If the filter contamination continues, the red scale will finally completely cover the display and via the second contact of the electrical contamination indicator (list no. 53b) an alarm signal is released (100 %). Now the filter element of the maintenance circuit filter (list no. 53a) has to be replaced immediately. To this effect, the electric motor (list no. 52) of the maintenance circuit pump (list no. 51) must be shut down while the installation (mill) can keep on running.
Now the shut-off valve with hand lever and limit switch (list no. 56) must be closed.

Attention:
Only when the shut-off valves (list no. 56 and 58) are completely closed, the extra fine filter (list no. 53) may be opened and the filter insert be changed. The contact is made via the limit switch mounted at the shut-off valve. The corresponding indication lamp is not part of the Renk scope of supply.

Now remove the contaminated filter element from the maintenance circuit filter and fit a new filter element (for instructions refer to the documents of the filter supplier in chapter 11). The contaminated filter element must be properly disposed of. See to it that the maintenance circuit can be activated again as soon as possible to make sure that the gear unit is supplied with extra fine-filtered lube oil again.

Attention:
Only when the shut-off valves (list no. 56 and 58) are completely opened, maintenance circuit pump motor (list no. 52) may be in operation. The contact is made via the limit switch mounted at the shut-off valve.

The limit switches of the shut-off valves (list no. 56 and 58) serve for release of automatic operation of the maintenance circuit pump (list no. 51).

Note:

For exact monitoring and switching functions please see Technical Data Oil System, chapter 1, table 1 and 2.

3.5 High-pressure lubrication circuit

In order to avoid mixed friction existing between bearing metal and thrust plate, high pressure lubricating circuits must be provided. To this effect, all round pads of the special axial thrust bearing are equipped with a pocked each, through which high-pressure oil is supplied to form a hydrostatic lubricating film. By means of this lubricating film existing between pressure plate and round pads, the pressure plate with grinding bowl and ground material is lifted.

Prior to the oil system outlet the supply quantity of the high-pressure oil pumps is derived from the low-pressure oil line. With this oil the high-pressure oil pumps are approached on the suction side. The four-bank pumps (radial piston pumps) (list no. 31) driven by the motors (list no. 32) supply the oil to the round pads incorporating the pockets. Each of the round pads is supplied with oil from one of the four banks of the high-pressure oil pumps. Each of the oil circuits adapts itself in terms of pressure to the pressure required for the relevant pockets. The starters required for operation of the motors are not comprised in the RENK scope of supply. Prior to the entry into the gear unit, a check valve (list no. 35) is fitting in each line which inhibits the oil from disappearing through the high-pressure oil lines in case of a pump failure.

Note:

Prior to the start of the high-pressure oil pumps, it is indispensable to start the low-pressure lubricating oil pump. For reasons of safety, a pressure limiting valve (list no. 38) is installed in each of the high-pressure oil line (for set value see technical data).

3.6 Monitoring high-pressure lubrication circuit

To check the hydrostatic system, measuring connections (list no. 36) are installed in each high-pressure line upstream of the gear unit inlet to which one of the two pressure gauges (list no. 37) each supplied can be connected to measure the corresponding pocket pressure. Thus the pressure required from the individual banks of the high-pressure oil pumps can be directly read. After measuring, the pressure gauges should be dismounted and safely deposited in the box supplied for this purpose.

Monitoring of the oil pressure of such hydrostatic system is done by the pressure switches (list no. 34) each in each high-pressure oil line.

If the pressure drops below the set minimum pressure value an alarm signal will be released (for set value see technical data). The cause for the pressure decrease must be established immediately.

If the oil pressure drops below the set pressure at two neighbouring axial bearing blocks, the input motor is disconnected.

If the pressure drops below the set pressure value at all axial bearing blocks which are supplied by the same high-pressure oil pump, the input motor is disconnected if the other pressure switch releases an alarm signal.

Note:
When the milling rollers are in unloaded condition (starting of the mill or when idling) the set pressure can be reduced by the pressure switch (list. no. 34).
In such case the disconnection of the input motor can be bridged by the plant's control system. The simultaneously occurring alarm signal may be neglected. However, it has to be ensured that the high-pressure oil pumps (electric motors) are operating. Otherwise the gear unit shaft must not be turned.

Attention:

All shut-off valves towards the pressure gauges and pressure switches must be necessarily opened during operation of the oil system, i.e. are in operating position. The shut-off valves may be brought out of operating position only temporarily during operation of the oil system (for check and/or exchange of an instrument).

Note:

For exact monitoring and switching functions please see Technical Data Oil System, chapter 1, table 1 and 2.

3.7 Heating

In order to be able to heat up the cold oil at low ambient temperatures within a shorter period of time and/or to be able to start the lubricating oil pump at all, various immersion heaters (list no. 17a) are installed in the oil collecting tank (list no. 14). These immersion heaters considerably shorten the time till the start of the input motor.

Connection and disconnection of the immersion heaters (list no. 17a) as well as of the lube oil pump (list no. 1) is effected via the control system (no RENK delivery) by monitoring the oil temperature in the oil collecting tank (list no. 14) by means of a resistance thermometer (list no. 18) fitted into the oil recipient (list no. 14). The measuring transducer and the corresponding contact instrument are not included in RENK scope of delivery.

The temperature limiters (list no. 17 b) additionally installed in the oil collecting tank are intended for emergency cases. If the temperature switch (list no. 18) does not operate, the immersion heaters will be disconnected by the temperature limiter as soon as the oil temperature exceeds the max. value (adjusting value see technical data). For reasons of safety, several temperature limiters are always provided.

The besides level control instrument (list no. 19) prevents connecting of the immersion heaters in case of an inadmissibly low oil level and/or disconnects the immersion heater if the oil level drops underneath a prescribed mark and will release an alarm signal.

3.8 Electric cabling

The resistance thermometers (list no. 21) are wired to a terminal box each mounted on the gear unit close to the sensor.

The motors and the installed immersion heaters are not wired, i.e. they have to be connected directly.

All other electrical appliances are connected to the terminal box attached to the instrument panel of the oil system.

The electrical supplementary installations required for all switch processes are not comprised in the RENK scope of supply. The customer is likewise responsible for preparing

Contents

4 Putting into service and placing out of service, maintenance

4.1 Erection

ATTENTION
Risk of damage of gear unit components.
Turning through the gear unit while erection or during assembly jobs on the mill is not allowed without connected oil pumps. The gear unit must not be operated without oil filling.

- ❑ Gear unit, input and output components must be properly mounted, balanced out and prepared according to installation drawing and/or operating instructions (s. chap. 5).

4.2 Putting into service

REMARK
Prior to putting into service of the gear unit the corrosion protection compound of inner and outer preservation must be removed (see chapter 2).

For putting into service the gear unit the oil system must be filled.

Please proceed as follows:

REMARK
In case of cold weather and/or after extended rest it is reasonable to connect the oil system and the heating system some hours prior to putting into service the gear unit in order to ensure the minimum oil temperature at the requested gear unit starting time.

1. Fill gear unit bottom part or oil recipients with lube oil according to the lubricants chart via the maintenance circuit pump (see chap. 6) (see installation drawing chap. 10)
2. Prior to the first start fill in oil into suction line via the oil filling neck to improve the suction behaviour of the oil pump (according to lubricants chart, see chap. 6)

WARNING
Pump damage caused by missing lube oil
Prior to the first start of the oil pumps they have to be wetted with oil necessarily.

3. Connection of lube oil pump

4. Re-fill oil in the gear unit bottom part or in the oil recipient, in doing so measure oil quantity so that the oil reaches the upper marking of the oil dip stick.

WARNING

Pump damage by air sucking.
During the first start-up of the oil pump, first pipes and casing parts must be filled. In doing so, it must be seen to that the oil level is sufficient for operation of the pump. A dry operation of the pump is to be avoided absolutely.

ATTENTION

Risk of injury by pressurized hot oil.
To fill in oil the respective pipes must be pressureless.

5. Start motor of the lube oil pump (operational period 10 minutes at least), all pipes and additional recipients will be filled with oil.
6. If need be, refill oil up to the upper marking of the dip stick some time after disconnection of the pump
7. Rinse oil system for 2 to 4 hours with the prescribed operating oil (according to lubricants chart, see chap. 6). By connecting the pumps the oil is cleaned prior to the first start-up of the gear unit.
8. Clean or change filter inserts according to the degree of contamination.

   The complete oil system must be in operation and the measured values on the gear unit inlet (temperature, pressure, oil quantity) according to operating instructions and technical data must be within the operating range.

✓ The gear unit can be started.

After connection and the first starting of the gear unit the following jobs have to be carried out:

- ❑ After 20 hours all exterior bolts and nuts must be checked for tight fit and must be re-tightened if necessary.
- ❑ Check oil level and refill up to the upper marking on the oil level indication if necessary
- ❑ Take oil sample and carry out oil analysis (after 600 operating hours at the latest, further maintenance intervals can be taken from the table in section 4.4.1)
- ❑ Check oil filter (double oil filter and finest filter) every 3 to 4 hours and remove any possible deposits (see section 4.4.4) until the filters remain clean.

REMARK

The position of the oil filling apertures and of the oil level indicators can be taken from the drawings attached (see chap. 9).

4.3 Placing out of service

After normal disconnection of the mill the gear unit is still doing some revolutions.

Upon disconnection of the gear unit the following conditions have to be maintained:

- ❑ After disconnection of the gear unit the oil system must be kept in operation for approx. 30 minutes to make sure that the lubrication of the teeth and of the bearings is maintained and no dammed heat is created.
- ❑ In case of reduced standstill periods (up to 10 hours) the oil pump must continue to run in order to keep the oil on a minimum operating temperature (approx. 25 C) and hence to enable starting of the gear unit at any time.
- ❑ In case of extended standstill periods (exceeding 10 hours), the oil system must be put into operation approx. every 14 days. The oil pump must run with heated oil for approx. 30 minutes to provide fresh oil to all lubricating points.
- ❑ In case of extended standstill periods (exceeding 6 months) or in case of missing oil supply the gear unit must be preserved according to the corrosion protection instructions (see chap 2). Concerning the use of the preservation compound please contact RENK AG.

REMARK

In case of a sudden gear unit stop by failure of the current supply the lubrication and cooling points are supplied by the oil provided in the individual pipes.

4.4 Maintenance

4.4.1 Maintenance intervals and activities

Interval	Activities
Every 100 operating hours	Check oil level Check oil pressure Check oil temperature
Every 1000 operating hours	Clean oil filters (see chap. 3)
Every 2000 operating hours	Check exterior bolts and nuts for tight fit and re-tighten if need be
Every 2000 operating hours	Check exterior bolts and nuts for tight fit and re-tighten if need be
Every 4000 operating hours or every 6 months	Take and examine oil sample
Every 20.000 operating hours or if need be	Carry out oil change (see chap. 3)
If need be	Remove low pressure lubrication or maintenance circuit oil pump (see chap. 3)

REMARK

All maintenance jobs which have to be carried out after putting into service are described in chap. 6.2.

4.4.2 Clean and/or change filters

WARNING

Risk of damage to filter insert

The filter insert must not get damaged when the filter is cleaned and or changed.

WARNING

Risk of defective components.

Striking filter residues indicate gear unit damage. Therefore such residues always have to be checked for their type and origin when changing the filters and the cause has to be eliminated.

WARNING

Risk of consequential damage on gear unit.

When changing the filters it must be seen to that no dirt particles penetrate into the clean side of the filter and of the oil system.

WARNING

Risk of contamination caused by oil leakage.
The leaving oil while cleaning the filters and/or when changing the filters must not penetrate into the canalisation or into the ground. It must be collected and disposed of ecologically or be supplied to a reprocessing plant. The contaminated filter elements must be disposed of ecologically after the change.

After the first starting of the gear unit the oil filters (double oil filter and finest filters) must be checked every 3 to 4 hours and any possible deposits have to be removed until the filters remain clean.

During normal operation the filters have to be monitored approximately every 1000 operating hours or after release of the alarm signal. In this context the following shall apply:

- ❑ The filter insert of the double oil filter in the low pressure lubrication circuit (ref.no. 3a) can be cleaned.
- ❑ The filter insert of the finest filter in the maintenance circuit (ref.no. 53a) must be changed.

Please proceed as follows when changing and/or cleaning a double oil filter insert:

DANGER

Risk of injury due to pressurized hot oil.
For cleaning and changing a double oil filter insert the respective filter pot must be pressureless. While the jobs are going on a respective danger sign has to be mounted.
Cleaning and change have to be carried out according to the manufacturer's operating and maintenance instructions (see chap. 10).

All required working steps to clean and to change a filter insert can be read in the manufacturer's instructions. Depending on the degree of contamination it is recommended to replace the filter inserts after several cleaning processes. When changing the filter inserts and/or elements according to the cleaning instructions the cleaning intervals may be longer accordingly.

When changing the finest filter insert please proceed as follows:

DANGER

Risk of injury by pressurized hot oil.
For changing a finest filter insert the filter must be pressureless. While changing the insert a corresponding danger sign is to be mounted on the oil system.
The change is to be carried out according to the manufacturer's operating and maintenance instructions (see chap. 10).

ATTENTION

Risk of oil contamination due to the missing maintenance circuit. The maintenance circuit must be put into operation as soon as possible after changing the filter insert in order to re-establish the supply with finest filtered oil.

The change of the filter insert can take place with the plant being in operation (mill). All required working steps can be taken from the manufacturer's instructions.

4.4.3 Pump removal

ATTENTION

Risk of injury by pressurized hot oil.
Prior to all jobs on the pumps all systems have to be made pressureless before.

If needed, the low pressure lubrication or maintenance circuit oil pump can be removed independently from each other without having to drain a major oil quantity.

To this end the respective locking valve has to be closed and the pump has to be removed. After removal of the pump the connection seats must be closed oil-tight.

4.4.4 Oil change

ATTENTION

Risk of contamination by oil leakage.
The leaving oil when changing the oil must not penetrate into the canalisation or ground. The oil must be collected and disposed of ecologically or be supplied to a reprocessing plant.

The time of the first oil change depends on the respective oil condition. To estimate the oil quality oil analyses according to the table on the maintenance intervals (see chap. 6.3.1) have to be carried out.
During normal operation an oil change according to the indicated intervals is required.

ATTENTION

Risk of consequential damage.
Bad oil values indicate damage to the oil cooler and/or to wear in the gear unit. Therefore the cause of the bad values always has to be ascertained and eliminated.

In case of deteriorating oil values first the test intervals have to be reduced and then an oil change is to be carried out.

NOTE
When changing the oil the recommendations of the lubricant suppliers and the remarks in chap. 6 have to be considered.

4.4.5 Fill oil recipient or gear unit bottom part.

ATTENTION
Risk of contamination by oil leakage.
While filling oil must not penetrate into the canalisation or into the ground. The oil must be collected and disposed of ecologically or supplied to a reprocessing plant.

Filling of the oil recipient (ref.no. 14) or of the gear unit bottom part takes place by the manual control of the electric motor of the maintenance circuit pump (ref.no. 52).

1. Close suction side locking valve (ref.no. 56)
2. Open pressure side locking valve (ref.no. 58)
3. Remove blind flange on filling-in flange (item no. 951)
4. Mount oil supply line via suitable flange on the filling flange
5. Manually connect electric motor of the maintenance circuit pump, the oil is sucked in from the oil barrel and is pumped into the oil recipient via the maintenance circuit filter (ref.no. 53a) up to the upper marking on the inspection glass of the oil recipient.
6. Disassemble oil supply line and close filling flange with blind flange.
7. Completely open suction side locking valve.
8. Check pressure side locking valve for completely opened condition.

4.4.6 Drain oil recipient or gear unit bottom part

ATTENTION
Risk of contamination by oil outlet.
While draining the oil the oil must not penetrate into the canalisation or into the ground. The oil must be collected and disposed of ecologically or be supplied to a reprocessing plant.

Draining of the oil recipient (ref.no. 14) or of the gear unit bottom part may be carried out by the manual control of the electric motor of the maintenance circuit pump (ref.no. 52).

1. Disconnect plant and secure against re-connection.
2. Remove draining filter.
3. Close pressure side locking valve (ref.no. 58).
4. Open suction side locking valve (ref.no. 56)

5. Remove blind flange on draining flange (ref.no. 952)
6. Mount oil draining line via suitable flange on draining flange.
7. Manually connect electric motor of maintenance circuit pump, the oil is sucked in from the oil recipient and is pumped into the oil barrel via the maintenance circuit filter (ref.no. 53a).
8. Disassemble oil draining line and close draining flange with blind flange.
9. Completely open pressure side locking valve.
10. Check suction side locking valve for completely opened condition.

The remaining oil is drained via the draining valve mounted on the gear unit bottom part and/or via the draining screw (see outer piping scheme ref.no. 26).

4.4.7 Drain oil from gear unit and oil system components

ATTENTION
Risk of contamination by oil outlet.
While draining the oil it must not penetrate into the canalisation or into the ground. The oil must be collected and disposed of ecologically or supplied to a reprocessing plant.

Drain the components of the oil systems such as e.g. coolers, filters, etc. they must be drained via the respective discharge devices.

Table of contents

5 Assembly and/or disassembly of the gear unit

DANGER

Risk of accident and injury by missing special knowledge.
All assembly and disassembly jobs on the gear unit and on gear unit parts must be carried out by a specialist of RENK AG only
The safety instructions (see chapter 0) and the assembly instructions of the bearing manufacturer must be absolutely adhered to.

DANGER

Risk of injury by dropping gear unit components.
All assembly and disassembly jobs on the gear unit and on the gear unit components may be carried out with sufficiently dimensioned lifting tools and sling means only, which have to be provided by the user of the plant.

DANGER

Risk of injury by electric shock.
All assembly and disassembly jobs in connection with the electric system of the gear unit must be carried out by a technician specialized in electrics only. All electric groups and fixtures must be connected properly. The user shall be responsible for the electric connections and not RENK AG.

WARNING

Risk of contamination and hence risk of gear unit damage.
During all assembly and disassembly jobs on the gear unit and on the gear unit components cleanliness must be seen to. Neither dirt nor foreign bodies must penetrate into the stripped gear unit.

5.1 General instructions

- ❑ During the planning stage it should be made sure that sufficient space around the gear unit is provided for assembly and subsequent care and maintenance is guaranteed.
- ❑ Prior to starting assembly sufficient space must be provided to lift the gear unit.

ATTENTION:
The space required and the dimensions should be taken from the drawings of the gear unit documentation.

