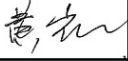
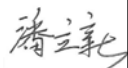


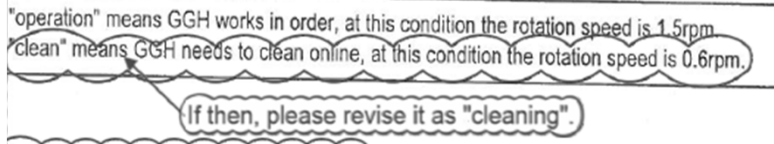
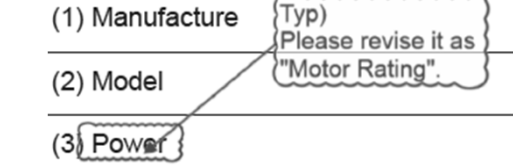
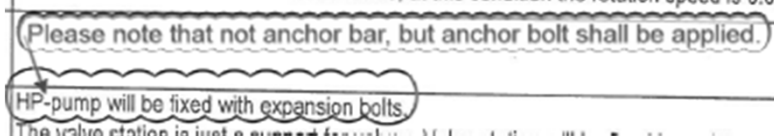
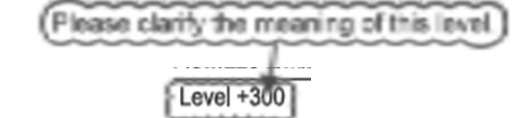
DOCUMENT SUBMISSION STATUS: FC						
NOTE:						
1	29 Aug. 2014	FOR CONSTRUCTION	Huang Kai	Chen Kelei	Pan Lixin	
0	20 Jun. 2014	FOR CONSTRUCTION	Huang Kai	Chen Kelei	Pan Lixin	
D	28 Mar. 2014	FOR APPROVAL	Huang Kai	Chen Kelei	Pan Lixin	
C	15 Jan. 2014	FOR APPROVAL	Huang Kai	Chen Kelei	Pan Lixin	
B	11 Nov. 2013	FOR APPROVAL	Huang Kai	Chen Kelei	Pan Lixin	
REV.	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED	APPROVED
OWNER			OWNER'S CONSULTANT			
 VIETNAM OIL AND GAS GROUP (PVN)			 FICHTNER  PVPOWER PCC			
EPC CONTRACTOR			EPC CONSTRUCTOR'S CONSULTANT			
 PETROVIETNAM CONSTRUCTION JOINT STOCK CORPORATION (PVC)			 WorleyParsons resources & energy WORLEYPARSONS			
POWER ISLAND PACKAGE SUPPLIER						
 SOJITZ CORPORATION			 DAELIM INDUSTRIAL CO., LTD.			
PROJECT TITLE						
THAI BINH 2 THERMAL POWER PLANT 2 x 600MW						
DRAWING / DOCUMENT TITLE						
Technical Specification / Data Sheet of GGH						
BIP SUPPLIER:	BIP SUB-SUPPLIER:	FUNCTION	NAME	SIGN	DATE	
 BABCOCK & WILCOX BEIJING CO., LTD.	 WUHAN KAI DI ELECTRIC POWER ENVIRONMENTAL CO.,LTD.	DRWN	Huang Kai		29 Aug. 2014	
		CHKD	Chen Kelei		29 Aug. 2014	
		APPD	Pan Lixin		29 Aug. 2014	
DOCUMENT NO: TB2-SDC.VP101-00HTB-M-M10-SPC-7001		No of page: 6		Scale	Rev. 1	

P.O NO.	110180-1600-101-001-A01
ITEM NO.	ALL
ITEM DESCRIPTION	Boiler and Boiler BOP
DOCUMENT NO.	TB2-SDC.VP101-00HTB-M-M10-SPC-7001
DOCUMENT TITLE	Technical Specification / Data Sheet of GGH
REV NO.	1

Daelim's Approval Status

Daelim Industrial Co., Ltd.	
Job No.	110180
	A - APPROVED
	B - APPROVED WITH COMMENTS
	C - RETURNED FOR CORRECTION
	D - REJECTED
	N - NOT APPLICABLE(REFERENCE ONLY)
SIGNED BY :	DATE :
DIC'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.	

BIP SUPPLIER:  BABCOCK & WILCOX BEIJING COMPANY LTD.	BIP SUB-SUPPLIER:  WUHAN KAIDI ELECTRIC POWER ENVIRONMENTAL CO.,LTD.
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Document Review Comment Sheet			Transmittal No. TB2-DIC-BWBC-T-1083&1084			
No.	Document No.	Rev	Title	Purpose	Approval Status	
					In	Out
2	TB2-SDC.VP101-00HTB-M-M10-SPC-7001	0	Technical specification/Data sheet of GGH	FC		
3	TB2-SDC.VP101-01HTB-M-M10-DGA-7001	0	M10 FGD plant general arrangemal of unit 1 GGH	FC		
4	TB2-SDC.VP101-02HTB-M-M10-DGA-7001	0	M10 FGD plant general arrangemal of unit 2 GGH	FC		
No	DAELIM's Comments	Item status	Contractor's Response			
2	TB2-SDC.VP101-00HTB-M-M10-SPC-7001					
2.1			Vendor has revised.			
2.2			Vendor has revised.			
3	TB2-SDC.VP101-01HTB-M-M10-DGA-7001 TB2-SDC.VP101-02HTB-M-M10-DGA-7001					
3.1			Based on the HP-pump factory's design, only expansion bolt can be applied, no need anchor bolt.			
3.2			The height of foundation of HP-pump. Also, "level" means "foundation elevation of HP pump".			

Document Review Comment Sheet

PEB Ref. No : TB2-PEB-SDC-M10-TVI-05304

No.	Document No.	Rev	Title	Purpose	Review Status	
					In	Out
1	TB2-SDC.VP101-00HTB-M-M10-SPC-7001	0	GGH - Technical Specification	FC		C
2	TB2-SDC.VP101-01HTB-M-M10-DGA-7001	0	GGH - Unit-1 General Arrangement	FC		C
3	TB2-SDC.VP101-02HTB-M-M10-DGA-7001	0	GGH - Unit-2 General Arrangement	FC		C
No.	Owner/PMC's Comments	Item status	Contractor's Response			
I	General comments					
1	The document under RE and/or AP purpose have not yet approved by the OWNER so these drawings are returned for correction and they cannot upgrade to FC status. PVC/Subcontractor is requested to resubmit in the RE purpose.		PVC/PVN comments should be issued and sent to SDC within their review cycle based on the Contract. Otherwise, SDC will regard that the vendor print is deemed approved by PVC/PVN, and the vendor print can be issued 'For Final'.			
II	Detail comments					
1	TB2-SDC.VP101-00HTB-M-M10-SPC-7001					
1.1	To add main parts of GGH and to show material code standard of GGH such as Rotor and heat element, rotor seal, rotor housing, internal connecting transition ducts, main bearing support beams, structure steelwork, platform...		Vendor has indicated the material in TB2-SDC.VP101-00HTB-M-M10-SPC-7001 and TB2-SDC.VP101-00HTB-M-M10-LST-7001. The main component of GGH is Heat Element, which main raw material is SPP NIPPON STEEL, the code and standard of the material is Nippon Steel Manufacture's Standard. Regarding to the Nippon Steel manufacture's Standard equivalent JIS Standard, Refer to TB2-SDC.VP101-00HTB-M-M10-LST-7001 Attached comparison data sheet between JIS and NSCSPP. The detail conten steel standards has been added on TB2-SDC.VP101-00HTB-M-M10-LST-7001.			
1.2	To confirm that The heating element material shall be of #22/20 USG low carbon steel covered with two coats of porcelain enameling or better		The heating element material is NSCSPP low carbon steel produced by NIPPON STEEL and covered with two coats of enameling. The carbon content of NSCSPP steel is less than 0.0015%. Regarding to the Nippon Steel manufacture's Standard equivalent JIS Standard, Refer to TB2-SDC.VP101-00HTB-M-M10-LST-7001 Attached comparison data sheet between JIS and NSCSPP.			
1.3	Missing a lot of information such as material, casing thickness, cooling medium, hopper, performance curve etc.,		The document has been revised. Material specification and thickness have been added in this file, the motor bearing doesn't require cooling medium.			
1.4	The inlet data for design the GGH must base on the BMCR worst coal		Noted.BWBC/KDPE confirm the inlet data for design the GGH must base on the BMCR worst coal.			
1.5	The information above is different from the document No. TB2-SDC.VP101-00100-M-M10-PFD-0003 & TB2-SDC.VP101-00100-M-M10-PFD-0004, To check and correct		Specification has been revised to show GGH inlet and outlet conditions, both clean gas and raw gas, based on 100% BMCR worst coal conditions.			
1.6	The information should be reflected in the technical specification		Refer to item 1.5.			

Document Review Comment Sheet

PEB Ref. No : TB2-PEB-SDC-M10-TVI-05304

1.7	Technical specification and data sheet shall have to follow a required form in the accepted codes/standards.		Refer to item 1.5.
1.8	The lubricating oil should priority select from one of the following firm which have branch in Vietnam market and used popularly in many power plant in Vietnam: - Sinopec from China, or		Vendor will provide the lubrication oil technical requirement for PVC/PVN, and vencor will check with Sinopec and Idemitsu if they can provide the equivalent oil, the owner can choose the lubrication oil manufacutre based on the requirement.
2	TB2-SDC.VP101-01HTB-M-M10-DGA-7001		
2.1	To add material code standard for GGH		The material code and standard for GGH please refer to TB2-SDC.VP101-00HTB-M-M10-LST-7001
2.2	To clarify the quantity and its weight of each component in the GGH of one unit, and to add the section view for reviewing with this drawing.		The weight of each component is for one unit. Please note that the plan and section view drawings have been shown in this drawing. Detail drawings will be provided containing detailed information.
2.3	Purge air duct support shall be grouted +100 mm from 0.000 EL.		For the purge air duct support, no grout is required, the elevation is +EL. 100mm
3	TB2-SDC.VP101-02HTB-M-M10-DGA-7001		
3.1	See comment item 2.		See response item 2.

Document Review Comment Sheet

PEB Ref. No : TB2-PEB-SDC-M10-TVI-05304

No.	TB2PEB's Comments	Item status	Contractor's Response
1	GENERAL COMMENTS		
2	TB2-SDC.VP101-00HTB-M-M10-SPC-7001		
	NEW COMMENT		
2.1	Item 7 - Revise "Purge Air Fan" to "Purge Gas Fan". The fan's source is from the FGD clean gas duct. Materials of construction of the fans have to be able to tolerate the saturated flue gas and associated corrosion. Add line item to indicate material specification. PEB Response - Revision not made.	OPEN	No Contractor Response received. Second Reply: Vendor has added a line to indicate the material. Please refer to TB2-SDC.VP101-00HTB-M-M10-SPC-7001.
3	TB2-SDC.VP101-01HTB-M-M10-DGA-7001 TB2-SDC.VP101-02HTB-M-M10-DGA-7001		
3.1	Key Plan: Unit-1 and Unit-2, as identified below the key plan, is not correct. Unit-1 is on the right and Unit 2 is on the left. Revise the information provided below the key plan. Review the drawings as well to ensure correctness. PEB Response - Unit 1 is plant east (left). Unit 2 is plant west (right). Revise.	OPEN	Please note that FGD unit 1 equipment shall be located in plant left(west) side and unit 2 equipment shall be located plant right(east) side. No Contractor Response received. Second reply: It should be Unit 1 is plant west (left). Unit 2 is plant east (right). Please refer to the latest PLOT PLAN FOR POWER BLOCK(FOR MAIN EQUIPMENT), Drawing No. TB2-SDC-00100-P-M8-DPP-0002.
	NEW COMMENTS		
3.2	Provide equipment tag numbers for equipment shown.	OPEN	No Contractor Response received. Second reply: Vendor has revised.KKS number has been added, please refer to TB2-SDC.VP101-00HTB-M-M10-SPC-7001.

* Legend

Contractor Purpose:

AP - For Approval
 RE - For Reference
 FC - For Construction
 AB - As Built
 INFO - For Information

Approval Status:

A - Approved
 B - Approved with Comments
 C - Returned for Correction
 D - Rejected
 I - Accepted for Reference / IB - Accepted for Reference with Comments / R - Returned for Correction



JINYANG Technical Specification / Data Sheet of GGH		DOCUMENT NO.	TB2-SDC.VP101-00HTB-M-M10-SPC-7001
		PAGE NO.	1 of 5
PROJECT NAME : THAI BINH 2 THERMAL POWER PLANT 2×600MW Located in both My Loc commune and Thai Do commune Of Thai Thuy district, Thai Binh province 1. P/O NO. 110180-1600-101-001-A01 2. ITEM NAME FGD Gas-Gas Heater(14/24THB10AC001) 3. CUSTOMER VIETNAM OIL AND GAS GROUP(PVN) 4. SUPPLIER Jiangsu Jinyang Energy & Environment Engineering Co., Ltd. Yangjian Town Xishan District Wuxi City Jiangsu Province P.R.China Tel:86+510+88738026 Fax:86+510+88731346 Website:www.jinyangenergy.com			
1	Huang Kai	Chen Kelei	Pan Lixin
	29 Aug. 2014	29 Aug. 2014	29 Aug. 2014
0	Huang Kai	Chen Kelei	Pan Lixin
	20 Jun. 2014	20 Jun. 2014	20 Jun. 2014
D	Huang Kai	Chen Kelei	Pan Lixin
	28 Mar. 2014	28 Mar. 2014	28 Mar. 2014
Rev. No.	NAME	NAME	NAME
	DATE	DATE	DATE
	DRAWN	CHECKED	APPROVED

I. GGH SPECIFICATION

The Gas-Gas Heater Exchanger/ GGH of a wet FGD system is used to reheat the flue gas leaving the absorber prior to entering the stack.

The GGH mainly consists of a rotor with several compartments which contain heat storage elements. A rotor- casing with four connecting ducts for inlet- and outlet of the treated and untreated gas flow and a sealing system which minimizes the leakage of untreated gas into the clean gas flow complete the GGH.

The heating elements consists of profiled, enameled metal sheets, which absorb heat from the raw gas upstream of the absorber thus cooling the gas flow. As the GGH rotates continuously into the clean gas flow, the heat is released to the treated gas thus reheating the gas flow. Raw gas and clean gas pass through the heating elements in counter flow. The hot raw gas enters from the bottom side whereas the cold clean gas enters at the top, then the hot raw gas transfer its heat to clean cold gas and become cold raw gas at the top of GGH, thus the top side be called cold end of GGH.

Material and profile of the heating elements are selected in order to resist corrosion, allow for a high heat transfer combined with low flow resistance and easy clean ability.

II. GGH DATA SHEET

Table 1 GGH Design Conditions

No.	Item	Unit	100% BMCR Worst coal			
			GGH Raw Gas Inlet	GGH Raw Gas Outlet	GGH Raw Clean Inlet	GGH Raw Clean Outlet
1	Total Flow (Wet)	m ³ /hr	2,985,390	2,860,357	2,548,792	2,712,920
2	Total Flow (Dry)	m ³ /hr	2,763,140	2,647,415	2,245,398	2,391,135
3	Total Flow (Wet)	Nm ³ /hr	2,078,005	2,057,225	2,172,927	2,193,707
4	Total Flow (Dry)	Nm ³ /hr	1,923,306	1,904,073	1,914,274	1,933,507
5	Pressure	Pa	3,273	2,423	1,000	350
6	Temp	℃	131.0	114.8	49.6	65.0

1

Table 2 GGH Technical Specification Data Sheet

Item	Unit	Data	Remark
1、Parameters for GGH			
(1)Manufacture		Jiangsu Jinyang Energy & Environment Engineering Co., Ltd	
(2)Type		Rotary	
(3)Model		CVOP14.40/0.300E	
(4)Drive type		Variable frequency drive	
(5)Major axis arrangement		Vertical	
(6)Rotation speed (operation/ <u>cleaning</u>)	rpm	1.5/0.6	
(7)Sealing arrangement		Double structure sealing system Material: --Radial: alloy cast iron + Corten (B480GNQR) --Circumferential: alloy cast iron + Teflon Leakage rate ≤1%	
(8)Total weight	t	Total weight: ~210 Heating elements:~58t Housing: ~70t	

1

Item	Unit	Data	Remark
		Rotor: ~63t Sealing system: ~12t	
(9)Qty per unit	set	1	
<u>(10) Equipment KKS No.</u>		<u>14HTB10 AC001</u> <u>24HTB10 AC001</u>	
2、Guide & Support Bearings			
(1) Manufacture		SKF	
(2) Model		Guide bearing: 23044 Support bearing: 29488	
(3) Qty per unit	set	1	
3、Drive motors			
(1) Manufacture		ABB	
(2) Model		M2QA-180M	
(3) <u>Motor Rating</u>	KW	18.5	
(4) Qty per unit	set	2	
<u>(5) Equipment KKS No.</u>		<u>14HTB10 AC001-M01/M02</u> <u>24HTB10 AC001-M01/M02</u>	
4、Reduction Gearbox			
(1) Manufacture		Bauer	
(2) Model		GS3-250	
(3) Qty per unit	set	1	
5、Heating Elements			
(1) Manufacture		Nitchitsu Co., Ltd.	
(2) Model		L	
(3) Material		Enameling steel	
(4) Height	mm	300	
(5) Steel plate thickness	mm	≥0.7	

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Item	Unit	Data	Remark
(6) Enamel thickness (single side)	mm	≥ 0.15	
(7) Qty per unit	pcs	312	
6、Sealing Air Fan			
(1) Manufacture		Ventmeca Shanghai Co.,Ltd.	
(2) Model		HA60	
(3) Flow rate	m ³ /h	3000	
(4) Motor rating	kw	7.5	
(5) Discharge Pressure	Pa	6000	
(6) Qty per unit	set	2	
<u>(7) Equipment KKS No.</u>		<u>14HTB30 AN001</u> <u>14HTB30 AN002</u> <u>24HTB30 AN001</u> <u>24HTB30 AN002</u>	
7、Purge Gas Fan			
(1) Manufacture		Ventmeca Shanghai Co.,Ltd.	
(2) Model		XB125	
(3) Flow rate	Nm ³ /h	62000	
(4) Motor rating	kw	160	
(5) Discharge Pressure	Pa	4600	
(6) Qty per unit	set	1	
<u>(7) Material of purge gas</u>		<u>Corten Steel (Q345GNHL)</u>	
<u>(8) Equipment KKS No.</u>		<u>14HTB40 AN001</u> <u>24HTB40 AN001</u>	
8、Soot blower			
(1) Manufacture		Diamond Power Machine (Hubei) Co. Inc.	
(2) Model		IK-525-DM3	
(3) Material of nozzle		904L	

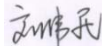
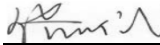
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Item	Unit	Data	Remark
(4) Material of lance		904L	
(5) Quantity of nozzle per lance	piece	High-pressure: 9 Low-pressure: 4	
(6) Consumption steam flow	t/h	~4.2	For one soot blower
(7) Steam pressure	bar (g)	8~10	
(8) Steam temperature	°C	300	
(9) Retractable length	mm	~2000	
(10) Qty per unit	set	2	
9、High Pressure Pump			
(1) Manufacture		Tianjin Tong Jie High Pressure Pump Co., Ltd	
(2) Model		TJ02A-S	
(3) Flow	m ³ /h	13.2	
(4) Pressure	bar (g)	200	Max. working pressure
(5) Motor rating	kw	90	
(6) Qty per unit	set	1	
<u>(7) Equipment KKS No.</u>		<u>14HTB20 AP001</u>	

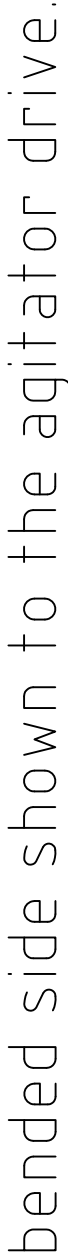


DOCUMENT SUBMISSION STATUS: FF						
NOTE: For Final						
0	13-Aug-15	For Final	LIU Weimin	Ding Houliang	ZHANG Chengwu	
REV.	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED	APPROVED
OWNER			OWNER'S CONSULTANT			
			 			
VIETNAM OIL AND GAS GROUP (PVN)			FICHTNER		PVPOWER PCC	
EPC CONTRACTOR			EPC CONSTRCTOR'S CONSULTANT			
						
PETROVIETNAM CONSTRUCTION JOINTSTOCK CORPORATION (PVC)			WORLEYPARSONS			
POWER ISLAND PACKAGE SUPPLIER						
			 DAELIM INDUSTRIAL CO., LTD.			
PROJECT TITLE						
THAI BINH 2 THERMAL POWER PLANT 2 x 600MW						
DRAWING / DOCUMENT TITLE						
Installation/Operation & Maintenance Manual for Absorber Agitator of FGD System						
Vendor's Logo:	Vendor's Logo:	FUNCTION	NAME	SIGN	DATE	
		DRWN	LIU Weimin		8/13/2015	
		CHKD	DING Houliang		8/13/2015	
		APPD	ZHANG Chengwu		8/13/2015	
DOCUMENT NO: TB2-SDC.VP101-00HTD-M-M10-MAN-0002		No of page:	149	Scale A4	Rev.0	

Customer:	Wuhan Kaidi Electric Power
Customer order no.:	KH1303C-TB2-006
Project:	THAI BINH 2
Agitator model:	SR4D7 F-37
Serial-no.:	13-205086 -1 until -8

Cover sheet

1	Drawings:	
	<i>Dimension drawing.:</i>	9-35567
	<i>Assembly drawing:</i>	1-16722
	<i>Assembly of the impeller:</i>	7-16723
	<i>Torquetable for assembly:</i>	8-3103
	<i>Mechanical seal TDSL-80:</i>	5-09905-2
	<i>Removal of the mechanical seal:</i>	5-9755 / 5-26982
2	EC-Declaration of Incorporation	
3	General	BA 01.0
	of the agitator	B 2127
	Mounting of the oil expansion tank	BAW 05.0
	Impeller Assembly SR	BAW 05.1
	Mechanical seal TDSL-80	B 2337
4	Troubelshooting	
	Lubricants list	
	Spare Part List	
	Special Tool List	
5	Operation instruction of flat gear motor	
	<i>Fa. NORD Type: SK7282AFBH66-225S/4 TF RDD</i>	

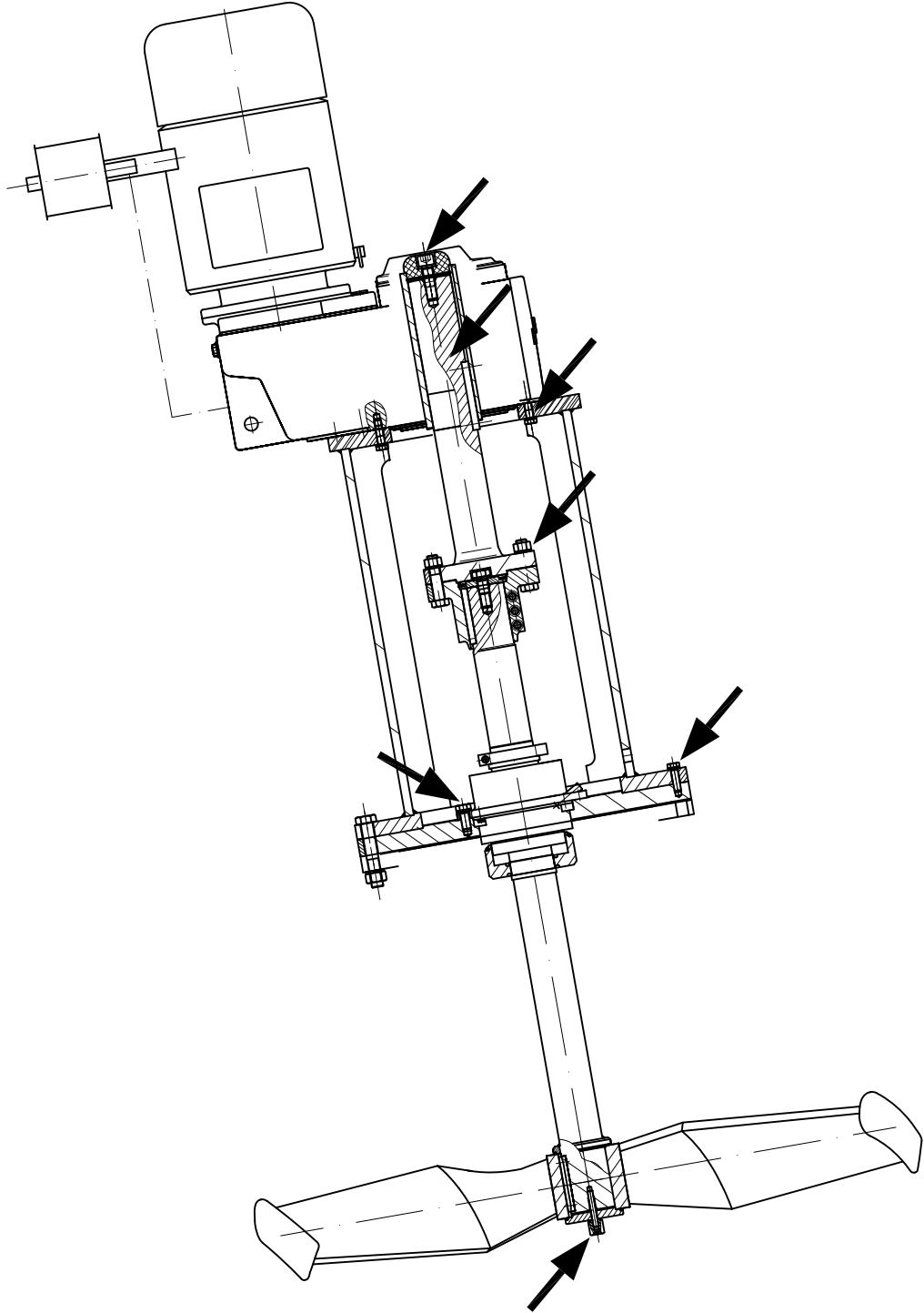


Rührorganbefestigung SR4
Fastening impeller SR4, Zapfend=82

DE Schraubenanzugsmomente für Rührwerksmontage

GB Torquetable for assembly of agitator

FR Couples de serrage des vis pour le montage de l'agitateur



Alle Schrauben, die durch die Betriebskräfte beansprucht werden, sind entsprechend ihrer Größe und des Werkstoffes mit den in der Tabelle angegebenen Anzugsmomenten anzuziehen.

All bolts have to be torqued according to the size and material according to the values listed below.