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- ❑ RENK scope of supply of assembly accessories is listed on table 1. Moreover, lifting tools with accessories have to be made available by the user of the plant.
- ❑ Prior to assembly all parts have to be carefully cleaned (e.g. with trichloroethylene). It is recommended to fasten all tools e. g. by means of a cord on the wrist.
- ❑ The difference in height of the individual round pads shall not exceed ± 0.025 mm. If necessary, the supporting surface (tilting surface) has to be reground or retouched by hand.
- ❑ Inspection holes have been provided in the casing wall on the level of the running race of the pads. Thus, it is possible to carry out a visual inspection of the pads after installation of the pads or lateron (difference in height of the individual pads).
- ❑ The alignment of the bevel gears is done by RENK using the adjusting rings depicted in the assembly drawing. The strength of the rings should only be changed on the occasion of the replacement of the bevel gear pair. For such job a specialist shall be demanded.
- ❑ Screws and other connecting elements as well as safety elements shall have to be replaced if damaged during disassembly.
- ❑ After major and extended repair work an oil change is recommended.
- ❑ After comprehensive and extended repair jobs an oil change is recommended. The gear unit alignment has to be checked.
- ❑ Hampering pipelines shall be removed prior to the disassembly of gear unit elements. Pipe apertures have to be closed so as to avoid the penetration of dirt.
- ❑ The gear unit will be supplied completely in mounted condition. After removal of the packing, the corrosion protection on the outside positioned shaft journal must be removed.

Contents

5.2 Gear unit assembly on foundation

5.2.1 Remarks

- ❑ The gear unit foundation must be even, horizontal, strong and free from vibrations.
- ❑ In case of a gear unit fixation on a concrete foundation by using stone bolts respective recesses should be provided on the foundation.
- ❑ The gear unit foundation must meet the indications of RENK Augsburg (see installation drawing, position and foundation scheme in chap. 9). The foundation must be rigid enough so that no displacements occur under operating conditions which might influence the tooth contact patterns.

  ATTENTION Fixation of the foundation bolts the must not load the gear unit casing
- ❑ Prior to putting into service the foundation must be fully hardened and firm.

5.3 Gear unit alignment

The gear unit must be exactly aligned on the foundation in order to keep low loads on the processing machine, on the gear unit, on motor and couplings.

ATTENTION

When aligning input and output coupling the heat extension and further displacements of motor and gear unit and/or axial and radial displacements of the mill caused by operation must be taken into consideration!

5.3.1 Alignment of motor towards gear unit

The assembly temperature is usually lower than the operating temperature. The difference between the shaft position at this temperature and at rest as well as at operating temperature and operation under load is to be corrected by corresponding lead values so that the input shaft to be coupled with the motor is exactly in line in operational warm condition under load.

The displacement of the gear unit input shaft towards the foundation downwards can be taken from the following table. As operating temperature of the casing usually 60°C can be assumed, the distance of the input shaft from the foundation support is indicated on the installation drawing (Chap. 9).

Heat growth [mm]	delta T [°K]						
Length [mm]	20	30	40	50	60	70	80
500	0,11	0,17	0,23	0,28	0,34	0,39	0,45
600	0,14	0,20	0,27	0,34	0,41	0,47	0,54
700	0,16	0,24	0,32	0,39	0,47	0,55	0,63
800	0,18	0,27	0,36	0,45	0,54	0,63	0,72
900	0,20	0,30	0,41	0,51	0,61	0,71	0,81
1000	0,23	0,34	0,45	0,56	0,68	0,79	0,90
1100	0,25	0,37	0,50	0,62	0,74	0,87	0,99
1200	0,27	0,41	0,54	0,68	0,81	0,95	1,08
1300	0,29	0,44	0,59	0,73	0,88	1,02	1,17
1400	0,32	0,47	0,63	0,79	0,95	1,10	1,26
1500	0,34	0,51	0,68	0,84	1,01	1,18	1,35
1600	0,36	0,54	0,72	0,90	1,08	1,26	1,44
1700	0,38	0,57	0,77	0,96	1,15	1,34	1,53
1800	0,41	0,61	0,81	1,01	1,22	1,42	1,62
1900	0,43	0,64	0,86	1,07	1,28	1,50	1,71
2000	0,45	0,68	0,90	1,13	1,35	1,58	1,80

REMARK

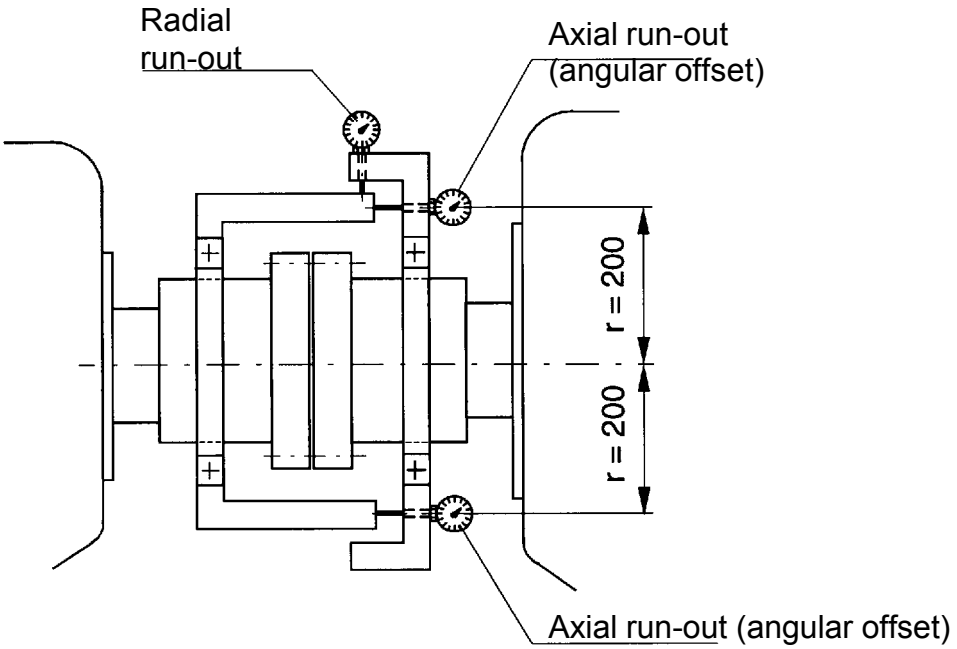
The position of the gear unit casing on the foundation influences the tooth contact pattern and the bearing load, therefore the precise gear unit alignment is of decisive importance for the gear unit service life.

The lead values for the growth of the motor shaft can be taken from the indications of the motor manufacturer.

The resetting forces of the coupling have to be considered in all operating conditions regarding their effect on the motor support.

Radial and axial run-out must be checked by means of the measuring arrangement indicated on the following scheme.

Sketch: Alignment of input coupling in operating condition



Admissible tolerances for r = 200 mm

Type of coupling	**Radial run-out**	**Axial run-out**
Rigid coupling	0.03 mm	0.02 mm
Flexible coupling	0.1 mm	0,1 mm

At r ? 200 mm the axial run-out tolerance changes proportionally towards the measuring radius **r.**

5.4 Gear unit accessories

The fixtures, pressure switches, pressure gauges and parts of the piping can be supplied along in separate packing for transportation reasons, they have to be carefully cleaned prior to assembly. In case of subsequent modifications on the piping (just after written approval by RENK) the respective pipes must be carefully cleaned (pickling in 10% hydrochloric acid). In particular it must be seen to that foreign bodies (cleaning cotton waste, paper, wood, etc.) cannot penetrate into the pipes during assembly.

5.5 Further remarks on erection

For a check of the gear unit assembly at site and while first start-up a RENK specialist is recommended.

Special attention has to be paid to: Dirt-free assembly of milling bowel and thrust plate. Screws for mounting of the milling bowel on our thrust plate have to be tightened evenly. A distortion of the thrust plate has to be avoided. The admissible radial runout error must not exceed ± 0.02 mm.

The alignment of the auxiliary gear unit towards the motor is carried out according to a.m. regulations.

RENK shall not be responsible for proper connection of all electric groups and fixtures.

ATTENTION

Turning through of the gear unit, e.g. during assembly jobs on the mill and/or on the gear unit without oil filling and without connected oil pumps is not allowed!

ATTENTION

To avoid any damage due to current passage through the gear unit, suitable grounding is to be provided for welding jobs on the mill system. If contained in the scope of supply, the grounding cable can be used for them after check of the contacts with the mill at rest.

6 Lubricant recommendations

6.1 Field of application

This recommendation applies to splash-lubricated and pressure-lubricated normal industrial gear units (spur gears , bevel gears, slow-running planetary and branching gears: n ≤ 1,800 rpm) whose transmitted powers operating conditions or gear unit-specific criteria demand oils with a higher pressure absorption capability.

6.2 Lubricant requirements

Non-aging, non-foaming, high-pressure gear oils to DIN 51 517, Part 3 with good corrosion protection characteristics. Neutral towards the shaft sealing elements, nonferrous metals, sealing paints and pastes generally used in gear unit construction, and protective coatings (based on artificial resin) an conservation products. Viscosity index VI > 80, FZG load stage ≥ 12 to DIN 51 354.

Thermal capacity: transient 120 °C
constant 80 °C

6.3 Lubricants

The ISO VG viscosity class to DIN 51 519 required is given in the installation drawing or in the type / name plate and/or in the operating instructions.

Mineral oils to the following specifications must be used:

ISO viscosity-grade DIN 51 519	Lubricating oil type DIN 51 502	ISO classification ISO 6743-6	AGMA-lubrication no. AGMA 250.04
ISO VG 100	CLP 100	L-CKC 100	3 EP
ISO VG 150	CLP 150	L-CKC 150	4 EP
ISO VG 220	CLP 220	L-CKC 220	5 EP
ISO VG 320	CLP 320	L-CKC 320	6 EP
ISO VG 460	CLP 460	L-CKC 460	7 EP

Unless otherwise indicated, the ISO-VG listed is based on a constant ambient temperature of 10 to 40 ^{O}C.

With pressure-lubricated gear units, RENK must be consulted if this reference temperature is exceeded or not achieved.

With splash lubricated gear units, the next lower or next higher viscosity grademust be chosen if the reference temperature is exceeded or not achieved. Please ensure that the setting point is not above the minimum starting temperature. Further details are available from the mineral oil companies.

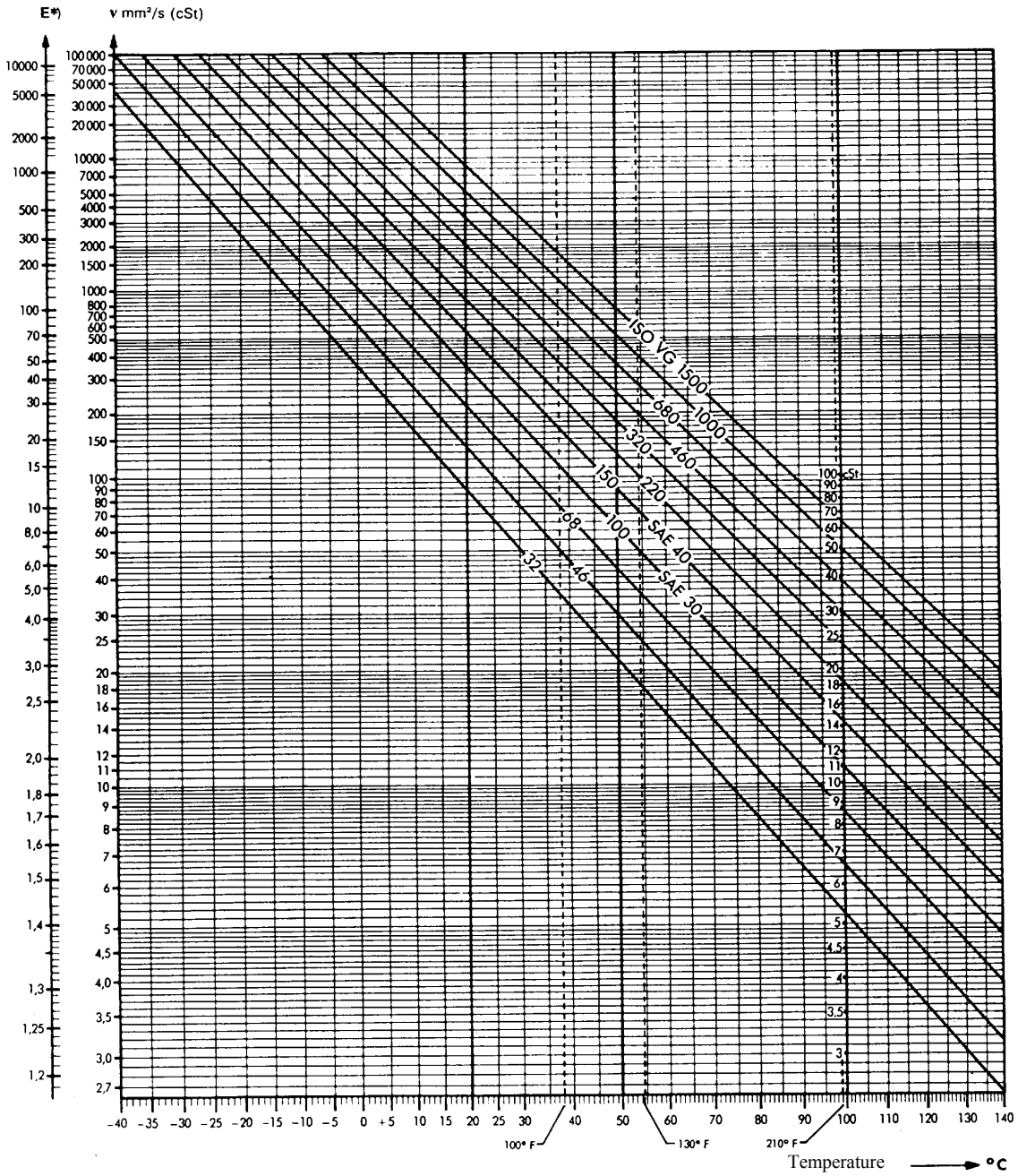
6.4 Notes

- For estimated analysis of accepted viscosity data into ISO viscosity grades see page 3.
- Summary of suitable lubricants, see pages 4. and 5
- Further information on operating conditions, change of lubricant, maintenance and installation are given in the operating instructions of RENK.
- In the absence of special information in the operating instructions, the selection of lubricants is left to the user or to the manufacturer of the plant.
- Reliable operation of the gear unit is guaranteed only if the oil is changed at the recommended intervals, or if examination of the oil and any deposits demonstrates that the lubricant has all the necessary characteristics.
- Different types of lubricant may not be mixed without previous consultation of the lubricant manufacturers.
- Each of the lubricant manufacturers listed has a technical service, whose engineers are always available for advice on technical lubrication questions and who carry out testing as part of a lubrication support service.
- The lubricant manufacturers are listed in alphabetical order. The order in which they are listed in no way reflects the value of the brands listed.
- Branded lubricants from other manufacturers may be used where they meet the specifications indicated.

Viscosity / Temperature Sheet

Averages to DIN 51 519
Viscosity - Index VI = 95

Kinematic Viscosity



*) For information only. Not for official or technical use.

Selection of Suitable Lubricants

ISO-Viscosity-class to DIN 51 519	ISO VG 100	ISO VG150	ISO VG 220	ISO VG 320	ISO VG 460
Addinol	ECO GEAR 100 M	ECO GEAR 150 M	ECO GEAR 220 M	ECO GEAR 320 M	ECO GEAR 460 M
Agip	AGIP BLASIA 100	AGIP BLASIA 150	AGIP BLASIA 220	AGIP BLASIA 320	AGIP BLASIA 460
ARAL	Aral Degol BG 100 Aral Degol BMG 100	Aral Degol BG 150	Aral Degol BG 220 Aral Degol BMG 220	Aral Degol BG 320 Aral Degol BMG 320	Aral Degol BG 460 Aral Degol BMG 460
AVIA	AVILUB RSX 100	AVILUB RSX 150	AVILUB RSX 220	AVILUB RSX 320	AVILUB RSX 460
BP	BP Energol GR-XP 100	BP Energol GR-XP 150	BP Energol GR-XP 220	BP Energol GR-XP 320	BP Energol GR-XP 460
Castrol	ALPHA ZN 100 ALPHA SP 100	ALPHA ZN 150 ALPHA SP 150	ALPHA ZN 220 ALPHA SP 220	ALPHA ZN 320 ALPHA SP 320	ALPHA ZN 460 ALPHA SP 460
Chevron	Chevron Non-Leaded Gear Compound 100	Chevron Non-Leaded Gear Compound 150	Chevron Non-Leaded Gear Compound 220	Chevron Non-Leaded Gear Compound 320	Chevron Non-Leaded Gear Compound 460
ECUBSOL	ECUBSOL Oel 8030	ECUBSOL Oel 8040	ECUBSOL Oel 8050	ECUBSOL Oel 8060	
Elf	REDUCTELF SP 100, ELF KASSILLA 100	REDUCTELF SP 150, ELF KASSILLA 150	REDUCTELF SP 220, ELF KASSILLA 220	REDUCTELF SP 320, ELF KASSILLA 320	REDUCTELF SP 460, ELF KASSILLA 460
Esso	SPARTAN EP 100	SPARTAN EP 150	SPARTAN EP 220	SPARTAN EP 320	SPARTAN EP 460
FINA	FINA GIRAN 100, FINA SATURNA MM 100	FINA GIRAN 150	FINA GIRAN 220, FINA SATURNA MM 220	FINA GIRAN 320, FINA SATURNA MM 320	FINA GIRAN 460, FINA SATURNA MM 460
Fuchs **DEA**	-	RENOLIN CLP 150 PLUS	RENOLIN CLP 220 PLUS	RENOLIN CLP 320 PLUS	RENOLIN CLP 460 PLUS
Gulf	Gulf EP Lubricant HD 100	Gulf EP Lubricant HD 150	Gulf EP Lubricant HD 220	Gulf EP Lubricant HD 320	Gulf EP Lubricant HD 460
KLÜBER	Klüberoil GEM 1-100	Klüberoil GEM 1-150	Klüberoil GEM 1-220	Klüberoil GEM 1-320	Klüberoil GEM 1-460
Mobil	Mobilgear XMP100	Mobilgear XMP150	Mobilgear XMP220	Mobilgear XMP320	Mobilgear XMP460
		Mobilgear SHC-XMP150 1)	Mobilgear SHC-XMP220 1)	Mobilgear SHC-XMP320 1)	Mobilgear SHC-XMP460 1)

1) = polyalphaolefine (synthetic lubricant)

Selection of Suitable Lubricants (continuation)

ISO-Viscosity-class to DIN 51 519	ISO VG 100	ISO VG150	ISO VG 220	ISO VG 320	ISO VG 460
MOLUB-ALLOY	MA 80	MA 85 / 814	MA 90	MA 120 / 690	MA 322
Optimol	OPTIGEAR 100	OPTIGEAR 150	OPTIGEAR 220	OPTIGEAR 320	OPTIGEAR 460
Shell	Shell Omala F 100	Shell Omala F 150	Shell Omala F 220	Shell Omala F 320	Shell Omala F 460
STATOIL	LoadWay EP 100	LoadWay EP 150	LoadWay EP 220	LoadWay EP 320	LoadWay EP 460
SUNOCO	SUNEP 1055 ISO 100	SUNEP 1060 ISO 150	SUNEP 1070 ISO 220	SUNEP 1090 ISO 320	SUNEP 1150 ISO 460
TEXACO	Meropa 100, Rando Oil HD E-100	Meropa 150, Rando Oil HD F-150	Meropa 220	Meropa 320	Meropa 460
TOTAL	TOTAL Carter EP 100	TOTAL Carter EP 150	TOTAL Carter EP 220	TOTAL Carter EP 320	TOTAL Carter EP 460
VALVOLINE	VALVOLINE WA 7	VALVOLINE WA 10	VALVOLINE WA 15	VALVOLINE WA 20	VALVOLINE WA 30
WISURA	WISURA Kineta 100	WISURA Kineta 150	WISURA Kineta 220	WISURA Kineta 320	WISURA Kineta 460

6.5 Lubricant maintenance

6.5.1 Notes on Changing Oil

- Since the stresses on the lubricant from internal and external factors and from the environment can differ widely, we recommend that the oil change intervals are based on the actual condition of the oil.
- Because of the stress on the lubricants from the running-in processes during commissioning the **first oil change** must be carried out as specified in the operating instructions.
- Subsequent oil change intervals depend on the results of tests (full inspection) of the lubricant as specified in "Lubricant Inspection".
- The lubricant must at all events be changed after three years (or after 20000 operating hours at the latest).

6.5.2 Lubricant Inspection

Full inspection

- It is advisable to have full inspections carried out by the lubricant manufacturer or an independent laboratory under the following conditions
- Presentation of test results
- Assessment of lubricant, including comparison with new oil (for this purpose the condition of the new oil must be documented: take a reference sample).
- Release for further use, with restriction as to inspection intervals if applicable.
- Recommendation as to oil change.

Routine Inspection

- If routine inspections are carried out by an in-house laboratory, the limit criteria listed in the following table can be consulted for assessment purposes. These values are non-committal empirical values and should not **on their own** be used to determine oil changes, for which a full analysis is recommended.

Lubricant Requirements

Lubricant type	Scheduled data (as new)	Lubricant Nominal value 1)	Lubricant Limit value	Inspection to
Kinematic viscosity at 40 °C in mm^2/s	corresponding	.....	± 20% 2)	DIN 51 562
Water content in %	below detection limit	.....	< 0,1%	DIN 51 777
Acid number in mg KOH/g	as advised by supplier	.....	± 50% 2)	ASTM 0 2896 DIN 51 558
Damage effect level 3)	≥ 12	.....	- 1 2)	CEC L-07-A-85DIN 51 354
Additive content: EP, AO	as advised by supplier	.....	Assessment by laboratory	Infrared-spectroscopy
Solid particle contamination 4)	below detection limit	.....	Assessment by user / manufacturer	Spectroscopy

Footnotes to table:

1) To be indicated by oil supplier

2) Deviation from fresh oil

3) Repeat test not generally necessary; test by determining the additive content.

4) "Abnormal" contamination is not permissible:
Note any Fe or Cu abrasion during the running inspection; continuous wear generally acceptable, any sudden change in level of wear is indicative of prior damage.
Consult RENK customer service.
An unusually high level of environmental contamination is unacceptable; if it cannot be avoided, then change oil.

Cons. no.	Trouble	Possible causes	Remedial actions
1	Lubricating oil temperature too high	No cooling water In adequate quantity of cooling water	Correct cooling water supply Increase cooling water supply
		Cooling water too hot	Check cooling water inlet and outlet temperature Check cooling water supply Clean oil cooler
		Air in the cooler	Vent the cooler
		Oil cooler contaminated	Clean oil cooler
		Temperature regulator deficient (if provided)	Check adjustment or renew governor
2	Lubricating oil temperature too low	Immersion heaters defective (if provided)	Switch on the immersion heaters, check thermostat and temperature limiter if necessary
		Heaters switches on too late (if provided)	Wait for oil to heat up Wait for pump to start Wait for main motor to start
		Gear unit has not yet reached service temperature	Wait
		Too much cooling water Cooling water too cold	Reduce cooling water supply
		Temperature regulator deficient (if provided)	Check adjustment or renew governor
3	Lubricating oil pressure too low	Filter contaminated	Switch off duplex filter Clean and/or change filter insert (as well the filter must be without pressure)
		Pressure limiting valve setting faulty	Set pressure limiting valve for correct oil pressure
		Pressure limiting valve defective	Repair valve Install new spring
		Suction line obstructed	Clean the suction line
		Pump draws air	Oil level too low (fill in oil if appropriate) Check suction line Correct faults (tighten up flange screws, if appropriate)

Cons. no.	Trouble	Possible causes	Remedial actions
3	Lubricating oil pressure too low	Oil foaming badly	Oil must be inspected, renew oil if appropriate
		Leakage in pressure line (at flange seats or pipes)	Tighten up flange screws or renew seals or change pipings
		Lubricating oil temperature too high	Proceed as indicated under that heading
		Oil viscosity too low	Check viscosity Fill in proper grade of oil (see lubricant chart under chapter 6)
		Pump defective	Repair pump
4	Lubricating oil pressure too high	Gear unit has not yet reached service temperature	Wait
		Lubricating oil lines at gear unit obstructed	Find obstruction and clean lines
		Oil viscosity too high	Check viscosity Fill in proper grade of oil (see lubricant chart under chapter 6)
5	Oil consumption too high	Oil leaking past drain plug Leakage from oil lines Leakage through gear casing joints	Tighten screws Seal the joint
		Leakage past gearshaft seals	Install new sealing rings (if provided)
		Leakage from cooler	Install new cooler cartridge
		Oil leakage from accessories (if provided)	Check accessories Correct faults
		Filter leaking	Seal filter
		Oil tank respectively gear casing leaking	Check oil tank respectively gear casing Correct faults

Cons. no.	Trouble	Possible causes	Remedial actions
6	Striking or increased filter residues	Piping dirty (scale, welding cinder)	Clean the pipings
		Teeth wear Bearings (antifriction bearings) damaged (steel, metal grey, magnetic)	Check the teeth Check the alignment Remove the defects, align gear unit anew (see chapter 5) Check bearings and replace them (demand for RENK specialist, possibly)
		If the reduction gear has plain bearings: Plain bearing damaged (white metal, white)	Check the bearings, repair or replace (demand for RENK specialist, possibly)
		Lubricating oil dirty	Change the oil (see chapter 4 and 6)
		Oil tank respectively gear casing dirty	Clean the oil tank Change the oil
		Pump damaged (steel, metal grey, magnetic)	Repair pump or new pump
7	Striking gear unit noises	Bearing and/or toothing damaged	Demand for RENK specialist and repair of parts
		Alignment bad	Check of alignment (see chapter 5)
		Foreign body in the gear unit	Eliminate foreign body, detect and eliminate damage

RENK	**Spare parts list - Gear unit** for gear unit- type **KPBV 160**			Assembly drawing no.: 2065873/0				Code name Order-no.	**IRSAB / Iran** **80127657**
Pos.-no.	List-no.	Denomination	Drawing-no. Material- no.	Dimensions	Norm Make	Pcs.	Unit weight kg	Delivery approx.	Note
GROUP I	**Absolutely recommended spare parts** (at putting into service)								
GROUP II	**Recommended spare parts** (for < 2 years)								
1160		Guide bearing	2051004/1			1		6 months	
1605		Round rubber ring	428 6000 506	Ø 6 x 2040	ZAN 17410	1	< 1		
1613		Round rubber ring	428 6000 506	Ø 6 x 1580	ZAN 17410	1	< 1		
1624		Round rubber ring	428 6000 506	Ø 6 x 800	ZAN 17410	1	< 1		
2501		Tappered roller bearing	2042343			1 pair	214	10 months	
2502		Self aligning roller bearing	632 4290 050		DIN 635	1	125	10 months	
2503		Cylindrical roller bearing	1107080		DIN 5412	1	31,5	10 months	
2504		Tappered roller bearing	1102782			1 pair	84,5	10 months	
2505		Self aligning roller bearing	2045629		DIN 635	3	81,5	10 months	
2506		Self aligning roller bearing	2063011		DIN 635	12	40	10 months	

RENK	Spare parts list - Gear unit for gear unit- type **KPBV 160**			Assembly drawing no.: 2065873/0				Code name Order-no.	**IRSAB / Iran** **80127657**
Pos.-no.	List-no.	Denomination	Drawing-no. Material- no.	Dimensions	Norm Make	Pcs.	Unit weight kg	Delivery approx.	Note
2507		Axial self aligning roller bearing	1101 651		DIN 728	1	2,4	10 months	
2601		Axial bearing block	2069593/2		WWN 31502	6	246	10 months	
2602		Axial bearing block	2069594/2		WWN 31502	6	246	10 months	
2603		Axial bearing block with bore for temperature sensor	2069595/2		WWN 31502	2	246	10 months	
2604		Axial bearing block with bore for temperature sensor	2069596/2		WWN 31502	2	246	10 months	
6501		Oil level indicator with packing ring	6975900514		ZAN 15320	1	2	6 weeks	
6601		Air vent with packing ring	694800203 6561900713		ZAN 15317	2	1	6 - 8 weeks	
8501		Acceleration pick-up	2064999/4		PCB / IMI	2(6)	2	6 - 8 weeks	
2701 2702		Flexible Compress. Sleeve Coupling	from 2067332/4			1 set	5	6 - 8 weeks	
GROUP III		**Conditionaly recommended spare parts** (for > 2 years)							
1225		Annulus 1	2062847/2			1	780	9 months	
1230		Annulus 2	2062848/2			1	1170	9 months	
1620		Bevel pinion shaft	2065822/1			1	1031	9 months	

RENK	Spare parts list - Gear unit for gear unit- type **KPBV 160**			Assembly drawing no.: 2065873/0				Code name Order-no.	**IRSAB / Iran** **80127657**
Pos.-no.	List-no.	Denomination	Drawing-no. Material- no.	Dimensions	Norm Make	Pcs.	Unit weight kg	Delivery approx.	Note
1801		Bevel wheel shaft	2062844/1			1	605	9 months	
1802		Bevel wheel hub	2062976/1			1	591	9 months	
1810		Bevel gear rim	2065823/1			1	690	9 months	
2010		Sun pinion 1	2062828/2			1	106	9 months	
2110		Planetary bolt 1	2062974/2			3	110	9 months	
2115		Planet gear 1	2062845/2			3	282	9 months	
2151		Planetary carrier 1	2062840/0			1	1740	9 months	
2152		Coupling shaft	2062127/2			1	530	9 months	
2210		Planetary bolt 2	2062975/2			6	164	9 months	
2215		Planet gear 2	2062846/2			6	168	9 months	
2240		Sun pinion 2	2062829/2			1	314	9 months	
2249		Planetary carrier 2	2062977/0			1	2678	9 months	
2701		ELCO Coupling part 1	2067332/4			1	433	6 months	
2702		ELCO Coupling part 2	2067332/4			1	580	6 months	weight incl. transmission elements

RENK	**Spare parts list - Oil system** for gear unit- type **KPBV 160**			Oil Circuit Scheme, Technical Data Oil System 2067184/0, 2067185/4				Code name **IRSAB / Iran** Order-no. **80127657**	
Pos.-no.	List-no.	Denomination	Drawing-no.	Dimensions	Norm Make	Quantity recom. (exist)	Unit weight kg	Delivery approx.	Note
GROUP I	**Absolutely recommended spare parts** (at putting into service)								
7907 (5103)	53a	Filter insert for maintenance circuit oil filter	from 2054666/4		Internormen	3 (1)	2	2 months	
GROUP II	**Recommended spare parts** (for < 2 years)								
5101	1	Oil pump	2055063/4		Rickmeier	1	100	3 - 4 months	
5101	2	Motor	2068895/4		ABB	1	308	2 - 3 months	
5101	3a	Filter insert - duplex-oil filter	from 2049639/4		Internormen	1	4	2 months	
5101	3b	Dirt indication - filter	from 2049639/4		Internormen	1	1	1 month	
5101	4	Tubestack parts - cooler	from 2068898/4		HS Cooler	1	105	3 months	
5101	4	Gasket - cooler	from 2068898/4		HS Cooler	1 set	4	3 months	
5110	5	Remote-Thermometer (electronical digital-thermometer)	2062410/4		Sika	1	1	10 weeks	
5101	8	Pressure limiting valve with integrated relief valve	2054661/4		Rickmeier	1	16	8-10 weeks	

RENK	**Spare parts list - Oil system** for gear unit- type **KPBV 160**			Oil Circuit Scheme, Technical Data Oil System 2067184/0, 2067185/4				Code name **IRSAB / Iran** Order-no. **80127657**	
Pos.-no.	List-no.	Denomination	Drawing-no.	Dimensions	Norm Make	Quantity recom. (exist)	Unit weight kg	Delivery approx.	Note
5101	9	Pressure gauge	6967800104 (2044725/4)		WIKA	1	1	8 weeks	
5532	13	Resistance thermometer	2044726/4		Herth	1	1	10 weeks	
5555	15	Pressure switch	2059146/4		Danfoss	1	1	10 weeks	
5560	16	Pressure switch	2059146/4		Danfoss	1	1	10 weeks	
5110	17b	Temperature limiter with reset button	2057323/4		Danfoss	1(2)	1	10 weeks	
5101	18	Resistance thermometer	2057324/4		Danfoss	1	1	10 weeks	
8115	19	Level - control	2059607/4		Endress + Hfromer	1	1	> 12 weeks	
5556	20	Pressure gauge	6967800103 (2044725/4)		WIKA	1	1	8 weeks	
8201	21	Resistance thermometer	2026328/4		Herth	1(4)	1	6 - 8 weeks	
6501	22	Oil level indicator	6975900514		ZAN 15320	1	1	6 - 8 weeks	
6601	23	Air vent	6948000203		ZAN 15 317	1	1	6 - 8 weeks	
6601	25	Air vent	6948000203		ZAN 15 317	1	1	6 - 8 weeks	

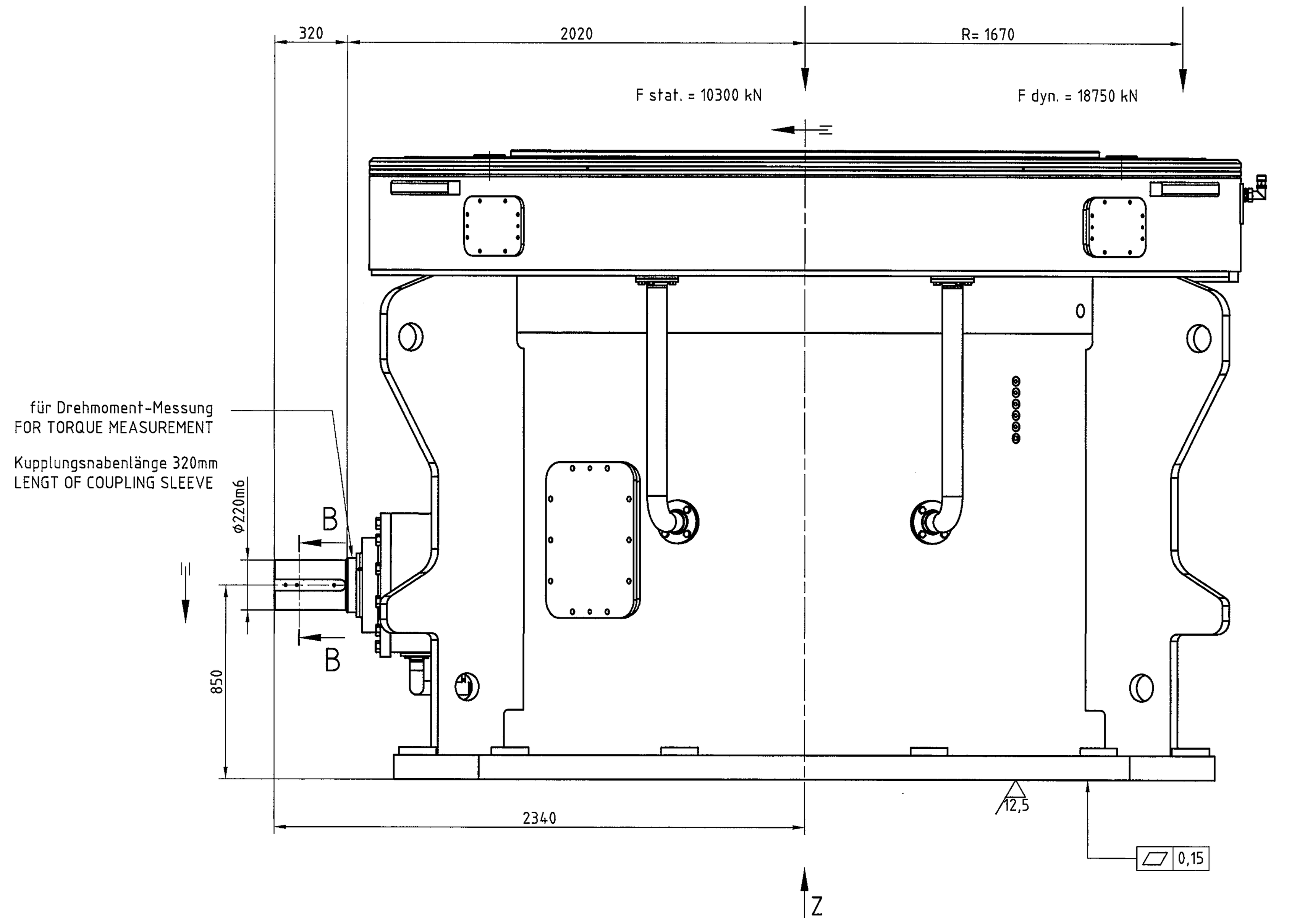
RENK	**Spare parts list - Oil system** for gear unit- type **KPBV 160**	Oil Circuit Scheme, Technical Data Oil System 2067184/0, 2067185/4	Code name **IRSAB / Iran** Order-no. **80127657**