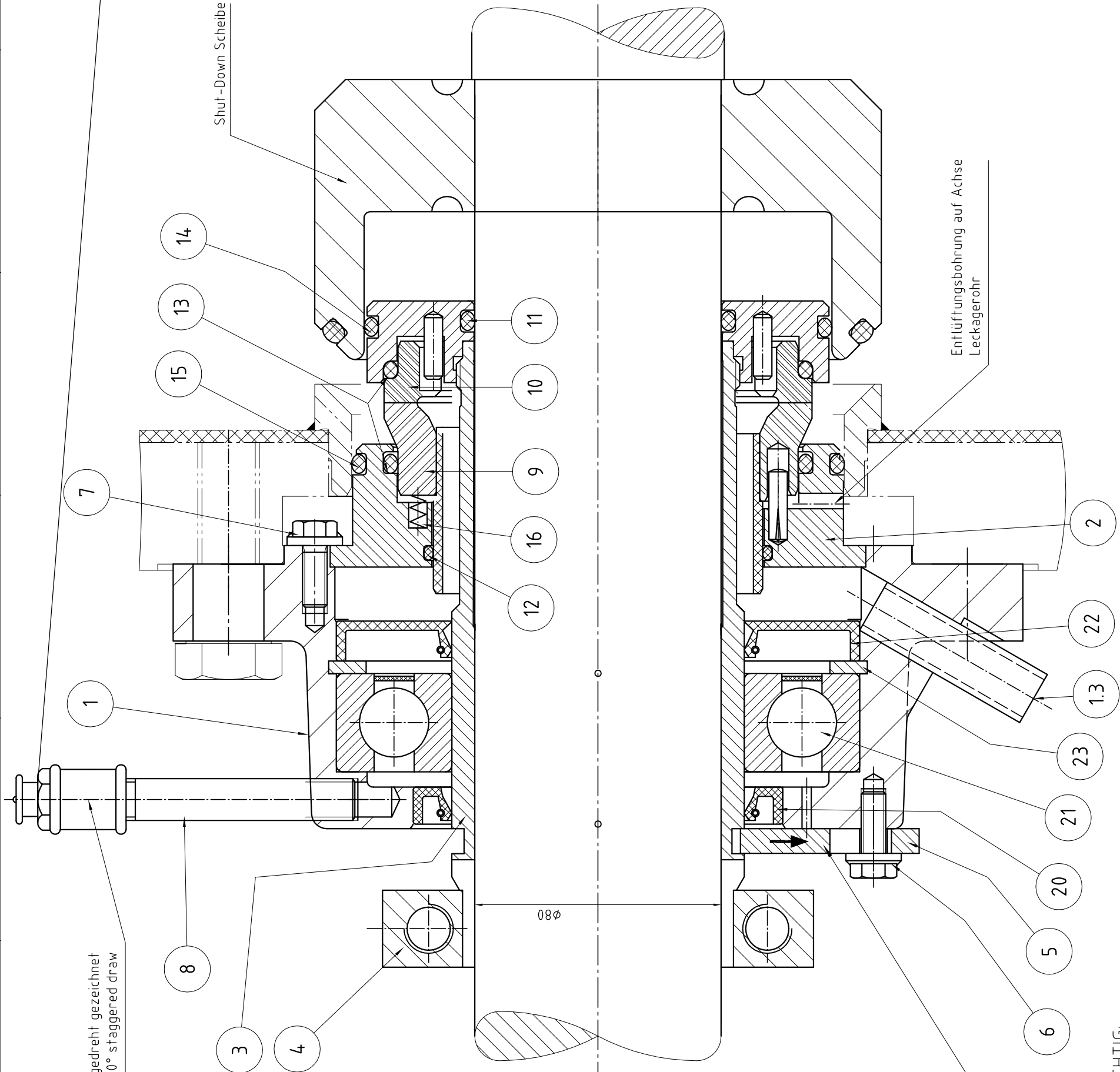
Toutes les vis qui sont sollicitées par les forces motrices seront serrées avec les couples de serrage indiqués dans le tableau selon leurs dimensions et leur matériau

material matériau	Sechskantschraube, hexagonal bolts, vis hexagonale					10.9 [Nm]
	8.8 A4-80 [Nm]	5.6 [Nm]	A2-70/A4-70 1.4529 [Nm]	1.4462 1.4501 [Nm]	1.4057 [Nm]	
Gewinde, Thread, Filet						
M8	25	11	16	25	18	12
M10	47	21	32	47	35	24
M12	78	35	56	78	60	42
M16	180	85	135	180	140	110
M20	360	165	280	360	280	220
M24	630	285	455	630	490	350
M30	1250	570	1050	1250	980	790
M36	2150	980	1473	2150	1680	1110
M42	3450	1550	2354	3450	2690	1770
M48	5200	2300		5200		
M56	8300	3600		8300		

TSCHAMBER MUT MISC- UND TRENNTECHNIK				Allgemeintoleranz ISO 2768-mK		Oberfläche Ra nach DIN ISO 1302 Reihe 1		Maßstab 1:1		Position –		Menge –			
					Datum	Name		Schraubenanzugsmomente für Rührwerksmontage							
				Bearb.	24.10.97	A. Scheuble									
				Gepr.	23.02.10	ad									
				Norm											
								EN-Nr.:							
B	2.4605+2.4610 ergänzt			23.02.2010		ad		ZNr.:		8-3103		Index B		Format A1	
A	1.4501 hinzugefügt			23.02.2010		ad									
Zust./ Änderungen				Datum		Name		Datenname 8-3103		Ersetzt durch:					



90° gedreht gezeichnet
90° staggered draw



WICHTIG:

In Betriebsstellung werden die Fixiersegmente aus der Nut der Führungsbuchse gezogen.

IMPORTANT:

Before you take the agitator into operation make sure that the fixing elements must be swung out of the groove from the sleeve !!!

Nachschmierfrist 1000 Std.
Fettmenge ca. 28 Gramm
Qualität: siehe Blatt-Nr. B1392

To grease every 1000 hrs.
with approx ca. 28 gram
Quality: see page Nr. B1392

23	1	Sicherungsring / snap ring	DIN 472 - 170 x 4
22	1	Wellendichtring mit CrN-Feder shaft sealing ring with CrN-spring	DIN 3760 - BASL - 95 x NBR 170 x 13
21	1	Rillenkugellager /bearing	DIN 625 T1 - 6219 - 95 x 170 x 32 RS1
20	1	Wellendichtring mit CrN-Feder shaft sealing ring with CrN-spring	DIN 3760 - BA - 95 x 120 x 12
16	6	Feder / spring	ø5,5 x 15,5
15	1	O-Ring /o-ring	148,49 x 5,33
14	1	O-Ring /o-ring	142,74 x 5,33
13	2	O-Ring /o-ring	129,54 x 5,33
12	1	O-Ring /o-ring	107,55 x 3,53
11	1	O-Ring /o-ring	78,74 x 5,33
10	1	Wellengleitring / shaft sealing ring TDSL-80	Z5-142-3
9	1	Gehäusegleitring / housing sealing ring TDSL-80	Z5-9184-4
8	1	Schmiernippel R1/4" mit Rohr /lubricant nipple with pipe	komplett
7	4	Sechskantschraube mit Flansch / hex. head screw with scw	DIN 6921 - M8 x 20
6	2	Sechskantschraube mit Flansch / hex.head screw with flange	DIN 6921 - M8 x 20
5	2	Fixiersegment / fixing device	#10133
4	1	Klemmring /clamping	Z5-314-3
3	1	Führungsbuchse /guiding bush	Z5-09931-2
2	1	Einsatz B /Insert TDSL-80	Z5-09923-2
13	1	Leckagerohr / Leakage pipe	Rohrø18x2,5 / L=60mm
1	1	Dichtungsgehäuse / seal housing TDSL-80	Z5-09919-1

Pos.	Anz	Beschreibung	Norm	Material
MUT-Tschamber				
Misch- und Trenntechnik GmbH				
Oberflächen Ra nach DIN ISO 1302 Reihe 1				
Maßstab 1:1				
Werkstoff:				
Freimaßtoleranzen Länge - und Winkelmaße nach DIN 7168 Tm Imittell nach DIN 7168 T2s				
Gleitringdichtung / mechanical seal				
Typ TDSL-80				
Typ: TDSL.				
Kunde: MUT-Tschamber				
Komm-Nr.:				
5-09905-2				
Ablageort: F:\zn\mutf\mutf34.11				
Blatt				
Zust./Änderung				
Datum				
Name				
Alle Rechte vorbehalten!				
Bearb. 06.09.05 R. Addario				
Gepr. Norm				
Datum				
Name				

Swing the fixing segment into the guide bush.
Fasten the fixing segment's with the hex. head screws

Remove the cover
Remove the axial locking screw
Remove the retaining ring
Remove the distance piece

Assemble the removal device

Pull the gear shaft upwards with the M20 screw

Draw the mixer shaft and the shut down washer against the mounting flange with the hexagonal nut M20, so that the shut down washer seals.
The shut down washer have to seal the vessel now.

Remove the screws from the mechanical seal carefully
Examine the tightness of the Shut down washer.
(check leakage)

Press away the mechanical seal from the mounting flange with 2 pieces hexagonal screws M16 carefully and uniformly.
Push the mechanical seal up to the coupling carefully.

Remove the hex. head screws between coupling and gear shaft.

Spread coupling with forcing screws.
Take coupling off from the agitator shaft.
Remove key from the mixer shaft.

Remove the gear box with the gear shaft

Remove screw, disk and retaining ring

Clamping flange has to be mounted to the mixer shaft and have to center at the mounting flange centring inside the lantern to hold mixer shaft in its seal position with the forcing screws.
(Please notice the detail drawing 5-26982)

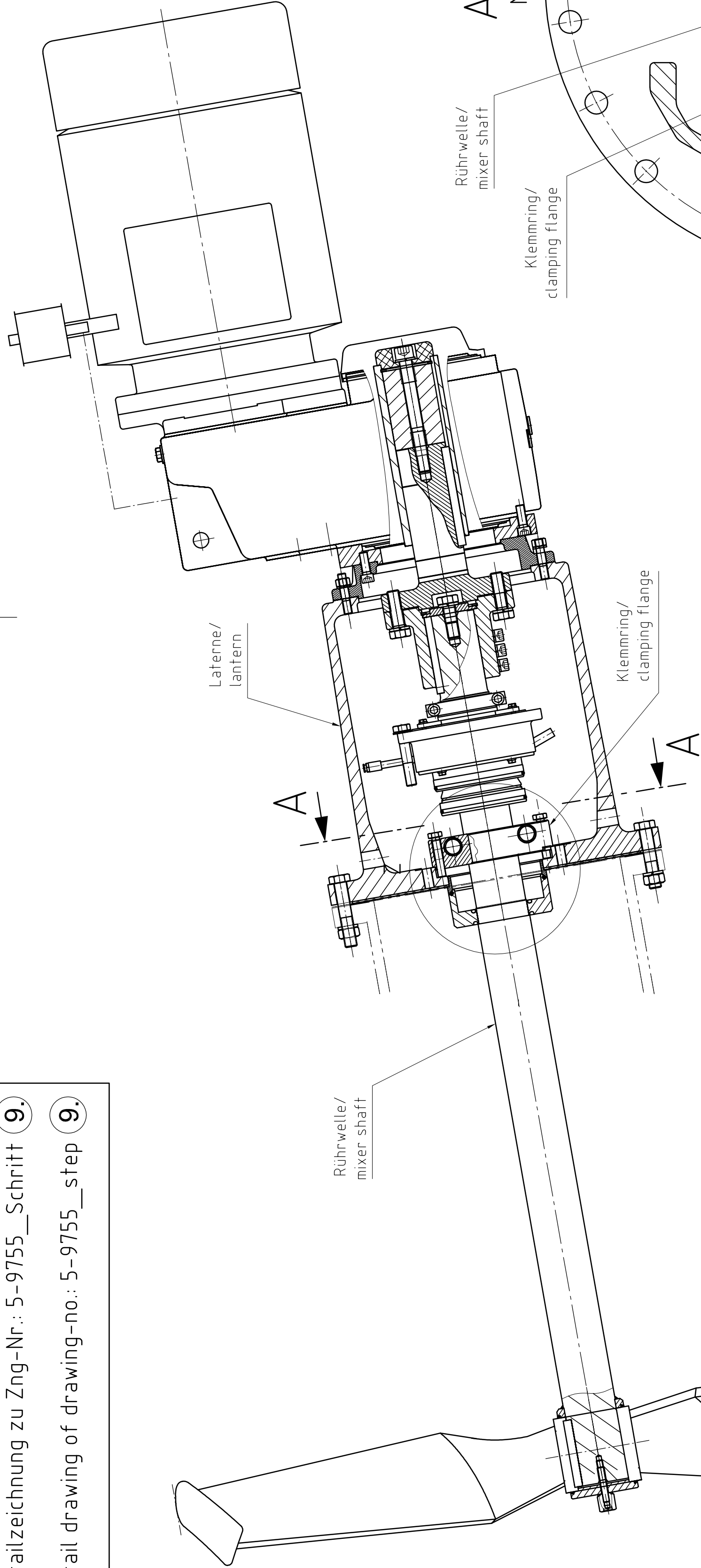
Push the GLRD unit carefully of the mixer shaft.
Secure at the same time the mechanical seal against fall down.
Carefully remove the mechanical seal upward.

 TSCHAMBER MUT MISCHE- UND TRENNTECHNIK		Allgemeintoleranz ISO 2768-mK		Oberfläche Ra nach DIN ISO 1302		Maßstab 1:10	Position	Menge
		Reihe 1						
		Name						
		Reihe 1						
			Bearb.	25.01.10	nh			
			Gepr.	26.01.11	nh			
			Norm					
			Datum					
D	Detailzeichnung	26.01.2011	nh			Z.Nr.: 5-9755		
C	neue Sprache	26.01.2011	nh					
B	Neue Version	25.01.2010	nh					
A	Neue Version	25.01.2010	nh					
Zust. Änderungen		Datum	Name	Dateiname 5-9755C		Ersatz für:		Index D
								Format A3

Ausbau der GLRD/ Removal mechanical seal SR4/SR5 TDSL-080/100		Z.Nr.: 5-9755	Index D	Format A3

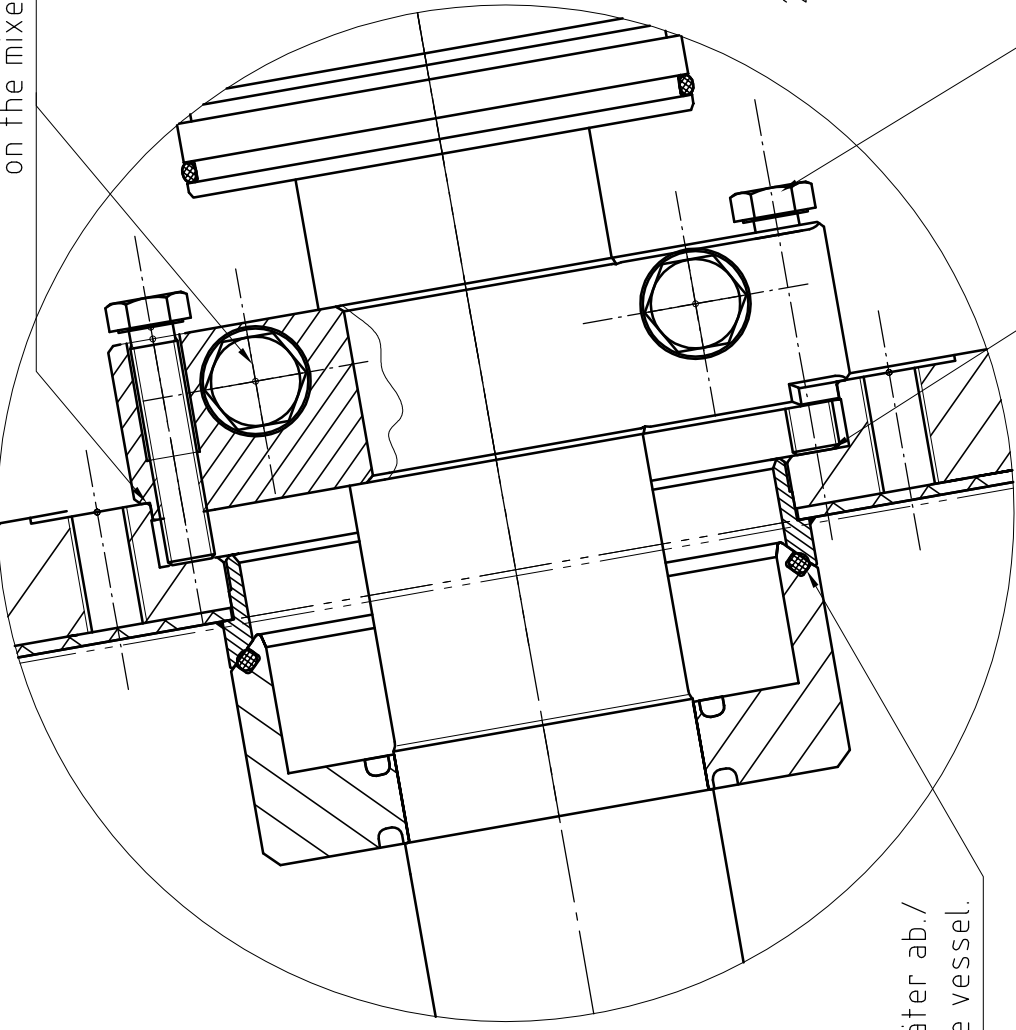
Detailzeichnung zu Zng-Nr.: 5-9755_Schritt 9.

Detail drawing of drawing-no.: 5-9755_step 9.



1. Klemmflansch in Laterne zentrieren
und mit Sechskantschrauben auf Rührwelle klemmen./
Center the clamping flange in the lantern
and clamp it with the hexagon head bolts
on the mixer shaft.

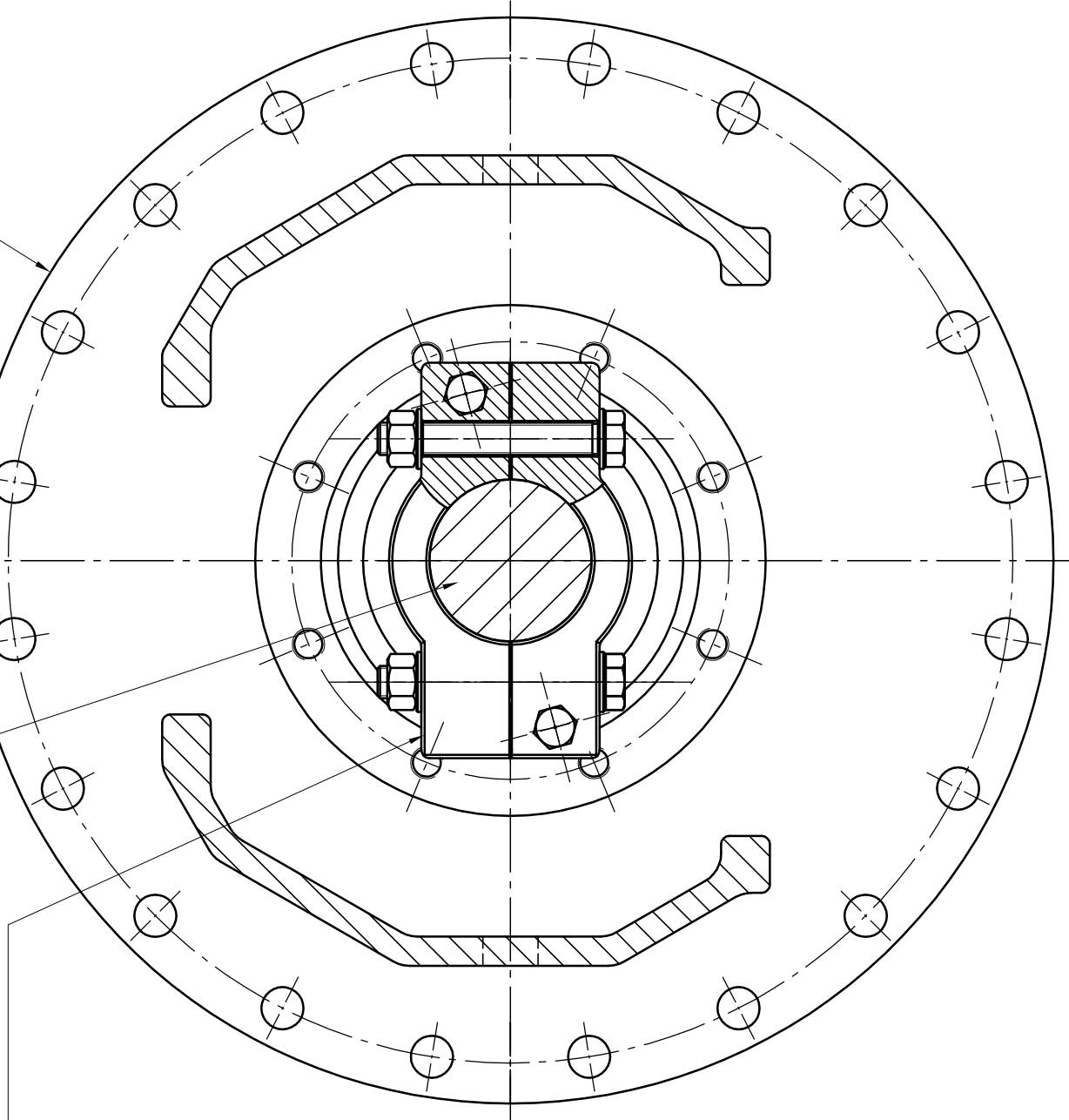
Z 1:2.5



Shut-Down Scheibe dichtet den Behälter ab./
The shut down washer have to seal the vessel.

2. Sechskantschrauben eindrehen bis sie
gegen Montageflansch drücken.
(Hält die Rührwelle in abgedichteter Position.)/
Hexagon head bolts screws until they
press against the mounting flange.
(Hold the mixer shaft in sealing position)

A-A
M 1:4
Rührwelle/
mixer shaft
Klemmring/
clamping flange
Laterne/
lantern



 TSCHAMBER MIT MISCH- UND TRENNTECHNIK		Allgemeintoleranz ISO 2768-mK		Oberfläche Ra nach DIN ISO 1302 Reihe 1		Maßstab	1:7	Position	-	Menge	-
		Datum		Name		-					
		Bearb.		25.01.11		nh					
		Gepr.									
		Norm									
		EN-Nr.:				Z.Nr.:		5-26982			
						Index		Format			
								A2			
Zust.	Änderungen	Datum	Name	Dateiname 5-26982		Ersatz für:		Ersetzt durch:			

Ausbau GLRD/Removal mechanical seal SR4/SR5
Detail Klemmflansch/detail clamping flange

Bitte folgen Sie den Schritten 1. - 2.

Please follow the steps 1. - 2.

MUT-Tschamber - IndustriestraÙe 12 - 79664 Wehr

Wuhan Kaidi Electric Power
Environmental Co., Ltd.
Kaidi Mansion, T1 Jiangxia Avenue,
Eastlake Newtech Development Zone
430223 WUHAN P.R. CHINA
CHINA

telephon

fax:

project number	20130205086
document number	2772
document number	2014-00156
date	09.07.2014
customer number	D12413
telephonical editor	0049/7762 52 06 -0

Please quote at every callback !

DECLARATION OF INCORPORATION OF PARTLY COMPLETED MACHINERY

according to the EC-machine guideline 2006/42/EC
annex II 1 B

We declare that the delivered agitator
which is delivered with the above projectnumber
Type : SR4D7 F-37
Serial no. : 13-205086 -1 until -8
corresponds to the relevant, fundamental safety and health requirements of the EC
guideline 2006/42/EC.

The following norms was been applied:
EN ISO 12100 Part 1, 2
EN ISO 13857
EMV 2004/108/EC

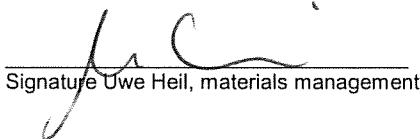
The special technical documents have been written according to appendix VII part B of the
EC-machine guideline 2006/42/EC.

Reponsible for the composition of the technical documents is:
Rodolfo Addario; phon: 07762-5206-29; addario@mut-tschamber.de

Starting operation is only allowed, if the machine where the agitator is built in fulfils the
rules of the " EC-machine guideline 2006/42/EC.



Signature Management



Signature Uwe Heil, materials management

General Instructions



Table of Contents

1	General.....	2
1.1	Safety Notes.....	2
1.2	Safety Instructions.....	3
1.3	Emissions.....	3
1.4	Limit of Use	3
1.5	Determined Use of Agitator	4
1.6	Manufacturer	4
2	Agitator Description	4
2.1	Assembly.....	4
2.2	Working at the Agitator.....	4
2.3	Operation in Explosive Atmosphere	5
3	Electrical Wiring & Connection	5
3.1	EMC-Directive	5
3.2	Earthing Connection.....	5
3.3	Safety and Controlling Instruments	5
4	Start-up Instructions	6
5	Malfunction	6
6	Warranty & Liability	6
7	Transport & Storage	7
8	Contact Information	7

1 General

All persons, who are involved in assembly, erection or start-up of this agitator have to read the following instructions carefully and in all details.

Please contact MUT-Tschamber GmbH on any unclarities.

The agitator is subject to the EC machinery directive 2006/42/EG

Additionally various harmonized norms are applied, e.g. DIN EN 12100-1/-2, DIN EN 60204-1, etc.

The manufacturer declares that the described agitator is only a partly completed machine and determined to be incooperated into a final machinery. The agitator itself is not determined to operate at its own.

The erection and commissioning is only allowed if the machine / plant where the agitator is installed is conform with the EC machinery directive 2006/42/EG

We reserve the right to change the agitator's design and specifications described in this manual where it is necessary for technical development without prior notice. The latest issue supersedes all previous versions.

1.1 Safety Notes

The safety notes refer only to the arrangement supplied. They can never be exclusive, and must be used in conjunction with the relevant safety regulations for the machine and auxiliary equipment.



Danger!
Mandatory instructions to avoid personal injury and / or major damage to property



Danger!
Mandatory instructions for explosion protection to avoid personal injury and / or major damage to property



Attention!
Instructions to avoid damages or destructions to the machine as well as the plant equipment



Advice!
Important information, instructions or advices to be considered for correct use of the machine.

1.2 Safety Instructions

This MUT-Tschamber agitator is a machine of high technical quality level. It is built acc. to common used technical and safety rules. Prior to delivery the agitator is tested on its function.

The agitator meets all relevant safety and health protection rules in terms of the EC machinery directive however only limited to the determined and specified use by the manufacturer. Any deviations from the specified use can cause risks and danger for operators life or third parties as well as affecting the machines performance or other asset values.

The agitator was designed for efficient operation only under the specified operating conditions (see dimension drawing and application conditions). MUT-Tschamber is not liable for any caused damages resulting on unspecified working conditions. If the agitator shall operate under other conditions the harmlessness has to be clarified with MUT-Tschamber before.

The operating company is requested to check within the scope of his basic obligations the labour protection laws in respect of consequences to the environment in case of agitator malfunction as well as which additional safety precautions have to be respected for people and environment protection.

It is only allowed for authorized personnel with skilled agitator knowledge to install, operate, maintain and dismantle the agitator.

The responsibilities during any workings have to be clearly determined and followed to avoid unclear competences regarding safety aspects.

Additionally to the advices mentioned in this manual all general regulations for operational safety and rules for accident prevention have to be taken into consideration.

Important: It is only allowed to start-up and operate the agitator after proper installation into the destined vessel, otherwise it reserves threatening danger for life and limb as well as for asset values to the operator.

For avoiding safety risks for human beings and properties unauthorized modifications or any changings at the agitator are not permitted.

Neglected preventative maintenance work increases the failure risk of the agitator. We advice to proper check any wear and tear parts during each plant / machine revision. Please contact the appropriate staff member at MUT-Tschamber.

We strongly advice to ask for genuine spare parts from MUT-Tschamber. This guarantees proper and safe function with long lifetime of the agitor.

1.3 Emissions

Each dynamic seal like mechanical seal, stuffing box, and other seal-rings is not leakage free. The amount of leakage is determined by operating and maintaining conditions.

1.4 Limit of Use

For limits in pressure and temperature please see dimensional drawing .

1.5 Determined Use of Agitator

The agitator is only to use in the determined vessel conditions. The operation under other conditions as specified is not allowed. Please avoid operation under various specified limit datas.