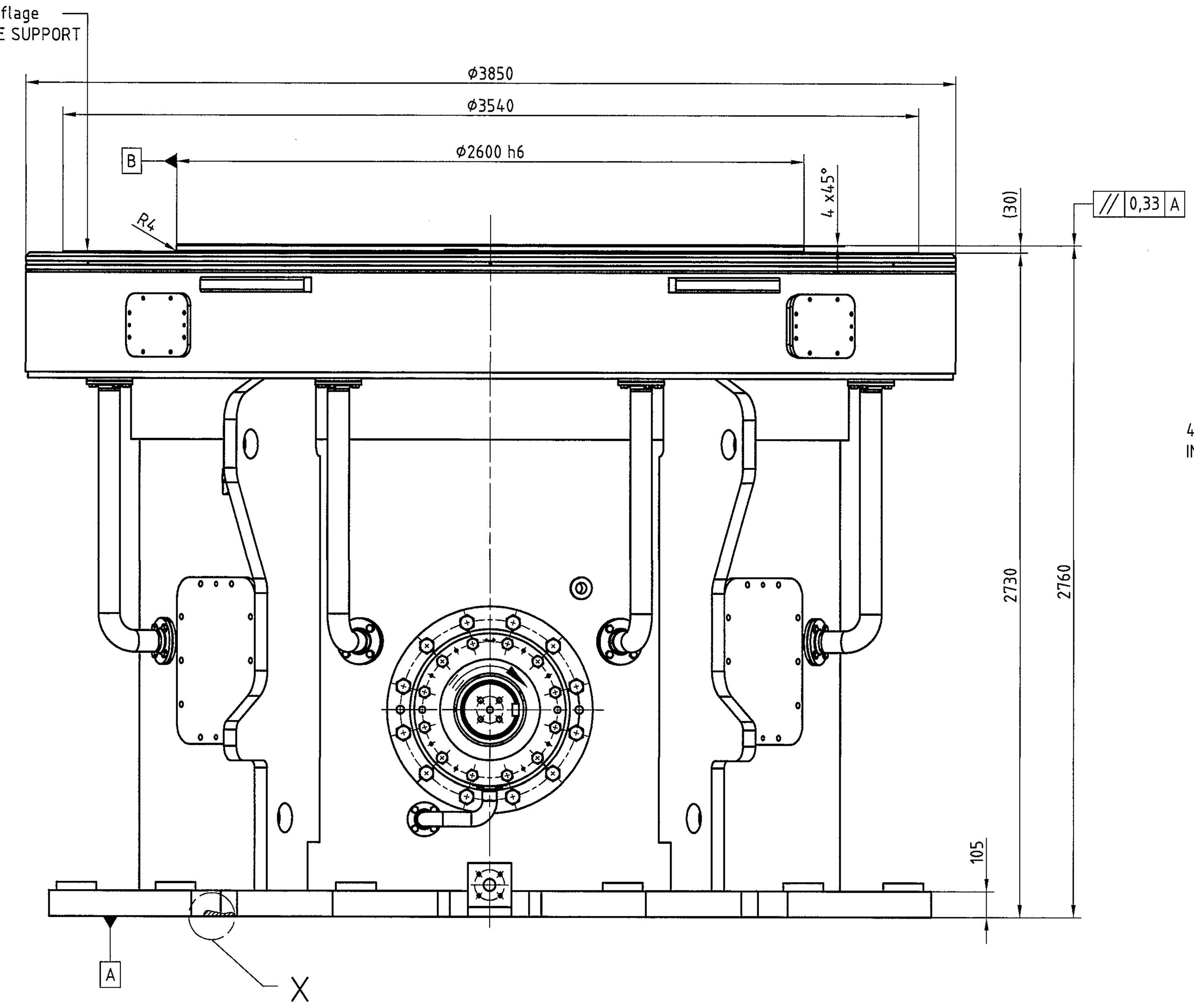
Pos.-no.	List-no.	Denomination	Drawing-no.	Dimensions	Norm Make	Quantity recom. (exist)	Unit weight kg	Delivery approx.	Note
5582	29	Remote-Thermometer (electronical digital-thermometer)	2062409/4		Sika	1	1	10 weeks	
5101	31	Four-bank high pressure oil pump	2047143/4		Heilmeier und Weinlein	1(4)	22	3 - 4 months	
5101	32	Motor	2068896/4		ABB	1(4)	137	2 - 3 months	
5101	34	Pressure transmitter	2057493/4		Danfoss	4(16)	2	10 weeks	
7904	37	Pressure gauge-measuring box	2801095/4		Stauffenberg	1	< 1	10 weeks	
5101	38	Pressure limiting valve (relief valve)	2044728/4		Heilmeier und Weinlein	3(16)	3	8 weeks	
5101	40	Temperature regulating valve	2055868/9 2055865/4		MVA	1	32	10 weeks	
5101	48	Temperature switch	2057324/4		Danfoss	1	1	10 weeks	
5101	51	Oil pump	2062335/4		Rickmeier	1	15	3 - 4 months	
5101	52	Motor	2068897/4		ABB	1	45	2 - 3 months	
5101	53b	Dirt indicator - filter	from 2054666/4		Internormen	1	26	1 month	
5101	54	Pressure gauge	6967800104 (2044725/4)		Wika	1	1	8 weeks	
5101	56b	Limit switch for shutoff valve	2060053/4		Turck	1	1	10 weeks	

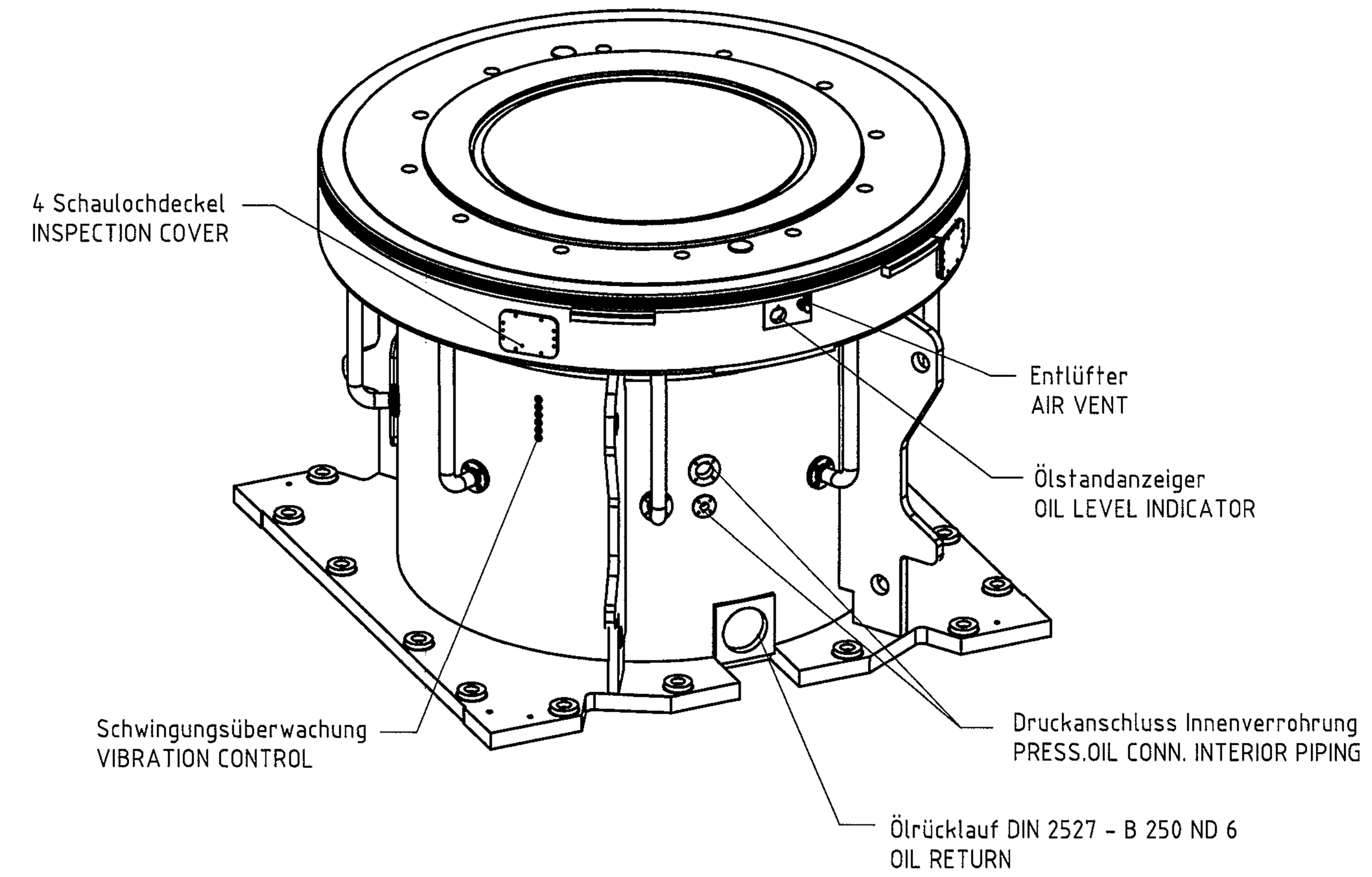
RENK	**Spare parts list - Oil system** for gear unit- type **KPBV 160**			Oil Circuit Scheme, Technical Data Oil System 2067184/0, 2067185/4				Code name **IRSAB / Iran** Order-no. **80127657**	
Pos.-no.	List-no.	Denomination	Drawing-no.	Dimensions	Norm Make	Quantity recom. (exist)	Unit weight kg	Delivery approx.	Note
5101	58b	Limit switch for shutoff valve	2060053/4		Turck	1	1	10 weeks	
5101	59	Pressure limiting valve	2062341/4		Rickmeier	1	7	6 - 8 weeks	
8501	510	Acceleration sensor	2064999/4		PCB / IMI	2(6)	1	10 weeks	
GROUP III		**Conditionaly recommended spare parts** (for > 2 years)							
5101	3	Duplex oil filter, compl.	2049639/4		Internormen	1	150	2 months	
5101	4	Oil cooler, compl.	2068898/4		HS Cooler	1	144	3 months	
5101	7	Non return valve	2055405/4		Convey	1	7	6 - 8 weeks	
5610	12	Non return valve	6721008650 (2055818/4)		Gestra	1	< 2	6 - 8 weeks	
5101	17a	Immersion heater	2052323/4		Helios	2(4)	6	10 weeks	
6802	24	Oil drain valve (ball valve)	2048244/4		MVA	1	3	6 - 8 weeks	
6853	26	Oil drain valve (ball valve)	2049634/4		MVA	1	7,2	6 - 8 weeks	
6301	35	Non return valve	2060926/9		Ermeto	3(16)	2	6 - 8 weeks	

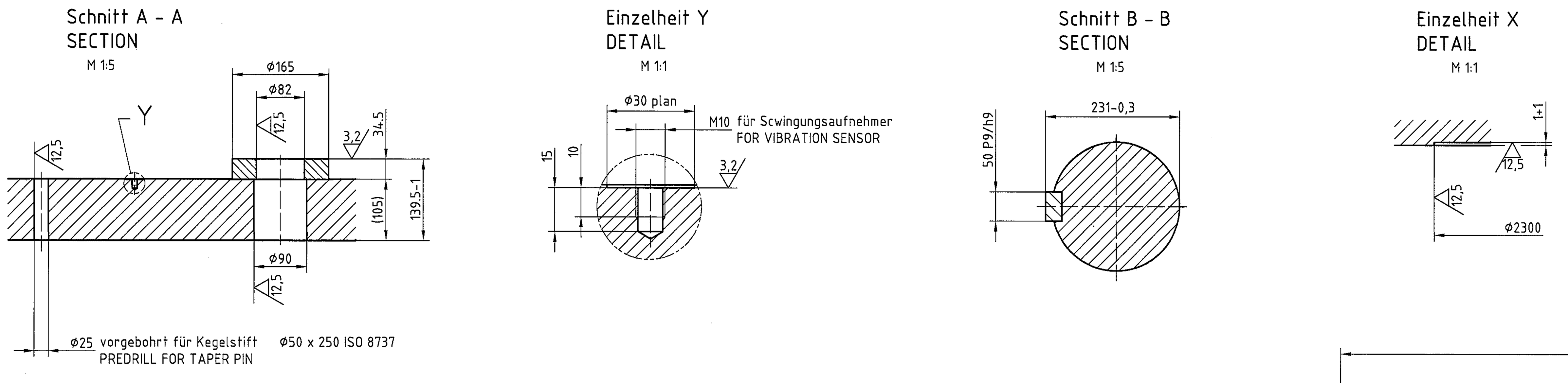
RENK	**Spare parts list - Oil system** for gear unit- type **KPBV 160**			Oil Circuit Scheme, Technical Data Oil System 2067184/0, 2067185/4				Code name **IRSAB / Iran** Order-no. **80127657**	
Pos.-no.	List-no.	Denomination	Drawing-no.	Dimensions	Norm Make	Quantity recom. (exist)	Unit weight kg	Delivery approx.	Note
5101	53	Oil filter (maintenance circuit), compl.	2054666/4		Internormen	1	17	2 months	
5101	56a	Shutoff valve (butterfly valve)	2055850/9 (2055817/4		END - Armaturen	1	4	6 - 8 weeks	
5101	58a	Shutoff valve (butterfly valve)	2052577/9 (2052576/4)		END - Armaturen	1	2	6 - 8 weeks	

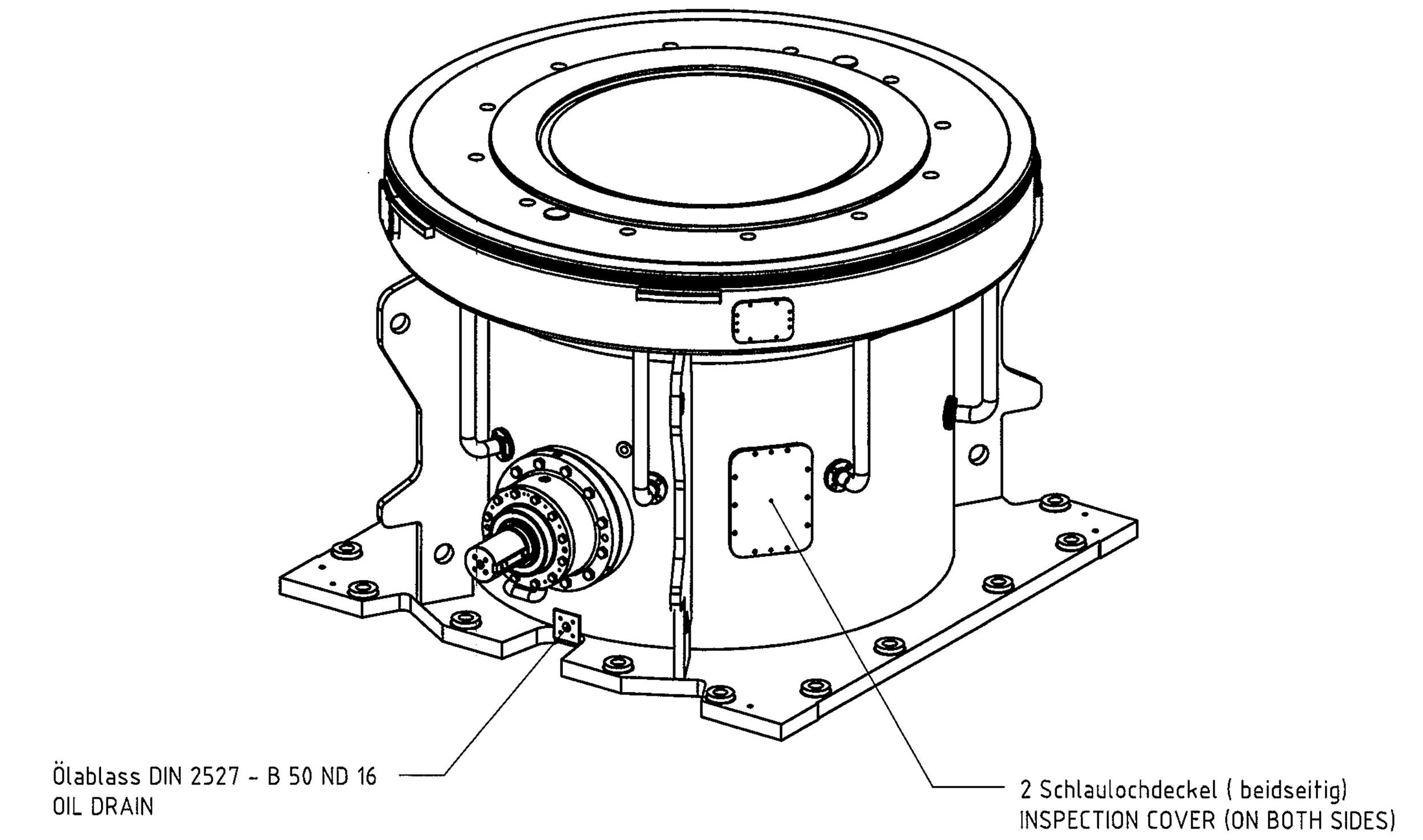
Passmaß
Abmaße
Änd.-Zust.
Buchstabe kommt vor
Beschreibung der Änderung
Datum
gepr.
A
Hauptmotor bekannt, Drehwellenschalter nach Angaben RH
21.11.05
Hdr
Hilfstrieb zum Langsamdrehen von Getriebe und Muehle
AUXILIARY DRIVE FOR SLOW TURNING OF GEAR AND MILL
2340 bis Mitte Getriebe
2340 UP TO CENTER OF GEAR UNIT
2723
970
4325
ø80 H7/m6
ø55 H7/m6
585
350
325
260
255
95
35
250
35
ø160 H7/m6
ZAN 12207
ø200 H7/m6
DIN 6885
2722
2721
ø200 H7/m6
DIN 6885
ø220 H7/m6
DIN 6885
320
320
4.5
ø880
X
Hauptmotor, ELIN EBG Typ: HRR-010 Z06
(gehoert nicht zum RENK - Lieferumfang)
P = 4100 kW; n = 990 min⁻¹
MAIN MOTOR (NOT INCLUDED IN RENK 'S SCOPE OF SUPPLY)
Getriebe
Gear unit
350
2706
2704
2705
2702
2701
470
550
348
757
109
200
100
580
ø18
Schaltbare Ueberholkupplung mit schraegen Zaehnen
Fabr. RENK HANNOVER, Groesse 18+PFB; Tmax.=55 kNm
OVERRUNNING CLUTCH WITH OBLIQUE TEETH, MAKE RENK HANNOVER, SIZE 18+PFB
ELCO- Kupplung, Fabr. RENK HANNOVER, Groesse 378 NSOHU
ELCO- COUPLING, MAKE RENK HANNOVER
2707
Ansicht X
VIEW X
ELCO- Kupplung, Fabr. RENK HANNOVER, Groesse 214 NSOMU
ELCO- COUPLING, MAKE RENK HANNOVER
Kegelstirnradgetriebe (Hilfsantrieb), Typ: K3-360
n = 1486/21,1 min⁻¹ ; i = 70,404; n Mühle = 0,47 min⁻¹
BEVEL CYLINDRICAL GEAR (AUXILIARY DRIVE)
n = 1486/21,1 min⁻¹ ; i = 70,404; n MILL = 0,47 min⁻¹
Tauchschmierung / SPLASH LUBRICATION: ISO VG 320
Oelmenge im Getriebe/OIL QUANTITY IN THE GEARBOX: 108 l
Gewicht / GEARBOX WEIGHT: 1600 kg
Drehwellenschalter (zum Schalten der Ueberholkupplung)
pneumatisch betaetigt, mit Fernbedingung
Fabr. RENK HANNOVER, Groesse 18 PFB; G = 440 kg
Elektrische Anschlusswerte:
Magnetventil u. Endtaster: 48V DC
OPERATING DEVICE (FOR OPERATING OF OVERRUNING CLUTCH)
PNEUMATICALLY ACTUATED, WITH REMONTE CONTROL
MAKE RENK HANNOVER, SIZE 18 PFB; G = 440 KG
ELECTRIC CONNECTION VALUES:
SOLENOID VALVES AND LIMIT SWITCH: 48V DC
E- Motor (Hilfsantrieb), Fabr. , Typ
(gehoert nicht zum RENK - Lieferumfang)
P = 110 kW; n = 1486 min⁻¹ ; 400V; 50 Hz
E- MOTOR (AUXILIARY DRIVE), MAKE , TYPE
(NOT INCLUDED IN RENK 'S SCOPE OF SUPPLY)
2711
2710
400
340
480
50
325
ø33
1320
Getriebefuss
GEAR UNIT PEDESTAL
Schutzvermerk ISO 16016 beachten
CAD-Zeichnung darf nicht manuell geändert werden
IRSAB / Iran
Verwendungsbereich Typ
KPBV 160
80 127 657
Tolerierung ISO 8015
Allg.Tol. ISO 2768-mK
Oberfl. DIN ISO 1302
Maßstab 1:10
Gewicht kg
Werkst. Halbz.
Benennung
LAGEPLAN
SITE PLAN
Bearb. 02.06.2005 Cosoreanu
Gepr. 08.06.2005 eh-719
Norm
B 660 war 740 17.02.06 Hdr
A s.o. 21.11.05 Hdr
Zust. Änderung Datum Name
Zeichn.-Nr.
2065983/1
Blatt
Entst. aus 2063915/1
erstellt mit AutoCAD
VERFILMT

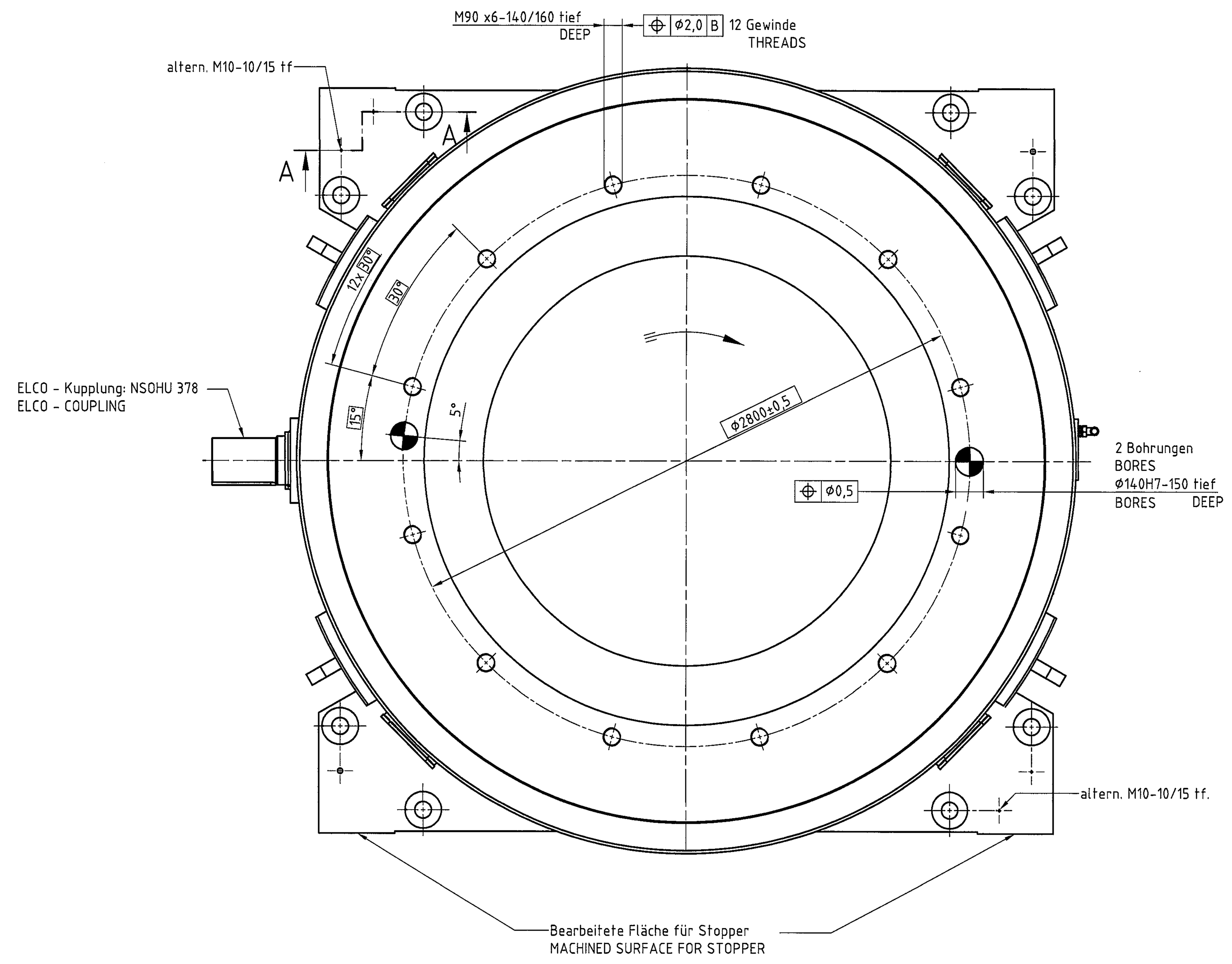


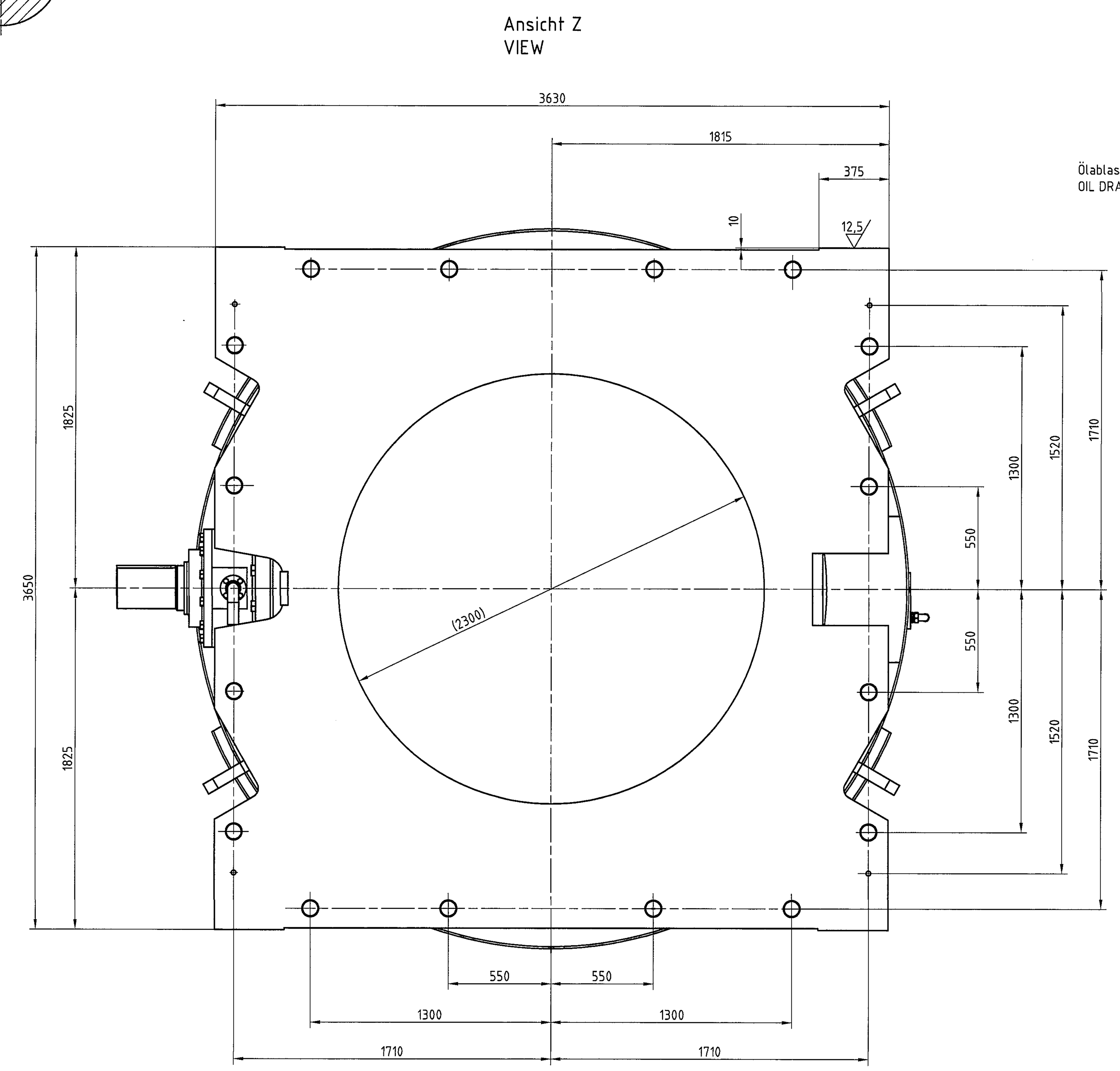












E - Motor / Rollenmühle
ELECTRIC MOTOR / ROLLER MILL

P= 4100 kW (Getriebedauerleistung)
(CONT.GEAR BOX POWER)

n_1 = 990 min⁻¹ → $n_1 = 990\ min^{-1}$

$n_2 = 22,10\ min^{-1}$

i = 44,79

AGMA SF >= 2,5

Ölviskosität: CLP-Oil ISO VG 320
OIL VISCOSITY:

Ölmenge im Tank: ca. 3150 l
OIL QUANTITY IN TANK:

Ölmenge im Axiallagerraum: ca. 1450 l
OIL QUANTITY IN AXIAL BEARING SPACE:

Ölmenge im Gehäuse Unterteil: 1150 l
OIL QUANTITY IN CASE BOTTOM PART:

Gesamtölmenge: ca. 6600 l
TOTAL OIL QUANTITY:

Öldruck bei Betriebstemperatur 50°: 1-2 bar
OIL PRESSURE AT OPERATING TEMPERATURE

Gesamtgewicht: ca. 76,4 t
TOTAL WEIGHT

IRSAB | Iran | Polysius MILL TYPE RMR 60/29

Verwendungsbereich Typ: KPBV 160

80 127 657

Tolerierung ISO 8015
Allg.Tol. ISO 2768-mK
Oberfl. DIN ISO 1302

	Datum	Name
Bearb.	09.06.2005	Wm
Gepr.	10.06.2005	Heidenreich
Norm.		

Maßstab 1:15 (1:1, 1:5)

EINBAUZEICHNUNG
INSTALATION DRAWING

Zeichn.-Nr. 2065851/0

A Ölmenge 23.01.06

RENK

Schutzvermerk ISO 16016 beachten

CAD-Zeichnung darf nicht manuell geändert werden

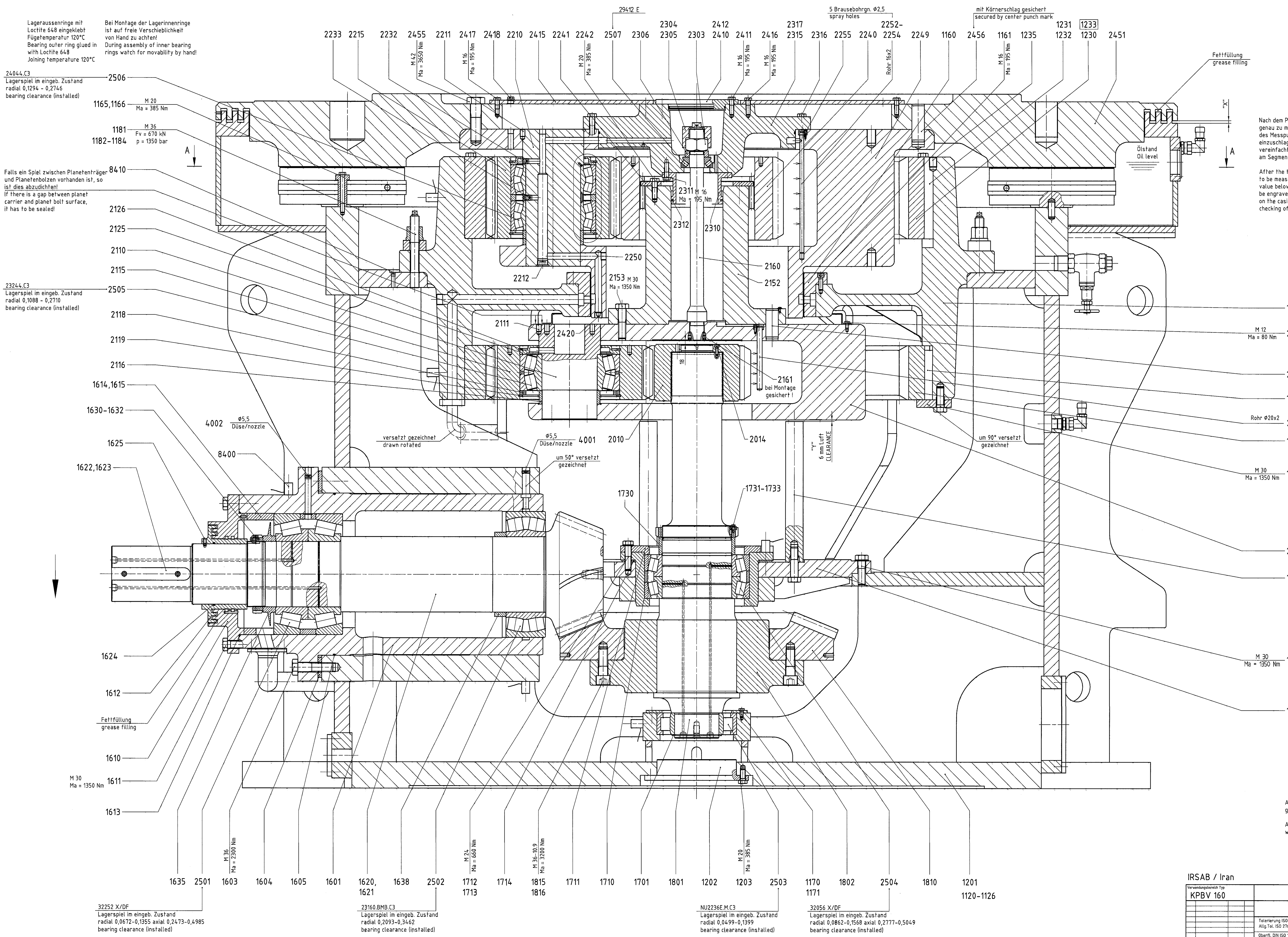
erstellt mit AutoCAD

Passmaß	Abmaße

Änd.-Zust.	Buchstabe kommt vor	Beschreibung der Änderung	Datum	gepr.

Lageraussenringe mit Loctite 648 eingeklebt
Fügetemperatur 120°C
Bearing outer ring glued in with Loctite 648
Joining temperature 120°C

Bei Montage der Lagerinnenringe ist auf freie Verschieblichkeit von Hand zu achten!
During assembly of inner bearing rings watch for movability by hand!



29412 E
5 Brausebohrgn. Ø2,5
spray holes
mit Körnerschlag gesichert
secured by center punch mark
2233 2215 2232 2455 2211 2417 2418 2210 2415 2241 2242 2507 2306 2304 2305 2303 2412 2410 2411 2416 2317 2315 2316 2255 2240 2252- 2254 2249 1160 2456 1161 1235 1231 1232 1233 1230 2451
M 42 Ma = 3650 Nm
M 16 Ma = 195 Nm
M 20 Ma = 385 Nm
Rohr 16x2
Fettfüllung
grease filling
24044.C3
Lagerspiel im eingeb. Zustand
radial 0,1294 - 0,2746
bearing clearance (installed)
2506
1165,1166 M 20 Ma = 385 Nm
1181 M 36 Fv = 670 kN
1182-1184 p = 1350 bar
A
Falls ein Spiel zwischen Planetenträger und Planetenbolzen vorhanden ist, so ist dies abzudichten!
If there is a gap between planet carrier and planet bolt surface, it has to be sealed!
8410
2126
2125
2110
2115
23244.C3
Lagerspiel im eingeb. Zustand
radial 0,1088 - 0,2710
bearing clearance (installed)
2505
2118
2119
2116
1614,1615
1630-1632
4002 Ø5,5 Düse/nozzle
1625
8400
1622,1623
1624
1612
Fettfüllung
grease filling
1610
M 30 Ma = 1350 Nm 1611
1613
Ölstand
Oil level
"X"
2311 M 16 Ma = 195 Nm
2312 2310
2250
2212
2153 M 30 Ma = 1350 Nm
2160
2152
2111
2420
18
2161 bei Montage gesichert!
versetzt gezeichnet
drawn rotated
Ø5,5 Düse/nozzle 4001
2010
2014
um 50° versetzt gezeichnet
"Y" 6 mm Luft CLEARANCE
um 90° versetzt gezeichnet
1730
1731-1733
1220, 1228
M 12 Ma = 80 Nm 2105-2106
2154-2156
1226,1227
Rohr Ø20x2 2157, 2158 4 Brausebohrgn. Ø4 spray holes
1225
M 30 Ma = 1350 Nm 1240,1241
2151
1744, 1745
M 30 Ma = 1350 Nm 1741,1742
1740
M 36 Ma = 2300 Nm
M 24 Ma = 660 Nm
M 36-10.9 Ma = 3200 Nm
M 20 Ma = 385 Nm
1635 2501 1603 1604 1605 1601 1620, 1621 1638 2502 1712 1713 1714 1815 1816 1711 1710 1701 1801 1202 1203 2503 1170 1171 1802 2504 1810 1201 1120-1126
32252 X/DF
Lagerspiel im eingeb. Zustand
radial 0,0672-0,1355 axial 0,2473-0,4985
bearing clearance (installed)
23160.BMB.C3
Lagerspiel im eingeb. Zustand
radial 0,2093-0,3462
bearing clearance (installed)
NU2236E.M.C3
Lagerspiel im eingeb. Zustand
radial 0,0499-0,1399
bearing clearance (installed)
32056 X/DF
Lagerspiel im eingeb. Zustand
radial 0,0862-0,1568 axial 0,2777-0,5049
bearing clearance (installed)

Nach dem Probelauf ist der Abstand "X" genau zu messen und der Wert unterhalb des Messpunktes an das Gehäuse sichtbar einzuschlagen. Dieser Wert dient zum vereinfachten Prüfen der Abnützung am Segmentlager.