1.6 Manufacturer

MUT-Tschamber GmbH
Industriestrasse 12
79664 Wehr
Tel.: 07762-5206-0
Fax: 07762-5206-33
President: Hanspeter Tschamber

2 Agitator Description

2.1 Assembly

The agitator is driven either by an electric, pneumatic or hydraulic drive.

The agitator shaft is double beared and consists of a floating bearing and a fixed bearing. The shaft length and the shaft diameter as well as the installed impellers are designed and calculated based on the given mixing task.

The shaft bearing is designed to absorb upcoming forces and torque from the shaft. The generated loads are resulting from shaft and impeller weight, hydraulic radial and axial impeller forces and the vessel pressure. The agitator is designed for vibration-free operation meaning that the natural vibration frequency of the agitator shaft has adequate distance to the actual shaft "critical" speed. The impellers are balanced staticly.

2.2 Working at the Agitator

Any work at the agitator is only allowed:

- ✓ when all drives are switched off
- ✓ when the vessel is pressureless
- ✓ when all switches are protected against unauthorized switching

2.3 Operation in Explosive Atmosphere

If not explicit mentioned in the agitator specification the operation is only allowed in the **non-explosive area**. This means that it must be ensured that within the vessel as well as outside of the vessel there is not any explosive atmosphere existing at any time.

The operator has to evaluate any possible danger of explosion considering the guidelines of directive 94/9/EC as well as DIN EN 13463-1 and DIN EN 1127-1. Particularly it is only allowed to operate the agitator at specified speed and frequency! Another or further use is not in accordance to the regulations.

3 Electrical Wiring & Connection

The AC-motor has to be electrical connected in accordance to the local rules (e.g. VDE 0100 etc.) and has to be carried out by an authorised electrician. Especially cable run, cable cross-section and fuse protection of the AC-motor has to be executed professional and in accordance to the local rules.

Consider also the especial explosion proof rules when operating in explosive atmosphere.

3.1 EMC-Directive

If the machine will be connected to the electrical control cabinet, especially when using electrical control units like e.g. frequency converter the instructions of the control unit manufacturer have to be strongly considered in regard to the effective EMC-directive. It may be that for the electric and control leads special sanctions will be necessary (e.g. special shielded wires etc.) .

3.2 Earthing Connection

The agitator including all protection covers, control sections and lifting devices have to be grounded. If it is possible that the operator can come in contact with the machine and the mixed product, the earthed connection must be additionally equipped with a residual-current operated circuit breaker.

3.3 Safety and Controlling Instruments

The agitator is equipped with various safety and control surveillance installations. These are e.g. temperature probes, pressure probes, limit switches etc. It is not allowed to dismantle, switch-off, modify or manipulate these installations.

All safety and control surveillance installations have to be electrical connected and proper function checked before first start-up.



Danger!

Safety and control surveillance installations have to be installed in a professional way and any removal is not allowed.

4 Start-up Instructions

The instruction manual and the safety instructions have to be read carefully before start-up of the machine.

Check following items before agitator commissioning:

- ✓ reliable fixation
- ✓ all bolts properly tightened with specified torque
- ✓ all protection covers placed and fixed
- ✓ make sure that no foreign subjects are in the vessel
- ✓ remove all loose subjects around the agitator and vessel area
- ✓ close all access doors to the vessel due to safety reasons
- ✓ all electrical installations have to be executed in professional way
- ✓ all additional instruction manuals (e.g. gear box, motors etc.) have to be respected
- ✓ optionally explosion proof directories have to be respected
- ✓ correct rotating direction of motor has to be checked. Notice the direction arrow at the motor

5 Malfunction

Detect and keep records of the malfunction character. The attached malfunction list serves as a first advice to specify malfunction. If temperature and / or pressure increases in comparison to the specified or standard parameter the agitator has to be switched off due to safety reasons. Check and specify the reason for it.

If you are not able to proper specify the malfunction reason when contact MUT-Tschamber accordingly.

6 Warranty & Liability

The MUT-Tschamber general sales and supply conditions are the valid agreement if there is no further contractual agreement existing.

Any warranty and liability claims of any damages of goods and persons are excluded, if they are based on following reasons:

- ✓ non-conform use of the agitator
- ✓ inappropriate erection, commissioning, operating and maintaining of agitator
- ✓ agitator operating without mounted safety and guard equipment
- ✓ ignoring of any advices mentioned in the instruction manual regarding transportation, storing, erection, commissioning, operating and maintaining of agitator
- ✓ unauthorized constructural and design changings of agitator
- ✓ inadequate inspection and replacement of wear and tear parts

- ✓ inadequate executed repair work
- ✓ damages caused by foreign objects or force majeure

7 Transport & Storage

Please check the agitator directly after receivment in regard to any transport damages. Please inform MUT-Tschamber accordingly if you detect any possible damage. Please take all labels and advices mentioned on the package into consideration.

Normally the agitator is shipped as a complete unit. If dimensions and / or weight of the machine is oversized for the packing (pallets) it will be splitted in several components suitable for pallet transport.



Advice!

The agitator weight is mentioned in the specification and the dimension sheet

The agitator load pick up must be executed in a way that no parts can be damaged.

The adequate carrying capacity of any load-carrying equipment and further characteristics must be known at site. The assembly personnel must have knowledge about any on-site effective accident prevention regulations to assure a safe agitator assembly.



Attention!

Before lifting up check the adequate carrying capacity of the load-carrying equipment!

The agitator storage room must be tempered, dry and dustfree. Please avoid extreme temperature fluctuations. The agitator is protected against corrosion for a period of at least one (1) year under correct storage conditions.

A longer storing needs an after treatment with inhibitors and further additional protection procedures.

Please contact MUT-Tschamber in case of any unclarities.

8 Contact Information

Service and Spare Parts: Tel. +49 7762 5206-25 uwe.heil@mut-tschamber.de

Technical: Tel. +49 7762 5206-29 rodolfo.addario@mut-tschamber.de

Sales: Tel. +49 7762 5206-36 hagen.sudau@mut-tschamber.de

Documentation: Tel. +49 7762 5206-29 rodolfo.addario@mut-tschamber.de

Assembly of side-entry agitator

Before you assemble the agitator you must check the safety regulations of your site.
Avoid all danger for live or environment.

The agitator consists of:

- flat gear motor
- slurry mechanical seal
- lantern and mounting flange
- agitator shaft and impeller

Assemble as follows:

- Clean the mounting flange and the vessel-flange
- Put flat gasket ring on to vessel flange
- Carefully lift the agitator to the mounting flange
- Do not stress the agitator shaft.

Fix the agitator upon the mounting flange of the vessel.

Attention: See drawing 8-3103 (Torquetable for assembly...)

- Remove lifting device
- Bring in the impeller by the man-hole into the vessel
- Fix impeller at the shaft accordingly page “assembly of the impeller”
- Move fixing blade out of the groove of the sleeve. Secure the fixing blades in this position. (Working-position) See page “mechanical seal”.
- Connect motor electrically
- Check direction of rotation:
clockwise seen from drive to impeller
- It is not permits to operate the agitator with a empty vessel, the agitators mechanical seal must be always covered with product. The mechanical seal have to lubricated with product.

Disassemble in reverse order!

Data for maintenance:

- Lubricate the bearings of the mechanical seal according to lubrication list.
- Maintenance of the mechanical seal according page mechanical seal.

Montage des Ölausgleichsbehälters Mounting of the oil expansion tank

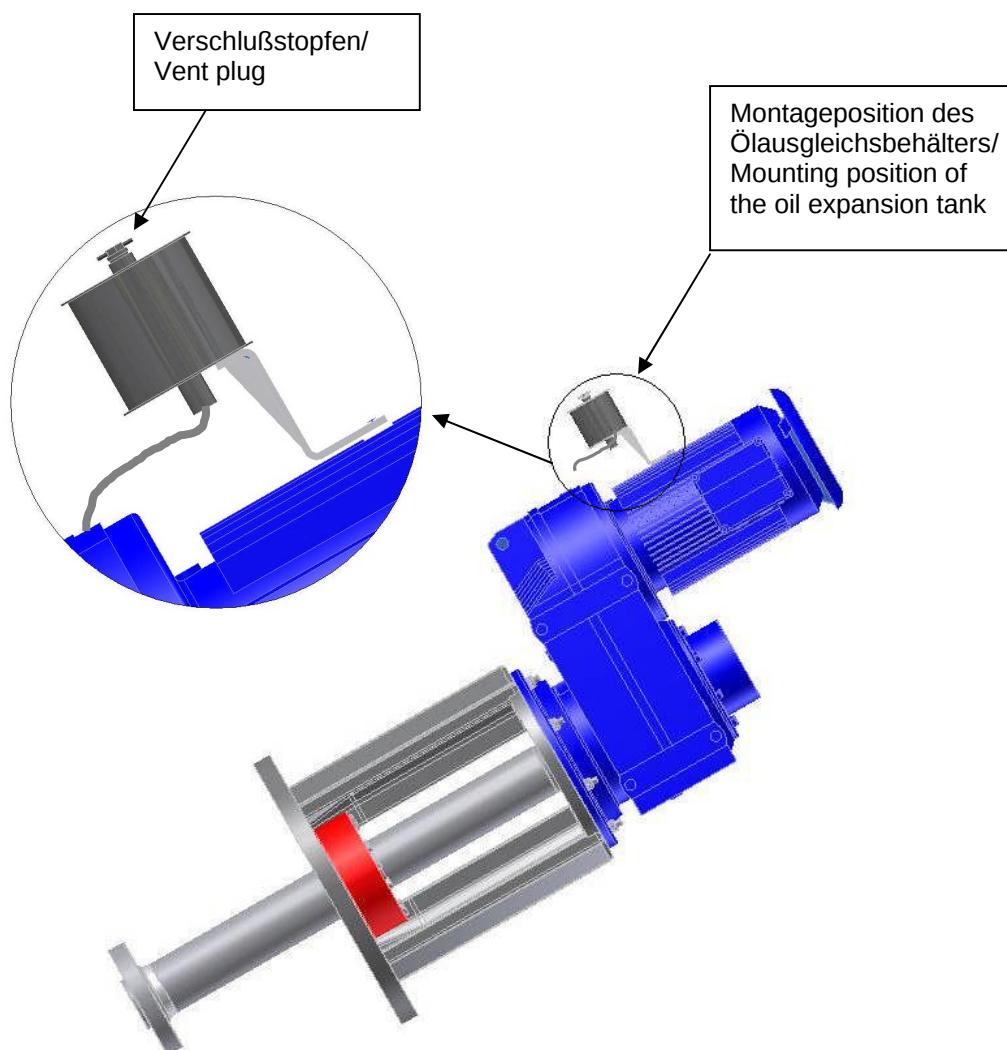
Hinweis!

- Entfernen des Verschlußstopfens vor der Inbetriebnahme (Überdruck), ggf. Druckentlüftungsschraube montieren.
- Betriebsanleitung des Getriebeherstellers beachten!



Attention!

- Prior to starting-up, remove vent plug from vent screw if necessary
- Note the manual instruction of the gear box.



Impeller Assembly SR



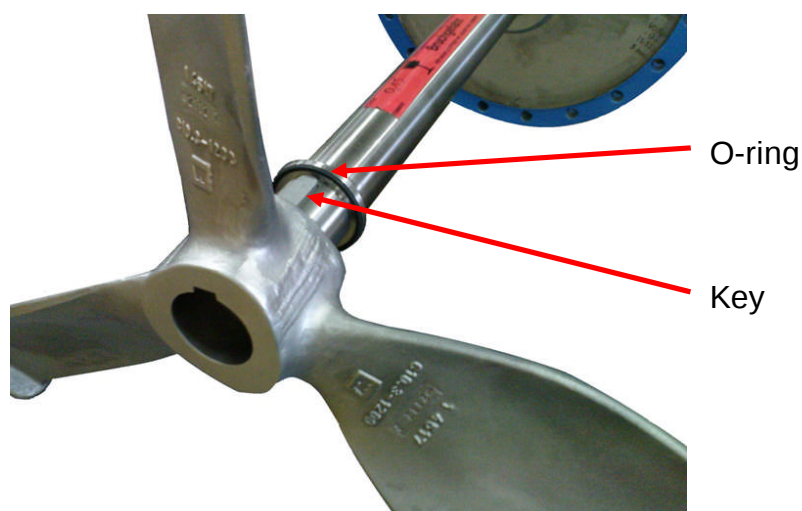
The agitator will be shipped with disassembled impeller. Normally the assembly of the impeller will be executed after insertion of the agitator into the tank.

1 Safety Instructions

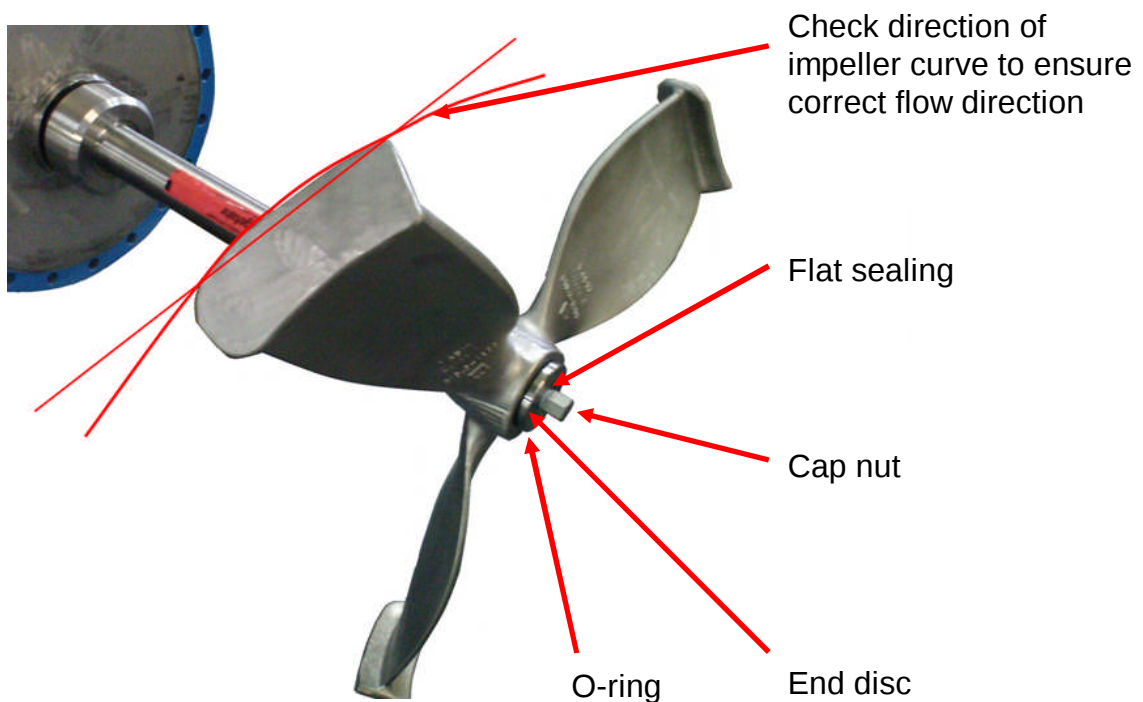
The local instructions regarding working safety have to be respected. Every working practice that compromises safety has to be avoided!

2 Impeller Assembly

- Dismantle all preassembled parts from the agitator shaft end: Cap nut, seal ring, end disc and the two (2) O-rings.
- Make sure that the shaft end as well as the impeller hub are clean and not damaged. Remove all protection layers and clean all seal surfaces as well as assembly surfaces.
- Place the O-ring in the shaft groove. It is recommended to grease it with Vaseline before to make sure that the O-ring stays in correct position during assembly.
- Shift the impeller onto the shaft end along the key until its end position. Check before the correct flow direction of the impeller.



- Place the second O-ring in the groove of the end disc. It is recommended to grease it with Vaseline before to make sure that the O-ring stays in correct position during assembly. Shift end disc onto the threaded rod.
- Place the cap nut together with the seal ring. Tighten the cap nut to torque levels indicated in the torque-table for agitator assembly.

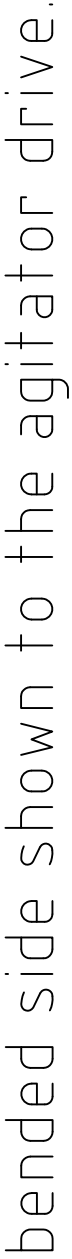


3 Impeller Removal

For impeller removal please follow the a.m. instructions in reverse direction

4 Accompanying Documents

Assembly Drawing with Spare Parts List



Rührorganbefestigung SR4

Mechanical seal: TDSL-80

Single acting Slurry Type with 2 Sealrings

Instruction for Storing Mounting Maintenance:

1. Delivery:

The mechanical seal is fully assembled.

2. Drawing

Part of this Manual must be the following drawings:

Drawing of mechanical seal 5-... , see Drawing of agitator

3. Safety:

The mechanical seal offers high operating safety. Never the less, it is still the duty of the operator to preview safety measures that prevent danger from people and environment in case of failure of the mechanical seal.

4. Storage:

Store in dry and dust free areas only.

After prolonged storage periods (more than one year), the o-rings of the mechanical seal have to be replaced, in order to insure start up.

5. Preparations of mounting:

During Mounting of agitator you have to take care that no sealrings will be damaged caused by hitting.

You must not put any load on seal rings during assembly.

During transport and assembling of the agitator the fixing elements (Pos. 7) have to be in the groove of the sleeve.

6. Start Up and Operating

The mechanical seal is a Sub-level Type. That means that the liquid level inside the vessel is above the level of the mechanical seal. The mechanical seal will be lubricated and cooled by the medium in your vessel.

Important:

The liquid level of the vessel must always be higher then the mechanical seal.

This must be guaranteed by monitoring of the liquid level.

The mechanical seal must never run dry.

The fixing elements must be removed from the groove of the sleeve into operating position.

After a long period of standstill you should first move the shaft by hand.
(turn the van of the drive)

7. Maintenance of mechanical seal:

If you have normal operating conditions there is no special maintenance necessary.
However we recommend to overhaul the mechanical seal every 10000 operating hours.

8. Removing of the mechanical seal drawing-no. 5-9755-2

The mechanical seal should only be maintained at MUT-Tschamber.

Note for reassemble

All seal-rings and O-rings have to be checked.

All surfaces has to be smooth otherwise grind with sand-paper

Please take care for absolute clean working conditions all parts have to be absolute clean.

O-Rings of mechanical seal have to be lubricated with Vaseline before assembly.

The seal faces will be assembled clean and dry.

After all parts have been assembled, the Clamping ring is fastened again.

Finally the locking plate must be removed from the groove of the sleeve.

You must only put pressure to the mechanical seal after you have securely fastened all bolts of the mechanical seal and the agitator.

Problem	Possible cause	Solution
Unusual, regular running noise	a) Meshing / kibbling noise: Bearing damage b) Knocking noise: Irregularity in teeth of gear motor c) Mechanical sealing damaged	1. Check the oil 2. Lubricate the bearing 3. Contact customer service 1. Check the oil 2. Lubricate the bearing 3. Contact customer service 1. Mechanical seal TDSL: switch off the agitator 2. Mechanical seal TDSL: Control level conditions of the vessel. The liquid level of the vessel must always be higher than the mechanical seal. The mechanical seal must never run dry. 3. Contact customer service
Unusual, irregular running noise	a) Foreign bodies in the oil of the drive	1. Check the oil 2. Stop the drive 3. Contact customer service
Oil leaking from the motor flange from the motor oil seal from the gear unit flange from the output end oil seal	a) Sealing damaged b) Gear unit not vented	Call customer service for a) Vent the gear unit for b)
Oil leaking from the breather valve	a) Too much Oil b) Breather valve not fitted properly c) Frequent cold starts (oil foams) and/or high oil level	a) Correct the Oil level b) Fit the breather valve correctly
Direction of rotation of the impeller wrongly	Phase attaching	Phase attaching examine / phases exchange

Note:

Please have the following information to hand if you require the assistance of our customer service:

- . Name plate data of the agitator
- . Type and extent of the fault
- . Time and circumstances of the fault
- . Presumed cause

[illegible]

ERECTION SPARE PART LIST		DIC JOB NO. : 110180
		P/O NO. : KH1303C-TB2-006
		ITEM NO. : 13-205086
NAME OF EQUIPMENT : Agitator SR4D7F-37 Article-No.: 51224		VENDOR'S NAME : MUT-Tschamber

SL. No.	NAME OF SPARE PARTS	SPECIFICATION (MATERIAL)	DRAWING NO. (PART NO.)	SKETCH	QUANTITY			REMARKS
					INSTALLED PER ONE EQUIPMENT	RECOMMENDED BY VENDOR PER ONE EQUIPMENT	TOTAL SUPPLY BY VENDOR	
1	Flat geared motor				1			
2	Lantern	GG20	3-09932-2		1			
3	Distance piece	1.4301	3-10285-4		1			
4	Gear shaft	EN-GJS-500-7	3-9583-3		1			
5	Coupling	GGG50	3-5040-3		1			
6	Flange connection	St / A4			1			
7	Agitator shaft	1.4529	3-16721		1			
8	Mechanical seal	SSV-1.4529	5-09905-2		1			
9	Impeller	1.4517	7-16729		1			
10	Fastening impeller	1.4462 / 1.4529 / Viton	7-16723		1			

TWO - YEARS SPARE PART LIST	
DIC JOB NO. : 110180	
P/O NO. : KH1303C-TB2-006	
ITEM NO. : 13-205086	
VENDOR'S NAME : MUT-Tschamber	
NAME OF EQUIPMENT : Wear parts mechanical seal TDSL2-080 Article-No.: 16410	

SL. No.	NAME OF SPARE PARTS	SPECIFICATION (MATERIAL)	DWG NO. PART NO.	SKETCH	QUANTITY			UNIT PRICE	TOPTAL PRICE	Q'TY REVIEWED BY VENDOR	Q'TY REQ'D BY VENDOR	REMARKS
					INSTALLED PER ONE EQUIP.	RECOMMENDED BY VENDOR PER ONE EQUIP.	TOTAL SUPPLY BY VENDOR					
1	Wear parts mechanical seal	SSV	5-09905-2			1		2.400 €	2.400 €			

SPECIAL TOOL LIST	
DIC JOB NO.	: 110180
P/O NO.	: KH1303C-TB2-006
ITEM NO.	: 13-205086
NAME OF EQUIPMENT : Special tools SR4 mechanical seal Article-No.: 50483	
VENDOR'S NAME : MUT-Tschamber	

SL. No.	NAME OF SPECIAL TOOL	SPECIFICATION (MATERIAL)	SKETCH	PURPOSE	QUANTITY		REMARKS
					SUPPLY PER ONE EQUIPMENT	SUPPLY PER ONE EQUIPMENT	
1	Special tools SR4 mechanical seal	S235JRG2		replace mechanical seal	1		

Installation Declaration

Getriebebau NORD GmbH&Co.KG

Rudolf-Diesel-Str. 1, D-22941 Bargteheide, Germany

declares in its sole responsibility, that the fundamental requirements of Directive 2006/42/EC for incomplete machines have been complied with for the following products.

Helical gear units and helical inline gear motors

Type SK ...

Parallel shaft gear units and parallel gear motors

Type SK ...82, SK ...82NB

Bevel gear units and bevel gear motors

Type SK 90 ..., SK 92 ...

Worm gear units and worm gear motors

Type SK 1S..., SK 2S..., SK 020..., SK 120..., SK 130..., SK 32100, SK 33100, SK 42125, SK 43125

Industrial gear units

Type SK 1 ...07

The gear units and geared motors are solely intended for installation in a machine.

The special technical documents have been produced and will be presented to the relevant authorities by the authorised person in case of justified demand.

The following harmonised standards (or parts of these standards) have been taken into account:

DIN EN ISO 12100-1: 2003

DIN EN ISO 12100-2: 2003

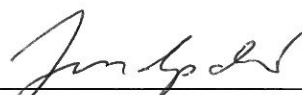
DIN EN ISO 14121-1: 2007

The products may only be commissioned if, as necessary, it has been established that the machine in which the products are to be installed complies with the regulations of the applicable Directive.

Bargteheide 1 April 2010



U. Küchenmeister, Managing Director



Dr. J. Jendryschik, Technical Director *)

*)Authorised for the compilation of the technical documents



Getriebebau NORD GmbH & Co. KG / Getriebebau-Nord-Straße 1 / 22941 Bargteheide

- Spare parts list -

Ack No: 0201261627/900
PO No: 2014-10347
Cu Mat No: 50121

MUT-TSCHAMBER
MISCH-U. TRENNTÉCHNIK GMBH
INDUSTRIESTR. 12
79664 WEHR

Type: SK7282AFBH66-225SH/4 TF RDD

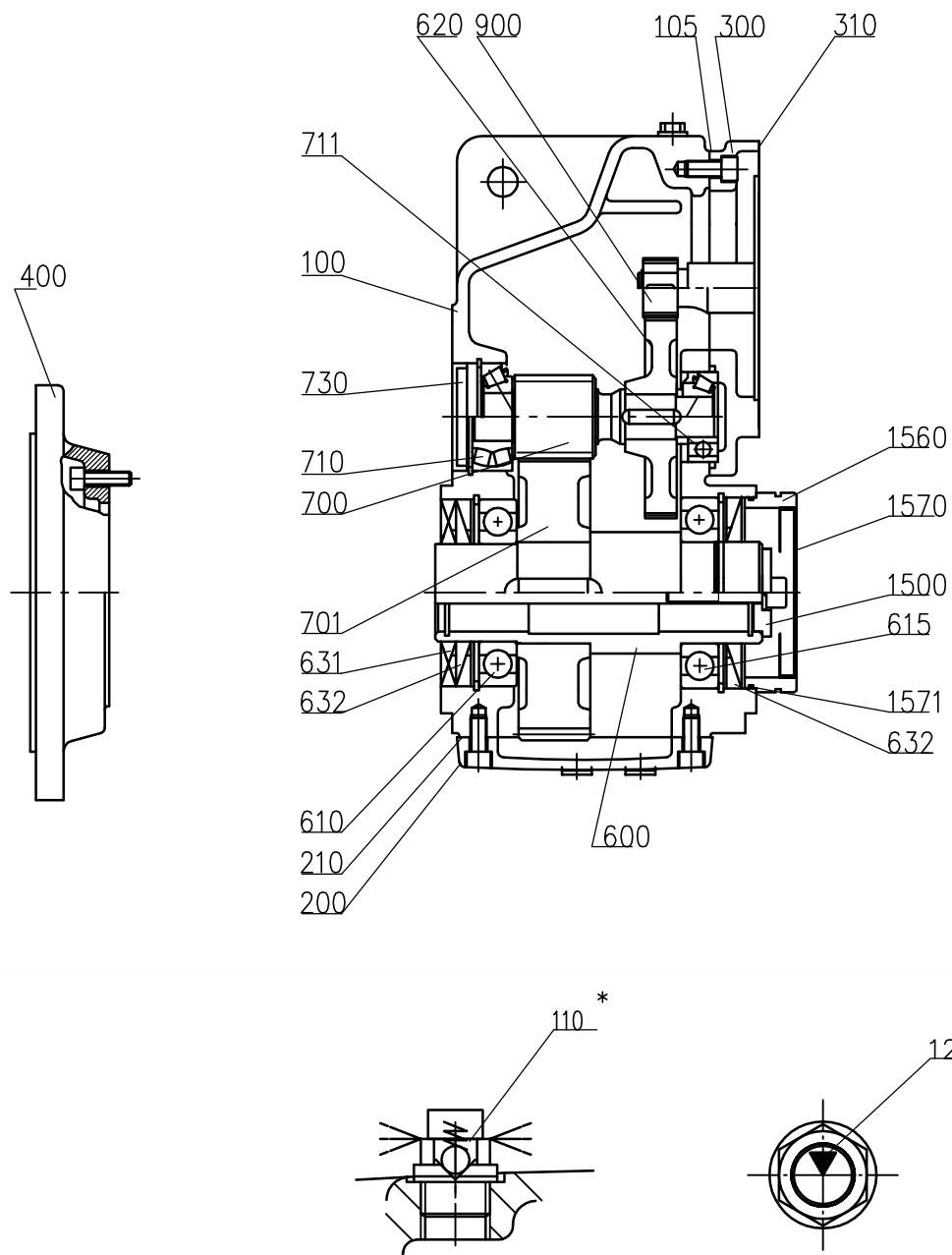
Output Speed: 156,000 1/min
Ratio: 9,48
Gearbox Mounting Position: M1
Lubricant Type: ISO VG 220 synthetic oil

Pos	Partnumber	Quantity	Type
0001	008002210	0,010 L	OIL ALPHASYN GS 220
0005	038674081	1 PC	MOTOR 225SH/4 P28 350 400D TW/TF 1LE15
0100	087211000	1 PC	HOUSING SK 7282AZ B14 A-SIDE ONLY
0105	052797010	1 PC	GASKET-HOUSING SK72
0120	022024010	1 PC	OIL LEVEL GLASS M24 X1,5 BRASS
0200	087218000	1 PC	ASSEMBLY COVER SK 7282/7382
0210	087297000	1 PC	GASKET-ASSY COVER SK 7282 S=0.5
0300	052713030	1 PC	INPUT COVER 350 SK 72
0310	052797000	1 PC	MOTOR GASKET SK72 350X250 LK300 S=0.5
0400	087214000	1 PC	FLANGE 450 SK 7282/9062/9072
0600	087237000	1 PC	OUTPUT SHAFT 80H7 SK7282A
0610	024622200	1 PC	BEARING 6222
0615	024622200	1 PC	BEARING 6222
0620	087273020	1 PC	OUTPUT GEAR Z=77/4.00
0631	025110031	1 PC	SEAL 110X200X13 AS MAT.:FKM
0632	025110041	2 PC	SEAL 110X200X13 A MAT.:FKM
0700	087272020	1 PC	PINION SHAFT Z=16/4.00
0701	052771010	1 PC	INPUT GEAR Z=57 M=3.00
0710	024323090	1 PC	BEARING 32309 A
0711	024323080	1 PC	BEARING 32308 A
0730	025810000	2 PC	SEAL CAP 100X12 SK72/7282/3282
0900	052870030	1 PC	INPUT PINION D=42 Z=29 M=3.00
1500	087282310	1 PC	FIXING ELEMENT KIT HS80 1.4305 SS
1560	087282130	1 PC	SOCKET 215.0/180.0X 53 VK
1570	025818000	1 PC	SEAL CAP 180X12 SK6282 SOLIDSHAFT
1570	025818000	1 PC	SEAL CAP 180X12 SK6282 SOLIDSHAFT
1571	025518635	1 PC	O-RING 186X3,5
1800	028390400	1 PC	EXPANSION CHAMBER KIT II SIZE 6-7
9430	010385130	1 PC	PROT.SHIELD 225 RDD 1LE15
9431	022106205	4 PC	SHCS M 6 X 20 DIN 912 VZ PRE30-8
9432	022500600	8 PC	HEX NUT M 6 DIN 934 VZ
9433	028560066	8 PC	LOCK WASHER A 6 DIN 127 VZ
9434	022710640	8 PC	PLAIN WASHER B 6,4 DIN9021B-ST VZ



Ersatzteilzeichnung / Spare Parts Drawing

Flachgetriebe SK 6282AF – SK 11282AF (IP66) Parallel Shaft Gear Unit SK 6282AF – SK 11282AF (IP66)



Bei Ersatzteilbestellungen bitte den Typ und die Fertigungsnummer angeben.
Schmierstoffe und Schmierstoffmenge der Tabelle im Katalog entnehmen.

*optional

When ordering spare parts please give the type and the production number.
See lubrication table for type and quantity of oil

*optional

EB100058

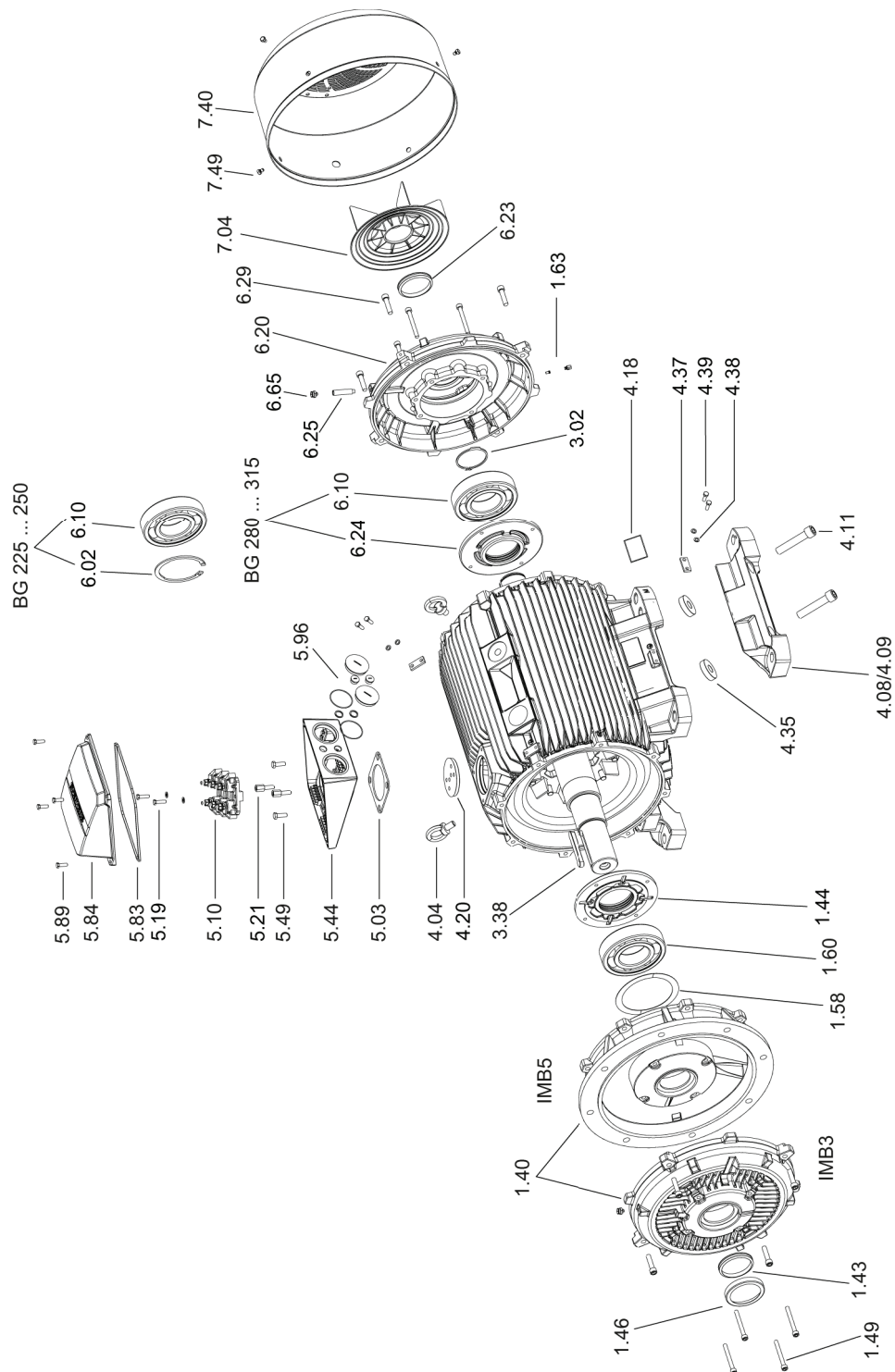
10.4 Machine parts

Part	Description	Part	Description
1.00	DE bearings		Terminal box, complete
1.30	Bolt	5.30	Rubber stopper (1MA618.-20.)
1.31	Spring lock washer according to SN 60727	5.31	Terminal clamp (1MA618.-20.)
1.32	Bolt	5.32	Angle (1MA618.-20.)
1.33	Nut	5.33	Washer (1MA618.-20.)
1.40	End shield	5.36	Spring lock washer according to SN 60727
1.43	Shaft sealing ring	5.37	Spring lock washer according to SN 60727
1.44	Bearing cover	5.42	Terminal box housing, including seal
1.45	Bolt	5.43	Entry plate
1.46	Cover ring	5.44	Terminal box top side
1.47	O ring	5.45	Enclosure
		5.46	Bolt
1.48	Self-tapping screw	5.47	Bolt
1.49	Bolt	5.48	Spring lock washer according to SN 60727
1.50	Flanged nut	5.49	Self-tapping screw
1.56	Spacer washer	5.51	Nut
1.58	Spring washer	5.52	Cable gland
1.60	Roller bearing	5.53	Sealing plug
1.61	Spring band for end shield hub	5.54	O ring
1.62	Sealing plug 1LG	5.55	Nut
1.63	T plug 1LE GG 100..315	5.60	Connecting terminal plate screw
1.64	DE bearing cover, inner	5.61	Bolt
1.67	Outer bearing cover	5.62	Spring lock washer according to SN 60727
1.68	Grease slinger (optional)	5.63	Mounting rail
1.69	Compression spring	5.64	Spring washer
3.00	Rotor, complete	5.65	Bolt
3.02	Locking ring	5.68	O ring
3.38	Featherkey	5.69	Sealing plug
3.88	Featherkey for fan	5.70	Terminal clamp
4.00	Stator, complete	5.72	Contact bracket
4.04	Eyebolt	5.76	Terminal plate / contact bracket
4.05	Disk	5.78	Spring lock washer according to SN 60727
4.07	Housing foot	5.79	Bolt
4.08	Housing foot, left	5.80	Self-tapping screw 1LE + 1LE GG 100..315
4.09	Housing foot, right	5.81	Self-tapping screw
4.10	Spring lock washer according to SN 60727	5.82	O ring
4.11	Bolt	5.83	Seal
4.12	Nut	5.84	Terminal box cover
4.14	Nut	5.85	Terminal box cover including seal (optional screw)
4.18	Rating plate	5.86	Protection mark
4.19	Self-tapping screw	5.87	Bolt
4.20	Cover	5.88	Spring lock washer according to SN 60727

Part	Description	Part	Description
4.30	Contact bracket	5.89	Bolt
4.31	Grounding bracket	5.90	The top side of the terminal box can be rotated 4 x 90 degrees, complete (for subsequent mounting)
4.35	Disk	5.91	Bolt
4.37	Terminal board	5.92	Terminal box cover
4.38	Spring lock washer according to SN 60727	5.93	Seal
4.39	Grounding screw (self-tapping screw)	5.94	Bolt
4.40	Disk	5.95	Terminal box top side
4.41	Grounding lug	5.96	Sealing plug
5.00	Terminal box, complete	5.97	Nut
5.02	spacer	5.98	Metal-sheet nut
5.03	Seal	5.99	Adapter plate
5.04	Seal	6.00	NDE bearings
5.06	Mounting rail	6.02	Locking ring
5.08	Spacer sleeve	6.03	Bearing cover NDE, inner
5.09	Bolt	6.10	Roller bearing
5.10	Complete terminal board	6.11	Spring band for end shield hub
5.11	Terminal block	6.20	End shield
5.12	Ex d terminal box (1MJ6) (star point connection)	6.23	Shaft sealing ring
5.13	Link rail	6.24	Bearing cover NDE, outer
5.14	Terminal box underside	6.25	Lubrication sleeve
5.15	Plug	6.26	Cover
5.16	Spring lock washer according to SN 60727	6.27	Outer bearing cover
5.17	Bolt	6.28	Bolt
5.18	Spring lock washer according to SN 60727	6.29	Self-tapping screw
5.19	Self-tapping screw	6.30	Bearing cover NDE, inner
5.20	Cable entry, complete	6.31	Nut
5.21	Screw (drilled)	6.45	Bolt
5.22	Connection terminal, complete	6.64	Nut
5.23	Cable entry, complete	6.65	Grease nipple
5.24	Bolt	6.67	Rubber bush
5.25	Combination screws M3.5	6.72	Grease slinger
5.26	Set: Jumper plug Y, jumper plug Δ	7.00	Complete ventilation
5.27	Clamp	7.04	Fan
5.28	High saddle terminal	7.12	Lockwasher
5.29	Lower saddle terminal	7.19	Bolt
		7.40	Fan cover
		7.41	bracket
		7.47	Sleeve
		7.48	Spring lock washer according to SN 60727
		7.49	Bolt

Tools for mounting and withdrawing roller bearings; fans and output elements cannot be supplied!

B.1.12 1LE1 / 1MB1 BG 225 ... 315 cast iron



Intelligent Drivesystems, Worldwide Services

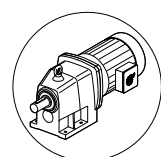


GB

B1000

Operating and Assembly Instructions for
Gear Units and Geared Motors


DRIVESYSTEMS



1. Notes	4
1.1 General information	4
1.2 Safety and information symbols	4
1.3 Correct use	4
1.4 Safety information	5
1.5 Other documents	6
1.6 Disposal	6
2. Description of gear units	7
2.1 Type designations and gear unit types	7
2.2 Name plate	8
3. Assembly instructions, storage, preparation, installation	9
3.1 Storing the gear unit	9
3.2 Long-term storage	9
3.3 Transporting the gear unit	10
3.4 Preparing for installation	10
3.5 Installing the gear unit	11
3.6 Fitting hubs on the gear shafts	12
3.7 Fitting push-on gear units	13
3.8 Fitting shrink discs	15
3.9 Fitting the covers	16
3.10 Fitting a standard motor	17
3.11 Retrospective paintwork	18
3.12 Fitting the cooling coil to the cooling system	19
4. Commissioning	20
4.1 Checking the oil level	20
4.2 Activating the automatic lubricant dispenser	20
4.3 Operation with lubricant cooling	21
4.4 Running-in time for the worm gear unit	21
4.5 Checklist	21
5. Service and maintenance	22
5.1 Service and maintenance intervals	22
5.2 Service and maintenance work	22
6. Appendix	26
6.1 Versions and maintenance	26
6.2 Torque values	38
6.3 Troubleshooting	38
6.4 Lubricants	39
6.5 Lubricant quantities	41



1. Notes

1. Notes

1.1 General information

Read the Operating Manual carefully prior to performing any work on or putting the gear unit into operation. Strict compliance with the instructions in this Operating Manual is essential. Getriebebau NORD accepts no liability for damage to persons, materials or assets as a result of the non-observance of this Operating Manual, operating errors or incorrect use. General wearing parts, e.g. radial seals are excluded from the warranty.

If additional components are attached to or installed in the gear unit (e.g. motor, cooling system, pressure sensor etc.) or components (e.g. cooling system) are supplied with the order, the operating instructions for these components must be observed.

If geared motors are used, compliance with the Motor Operating Manual is also necessary.

If you do not understand the contents of this Operating Manual or additional operating instructions, please consult Getriebebau NORD!

1.2 Safety and information symbols

Please always observe the following safety and information symbols!

	Danger!
	Risk of fatalities and injury
	Attention!
	Machine may be damaged
	Note!
	Useful information

1.3 Correct use

These gear units generate a rotational movement and are intended for use in commercial systems. The gear unit must only be used according to the information in the technical documentation from Getriebebau NORD.

	Danger!
	Use in explosion hazard areas is prohibited.

Strict compliance with the technical data on the rating plate is essential.

The documentation must be observed.

Appropriate safety measures must be taken for applications where failure of a gear unit or geared motor may result in injury.

1. Notes

1.4 Safety information

All work including transportation, storage, installation, electrical connection, commissioning, servicing, maintenance and repair must be performed **only by qualified specialist personnel**. It is recommended that repairs to NORD Products are carried out by the NORD Service department.

	Danger!
	Installation and maintenance work must only be performed when gear units are at a standstill and have cooled down. The drive must be isolated and secured to prevent accidental start-up. CAUTION! Depending on the operating conditions, the temperature of the gear unit may exceed 60°C. Danger of burns! Protection against accidental contact may need to be installed. Tighten the drive elements or secure the parallel key before switching on.

	Danger!
	Only use the eyebolts attached to the gear unit for transport. No additional loads may be attached. Transportation aids and lifting gear must have an adequate load-bearing capacity.

If geared motors have an additional eyebolt attached to the motor, this must also be used. Avoid pulling the eyebolts at an angle. The thread of the eyebolt must be fully screwed in.

Observe all safety information, including that provided in the individual sections of this Operating Manual. All national and other regulations on safety and accident prevention must also be observed.

	Danger!
	Serious physical and property damage may result from inappropriate installation, non-designated use, incorrect operation, non-compliance with safety information, unauthorised removal of housing components or safety covers and structural modifications to the gear unit.



1. Notes

1.5 Other documents

Further information may be obtained from the following documents:

- Gear unit catalogues (G1000, G2000, G1011, G1012, G1034, G1035)
- Operating and maintenance instructions for the electric motor
- if applicable, operating instructions for attached or supplied options

1.6 Disposal

Observe the current local regulations. In particular, lubricants must be collected and disposed of correctly.

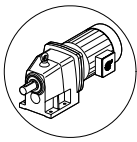
Gear unit components:	Material:
Toothed wheels, shafts, rolling bearings, parallel keys, locking rings, ...	Steel
Gear unit housing, housing components, ...	Grey cast iron
Light alloy gear unit housing, light alloy gear unit housing components, ...	Aluminium
Worm gears, bushes, ...	Bronze
Radial seals, sealing caps, rubber components,...	Elastomers with steel
Coupling components	Plastic with steel
Flat seals	Asbestos-free sealing material
Gear oil	Additive mineral oil
Synthetic gear oil (rating plate code: CLP PG)	Polyglycol-based lubricants
Cooling spiral, embedding material of the cooling spiral, screw fittings	Copper, epoxy, yellow brass

2. Description of Gear Units

2. Description of gear units

2.1 Type designations and gear unit types

	Versions / Options
<u>Helical gear units</u> SK 11E, SK 21E, SK 31E, SK 41E, SK 51E (single-stage) SK 02, SK 12, SK 22, SK 32, SK 42, SK 52, SK 62N (2-stage) SK 03, SK 13, SK 23, SK 33N, SK 43, SK 53 (3-stage) SK 62, SK 72, SK 82, SK 92, SK 102 (2-stage) SK 63, SK 73, SK 83, SK 93, SK 103 (3-stage)	- Foot mounting with solid shaft A Hollow shaft version V Solid shaft version L Solid shaft both sides Z Drive flange B14 F Output flange B5
<u>NORDBLOC helical gear units</u> SK 320, SK 172, SK 272, SK 372, SK 472, SK 572, SK 672, SK 772, SK 872, SK 972 (2-stage) SK 273, SK 373, SK 473, SK 573, SK 673, SK 773, SK 873, SK 973 (3-stage) SK 072.1, SK 172.1, SK 272.1, SK 372.1, SK 472.1, SK 572.1, SK 672.1, SK 772.1, SK 872.1, SK 972.1 (2-stage) SK 373.1, SK 473.1, SK 573.1, SK 673.1, SK 773.1, SK 873.1, SK 973.1 (3-stage)	X Foot mounting XZ Base and output flange B14 XF Base and output flange B5 AL Reinforced axial drive bearings 5 Reinforced output shaft (Standard helical gear unit) V Reinforced drive shaft (Standard helical gear unit)
<u>Standard helical gear units</u> SK 0, SK 01, SK 20, SK 25, SK 30, SK 33 (2-stage) SK 010, SK 200, SK 250, SK 300, SK 330 (3-stage)	D Torque support K Torque console S Shrink disc
<u>Parallel shaft gear units</u> SK 0182NB, SK 0282NB, SK 1282, SK 2282, SK 3282, SK 4282, SK 5282, SK 6282, SK 7282, SK 8282, SK 9282, SK 10282, SK 11282 (2-stage) SK 1382NB, SK 2382, SK 3382, SK 4382, SK 5382, SK 6382, SK 7382, SK 8382, SK 9382, SK 10382, SK 11382, SK 12382 (3-stage)	VS Reinforced shrink disc EA Hollow shaft with internal spline G Rubber buffer VG Reinforced rubber buffer
<u>Bevel gear units</u> SK 92072, SK 92172, SK 92372, SK 92672, SK 92772 SK 92072.1, SK 92172.1, SK 92372.1, SK 92672.1, SK 92772.1, SK 93072.1, SK 93172.1, SK 93372.1, SK 93672.1, SK 93772.1 (2-stage) SK 9012.1, SK 9016.1, SK 9022.1, SK 9032.1, SK 9042.1, SK 9052.1, SK 9062.1, SK 9072.1, SK 9082.1, SK 9086.1, SK 9092.1, SK 9096.1 (3-stage) SK 9013.1, SK 9017.1, SK 9023.1, SK 9033.1, SK 9043.1, SK 9053.1 (4-stage)	R Back stop B Fixing element H Covering cap as contact guard H66 Covering cap IP66 VL Reinforced bearings VL2 Agitator design VL3 Drywell agitator design
<u>Contrate worm gear unit</u> SK 02040, SK 02050, SK 12063, SK 12080, SK 32100, SK 42125 (2-stage) SK 13050, SK 13063, SK 13080, SK 33100, SK 43125 (3-stage)	IEC Standard motor mounting NEMA Standard motor mounting W With free drive shaft VI Viton radial seals
<u>MINIBLOC worm gear units</u> SK1 S32, SK1 S40, SK 1S50, SK 1S63, SK 1SU... SK 1SM31, SK 1SM40, SK 1SM50, SK 1SM63 (single-stage) SK 2S32NB, SK 2S40NB, SK 2S50NB, SK 2S63NB, SK 2SU..., SK 2SM40, SK 2SM50, SK 2SM63 (2-stage)	OA Oil expansion vessel OT Oil level tank SO1 Synthetic oil ISO VG 220 CC Casing cover with cooling spiral DR Spring Loaded Breather H10 Modular contrate pre-stage /31 Worm pre-stage /40 Worm pre-stage
<u>UNIVERSAL worm gear units</u> SK 1SI31, SK 1SI40, SK 1SI50, SK 1SI63, SK 1SI75, SK 1SIS31, ..., SK 1SIS75, SK 1SID31, ..., SK 1SID63, SK 1SMI31, ..., SK 1SMI75, SK 1SMID31, ..., SK 1SMID63, SK 1SIS-D31, ..., SK 1SIS-D63 (single-stage), SK 2SMID40, SK 2SMID50, SK 2SMID63, SK 2SID40, ..., SK 2SID63 (2-stage)	



2. Description of Gear Units

Double gear units consist of two single gear units. They are to be treated as per the instructions in this Manual, i.e. as two individual gear units. Type designation of double gear units: e.g. SK 73/22 (consisting of single gears SK 73 and SK 22)

2.2 Name plate

NORD DRIVESYSTEMS Getriebebau NORD GmbH & Co.KG D-22941 Bargteheide/Hamburg		085 03470 1	
Type SK 9282ASH - IEC280 - 280S/4		2	
		2	S1 3 2010 4
No. 200537905 - 100 12596508		5	
M2 12971 Nm 6	i 26,89 9	M3	10
P1 75 kW 7	n2 52 11 min ⁻¹		
1277 kg 8	CLP PG 220 / 55L 12		
1234567890 13 fB 1,3 14		www.nord.com	

Figure 2-1: Name plate (example)

Explanation of the Name Plate

- 1 Matrix – Barcode
- 2 NORD gear unit type
- 3 Operating mode
- 4 Year of manufacture
- 5 Serial number
- 6 Rated torque of gear unit output shaft
- 7 Drive power
- 8 Weight according to ordered version
- 9 Overall gear unit ratio
- 10 Installation orientation
- 11 Rated speed of gear unit output shaft
- 12 Lubricant type, viscosity and quantity
- 13 Customer's part number
- 14 Operating factor

3. Assembly instructions, storage, preparation, installation

Please observe all of the general safety information in Section 1.4, 1.3 and in the individual sections.

3.1 Storing the gear unit

For short-term storage before commissioning, please observe the following:

- Store in the fitting position (see Section 6.1) and secure gear units against falling
- Lightly grease bare metal housing surfaces and shafts
- Store in dry rooms
- Temperature must not fluctuate beyond the range of -5°C to $+50^{\circ}\text{C}$
- Relative humidity less than 60%
- No direct exposure to sunlight or UV light
- No aggressive, corrosive substances (contaminated air, ozone, gases, solvents, acids, alkalis, salts, radioactivity etc.) in the immediate vicinity
- No vibration or oscillation

3.2 Long-term storage

	Note! For storage or standstill periods in excess of 9 months, Getriebebau NORD recommends the long-term storage option. With the long-term storage option and the use of the measures listed below, storage for up to 2 years is possible. As the actual influences on the unit greatly depend on the local conditions, these times should only be regarded as guide values.
--	--

Conditions of the gear unit and storage area for long-term storage prior to commissioning:

- Store in the fitting position (see Section 6.1) and secure gear units against falling
- Transportation damage to the external paint must be repaired. Check that a suitable rust inhibitor is applied to the flange bearing surfaces. If necessary apply a suitable rust inhibitor to the surfaces.
- Gear units with the long-term storage option are completely filled with lubricant or have VCI corrosion protection agents added to the gear oil. (See label on gear unit)
- The sealing band in the vent plug must not be removed during storage. The gear unit must remain sealed tight.
- Store in a dry place.
- In tropical regions, the drive unit must be protected against damage by insects
- Temperature must not fluctuate beyond the range of -5°C to $+40^{\circ}\text{C}$
- Relative humidity less than 60%
- No direct exposure to sunlight or UV light
- No aggressive, corrosive substances (contaminated air, ozone, gases, solvents, acids, alkalis, salts, radioactivity etc.) in the immediate vicinity
- No vibration or oscillation

Measures during storage or standstill periods

- If the relative humidity is $<50\%$ the gear unit can be stored for up to 3 years.

Measures before commissioning

- If the storage or standstill period exceeds 2 years or the temperature during short-term storage greatly deviates from the standard range, the lubricant in the gear unit must be replaced before commissioning.
- If the gear unit is completely filled, the oil level must be reduced before commissioning.



3. Assembly instructions, storage, preparation, installation



3.3 Transporting the gear unit

	Danger!
	To prevent injury, the danger area must be generously cordoned off . Standing under the gear unit during transport is extremely dangerous .
	Attention!
	Avoid damage to the gear unit. Impacts to the free ends of the shafts may cause internal damage to the gear unit. Use adequately dimensioned and suitable means of transportation . Lifting tackle must be designed for the weight of the gear unit. The weight of the gear unit can be obtained from the dispatch documents.

3.4 Preparing for installation

The drive unit must be inspected and may only be installed if no transportation damage or leaks are visible. In particular the radial seals and the sealing caps must be inspected for damage.

All bare metal surfaces and shafts of the gear unit are protected against corrosion with oil, grease or corrosion protection agents before shipping.

Thoroughly remove all oil, grease or corrosion protection agents and any dirt from the shafts and flange surfaces before assembly.

In applications where an incorrect rotational direction may result in damage or potential risk, the correct rotational direction of the drive shaft is to be established by test running the drive when uncoupled and guaranteeing such for subsequent operation.