After the test run distance "X" is to be measured accurately and the value below the measuring point is to be engraved at a clearly visible place on the casing. This value is to simplify checking of the wear of the axial bearing.

▭ = Nacharbeit
= supplementary working

Alle innenliegenden Schraubenverbindungen gesichert mit Loctite 243 nach ZAN 11525,

All internal screw connections ensured with Loctite 243 as per ZAN 11525

IRSAB / Iran

Verwendungsbereich Typ KPBV 160		80 127 657
	Tolerierung ISO 8015 Allg.Tol. ISO 2768-mK	Maßstab 1:5 · Gewicht 76400 kg
	Oberfl. DIN ISO 1302	Werkst. Halbz. Roht.-Nr. Rohm. Mod.- Ges.-Nr.
	PRORED · Datum · Name Bearb. · 18.06.2005 · Mayer Gepr. · 10.05.2006 · Heidenreich Norm	Benennung **Zusammenstellung** Assembly drawing
A · siehe Bl.2 · 10.05.06 · Hdr Zust. · Änderung · Datum · Name	RENK	Zeichn.-Nr. 2065873/0 · Blatt 1 · 2 Bl.
		Entst. aus 2062967/0 · Ers. für

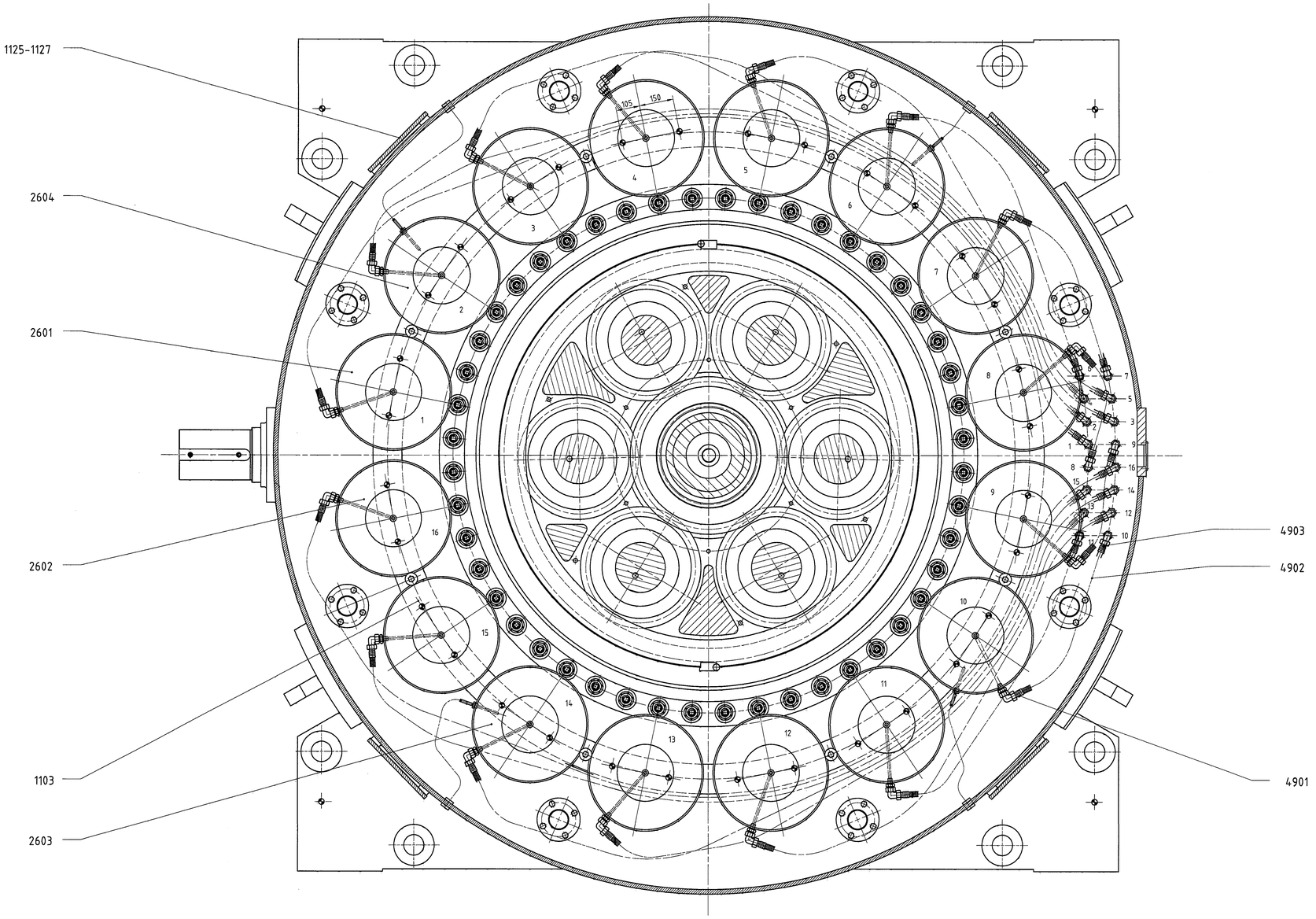
CAD-Zeichnung darf nicht manuell geändert werden

erstellt mit AutoCAD

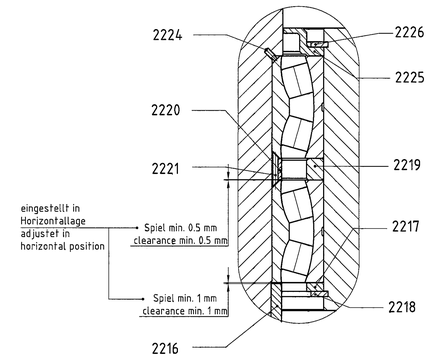
Passmaß	Abmaße

Änd.-Zust.	Buchstabe kommt vor	Beschreibung der Änderung	Datum	gepr.
A		Gleitschuhe mit 105/150	11.05.06	Hdr

Schnitt A - A
Section



Einzelheit X
Detail
M 1:2,5



Alle innenliegenden Schraubenverbindungen gesichert mit Loctite 243 nach ZAN 11525,

All internal screw connections ensured with Loctite 243 as per ZAN 11525

IRSAB / Iran

Verwendungsbereich Typ		80 127 657
KPBV 160		
	Toleranzen ISO 8015 Allg.Tol. ISO 2768-mK	Maßstab 1:7,5 (1:2,5) Gewicht 76400 kg Werkst. Halbz. Roh.-Nr. Roho.
	Oberfl. DIN ISO 1302	Mod.-Ges.-Nr.
	PROREG Datum Name Bearb. 18.06.2005 Mayer Gepr. 11.05.2006 Heidenreich Norm	Benennung Zusammenstellung Assembly drawing
A siehe oben 11.05.06 Wm Zust. Änderung Datum Name	RENK	Zeichn.-Nr. 2065873/0 Blatt 2 Ers.für 2062967/0 Ers.f. 2 Bl.

Schutzvermerk ISO 16016 beachten

CAD-Zeichnung darf nicht manuell geändert werden

Wälzlager	Bearings	137 l/min
Kegelradbrause	Bevel gear spray	32 l/min
Sonnenritzelbrause 1	Sun pinion spray 1	97 l/min
Sonnenritzelbrause 2	Sun pinion spray 2	95 l/min
Hohlradbrause 2	Ring gear spray 2	37 l/min
Kupplungsverzahng. Abtrieb	Coupling teeth output	10 l/min
Axial-Gelenklager	Axial ball and socket point	2 l/min
Radialgleitlager	Radial plan bearing	1 l/min
Axiallager HD-Pumpen	Axial thrust bearing HD-pumps	133 l/min
Axiallager Zusatzschmierung	Axial thrust bearing additionallubrication	177 l/min
Gesamt	Total	720 l/min

Verwendungsbereich Typ: KPBV 160

80 127 657

Tolerierung ISO 8015
Allg.Tol. ISO 2768-mK
Oberfl. DIN ISO 1302

Maßstab 1:10 (1:5, 1:2,5)

Bearb. 25.06.2005
Gepr. 27.06.2005

Innenrohrplan
INNER PIPING SCHEME

Zeichn.-Nr. 2065987/0

Blatt 1 / 2 Bl.

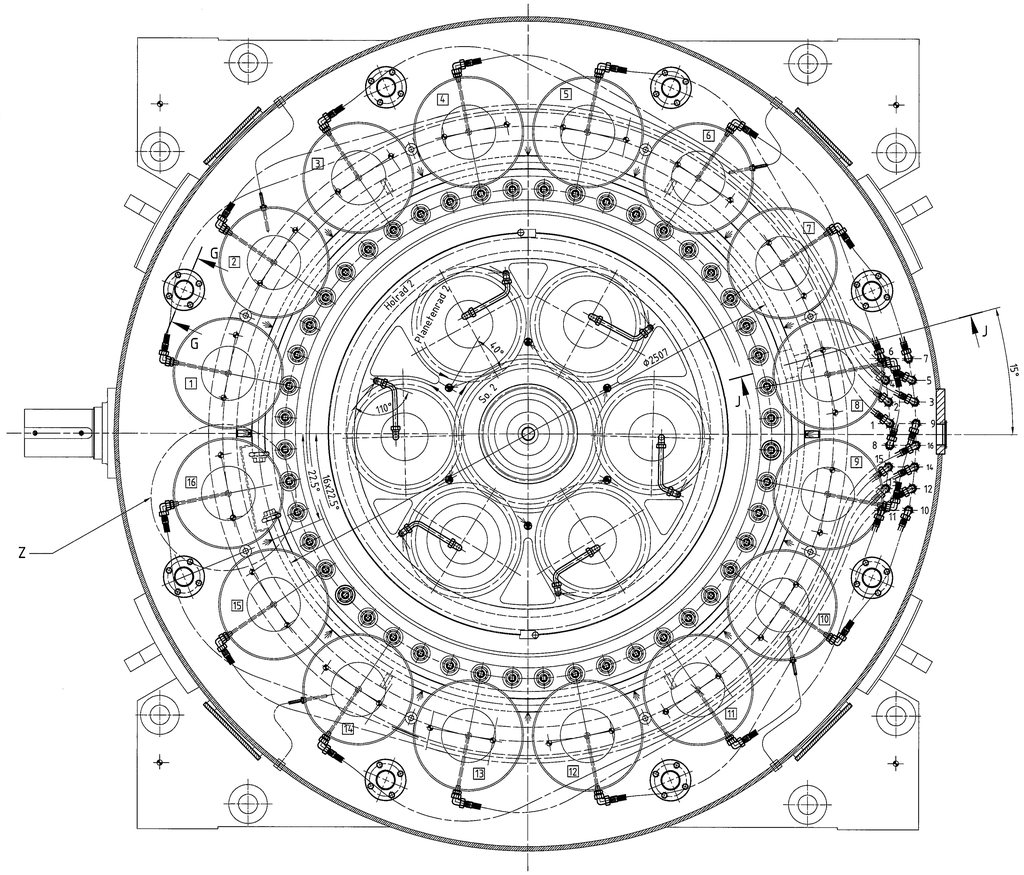
Ersatz für: 2065985/0

erstellt mit AutoCAD

Passmaß	Abmaße

Änd-Zust.	Buchstabe kennzeichnet vor	Beschreibung der Änderung	Datum	gegr.

Schnitt F-F
SECTION

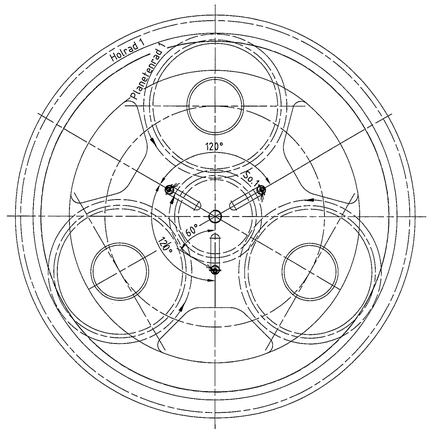


Schnitt G-G
SECTION

Einbaulage beachten
ATTENTION MOUNTING POSITION

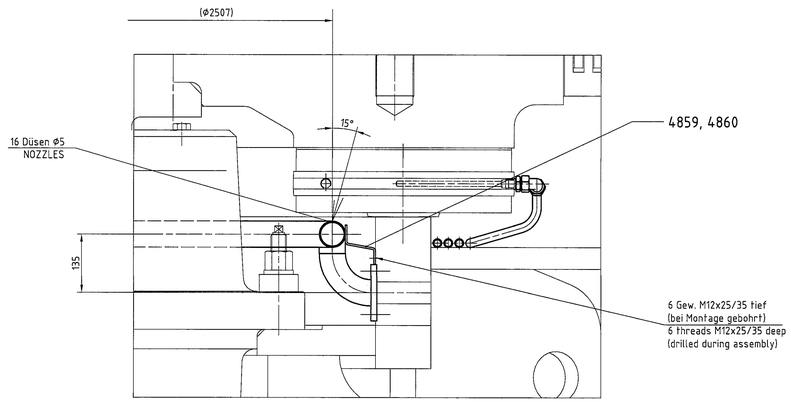
Schnitt C-C
SECTION

Planetenstufe 1
STAGE OF PLANETARY 1



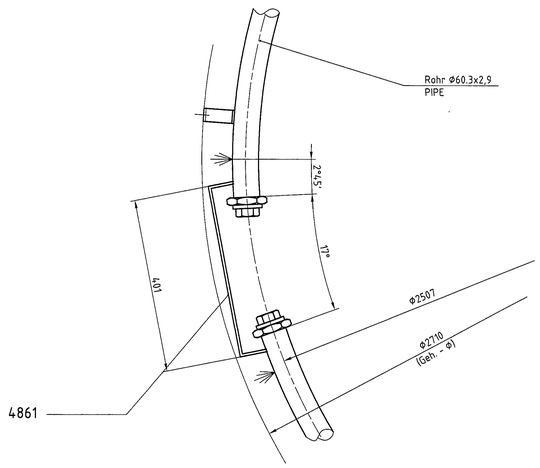
Schnitt J-J
SECTION

M 1:5



Einzelheit Z
DETAIL

M 1:5



Rohrleitungen bei Bedarf erschütterungsfrei abgestützt
OIL PIPES TO BE SUPPORED RESILIENTLY IF NEEDED

Alle innenliegenden Schraubverbindungen
gesichert mit LOCTITE 243 nach ZAN 11525

ALL INTERNAL SCREW CONNECTIONS ENSURED
WITH LOCTITE 243 AS PER ZAN 11525

Kantus DIN 6784

Schutzvermerk ISO 16016 beachten

CAD-Zeichnung darf nicht manuell geändert werden

Verwendungsbereich Typ KPBV 160			80 127 657
Toleranzierung ISO 8015 Allg.Tol. ISO 2768-mK		Maßstab 1:10 (1:5,)	Gewicht kg
Oberfl. DIN ISO 1302		Werkst.-Halbz. Rohl.-Nr. Rohm. Mod.-Ges.-Nr.	
PRÜFED Datum Name		Benennung	Innenrohrplan INNER PIPING SCHEME
Bearb. 25.06.2005 Ro			
Gepr. 27.06.2005 eh-719			
Norm		Zeichn.-Nr.	2065987/0
Zust. Änderung Datum Name	RENK	Blatt 2 / 2 Bl.	
		Ers.für 2065985/0	Ers.d.

erstellt mit AutoCAD

Passmaß	Abmaße

Änd.-Zust.	Buchstabe kannt vor	Beschreibung der Änderung	Datum	gepr.
A		Geräteschrank versetzt.	08.11.05	Hdr

M10 - 12/15 tief
(6 x 60° = 360°)

8180

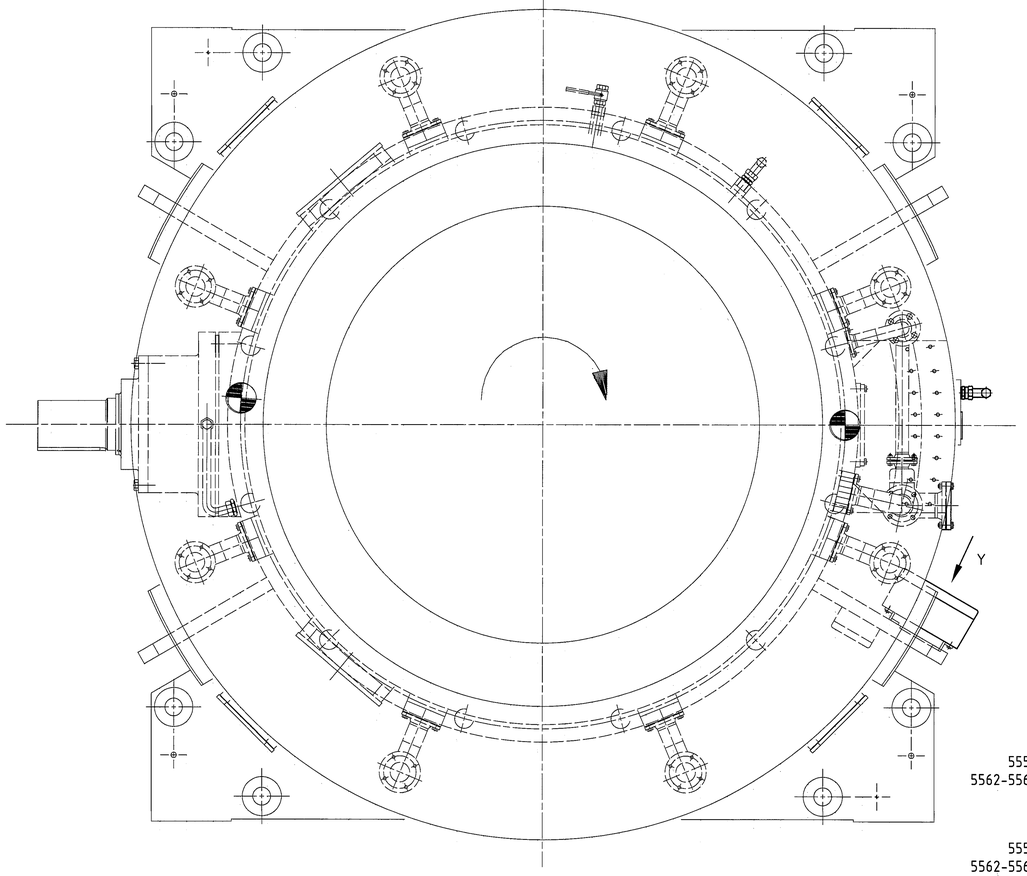
8181

8001-8020

X

Z

Rohr Ø88,9x3,2
PIPE
6551-6555



Ansicht X
VIEW

8201
8300

21/1

21/4

8201
8300

Rohr Ø20x2
PIPE
5901-5907

Q-Antr.lg.= 16 l/min

6503-6507
Rohr Ø60,3x2,9
PIPE

26
6850

6301
35
M 5 : 1
6302
6303
36

6304-6308
HP-16x
Q= 133 l/min

6501, 6502
22

Ansicht Z
VIEW

23
6600

21/2
8201
8300

P-Axiallager
Q= 209 l/min

5620, 5621

21/3
8201
8300

24
6800

5801- 5811

Rohr Ø60,3x2,9
PIPE
5610
5611-5614

Planetenstufe
Q= 290 l/min

25
6600

5501-5510
(6001-6004)
Rohr Ø114,3x3,6
PIPE

Ø 48,3x2,6
PIPE
Kegelradstufe
Q= 88 l/min

5701- 5704, 5710,5711

13
5532
5531, 5533

5581, 5583

5541, 5543

6510-6512
(Verschlossen)
(BLINDING)

555

255

Rohr Ø60,3x2,9
PIPE
5601-5604
5615-5619
(6005-6010)

6514-6517
P
Q= 587 l/min
(nur zum Versand)
(JUST FOR DESPATCH)

6508, 6509
R
Q= 720 l/min
(nur zum Versand)
(just for despatch)

Ansicht Y
VIEW

M 1 : 5

29
5582
5583-5585

15
5555
5562-5563

20
5565
5566-5570

16
5555
5562-5563

5561

5575
5576-5580

5551

5548-5550
Rohr Ø10x2
PIPE

5546,5547

P = Druckleitung / PRESSURE LINE
R = Rücklaufleitung / RETURN LINE
HP = Hochdruckleitung / HIGH PRESSURE LINE

Rohre bei Montage angepasst und sauber gebeizt
sowie erschuetterungsfrei abgestuetzt

PIPES ADJUSTED DURING ASSEMBLY, PROPERLY PICKLED
AND SUPPORTED SHOCKPROOF

Kanten DIN 6784

Schutzvermerk ISO 16016 beachten

CAD-Zeichnung darf nicht manuell geändert werden

Verwendungsbereich Typ
KPBV 160

80 127 657

Toleranzen ISO 8015
Allg.Tol. ISO 2768-mK

Oberfl. DIN ISO 1302

	Name
PROREG Datum	
Bearb. 14.07.2005	RO
Gepr. 26.10.2005	eh-719
Norm	

Maßstab 1:10 (1:5) | Gewicht kg

Werkst. Kalbz.
Rohr.-Nr. Rohre.
Mod.- Ges.-Nr.

Benennung
Aussenrohrplan
OUTER PIPING SCHEME

Änd.-Zust.		Datum	Name
C	siehe Blatt 2	17.01.06	My
B	siehe Blatt 2	25.11.05	My
A	siehe oben	08.11.05	My
Änd.-Zust.	Änderung	Datum	Name

Zeichn.-Nr. 2067188/0 | Blatt 1 | 2 Bl.

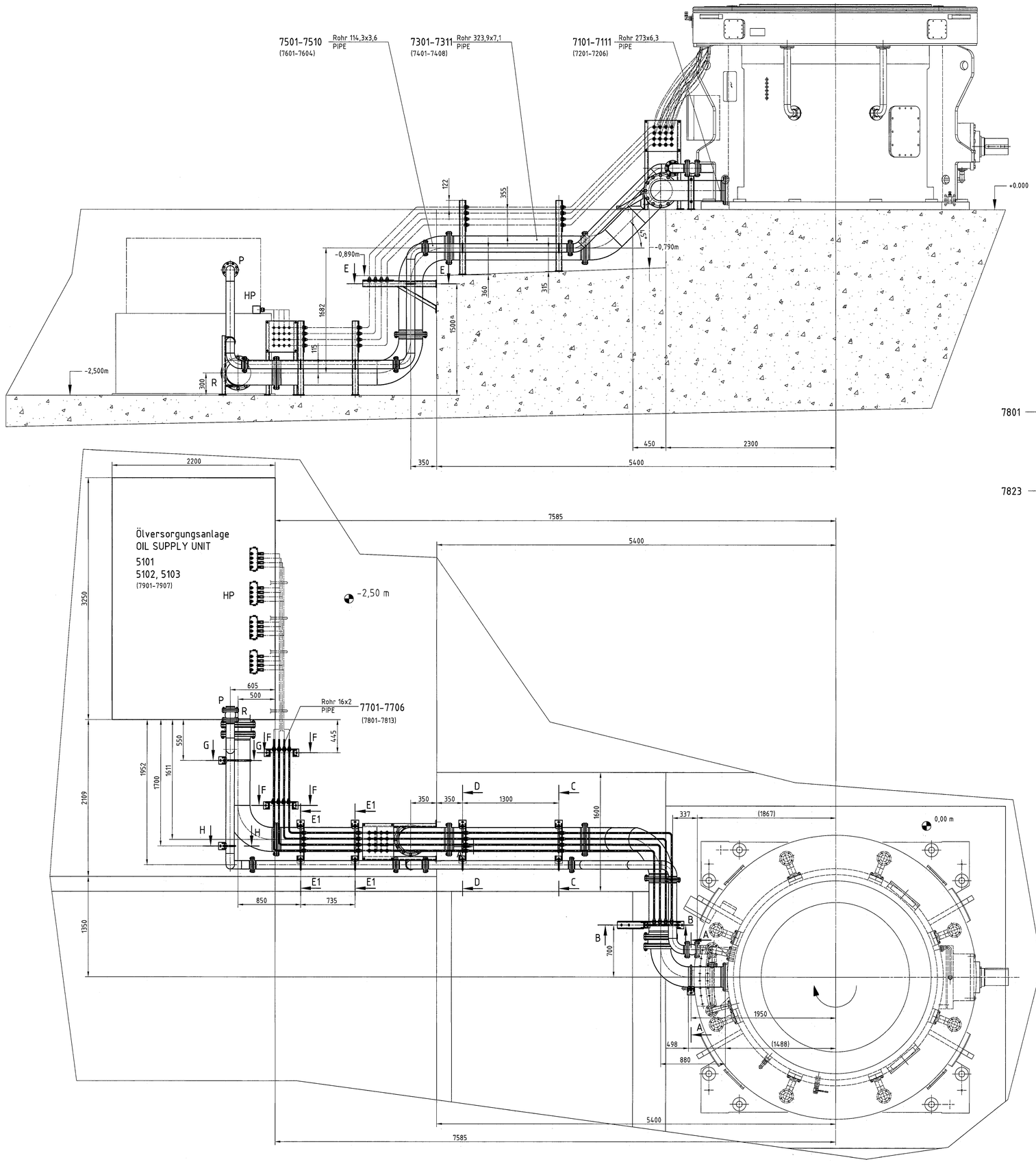
Ers. für | Ers. durch

erstellt mit AutoCAD

VERFILMT

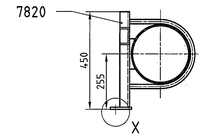
Passmaß	Abmaße

Änd.-Zust.	Buchstabe kennt vor	Beschreibung der Änderung	Datum	gepr.
A		NW richtiggestellt, ohne Mühle	10.11.05	Hdr
B		Plan mit Kanäle.	25.11.05	Hdr
C		Anschluss P an der ÖVA geändert	17.01.06	Hdr



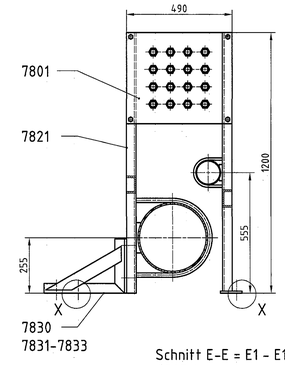
Schnitt A-A
SECTION

M 1:10



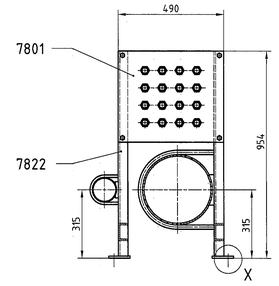
Schnitt B-B
SECTION

M 1:10



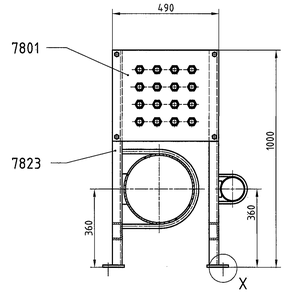
Schnitt C-C
SECTION

M 1:10



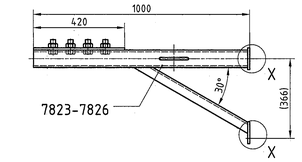
Schnitt D-D
SECTION

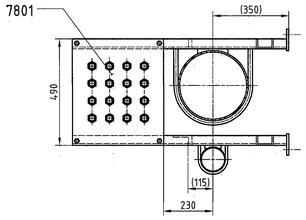
M 1:10



Schnitt E-E = E1 - E1 (ohne 30°)
SECTION

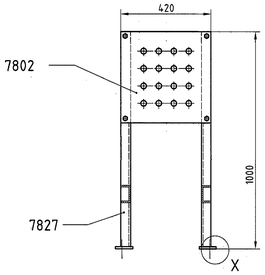
M 1:10





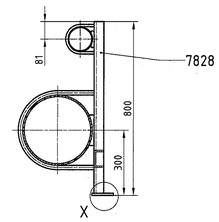
Schnitt F-F (2x)
SECTION

M 1:10



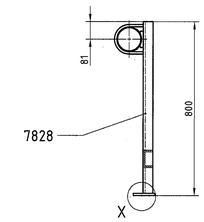
Schnitt G-G
SECTION

M 1:10

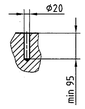


Schnitt H-H
SECTION

M 1:10



Einzelheit X
DETAIL



P = Druckleitung / PRESSURE LINE
R = Rückauf / RETURN LINE
HP = Hochdruckleitung / HIGH PRESSURE LINE

Rohre bei Montage angepasst und sauber gebeizt
sowie erschuetterungsfrei abgestuetzt

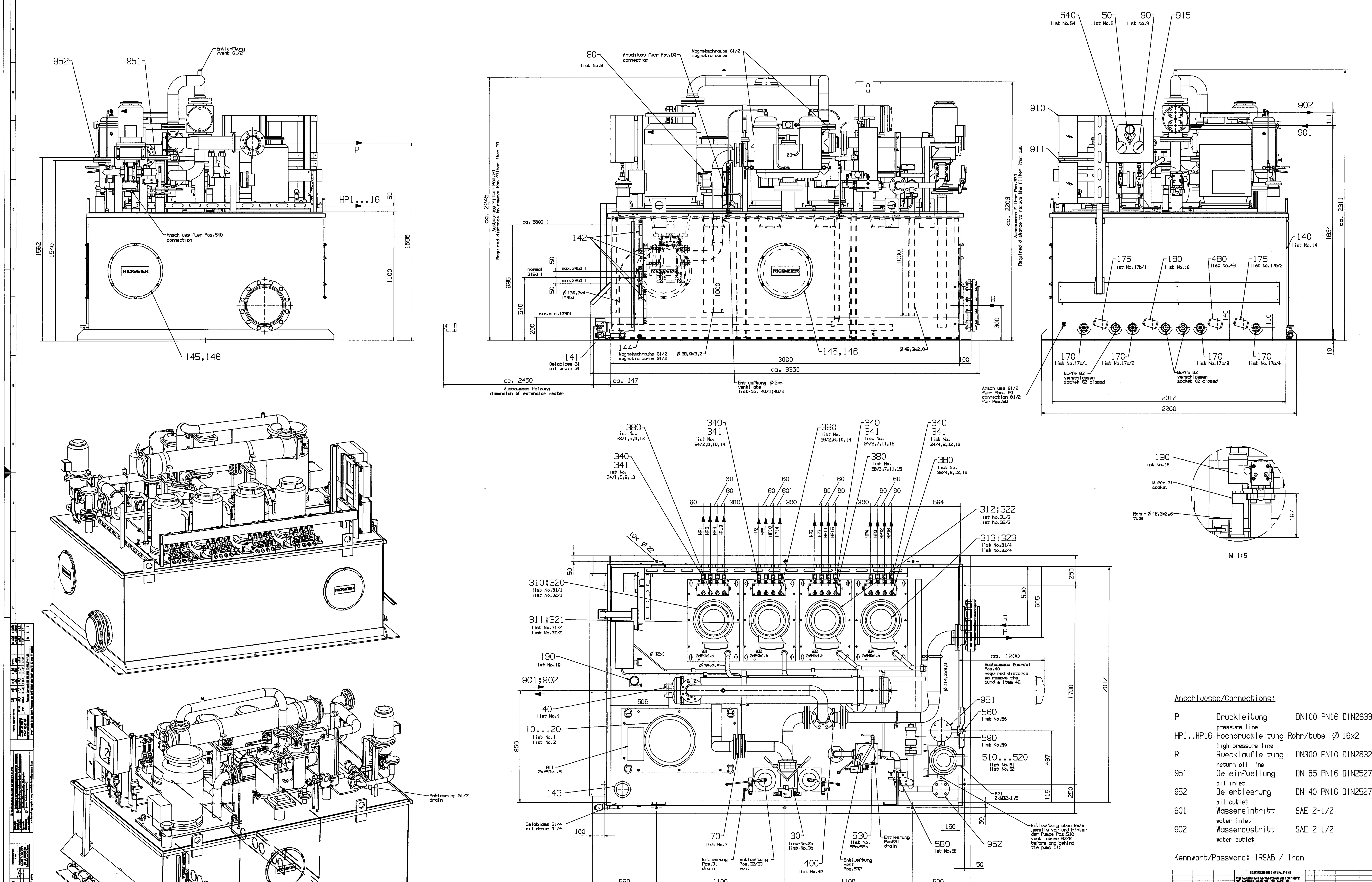
PIPES ADJUSTED DURING ASSEMBLY, PROPERLY PICKLED
AND SUPPORTED SHOCKPROOF

Verwendungsbereich Typ	KPBV 160		80 127 657
Toleranzen ISO 8015 Allg.Tol. ISO 2768-mK		Maßstab 1:20 (1:10)	Gewicht kg
Oberfl. DIN ISO 1302		Werkst. Halbz. Rohr.-Nr. Rohm. Mod.-Ers.-Nr.	
PRO/ED Datum Name		Benennung	AUSSENROHRPLAN VERBINDUNGSLEITUNGEN CONNECTION LINES
Bearb. 24.10.2005 M.Wettori			
Gepr. 26.10.2005 ah-719			
Norm		Zeichn.-Nr.	2067188/0
C siehe oben 16.01.06 Wn		Blatt	2
B siehe oben 25.11.05 Wn		Bl.	2
A siehe oben 09.11.05 Hy			
Zust. Änderung Datum Name		Ers.für	
RENK		Erst.as	erstellt mit AutoCAD

Schutzvermerk ISO 16016 beachten

CAD-Zeichnung darf nicht manuell geändert werden

VERFILMT



Anschluesse/Connections:

P	Druckleitung pressure line	DN100 PN16 DIN2633
HP1..HP16	Hochdruckleitung Rohr/tube Ø 16x2 high pressure line	
R	Ruecklaufleitung return oil line	DN300 PN10 DIN2632
951	Oeleinfuellung oil inlet	DN 65 PN16 DIN2527
952	Oelentleerung oil outlet	DN 40 PN16 DIN2527
901	Wassereintritt water inlet	SAE 2-1/2
902	Wasseraustritt water outlet	SAE 2-1/2

Kennwort/Password: IRSAB / Iran

IRSAB / Iran 80127657

Zeichnungsnummer 2067187 / 0

RENK

Index a Dat. 16.01.06 Name Bange

* OIL SUPPLY UNIT

Gewicht /weight: ca.4460 kg

Oelversorgungsanlage *
WS 6300 S-R95/800 FL-Z

Massstab 1:10

Bez. 09.01.05 Sz
Gepr. 16.01.05 Sz

RICKMEIER

FZ0-1985-426199//0

Ändergs.-zustand State	Buchstabe kommt vor No. of modific.	Beschreibung der Änderung Description of modification	Datum Date
A		Ersteller / Drawn by Bachhuber Prüfer / Checked by Bange	11/05

Elektrische Schaltgeraete mit Funktionen und Einstellwerten
Electrical switching units with functions and set points

0,7 bar ↓ — Getriebe-Antriebsmotor - Stopp und Abschaltung der HD-Pumpen 31/1-4
Gear unit input motor - stop and switch off the HP-pumps 31/1-4
Schmieroeldruck, min, min
Lubr. oil pressure, low, low
(16: 16-2, 16-3, 16-1)

70°C ↑ — 1. Getriebe-Antriebsmotor - Stopp
Gear unit input motor - stop
Oeltemperatur, max, max
Oil temperature, high, high

60°C ↑ — 2. Alarmsignal
Alarm signal
Oeltemperatur, max
Oil temperature, high

40°C ↑ — 3. Aktivierung, Filterueberwachungen 3b, 53b
Activation, filter monitorings 3b, 53b
Oeltemperatur
Oil temperature