Gears with integrated return stops are marked with arrows on the driven/driving sides. The arrows point in the rotation direction of the gear unit. It must be ensured, when connecting the motor and during motor control, that the gear unit can only operate in the rotation direction, e.g. by means of a rotary field test. (For further details, please refer to Catalogue G1000 and WN 0-000 40)

	Attention!
	With gear units with an integrated back stop, switching the drive motor to the blocked rotation direction, i.e. incorrect rotation direction, can lead to gear damage.

Ensure that no aggressive or corrosive substances are present in the area surrounding the installation site or are subsequently expected during operation, which attack metal, lubricants or elastomers. In case of doubt, please contact Getriebebau NORD and take the recommended action.

Oil expansion tanks (Option OA) must be fitted in accordance with works standard WN 0-530 04. For gear units with an M10x1 vent plug, works standard WN 0-52135 must be observed.

Oil expansion tanks (Option OT) must be fitted in accordance with works standard WN 0-521 30.

If venting of the gear unit is provided, the vent or the pressure vent must be activated before commissioning. To activate, remove the transport securing devices (sealing cord). Position of the vent plug: see Section 6.1.

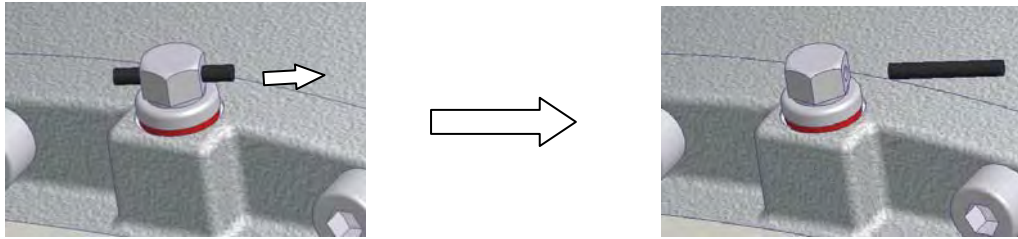


Figure 3-1: Activating the vent plug

Special pressure vents are supplied as loose parts. Before commissioning, the vent plug must be replaced with the pressure vent which is supplied as a loose part. This is achieved by screwing out the vent fitting and replacing it with the pressure vent and seal (refer to Section 6.2 for torque values). Double gear units consist of two single units and are equipped with 2 oil chambers and 2 pressure vents.

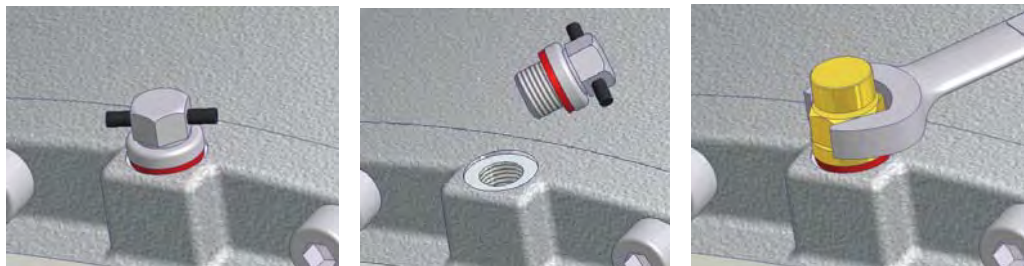


Figure 3-2: Removing vent plug and fitting the pressure vent

3.5 Installing the gear unit

The eyebolts screwed into the gear units must be used during installation. The safety notes in Section 1.4 must be observed.

The base and/or flange to which the gear unit is fitted should be vibration-free, torsionally strong and flat. The smoothness of the mating surface on the base or flange must be according to tolerance class K of DIN ISO 2768-2. All contamination to the bolting surfaces of gear unit and base and/or flange must be thoroughly removed.

The gear unit must be precisely aligned with the drive shaft of the machine in order to prevent additional forces from being imposed on the gear unit due to tension.

Welding of the gear unit is prohibited. The gear unit must not be used as the earth connection for welding work, as this may cause damage to the bearings and gear wheels.

The gear unit must be installed in the correct configuration (see Section 6.1) (UNIVERSAL gear unit types SI and SMI are independent of the configuration). Changes to the installation position after delivery require adjustment of the quantity of oil, and often other measures such as e.g. the installation of encapsulated roller bearings. Damage may result if the stated installation position is not observed.

All gear unit feet and/or all flange bolts on each side must be used. Bolts must have a minimum quality of 8.8. The bolts must be tightened to the correct torques (refer to Section 6.2 for torque values). Tension-free bolting must be ensured, particularly for gear units with a foot and flange.



3. Assembly instructions, storage, preparation, installation



	Danger!
	To ensure that the gearbox does not get too warm and to avoid injury to persons, observe the following during installation: • The surfaces of gear units or geared motors may become hot during or shortly after operation. Attention: danger of burns!! Protection against accidental contact may need to be installed. • With geared motors, the cooling air of the motor fan must be able to flow unobstructed onto the gear unit.

3.6 Fitting hubs on the gear shafts

	Attention!
	Do not subject the gear unit to harmful axial forces when fitting the hubs.

Drive and driven elements, e.g. coupling and chain-wheel hubs must be mounted onto the drive and driven shaft of the gear unit using suitable pullers that will not apply damaging axial forces onto the gear unit. In particular, do not hit the hubs with a hammer.

Use the end thread of the shafts for pulling. Fitting can be aided by coating the hub with lubricant or heating it up to approx. 100°C beforehand.

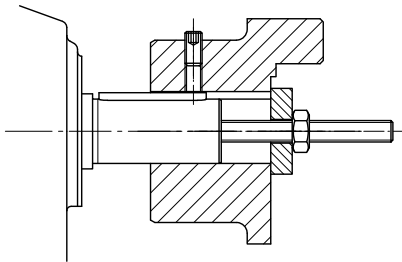


Figure 3-3: Example of a simple pulling device

	Danger!
	Drive and driven elements, such as belt drives, chain drives and couplings must be fitted with contact protection.

Driven elements may only subject the drive units to the maximum radial force F_R and axial force F_A as specified in the catalogue. Observe the correct tension, particularly on belts and chains. Additional loads due to unbalanced hubs are not permitted. The radial force must be applied to the gear unit as closely as possible.

3.7 Fitting push-on gear units

	Attention!
	The bearings, gear wheels, shafts and housing may be damaged by incorrect fitting.

The push-on gear unit must be fitted onto the shaft using a suitable puller, which will not exert damaging axial forces on the gear unit. In particular, do not hit the gear unit with a hammer.

Assembly and subsequent dismantling is aided by applying an anti-corrosive lubricant to the shaft before fitting (e.g. Nord Anti-Corrosion Art.No. 089 00099). Excess grease or anti-corrosion agent may escape after assembly and may drip off. Clean these points on the output shaft after a running-in time of approx. 24 hours. This escape of grease is not due to a leak in the gear unit.

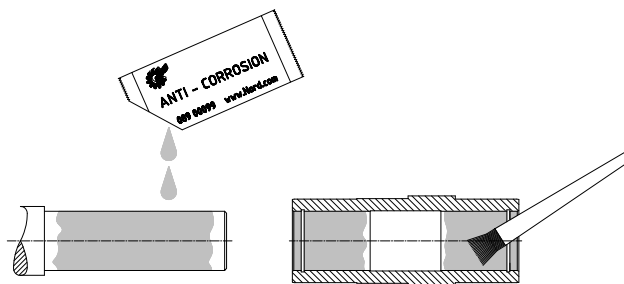


Figure 3-4: Applying lubricant to the shaft and the hub

	Note!
	The gear unit can be fitted to shafts with and without a shoulder using the fastening element (Option B). Tighten the bolt of the fastening element to the correct torque. (See Chapter 6.2 for torque values) For gear units with option H66, the factory-fitted closing cap must be removed before assembly.

For shaft mounted gear units with option H66 and fastening element (Option B) the pressed-in closing cap must be pushed out before fitting the gear unit. The pressed-in closing cap may be destroyed during dismantling. As standard a second closing cap is supplied as a loose spare part. After fitting the gear unit, fit the new / new condition closing cap as described in Section 3.11.

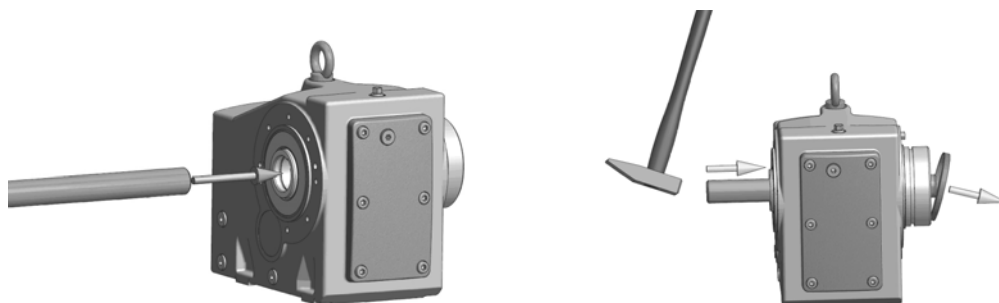


Figure 3-5: Removing the factory-fitted closing cap



3. Assembly instructions, storage, preparation, installation

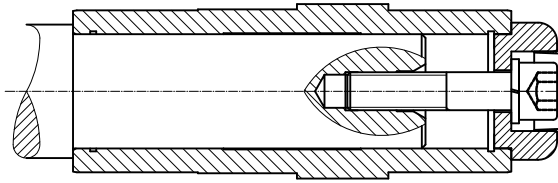


Figure 3-6: Gear unit mounted to shaft with a shoulder using the fastening element

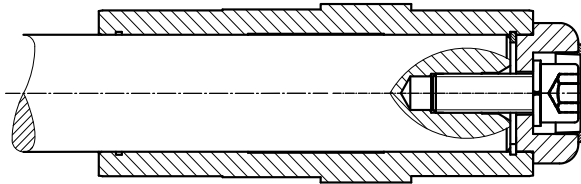


Figure 3-7: Gear unit mounted to shaft without a shoulder using the fastening element

A gear unit can be dismantled from a shaft with shoulder using the following device, for example.

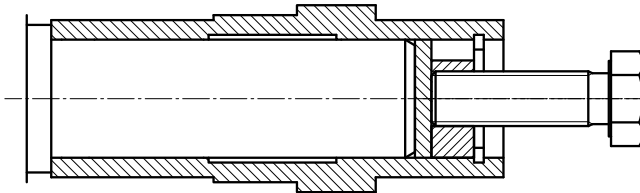


Figure 3-8: Dismantling using dismantling device

When mounting push-on gears with torque supports, the support must not be distorted. Tension-free mounting is aided by the rubber buffer (Option G and/or VG).

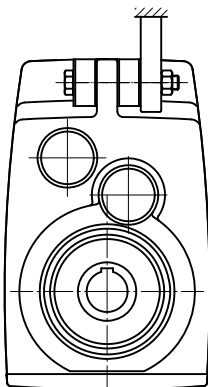


Figure 3-9: Mounting the rubber buffer (Option G and/or VG) on parallel shaft gear units

To fit the rubber buffer, tighten the screw fastening until there is no play between the contact surfaces when there is no load. Then turn the fastening nut (only applies for screw fastenings with adjusting threads) half a turn in order to pre-tension the rubber buffer. Greater pre-tension is not permissible. Secure the screw fastening from coming loose, e.g. with Loctite 242 or a second nut.

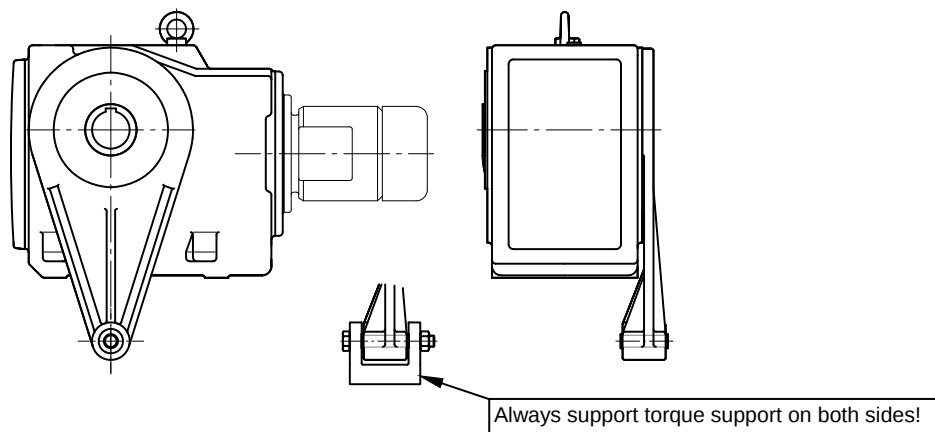


Figure 3-10: Attaching the torque support on bevel gear and worm gear units

Tighten the bolts on the torque support to the correct torque (see Section 6.2 for torque values) and secure to prevent loosening (e.g. Loctite 242, Loxeal 54-03).

3.8 Fitting shrink discs

Shrink disc type, Mat. No.
and torque details for tensioning screws

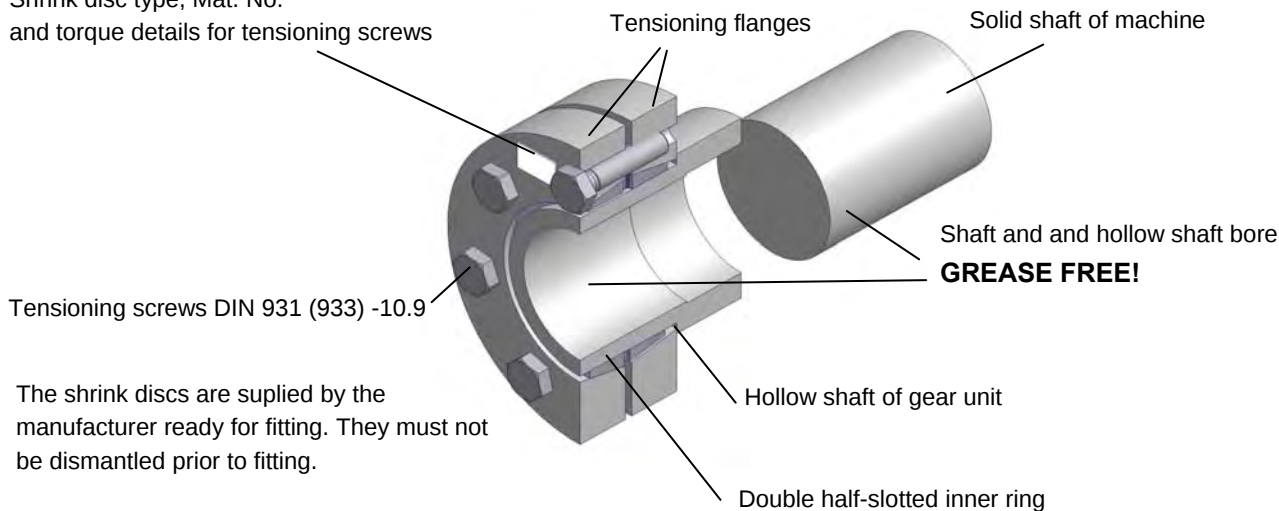


Figure 3-11: Hollow shaft with shrink disc

	Attention!
	Do not tighten bolts if the solid shaft is not inserted!

Assembly sequence:

1. Remove any transport securing devices.
2. Loosen but do not remove tightening bolt and tighten gently by hand until there is no play between the flanges and the inner ring.



3. Assembly instructions, storage, preparation, installation



3. Slide the shrink disc onto the hollow shaft until the outer clamping flange is flush with the hollow shaft. The shrink disc is easier to slide on if the bore of the inner ring is lightly greased.
4. Prior to mounting, grease the solid shaft only in the area which will later come into contact with the bronze bush in the hollow shaft of the gear unit. Do not grease the bronze bush, in order to prevent grease penetrating the area around the shrink connection.
5. The hollow shaft of the gear unit must be completely de-greased and **completely free of grease**.
6. In the area of the shrink connection the solid shaft of the machine must be degreased and **completely free of grease**.
7. Insert the solid shaft of the machine into the hollow shaft so as to completely fill the area around the shrink connection.
8. Position the clamping flange by gently tightening the bolts.
9. Tighten the bolts successively in a clockwise direction by several turns – not crosswise – with approx. $\frac{1}{4}$ rotation per turn. Tighten the bolts with a torque wrench to the torque indicated on the shrink disc.
10. When the tensioning bolts have been tightened, there must be an even gap between the clamping flanges. If this is not the case, the gear unit must be dismantled and the shrink disc connection checked for correct fit.

	Danger!
	Risk of injury from incorrect mounting and dismantling of the shrink disc.

Dismantling sequence:

1. Loosen the bolts successively in a clockwise direction by several turns with approx. $\frac{1}{4}$ rotation per turn. Do not remove the bolts from their thread.
2. Loosen the clamping flanges from the cone of the inner ring.
3. Remove the gear unit from the solid shaft of the machine.

3.9 Fitting the covers

	Danger!
	Shrink discs and exposed rotating shaft ends require contact guards in order to prevent injuries. A cover (Option H and Option H66) can be used as a guard. If this does not achieve sufficient protection against contact according to the required protection type, the machinery and plant constructor must ensure this by means of special attached components.

All fixing screws must be used and tightened to the correct torque. (See Section 6.2 for torque values) For covers with option H66, press in the new / new condition closing cap by tapping it lightly with a hammer.



Figure 3-12: Fitting the covers, Option SH, Option H, and Option H66

3.10 Fitting a standard motor

The maximum permitted motor weights indicated in the table below must not be exceeded when attaching the motor to an IEC- / NEMA adapter

Maximum permitted motor weights														
IEC motor size	63	71	80	90	100	112	132	160	180	200	225	250	280	315
NEMA Motor size		56C	143T	145T	182T	184T	210T	250T	280T	324T	326T	365T		
Max. motor weight [kg]	25	30	40	50	60	80	100	200	250	350	500	700	1000	1500

Assembly procedure to attach a standard motor to the IEC adapter (Option IEC)/NEMA adapter

1. Clean motor shaft and flange surfaces of motor and IEC /NEMA adapter and check for damage. Mounting dimensions and tolerances of the motor must conform to DIN EN 50347/NEMA MG1 Part 4.
2. Push the coupling sleeve onto the motor shaft so that the motor parallel key engages into the groove in the sleeve on tightening.
3. Tighten the coupling sleeve on the motor shaft in accordance with the motor manufacturer's instructions until it touches the collar. With motor sizes 90, 160, 180 and 225, any spacer bushes must be positioned between the coupling sleeve and the collar. With standard helical gear units, dimension B between the coupling sleeve and the collar must be observed (see Figure 3-13). Certain **NEMA adapters** require the adjustment of the coupling in accordance with the specifications indicated on the adhesive plate.
4. If the coupling half contains a threaded pin, the coupling must be secured axially on the shaft. The threaded pin must be coated prior to use with a securing lubricant e.g. Loctite 242, Loxeal 54-03 and tightened to the correct torque. (See Chapter 6.2 for torque values)
5. Sealing of the flange surfaces of the motor and the IEC /NEMA adapter is recommended if the motor is installed outdoors or in a humid environment. **The flange surfaces** of motor and adapter must be completely coated with **surface sealant** Loctite 574 or Loxeal 58-14 prior to mounting so that the flange seals after mounting.
6. Mount the motor to the IEC /NEMA adapter, do not forget to fit the gear rim or the sleeve. (See Figure 3-13)
7. Tighten the IEC /NEMA adapter bolts to the correct torque. (See Chapter 6.2 for torque values)



3. Assembly instructions, storage, preparation, installation

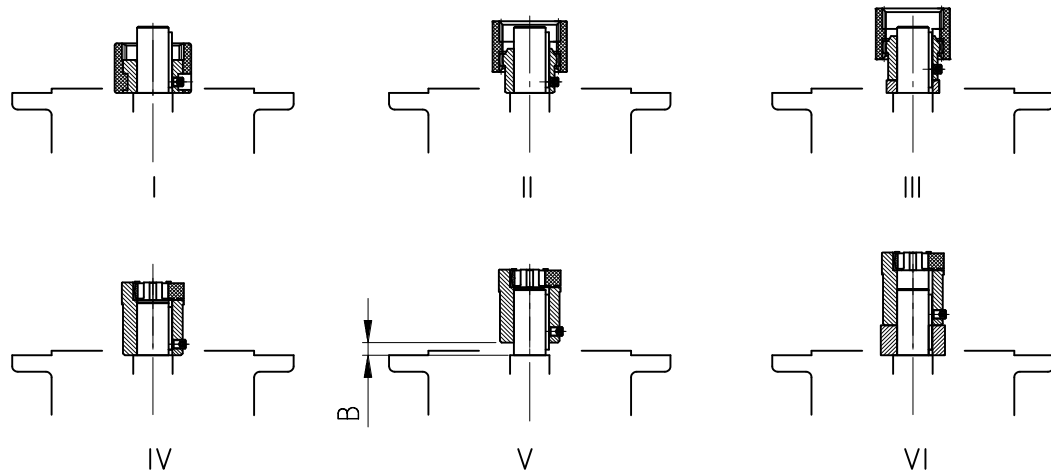


Figure 3-13: Fitting the coupling onto the motor shaft - various types of coupling

- I Gear coupling, one-part
- II Gear coupling, two-part
- III Gear coupling, two-part with spacer bush
- IV Claw coupling, two-part
- V Claw coupling, two-part, observe dimension B:

Standard helical gear unit: SK0, SK01, SK20, SK25, SK30, SK33 (2-stage)
SK010, SK200, SK250, SK300, SK330 (3-stage)

	IEC size 63	IEC size 71
Dimension B (Fig. 3-13V)	B = 4.5mm	B = 11.5 mm

- VI Claw coupling, two-part with spacer bush

3.11 Retrospective paintwork



Attention!

For retrospective painting of the gear unit, the radial seals, rubber elements, pressure venting valves, hoses, type plates, adhesive labels and motor coupling components must not come into contact with paints, lacquers or solvents, as otherwise components may be damaged or made illegible.

3.12 Fitting the cooling coil to the cooling system

Cutting ring screw threads (see Item 1, Figs. 3-14) are located at the casing cover for the connection of a pipe with an external diameter of 10 mm according to DIN 2353. **Remove the drain plug from the screw neck prior to assembly to avoid any contamination of the cooling system.** The screw necks should be connected with the coolant circuit, which must be provided by the operator. The flow direction of the coolant is irrelevant.

Make sure not to twist the screw necks during or after assembly as the cooling coil may be damaged (see Item 3, Fig. 3-14). You must ensure that no external forces act on the cooling coil.

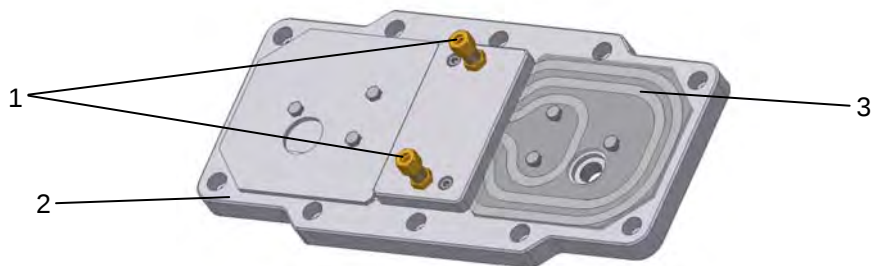


Figure 3-14: Cooling cover

	Danger!
	The pressure released from the cooling circuit before carrying out any work on the gear unit.



4. Commissioning

4. Commissioning

4.1 Checking the oil level

The oil level must be checked prior to commissioning. See Section 5.2.

4.2 Activating the automatic lubricant dispenser

Some gear unit types with standard motor (Option IEC/NEMA) have an automatic lubricant dispenser for the rolling bearings. This dispenser must be activated prior to commissioning. The cartridge case cover has a red information sign for the activation of the lubricant dispenser.

Activating the Automatic Lubricant Dispenser:

1. Loosen and remove cylinder bolts M8x16 **(1)**
2. Lift off cartridge case cover **(2)**
3. Insert activation screw **(3)** into the lubricant dispenser **(5)** until the lug **(4)** breaks off at the defined fracture point
4. Refit cartridge case cover **(2)** and fasten using cylinder bolt **(1)**. (See Chapter 6.2 for torque values)
5. Mark activation date on the adhesive plate **(6)** indicating month/year

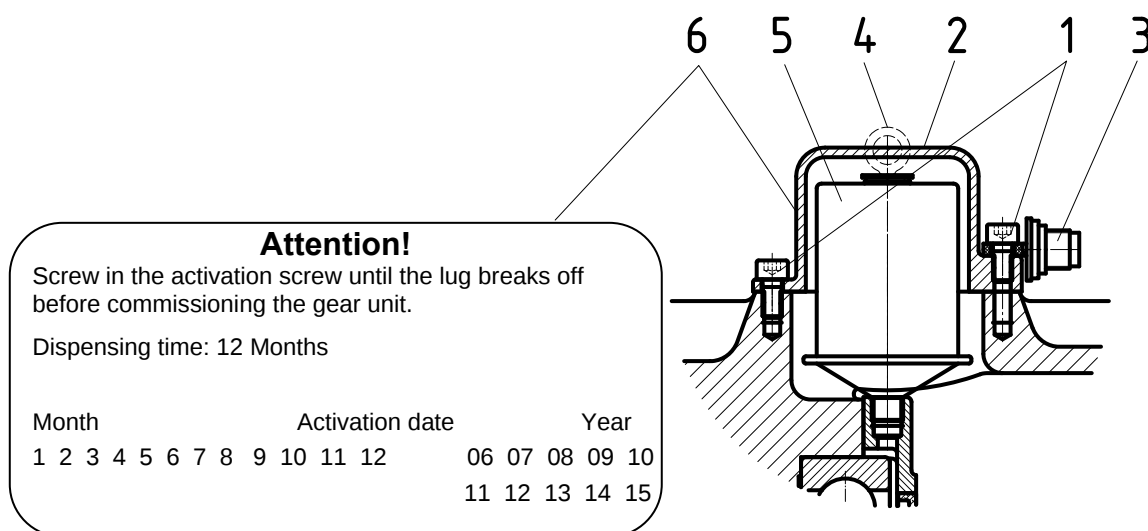


Figure 4-1: Activating the automatic lubricant dispenser with standard motor mounting

4. Commissioning

4.3 Operation with lubricant cooling

Water cooling

	Caution! The drive may only be commissioned after the cooling spiral has been connected to the cooling circuit, and the cooling circuit has been put into operation.
---	---

The coolant must have a similar thermal capacity as water (specific thermal capacity at 20°C $c=4.18 \text{ kJ/kgK}$). Industrial water without any air bubbles or sediments is recommended as a coolant. The water hardness must be between 1° dH and 15° dH, and the pH value must be between pH 7.4 and pH 9.5. No aggressive liquids should be added to the coolant!

The **coolant pressure** must not exceed **8 bar**. The required **quantity of coolant** is **10 litres/minute**, and the **coolant inlet temperature** should not exceed 40°C; we recommend **10°C**.

We also recommend fitting a pressure reducer at the coolant inlet to avoid any damage due to excessive pressure.

If there is a danger of frost the operator should add a suitable anti-freeze solution to the cooling water.

The **temperature of the cooling water** and the **cooling water flow rate** must be **supervised** and **ensured** by the operator.

Air/Oil cooler

This version and all important data concerning the air/oil cooler can be obtained from Catalogue G1000, or contact the manufacturer of the cooling unit.

4.4 Running-in time for the worm gear unit

	Note! In order to achieve maximum efficiency of the worm gear unit, the gear unit must be subjected to a running-in period of approx. 25 h – 48 h under maximum load. There may be a reduction in efficiency before the running-in period is complete.
---	--

4.5 Checklist

Checklist		
Object of the check	Checked on:	Information – see Section
Is the vent plug activated or the pressure vent screwed in?		Sec. 3.4
Does the required configuration conform with the actual installation?		Sec. 6.1
Are the external gear shaft forces within permitted limits (chain tension)?		Sec. 3.6
Is the torque support correctly fitted?		Sec. 3.7
Are contact guards fitted to rotating components?		Sec. 3.9
Is the automatic lubricant dispenser activated?		Sec. 4.2
Is the cooling cover connected to the cooling circuit?		Sec. 3.12/4.3



5. Service and Maintenance

5. Service and maintenance

5.1 Service and maintenance intervals

Service and Maintenance Intervals	Service and Maintenance Work	Information – see Section
At least every six months	- Visual inspection - Check for running noises - Check oil level - Re-grease (applicable only to free drive shaft / Option W and on agitator bearings / Option VL2 / VL3) - Replace automatic lubricator (for operating times < 8 h/day: a replacement interval for the lubricant dispenser of 1 year is permissible) (only with IEC/NEMA standard motors)	5.2 5.2 5.2 5.2 5.2
For operating temperatures up to 80°C Every 10000 operating hours at least every 2 years (The interval is double this if the unit is filled with synthetic products) For higher temperatures or extreme operating conditions (high humidity, aggressive environments and large temperature fluctuations) the oil change intervals must be halved.	- Change the oil - Clean or replace the vent plug.	5.2 5.2
Every 25000 operating hours, at least every 5 years	- Replace shaft sealing rings if worn - Re-lubrication of the bearings in the gear unit	5.2 5.2
At least every 10 years	- General overhaul	5.2

5.2 Service and maintenance work

Servicing and maintenance work must only be performed by qualified specialist personnel.

Installation and maintenance work must only be performed when gear units are at a standstill. The drive must be isolated and secured to prevent accidental start-up.

Visual inspection

The gear unit must be checked for leaks. In addition, the gear unit must be inspected for external damage and cracks in the hoses, hose connections and rubber buffers. Have the gear unit repaired in case of leaks, e.g. dripping gear oil or cooling water, damage or cracks. Please contact the NORD service department.

Note!	
	Shaft sealing rings are rubbing seals and have sealing lips made from an elastomer material. These sealing lips are lubricated with a special grease at the factory. This reduces the wear due to their function and ensures a long service life. An oil film in the region of the rubbing sealing lip is therefore normal and is not due to leakage.

5. Service and Maintenance

Check for running noises

If the gear unit produces unusual running noises and/or vibrations, this could indicate damage to the gear unit. In this case the gear should be shut down and a general overhaul carried out.

Check the oil level

Section 6.1 describes the versions and the corresponding oil level screws. With double gear units, the oil level must be checked on both units. The pressure vent must be at the position marked in Section 6.1.

The oil level does not need to be checked on gear units without oil level screw (see Section 6.1).

Gear unit types that are not supplied full of oil must be filled before the oil level is checked. (see "Changing the oil")

Checking the oil level:

1. The oil level may only be checked when the gear unit is **at a standstill and has cooled down**. The gear unit must be secured to prevent accidental switch-on.
2. The oil level screw corresponding to the version must be screwed out. (See Section 6.1)



Note!

At the first oil level check a small amount of oil may escape, as the oil level may be below the lower edge of the oil level hole.

3. Gear units with oil level screw: The maximum oil level is the lower edge of the oil level hole. The minimum oil level is 4 mm below the oil level hole. If the oil level is too low, this must be corrected using the correct type of oil. An oil level glass is available instead of the oil level screw.
4. Gear units with an oil level vessel: The oil level must be checked **in the oil level vessel** with the aid of the dipstick plug (thread G1 1/4). The oil level must be between the upper and lower mark when the dipstick is completely screwed in (see Fig. 5-2). The oil level must be corrected with the correct type of oil if necessary. These gearboxes may only be operated in the configuration stated in Section 6.1.
5. The oil level screw or the cap screw with dipstick and all other loosened screws must be correctly re-tightened.

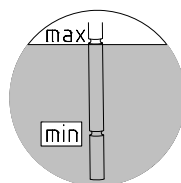


Figure 5-2: Check the oil level with a dipstick



5. Service and Maintenance

Regreasing

Some gear unit designs (free drive shaft, Option W, agitator designs VL2 and VL3) are equipped with a regreasing device.

For agitator versions VL2 and VL3, the vent screw located opposite to the grease nipple must be unscrewed before regreasing. Grease should be injected until a quantity of 20-25g escapes from the vent hole. After this, the vent plug must be reinserted and tightened.

For Option W and some IEC adapters, the outer roller bearing must be regreased with approx. 20-25g of grease via the grease nipple provided

Recommended grease: Petamo GHY 133N (see Section 6.4: Klüber Lubrication).

Replacing the automatic lubricant dispenser

Screw-off the cartridge case cover (2), (see Fig. 4-1). The lubrication dispenser (5) is screwed out and replaced with a new component (Part No. 283 0100). Then activate (see Chapter 4.2)!

Changing the oil

The figures in Section 6.1 show the oil drain screw, the oil level screw and the pressure vent screw for various designs.

Sequence:

1. Place the drip tray below the oil drain screw or the oil drain cock
2. Completely remove oil level screw, screwed sealing plug with dipstick if an oil level tank is being used and oil drain screw.

	Danger!
	Warning: Hot oil!

3. Drain all the oil from the gear unit.
4. If the screw lock coating of the oil drain screw or oil level screw is damaged in the thread, a new oil level screw must be used or the thread cleaned and coated with securing lubricant, e.g. Loctite 242, Loxeal 54-03 prior to inserting. Check the sealing ring for damage. Replace with a new sealing ring in case of damage.
5. Support the seal ring, insert the oil drain screw into the hole and tighten to the correct torque! (See Section 6.2 for torque values)
6. Using a suitable filling device, refill with oil of the same type through the oil level hole until oil emerges from the oil level hole. (The oil can also be filled through the pressure vent screw or a sealing plug located higher than the oil level). If an oil level vessel is used, fill the oil through the upper inlet (thread G1¼) until the oil level is set as described in Section 5.2.
7. Wait at least 15 minutes, or at least 30 minutes if an oil level tank is used, and then check the oil level. Proceed as described in Section 5.2.

	Note!
	The oil does not need to be changed on gear units without oil level screw (see Section 6.1). These gear units are lubricated for life. Standard helical gear units have no oil level screw. Here, the oil is topped up through the pressure vent bolt using the quantities listed in the table in Section 6.5.

5. Service and Maintenance

Cleaning or replacing the vent plug

Unscrew the vent screw and thoroughly clean it (e.g. with compressed air) and fit the vent screw in the same place. If necessary, use a new vent screw with a new sealing ring.

Replacing the shaft sealing ring

Shaft sealing rings are rubbing seals made from an elastomer material and according to their principle are subject to natural wear. The wearing life of shaft sealing rings depends on many factors and cannot be calculated in advance. Once the shaft sealing ring has reached the end of its service life, the oil film in the region of the sealing lip increases and a measurable leakage with dripping oil occurs. **The shaft sealing ring must then be replaced.** To reduce the risk of leaks due to worn shaft sealing rings we recommend that as a precaution, the shaft sealing rings are replaced after every 25,000 operating hours or every 5 years. The space between the sealing lip and the protective lip must be filled approximately 50% with grease on fitting (recommended grease: PETAMO GHY 133N). Take care that after fitting, the new shaft sealing ring does not run in the old wear track.

Re-lubricating bearings

For bearings which are not oil-lubricated and whose holes are completely above the oil level, replace the roller bearing grease (recommended grease: PETAMO GHY 133N). Please contact the NORD service department.

General overhaul

The gear units must be completely dismantled. The following work must be carried out:

- Clean all gear unit components
- Examine all gear unit components for damage
- All damaged components must be replaced
- All roller bearings must be replaced
- Replace back stops if fitted
- Replace all seals, radial seals and Nilos rings
- Replace plastic and elastomer components of the motor coupling

The general overhaul must be carried out by qualified personnel in a specialist workshop with appropriate equipment in observance of national regulations and laws. We recommend that the general overhaul is carried out by the NORD service department.

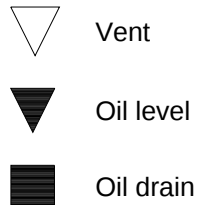


6. Appendix

6. Appendix

6.1 Versions and maintenance

Explanation of symbols for the following version illustrations:



	Note!
	SK 320, SK 172, SK 272, SK 372K, SK 273 and SK373 as well as SK 01282 NB, SK 0282 NB, SK 1382 NB and UNIVERSAL / Minibloc gear units are lubricated for life. These gear units do not have an oil filler screw.

UNIVERSAL / MiniBloc worm gear units

NORD UNIVERSAL / MiniBloc worm gear units are suitable for all installation positions. They have an oil filler which is independent of the the version.

As an option, types SI and SMI can be equipped with a vent screw. Gear units with vents must be installed in the stated position (see section 6.5)

Types SI, SMI, S, SM and SU as 2-stage gear unit types and types SI, SMI as worm gear units for direct motor mounting have an oil filler which depends on the version and must be installed in the stated position.

Parallel shaft gear units with oil level vessel

The following applies for SK 9282, SK 9382, SK 10282, SK 10382, SK 11282, SK 11382 parallel gear units and SK 12382 in the M4 configuration with oil level vessels:

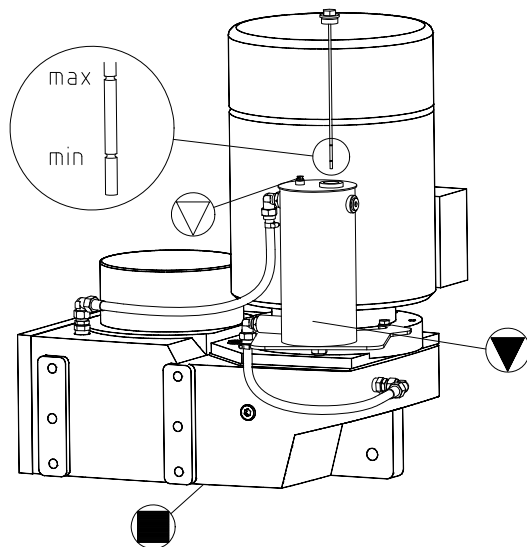
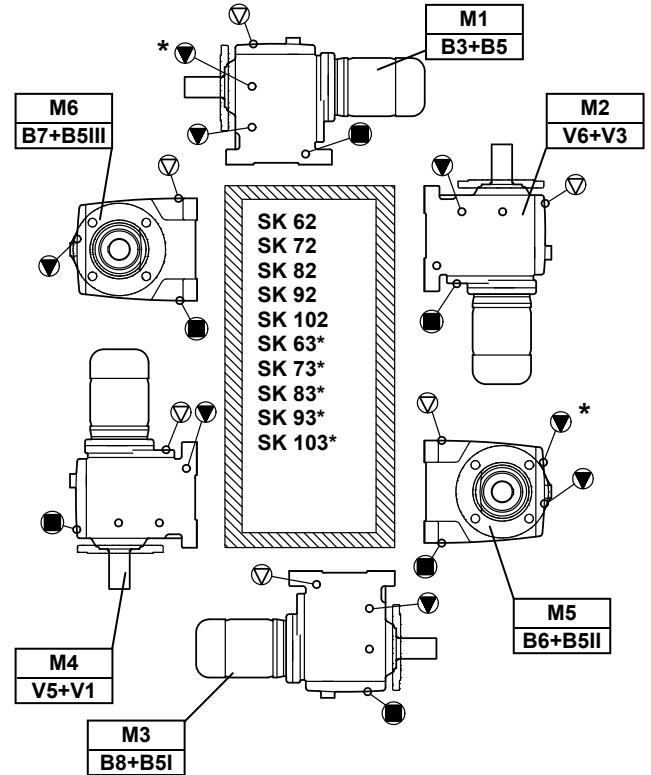
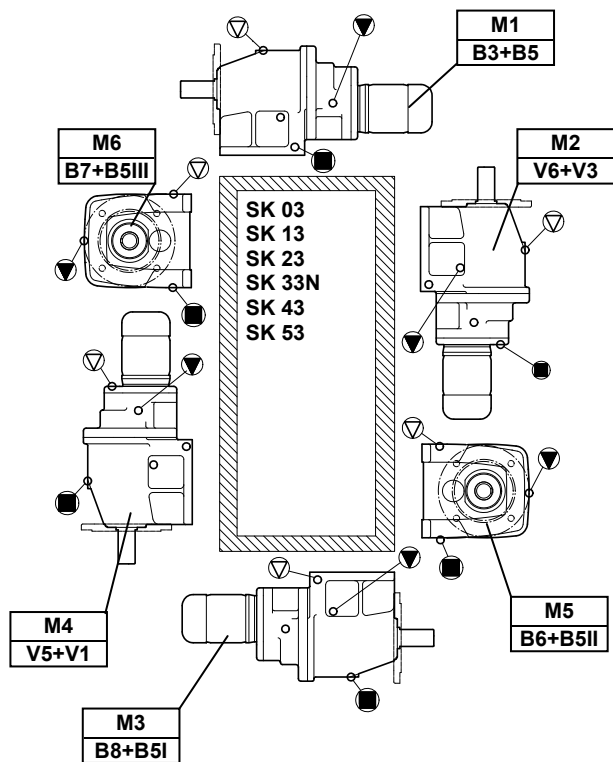
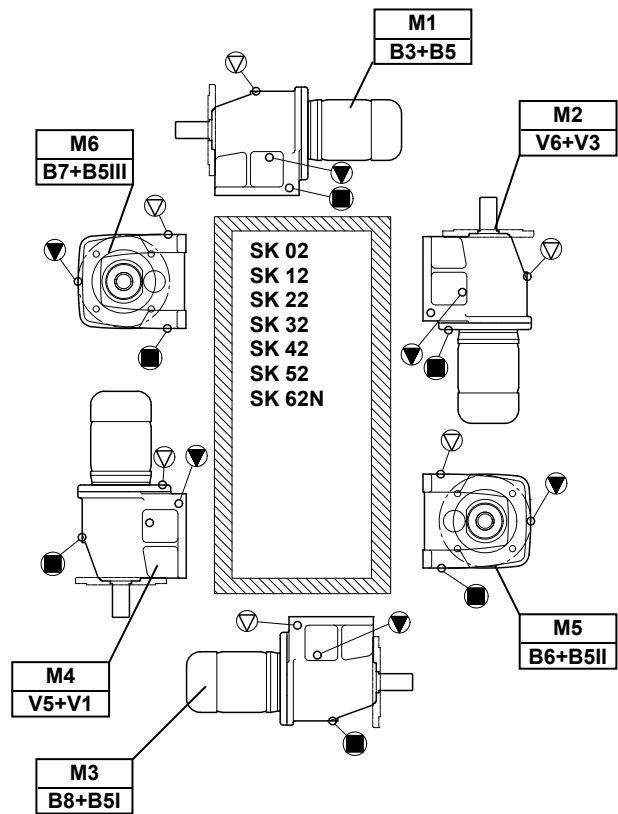
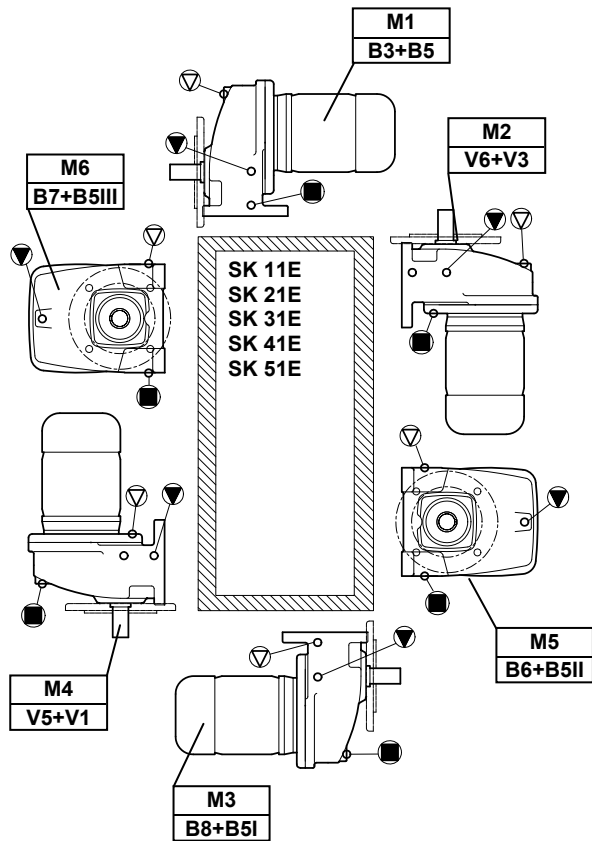
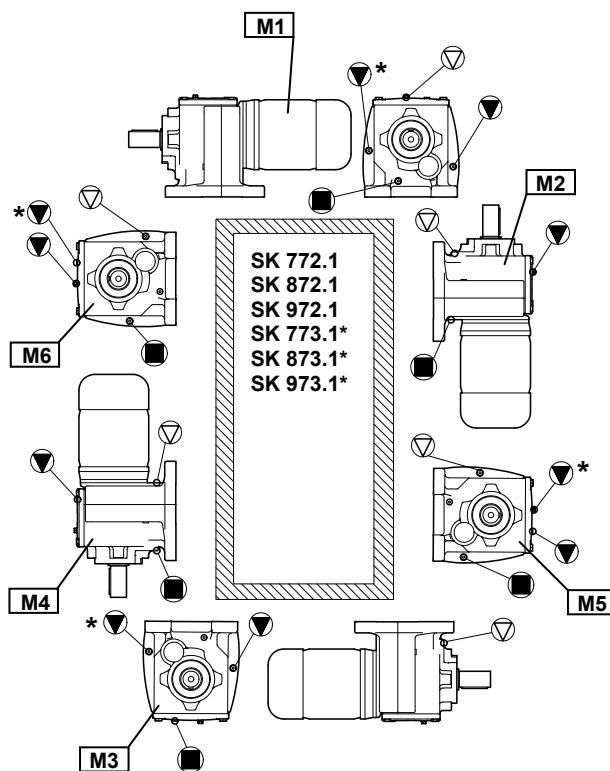
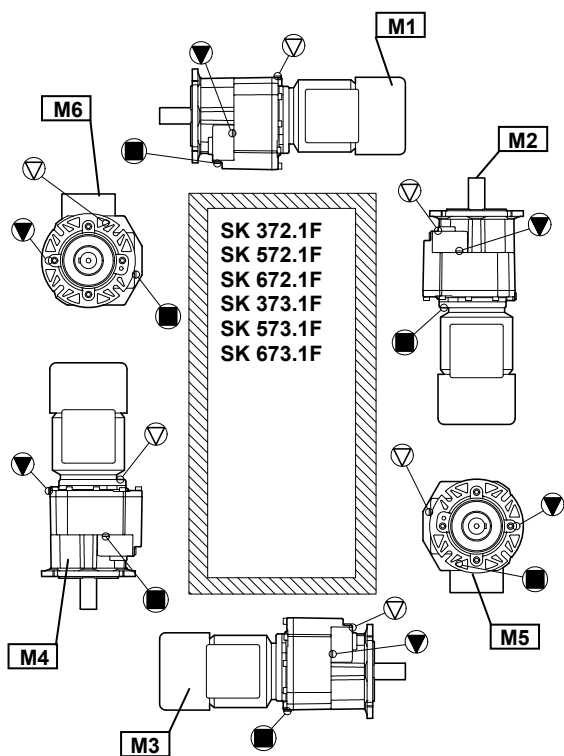
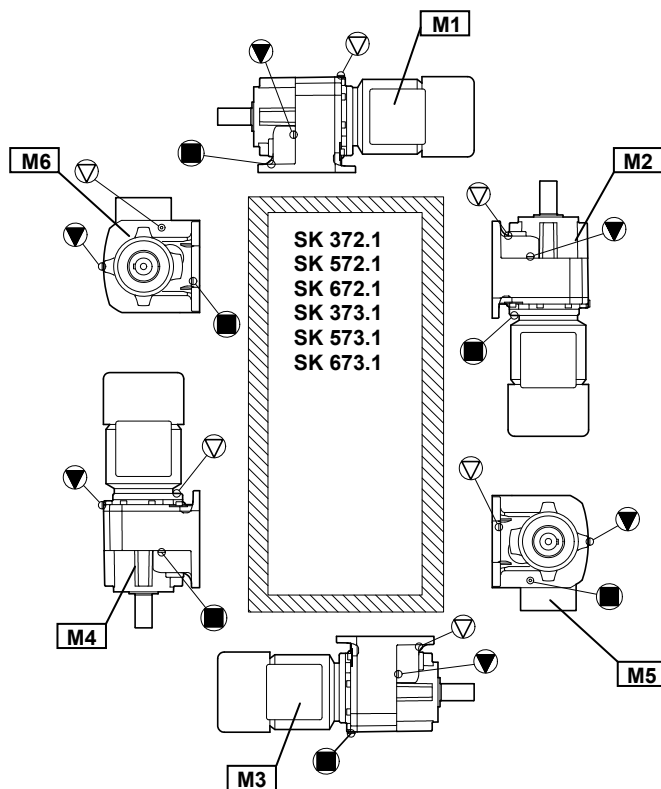
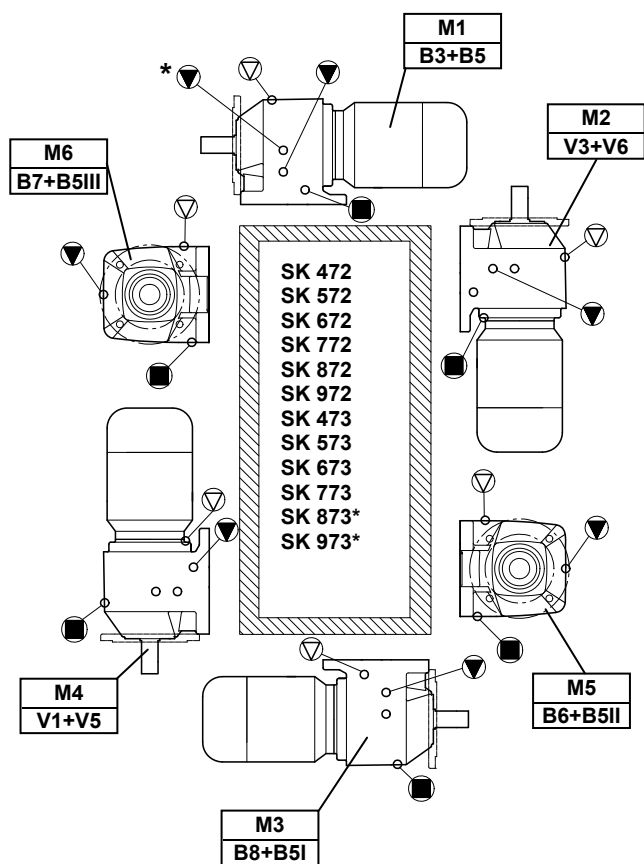
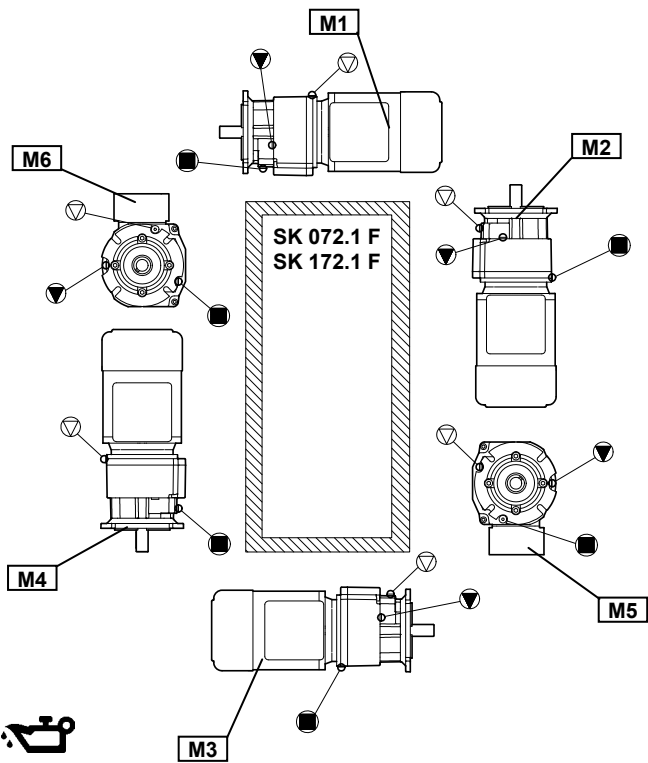
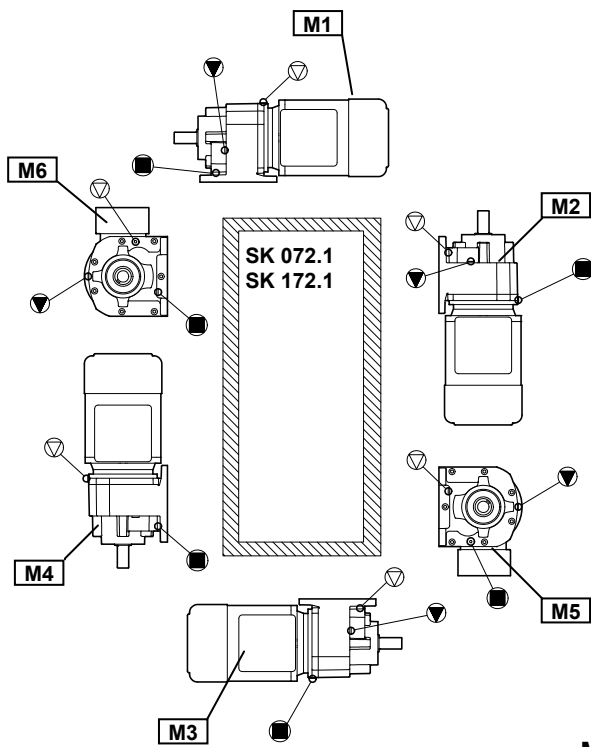
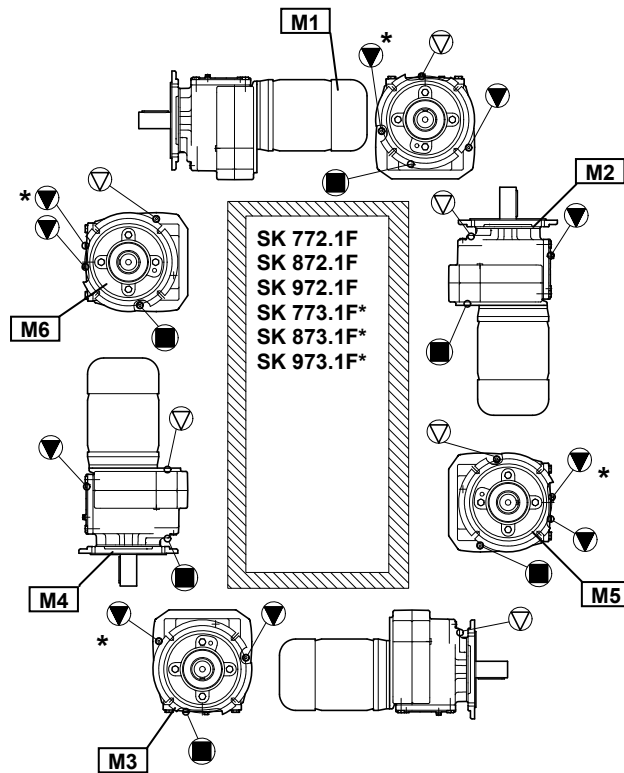