25°C ↑ — 4. Start der HD-Pumpen 31/1-4, Start der Pflegekreislaufpumpe 51 und nach 10 Min. Freigabe Getriebe Antriebsmotor - Start
Start of the HP-pumps 31/1-4, start of the mainterance circuit pump 51 and after 10 min. release of gear unit input motor - start
Oeltemperatur, min
Oil temperature, low
(13: 13A-1, 13A-1, 13A-2, 13A-2; Reserve 13B-1, 13B-1, 13B-2, 13B-2)

75°C ↑ — 1. Getriebe-Antriebsmotor - Stopp
Gear unit input motor - stop
Axiallagertemperatur, max, max
Axial bearing temperature, high, high

70°C ↑ — 2. Alarmsignal
Alarm signal
Axiallagertemperatur, max
Axial bearing temperature, high
(21/1 ... 21/4: 21/...A-1, 21/...A-2; Reserve 21/...B-1, 21/...B-2)

11 +/- 1,5 bar ↓ (4,6-4,8 mA) — Alarmsignal
+ ggf. Getriebe-Antriebsmotor - Stopp
Alarm signal
+ poss. gear unit input motor - stop
Oeldruck, Hydrostatik, min
Oil pressure, hydrostatic, low
(34/1 ... 34/16: 34/...-1, 34/...-2)

0,9 bar ↓ — Alarmsignal
Alarm signal
Schmieroeldruck, min
Lubr. oil pressure, low
(15: 15-2, 15-3, 15-1)

unter 200 mm ↓ (von Oelbehaelt.-Auflagefl. aus) / **lower than 200 mm ↓** (from oil tank base) — Alarmsignal + Ausschaltung der Tauchheizkoerper 17a/1-4
Alarm signal + to switch off the immersion heaters 17a/1-4
Oelstand, min, min
Oil level, low, low
(19: 19-1, 19-2, 19-3, 19-4, 19-5)

80°C ↑ — Ausschaltung der Tauchheizkoerper 17a/1-4
To switch off the immersion heaters 17a/1-4
Oeltemperatur, max
Oil temperature, high
(17b/1 ... 17b/2: 17b/...-2, 17b/...-1)

35°C ↑ (ca.30°C ↓) — Aus- und Einschaltung der Tauchheizkoerper 17a/1-4
To switch off and on the immersion heaters 17a/1-4
Oeltemperatur
Oil temperature
(18: 18-2, 18-1)

20°C ↑ — Start der Oelpumpe 1
Start of the oil pump 1
Oeltemperatur, min
Oil temperature, low
(48: 48-3, 48-1)

1,75 bar ↑ — Alarmsignal
Alarm signal
Differenzdruck (Filterverschmutzung), 70%
Differential pressure (filter contamination), 70%
(3b: 3b-2, 3b-3, 3b-1)

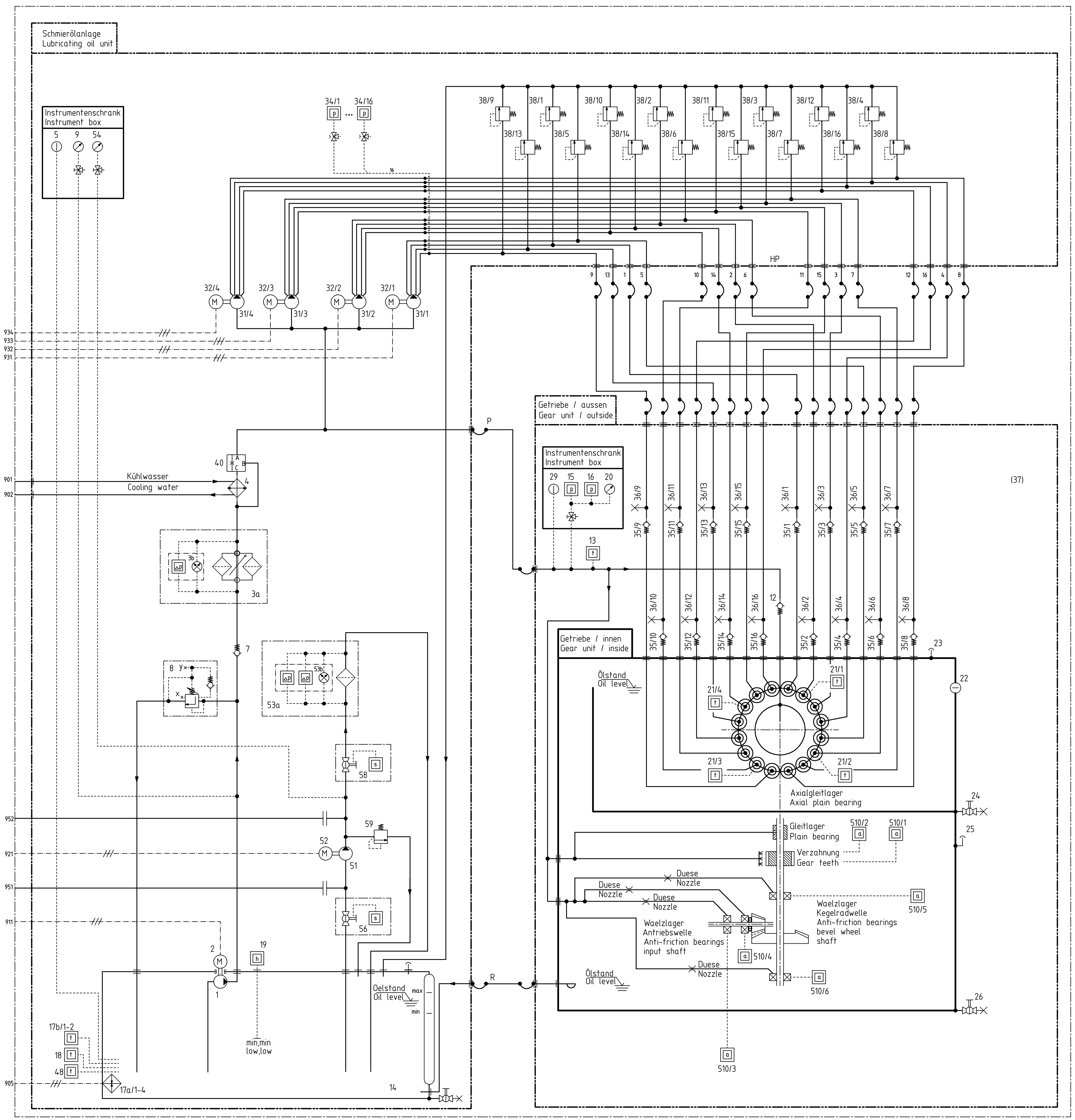
4,5 bar ↑ — Alarmsignal
Alarm signal
Differenzdruck (Filterverschmutzung), 100%
Differential pressure (filter contamination), 100%
(53b.1: 53b.1-2, 53b.1-3, 53b.1-1)

3,15 bar ↑ — Voralarm
Pre-alarm
Differenzdruck (Filterverschmutzung), 70%
Differential pressure (filter contamination), 70%
(53b.2: 53b.2-2, 53b.2-3, 53b.2-1)

Freigabe automatischer Betrieb der Pflegekreislaufpumpe 51
Release of automatic operation of the maintenance circuit pump 51 — 56
Pflegekreisoelleitung saugseitig "Auf"
Maintenance circuit oil line on suction side "open"
(56-1, 56-2)

Freigabe automatischer Betrieb der Pflegekreislaufpumpe 51
Release of automatic operation of the maintenance circuit pump 51 — 58
Pflegekreisoelleitung druckseitig "Auf"
Maintenance circuit oil line on pressure side "open"
(58-1, 58-2)

Vibrationsaufnehmer
Acceleration sensor
siehe Zusammenstellung
see assembly drawing
(510/1 ... 510/6: 510/...-RD (+), 510/...-BL (-))



Schmieroelleitung
Lubricating oil line

Steuerleitung
Pilot line

Elektr. Leitung
Electric wire

Einheit
Unit

vom Kunden zu verlegen
to be fitted by the customer

*) nicht RENK-Lieferung
not supplied by RENK

Technische Daten: 2067185 /4
Technical data:

Dargestellt im stromlosen und drucklosen Zustand, bei min. Temperatur und ohne Medium.
Shown in deenergized pressureless condition, at min. temperature and without medium.

R = Ruecklaufleitung
Return line
P = Druckleitung
Pressure line
HP = Hochdruckleitung
High pressure line

Klemmenbezeichnung unverbindlich, genaue Klemmenbelegung siehe Schema Getriebeverkabelung
Terminal marking not obligatory, exat terminal marking see scheme gaer wiring

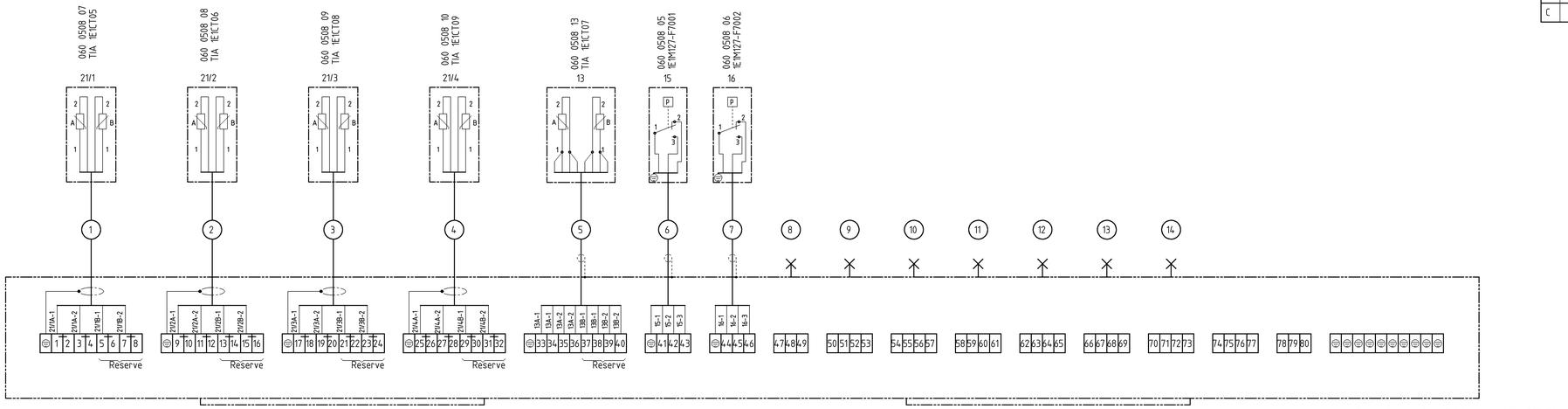
IRSAB / Iran

80127657

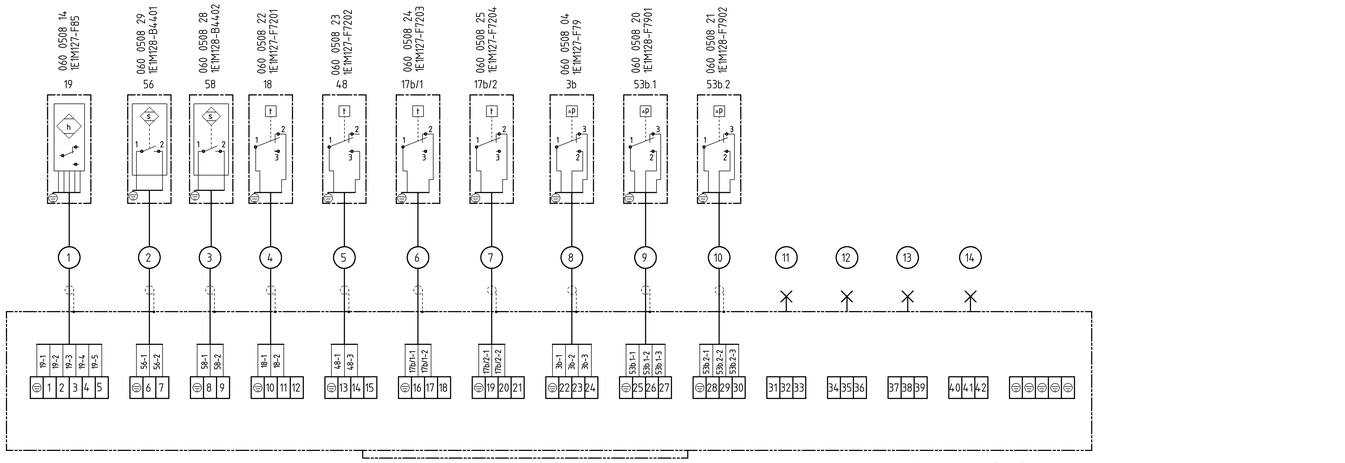
Verwendungsbereich Typ / Range of utilization KPBV 160	Tolerierung/Tolerating ISO 8015 Allg. Tol./Perm. var. ISO 2768-mK Oberfl./Surface DIN ISO 1302	Maßstab/Scale — Gewicht/Weight kg Werkst. Halbz./Mat. half-fin. product Roht.-Nr. Rohm./Blank No. Mod.- Ges.-Nr./Pattern or die No.
Schutzvermerk ISO 16016 beachten Refer to protection notice ISO 16016	gt / Datum/Date / Name Drawn 16-Dec-2005 Bachhuber Checked 16-Dec-2005 Bange Standard	Benennung/Title **Oelkreislauf Schema** Oil circuit scheme
	RENK	Zeichn.-Nr./Drawing-No. 2067184 /0 A — Blatt/Sheet 1, 1 Bl/Sh Entst. aus / Origin: 20686670A — Ers. fuer / Replaces:

geplottet von / plotted by: Bange, Karlheinz, 16-Dec-2005 — CAD-Zeichnung / CAD Drawing UNIGRAPHICS

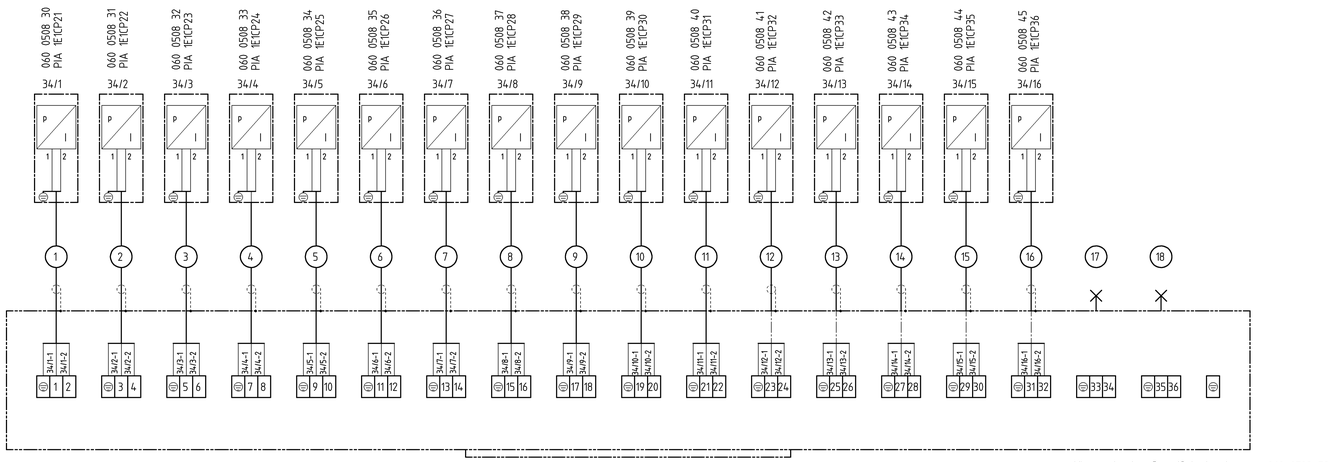
Änderg.-zustand/ State	Rückstehe kanal-no. / No. of modific.	Beschreibung der Änderung / Description of modification	Datum / Date
A		Ersteller / Drawn by Bachhuber Prüfer / Checked by Bange	12/05
B		Nummern hinzu Numbers added	12/05
C		Nummern hinzu Numbers added	12/05



Klemmenkasten 1 (Getriebe) 060 0508 50
Terminal box 1 (gear unit) 1E1C804



Klemmenkasten 2 (Oelanlage) 060 0508 51
Terminal box 2 (oil supply unit) 1E1C805



Klemmenkasten 3 (Oelanlage) 060 0508 52
Terminal box 3 (oil supply unit) 1E1C806

GEAR OIL SUPPLY SYSTEM
060 0508 01

Beachte:
Die Klemmenbezeichnungen in den Schaltbildern muessen nicht mit den Bezeichnungen an den Geraeten uebereinstimmen.
Massgeblich ist die funktionsgerechte Verkabelung (z. B. Oeffner, Schliesser) auf die entsprechend bezeichnete Klemme gemaess den Angaben auf dieser Zeichnung.

Caution:
The terminal numbers indicated in the wiring diagrams do not have to correspond with the numbers on the devices.
Determining is the correct functional wiring (e. g. opener, closer) to the correspondingly numbered terminal according to the instructions given on this drawing.

Achtung:
Die Such-Nrn. an den Geraeten beziehen sich auf das Oelkreislauf-Schema, die Oelanlagen-Zeichnung und die Technischen Daten.

Attention:
The list-nos. on the instruments refer to the oil circuit scheme, the oil installation drawing and technical data.

siehe auch Schema Verkabelung Vibrationsaufnehmer 2068822 /2
see also scheme wiring acceleration sensors

IRSAB / Iran 80127657

Verwendungsbereich Typ / Range of utilization: KPBV 160	Tolerierung/Tolerating ISO 8015 Allg. Tol./Perm. var. ISO 2768-mK Oberfl./Surface DIN ISO 1302	Maßstab/Scale — Gewicht/Weight kg Werkst. Halbz./Mat. half-fin. product Bestell-Nr. Rohe./Blank No. Mod.-Ges.-Nr./Pattern nr. or de No.
Schutzvermerk ISO 16016 beachten Refer to protection notice ISO 16016	gt / Datum/Date / Name Drawn: 23-Dec-2005 Kribner Checked: 23-Dec-2005 Bange Standard:	Benennung/Title: Schema Getriebeverkabelung Scheme gear wiring
	RENK	Zeichn.-Nr./Drawing-No.: 2067186 /0C Ersetzt aus / Origin. 2068691/0A — Ers. fuer / Replaces Blatt/Sheet: 1 / 1 BLTS
geplottet von / plotted by: Bange, Karlheinz, 23-Dec-2005		CAD-Zeichnung / CAD Drawing UNIGRAPHICS