Figure 6-1: Oil level check with oil level tank

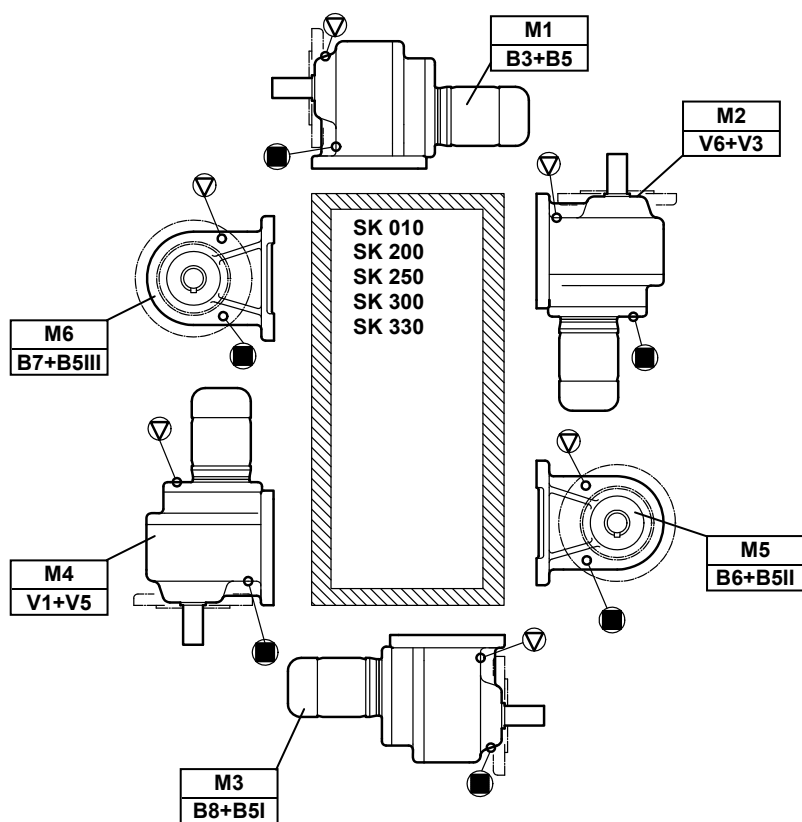
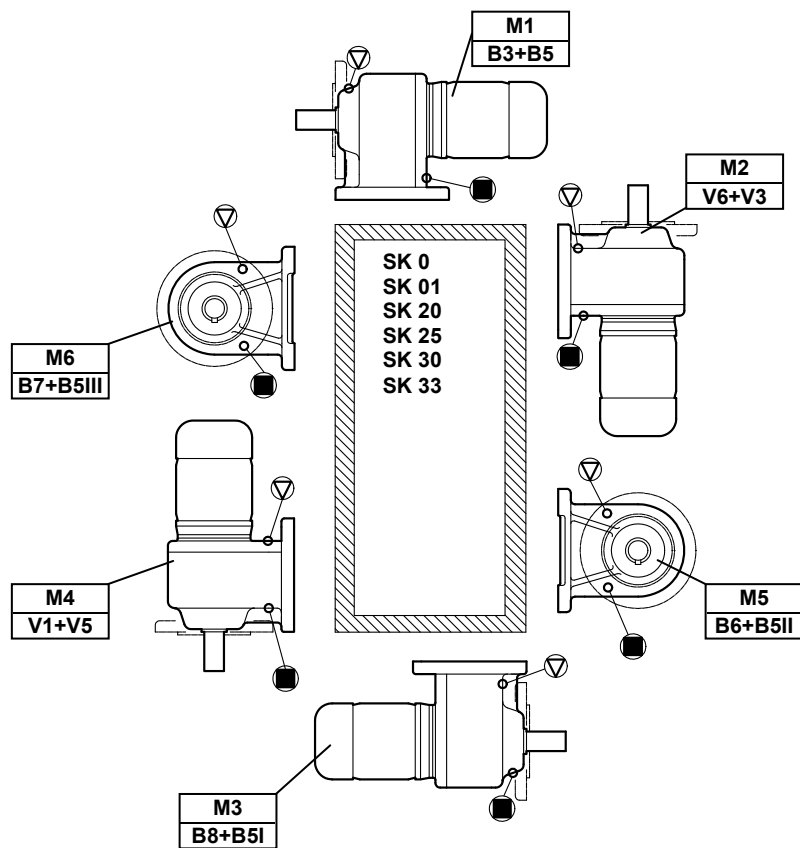


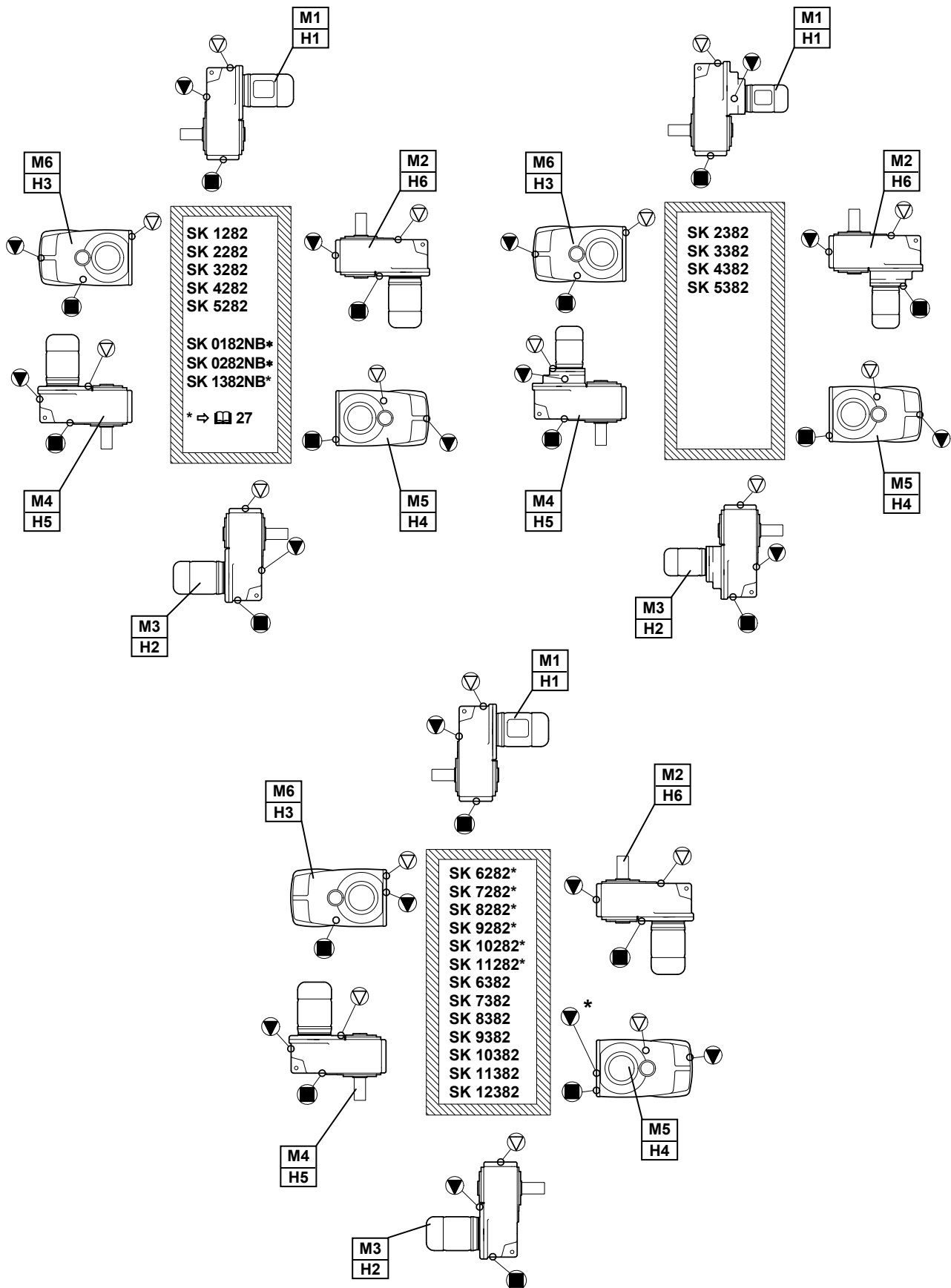


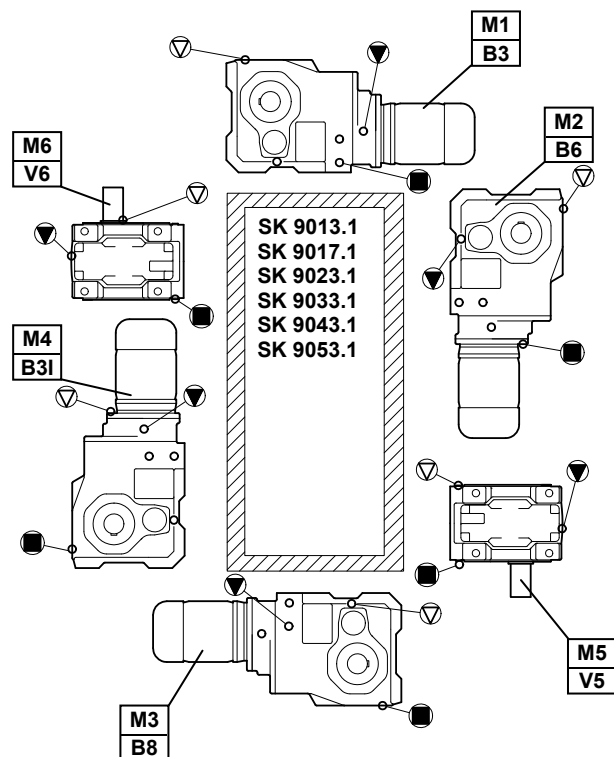
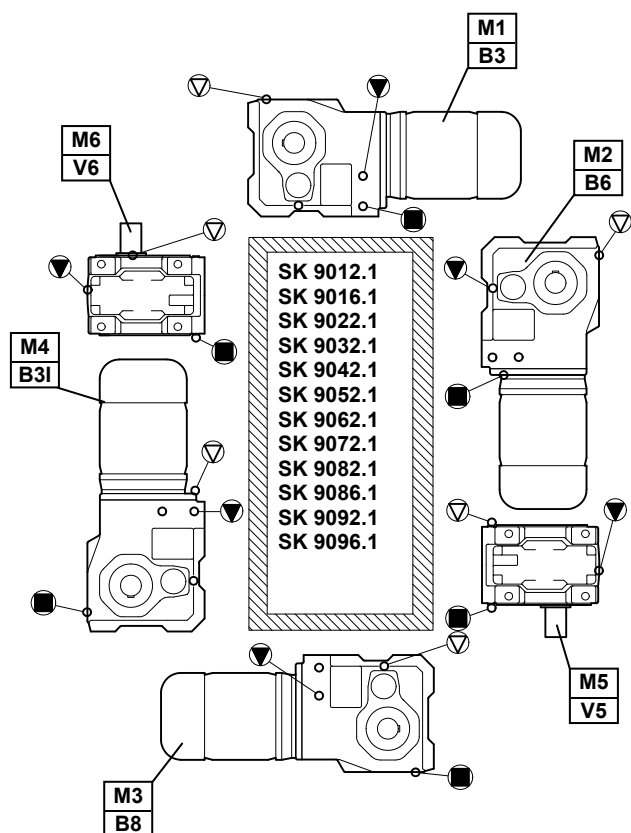
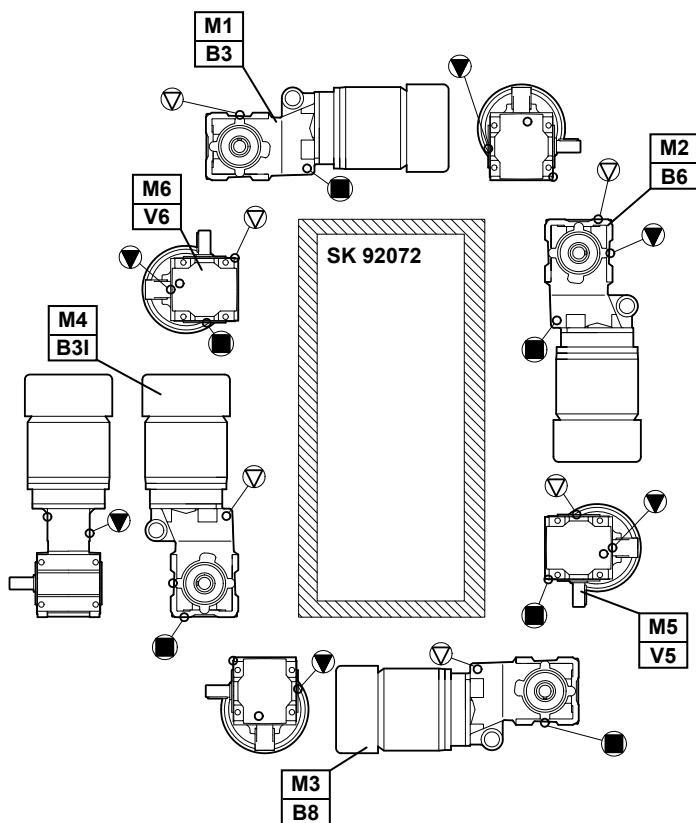
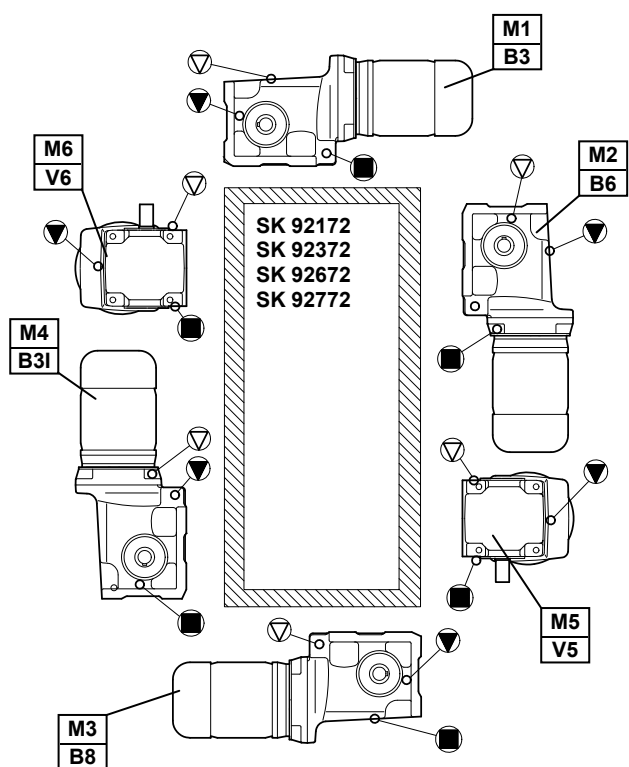


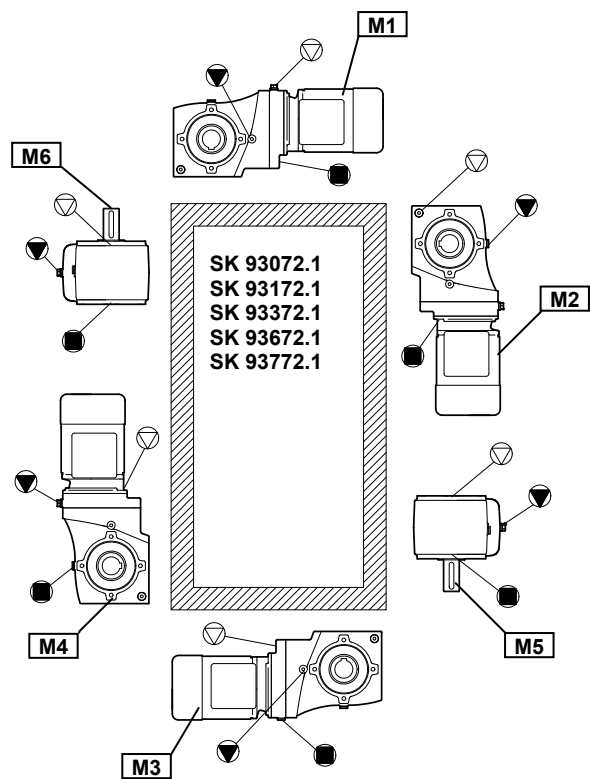
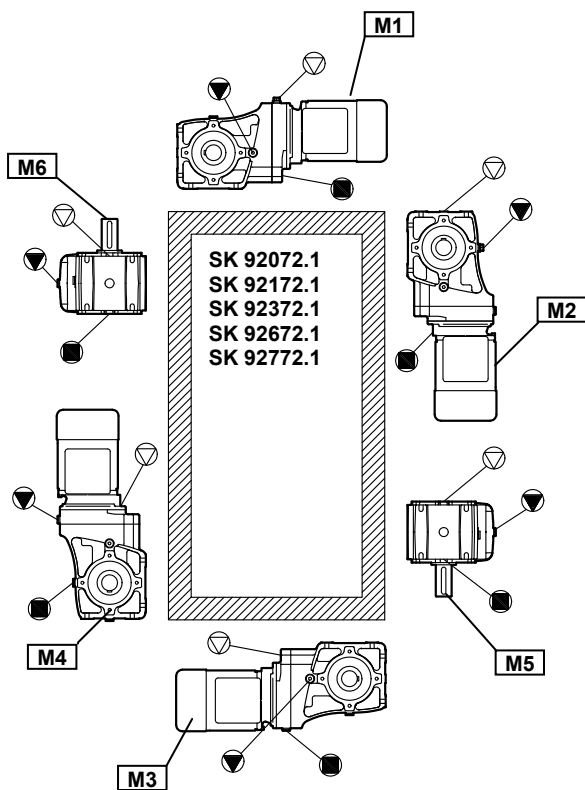
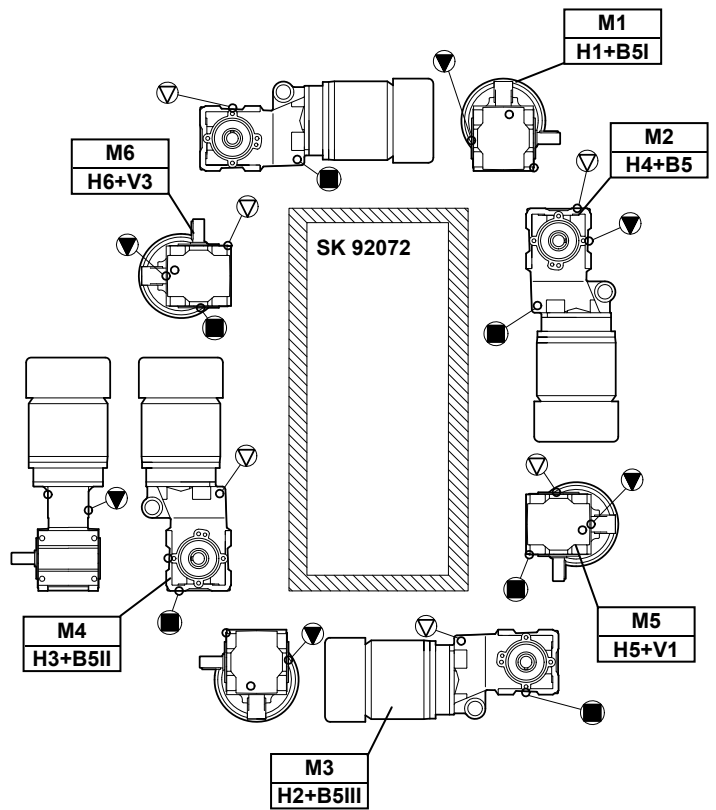
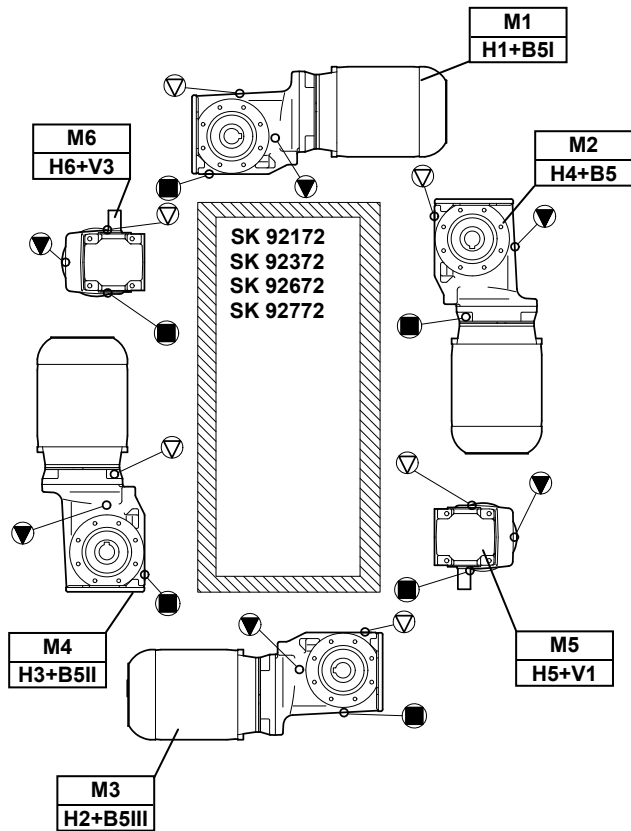
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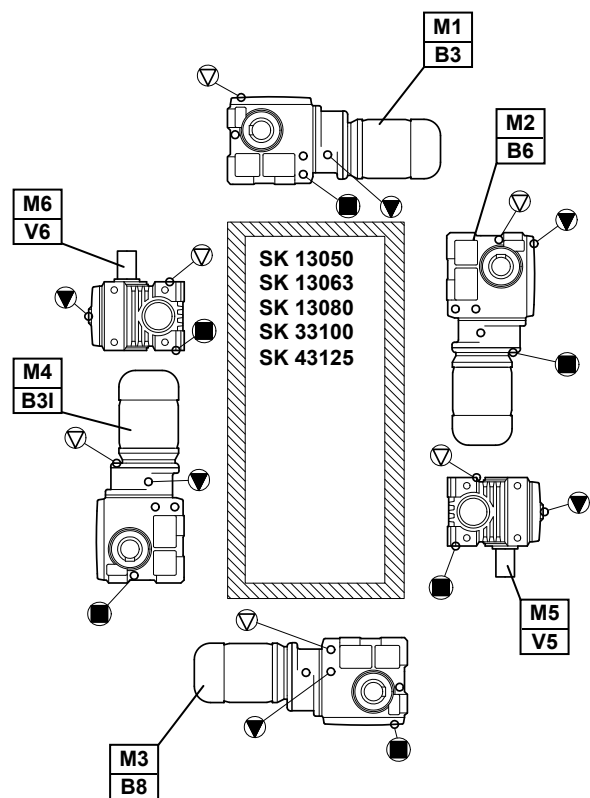
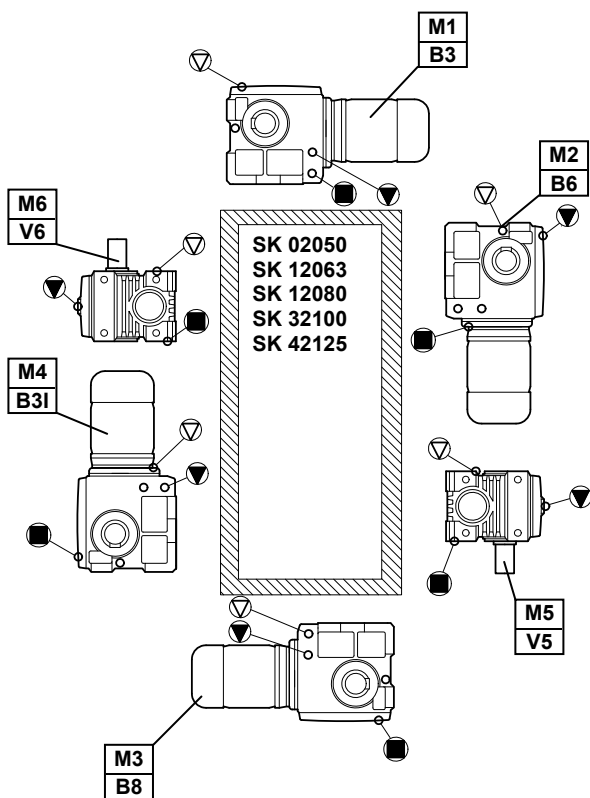
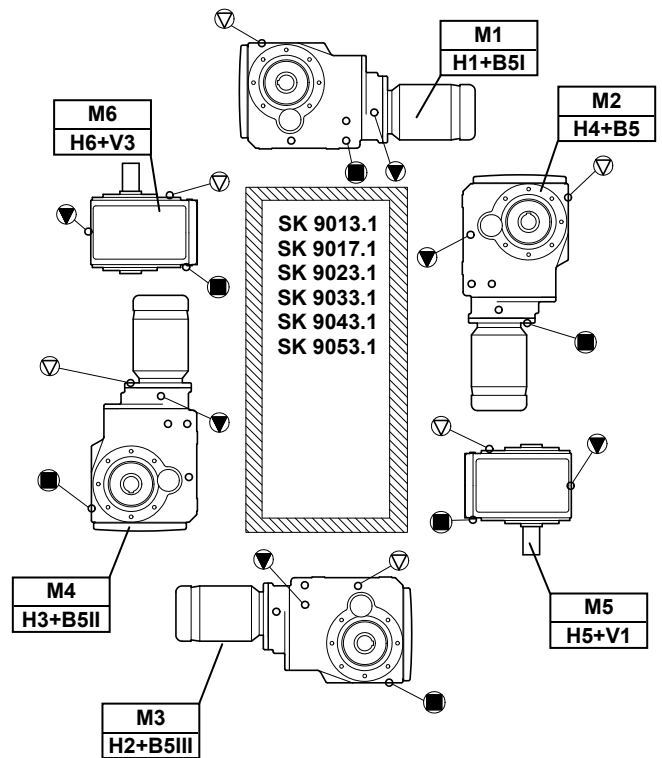
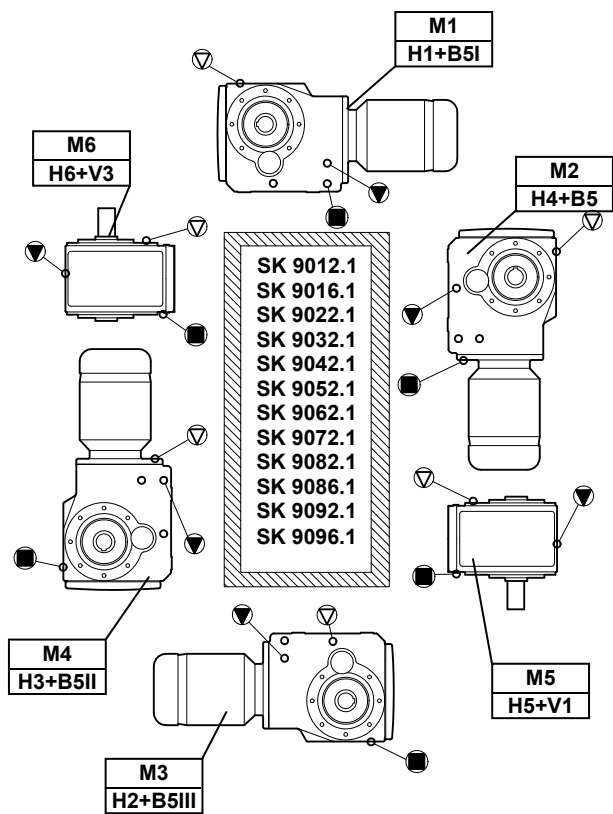
⇒ 43

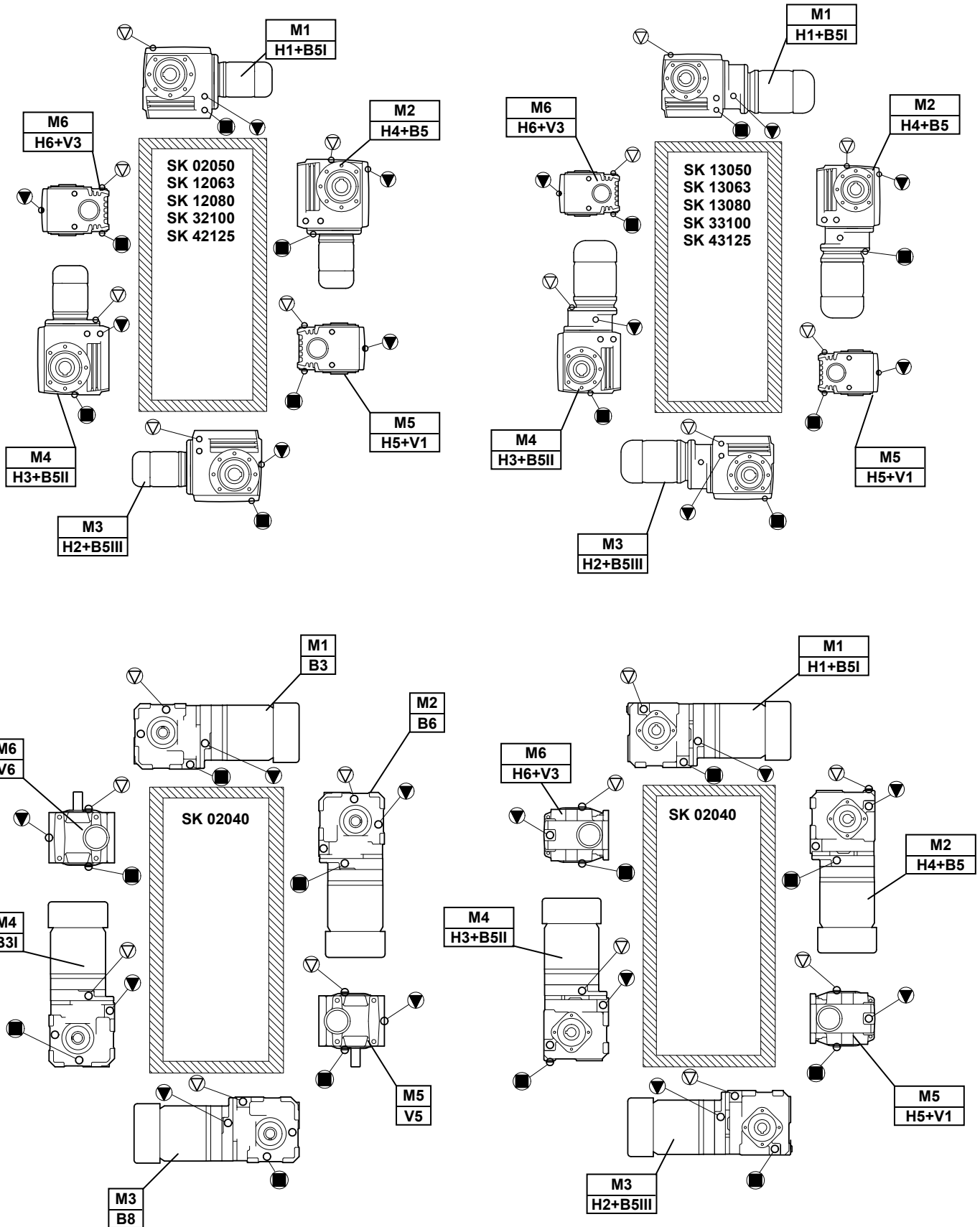




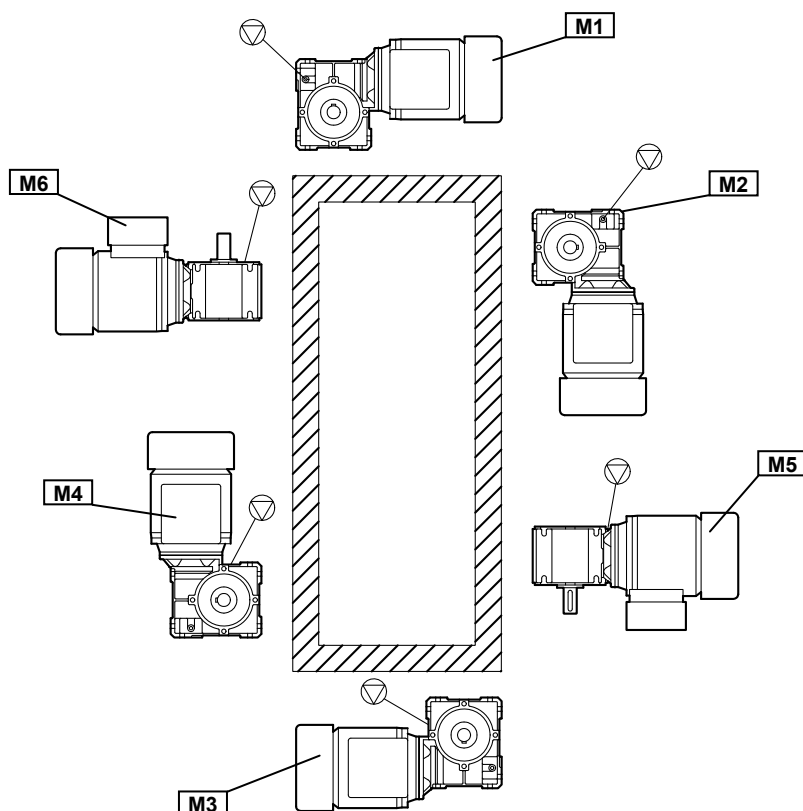








SK 1S32 – SK 1S63
 SK 1SU32 – SK 1SU63
 SK 1SM31 – SK 1SM63
 SK 1SI31 – SK 1SI75
 SK 1SIS31 – SK 1SIS75
 SK 1SMI31 – SK 1SMI75
 SK 1SID31 – SK 1SID75
 SK 1SIS-D31 – SK 1SIS-D63
 SK 1SMID31 – SK 1SMID75
 SK 2S32NB – SK 2S63NB
 SK 2SU32NB- SK 2SU63NB
 SK 2SM40 – SK 2SM63
 SK 2SIS-D40 – SK 2SIS-D63
 SK 2SID40 – SK 2SID63
 SK 2SMID40 – SK 2SMID63



⇒ 26



6. Appendix

6.2 Torque values

Bolt Torques [Nm]						
Size	Screw connections in the strength classes			Sealing screws	Threaded pin on coupling	Screw connections on protective covers
	8.8	10.9	12.9			
M4	3.2	5	6	-	-	
M5	6.4	9	11	-	2	
M6	11	16	19	-	-	6.4
M8	27	39	46	11	10	11
M10	53	78	91	11	17	27
M12	92	135	155	27	40	53
M16	230	335	390	-	-	92
M20	460	660	770	-	-	230
M24	790	1150	1300	80	-	460
M30	1600	2250	2650	170	-	
M36	2780	3910	4710	-	-	
M42	4470	6290	7540	-	-	
G1¼	-	-	-	20	-	

6.3 Troubleshooting

Gear unit malfunctions		
Fault	Possible cause	Remedy
Unusual running noises, vibrations	Oil too low or bearing damage or toothed wheel damage	Consult NORD Service
Oil escaping from gear unit or motor	Defective seal	Consult NORD Service
Oil escaping from pressure vent	Incorrect oil level or incorrect, contaminated oil or unfavourable operating conditions	Oil change Use oil expansion tank (Option OA)
Gear unit becomes too hot	Unfavourable installation conditions or gear unit damage	Consult NORD Service
Shock when switched on, vibrations	Defective motor coupling or loose gear unit mounting or defective rubber element	Replace elastomer gear rim, tighten motor and gear unit fastening bolts, replace rubber element
Drive shaft does not rotate although motor is running	Fracture in gear unit or defective motor coupling or shrink disc slippage	Consult NORD Service

	Attention!
	Warning: shut down the gear unit immediately should any of the above faults occur!

6. Appendix

6.4 Lubricants

With the exception of type SK 11282, SK 11382, SK 12382 and SK 9096.1 gear units, all gear units are filled with lubricant ready for operation in the required installation position when delivered. This initial filling corresponds to a lubricant from the column for the ambient temperatures (normal version) in the lubricant table.

Roller bearing greases

This table shows comparable roller bearing greases from various manufacturers. The manufacturer can be changed for a given grease type. Getriebebau NORD must be contacted in case of change of grease type or ambient temperature range, as otherwise no warranty for the functionality of our gear units can be accepted.

Lubricant type	Ambient temperature						
Mineral oil-based grease	-30 ... 60°C	Energrease LS 2 Energrease LS-EP 2	Longtime PD 2	RENOLIT GP 2 RENOLIT LZR 2 H	-	Mobilux EP 2	Gadus S2 V100 2
	-50 ... 40°C	-	Optitemp LG 2	RENOLIT JP 1619	-	-	-
Synthetic grease	-25 ... 80°C	Energrease SY 2202	Tribol 4747	RENOLIT HLT 2 RENOLIT LST 2	PETAMO GHY 133 N Klüberplex BEM 41-132	Mobiltemp SHC 32	Cassida EPS2
Biodegradable grease	-25 ... 40°C	Biogrease EP 2	-	PLANTOGEL 2 S	Klüberbio M 72-82	Mobil SHC Grease 102 EAL	Naturelle Grease EP2
Foodstuff-compatible grease	-25 ... 40°C	-	Obeen UF 2	RENOLIT G 7 FG 1	Klübersynth UH1 14-151	Mobilgrease FM 222	Cassida RLS2



6. Appendix



Lubricant table

This table shows comparable lubricants from various manufacturers. The manufacturer can be changed within a particular viscosity or lubricant type. Getriebebau NORD must be contacted in case of change of viscosity or lubricant type, as otherwise no warranty for the functionality of our gearboxes can be accepted.

Lubricant type	Details on type plate	DIN (ISO) / Ambient temperature						
Mineral oil	CLP 680	ISO VG 680 0...40°C	Energol GR-XP 680	Alpha EP 680 Alpha SP 680 Optigear BM 680 Tribol 1100/680	RENOLIN CLP 680 RENOLIN CLP 680 Plus	Klüberoil GEM 1-680 N	Mobilgear 600 XP 680	Omala S2 G 680
	CLP 220	ISO VG 220 -10...40°C	Energol GR-XP 220	Alpha EP 220 Alpha SP 220 Optigear BM 220 Tribol 1100/220	RENOLIN CLP 220 RENOLIN CLP 220 Plus	Klüberoil GEM 1-220 N	Mobilgear 600 XP 220	Omala S2 G 220
	CLP 100	ISO VG 100 -15...25°C	Energol GR-XP 100	Alpha EP 100 Alpha SP 100 Optigear BM 100 Tribol 1100/100	RENOLIN CLP 100 RENOLIN CLP 100 Plus	Klüberoil GEM 1-100 N	Mobilgear 600 XP 100	Omala S2 G 100
Synthetic oil (Polyglycol)	CLP PG 680	ISO VG 680 -20...40°C	-	Alphasyn GS 680 Tribol 800/680	RENOLIN PG 680	Klübersynth GH 6-680	Mobil Glygoyle 680	Omala S4 WE 680
	CLP PG 220	ISO VG 220 -25...80°C	Enersyn SG-XP 220	Alphasyn GS 220 Alphasyn PG 220 Tribol 800/220	RENOLIN PG 220	Klübersynth GH 6-220	Mobil Glygoyle 220	Omala S4 WE 220
Synthetic oil (hydrocarbon)	CLP HC 460	ISO VG 460 -30...80°C	-	Alphasyn EP 460 Tribol 1510/460 Optigear Synthetic X 460	RENOLIN Unisyn CLP 460	Klübersynth GEM 4-460 N	Mobil SHC 634	Omala S4 GX 460
	CLP HC 220	ISO VG 220 -40...80°C	-	Alphasyn EP 220 Tribol 1510/220 Optigear Synthetic X 220	RENOLIN Unisyn CLP 220	Klübersynth GEM 4-220 N	Mobil SHC 630	Omala S4 GX 220
Bio-degradable oil	CLP E 680	ISO VG 680 -5...40°C	-	-	PLANTOGEAR 680 S	-	-	-
	CLP E 220	ISO VG 220 -5...40°C	-	Tribol BioTop 1418/220	PLANTOGEAR 220 S	Klübersynth GEM 2-220	-	Naturelle Gear Fluid EP 220
Food grade oil	CLP PG H1 680	ISO VG 680 -5...40°C	-	Tribol FoodProof 1800/680	-	Klübersynth UH1 6-680	Mobil Glygoyle 680	Cassida Fluid WG 680
	CLP PG H1 220	ISO VG 220 -25...40°C	-	Tribol FoodProof 1800/220	-	Klübersynth UH1 6-220	Mobil Glygoyle 220	Cassida Fluid WG 220
	CLP HC H1 680	ISO VG 680 -5...40°C	-	Optileb GT 680	GERALYN SF 680	Klüberoil 4 UH1-680 N	-	Cassida Fluid GL 680
	CLP HC H1 220	ISO VG 220 -25...40°C	-	Optileb GT 220	GERALYN SF 220	Klüberoil 4 UH1-220 N	Mobil SHC Cibus 220	Cassida Fluid GL 220
Gear unit liquid grease		-25 ... 60°C	Energrease LS-EP 00	Longtime PD 00 Tribol 3020/1000-00	RENOLIT DURAPLEX EP 00 RENOLIT LST 00	MICROLUBE GB 00 Klübersynth GE 46-1200	Mobil Chassis Grease LBZ Mobil Glygoyle Grease 00	Alvania EP(LF)2 -

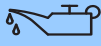
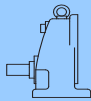
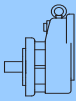
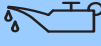
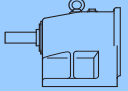
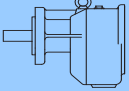
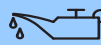
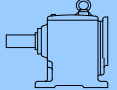
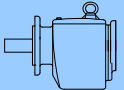
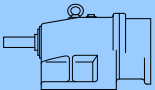
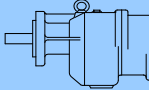
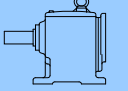
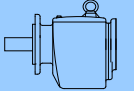
6. Appendix

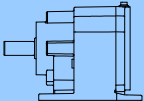
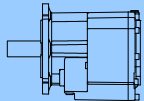
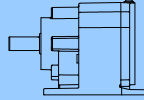
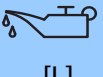
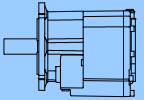
6.5 Lubricant quantities

	Note!
	After changing the lubricant, and in particular after the initial filling, the oil level may change during the first few hours of operation, as the oil galleries and hollow spaces only fill gradually during operation. The oil level is still within the permissible tolerance. If at the express request of the customer, an oil inspection glass is installed at an additional charge, we recommend that the customer corrects the oil level after an operating period of approx. 2 hours, so that when the gear unit is at a standstill and has cooled down, the oil level is visible in the inspection glass. Only then, is it possible to check the oil level by means of the inspection glass. The filling quantities stated in the following tables are for guidance only. The precise quantities vary depending on the exact gear ratio. When filling, always observe the oil level screw hole as an indicator of the precise quantity of oil.

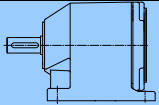
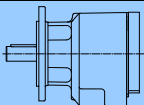
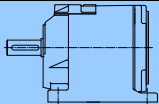
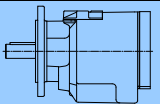
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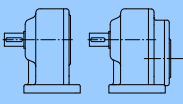
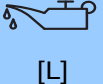
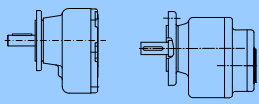


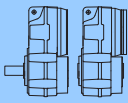
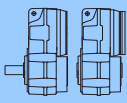
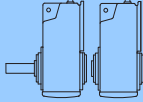
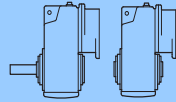
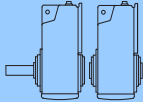
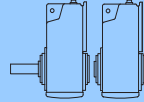
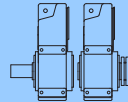
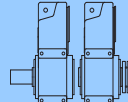
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SK11E	0,25	0,50	0,55	0,40	0,35	0,35	0,30	0,35	0,50	0,30	0,40	0,40
SK21E	0,60	1,20	1,20	1,00	1,00	1,00	0,50	1,40	1,10	0,70	0,90	0,90
SK31E	1,10	2,70	2,20	2,30	1,70	1,70	0,80	1,30	1,65	1,10	2,00	2,00
SK41E	1,70	2,60	3,30	2,50	2,60	2,60	1,00	2,60	2,80	1,60	3,30	3,30
SK51E	2,20	4,40	4,70	4,00	3,40	3,40	1,80	3,50	4,10	3,00	3,80	3,80
 [L]												
SK02	0,15	0,60	0,70	0,60	0,40	0,40	0,25	0,60	0,60	0,60	0,50	0,50
SK12	0,25	0,75	0,85	0,75	0,50	0,50	0,35	0,85	0,90	0,90	0,60	0,60
SK22	0,50	1,80	1,80	1,80	1,35	1,35	0,70	2,00	2,00	1,80	1,55	1,55
SK32	0,90	2,50	2,50	2,90	2,00	2,00	1,30	2,90	3,30	3,10	2,40	2,40
SK42	1,30	4,50	4,50	4,30	3,20	3,20	1,80	4,40	4,50	4,00	3,70	3,70
SK52	2,50	7,00	6,80	6,80	5,10	5,10	3,00	6,80	6,20	7,40	5,60	5,60
 [L]												
SK62	6,50	15,00	13,00	16,00	15,00	15,00	7,00	15,00	14,00	18,50	16,00	16,00
SK72	10,00	23,00	18,00	26,00	23,00	23,00	10,00	23,00	18,50	28,00	23,00	23,00
SK82	14,00	35,00	27,00	44,00	32,00	32,00	15,00	37,00	29,00	45,00	34,50	34,50
SK92	25,00	73,00	47,00	76,00	52,00	52,00	26,00	73,00	47,00	78,00	52,00	52,00
SK102	36,00	79,00	66,00	102,00	71,00	71,00	40,00	81,00	66,00	104,00	72,00	72,00
 [L]												
SK03	0,30	1,00	0,80	0,90	0,60	0,60	0,50	0,80	0,90	1,10	0,80	0,80
SK13	0,60	1,25	1,10	1,20	0,70	0,70	0,85	1,20	1,20	1,20	0,95	0,95
SK23	1,30	2,40	2,30	2,35	1,60	1,60	1,50	2,60	2,50	2,80	2,80	2,80
SK33N	1,60	2,90	3,20	3,70	2,30	2,30	2,50	3,40	3,50	4,40	2,60	2,60
SK43	3,00	5,60	5,20	6,60	3,60	3,60	3,50	5,70	5,00	6,10	4,10	4,10
SK53	4,50	8,70	7,70	8,70	6,00	6,00	5,20	8,40	7,00	8,90	6,70	6,70
 [L]												
SK63	13,00	14,50	14,50	16,00	13,00	13,00	13,50	14,00	15,50	18,00	14,00	14,00
SK73	20,50	20,00	22,50	27,00	20,00	20,00	22,00	22,50	23,00	27,50	20,00	20,00
SK83	30,00	31,00	34,00	37,00	33,00	33,00	31,00	34,00	35,00	40,00	34,00	34,00
SK93	53,00	70,00	59,00	72,00	49,00	49,00	53,00	70,00	59,00	74,00	49,00	49,00
SK103	74,00	71,00	74,00	97,00	67,00	67,00	69,00	78,00	78,00	99,00	67,00	67,00

 [L]							 [L]						
	M1	M2	M3	M4	M5	M6		M1	M2	M3	M4	M5	M6
⇒ 6.1							⇒ 6.1						
SK072.1	0,16	0,32	0,21	0,23	0,18	0,20	SK072.1 F	0,16	0,32	0,21	0,23	0,18	0,20
SK172.1	0,27	0,59	0,42	0,45	0,32	0,39	SK172.1 F	0,27	0,59	0,42	0,45	0,32	0,39
SK372.1	0,45	1,05	0,75	1,00	0,60	0,65	SK372.1 F	0,45	1,05	0,75	1,00	0,60	0,65
SK572.1	0,75	1,90	1,50	2,00	1,10	1,15	SK572.1 F	0,75	1,90	1,50	2,00	1,10	1,15
SK672.1	1,10	2,60	2,15	2,70	1,55	1,65	SK672.1 F	1,10	2,60	2,15	2,70	1,55	1,65
SK772.1	1,35	3,65	2,25	3,15	1,35	2,15	SK772.1 F	1,35	3,65	2,25	3,15	1,35	2,15
SK872.1	3,20	8,00	5,30	7,00	2,80	4,60	SK872.1 F	3,20	8,00	5,30	7,00	2,80	4,60
SK972.1	4,50	12,90	8,10	12,70	4,60	7,80	SK972.1 F	4,50	12,90	8,10	12,70	4,60	7,80
SK772.1VL	2,00	3,65	2,25	3,15	1,35	2,15	SK772.1VL F	2,00	3,65	2,25	3,15	1,35	2,15
SK872.1VL	5,00	8,00	5,30	7,00	2,80	4,60	SK872.1VL F	5,00	8,00	5,30	7,00	2,80	4,60
SK972.1VL	8,50	12,90	8,10	12,70	4,60	7,80	SK972.1VL F	8,50	12,90	8,10	12,70	4,60	7,80
 [L]							 [L]						
	M1	M2	M3	M4	M5	M6		M1	M2	M3	M4	M5	M6
⇒ 6.1							⇒ 6.1						
SK373.1	0,45	1,05	0,75	1,00	0,60	0,65	SK373.1 F	0,45	1,05	0,75	1,00	0,60	0,65
SK573.1	0,75	1,90	1,50	2,00	1,10	1,15	SK573.1 F	0,75	1,90	1,50	2,00	1,10	1,15
SK673.1	1,10	2,60	2,15	2,70	1,55	1,65	SK673.1 F	1,10	2,60	2,15	2,70	1,55	1,65
SK773.1	1,95	3,50	3,20	2,90	2,25	2,95	SK773.1 F	1,95	3,50	3,20	2,90	2,25	2,95
SK873.1	4,05	7,60	6,85	6,55	5,00	6,55	SK873.1 F	4,05	7,60	6,85	6,55	5,00	6,55
SK973.1	7,40	12,20	11,10	11,60	8,00	10,90	SK973.1 F	7,40	12,20	11,10	11,60	8,00	10,90
SK773.1VL	1,95	3,50	3,20	2,90	2,25	2,95	SK773.1VL F	1,95	3,50	3,20	2,90	2,25	2,95
SK873.1VL	4,05	7,60	6,85	6,55	5,00	6,55	SK873.1VL F	4,05	7,60	6,85	6,55	5,00	6,55
SK973.1VL	7,40	12,20	11,10	11,60	8,00	10,90	SK973.1VL F	7,40	12,20	11,10	11,60	8,00	10,90



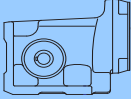
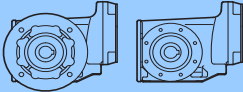
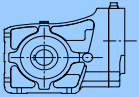
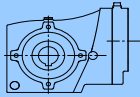
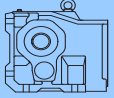
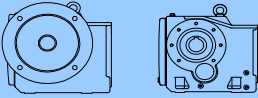
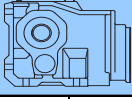
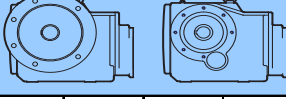
 [L]												
	M1	M2	M3	M4	M5	M6	M1	M2	M3	M4	M5	M6
	B3	V6	B8	V5	B6	B7	B5	V3	B5I	V1	B5II	B5III
⇒ 6.1												
SK172	0,35	0,50	0,50	0,50	0,50	0,50	0,35	0,50	0,50	0,50	0,50	0,50
SK272	0,60	1,00	1,00	1,00	1,00	1,00	0,60	1,00	1,00	1,00	1,00	1,00
SK372	0,60	1,00	1,00	1,00	1,00	1,00	0,60	1,00	1,00	1,00	1,00	1,00
SK472	1,00	1,90	1,90	2,00	1,80	1,80	1,00	1,90	1,90	1,90	1,90	1,50
SK572	1,00	1,90	1,90	2,00	1,80	1,80	1,00	1,90	1,90	1,90	1,90	1,50
SK672	1,40	3,40	3,10	3,15	1,45	3,15	1,15	3,40	2,70	2,80	1,25	2,70
SK772	2,00	3,30	3,50	4,20	2,70	3,30	1,60	3,30	3,50	3,30	3,10	3,10
SK872	3,70	9,60	9,10	7,30	4,70	8,00	3,50	9,00	7,90	7,70	3,90	7,20
SK972	6,50	16,00	15,70	14,70	8,50	14,00	6,50	15,00	13,00	13,50	6,50	12,00
 [L]												
	M1	M2	M3	M4	M5	M6	M1	M2	M3	M4	M5	M6
	B3	V6	B8	V5	B6	B7	B5	V3	B5I	V1	B5II	B5III
SK273	0,62	1,10	1,10	1,10	1,10	1,10	0,62	1,10	1,10	1,10	1,10	1,10
SK373	0,55	1,10	1,10	1,10	1,10	1,10	0,55	1,10	1,10	1,10	1,10	1,10
SK473	1,30	2,50	2,10	2,40	2,10	2,10	1,25	2,40	2,10	2,50	2,10	2,10
SK573	1,30	2,50	2,10	2,40	2,10	2,10	1,25	2,40	2,10	2,50	2,10	2,10
SK673	1,80	3,80	3,20	3,40	2,90	3,00	1,70	3,80	3,00	3,20	3,00	3,00
SK773	2,50	4,50	3,70	4,60	3,30	3,30	2,30	5,00	3,60	4,50	3,90	3,90
SK873	6,20	8,40	7,50	9,10	7,50	7,50	5,00	8,80	7,60	8,00	8,00	8,00
SK973	11,00	15,80	13,00	16,00	13,30	13,00	10,30	16,50	13,00	16,00	14,00	14,00

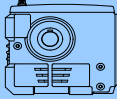
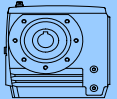
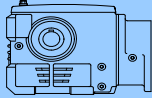
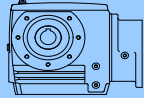
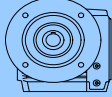
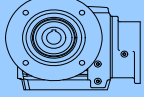
 [L]							 [L]						
	M1	M2	M3	M4	M5	M6		M1	M2	M3	M4	M5	M6
	B3	V6	B8	V5	B6	B7		B5	V3	B5I	V1	B5II	B5III
⇒ 6.1							⇒ 6.1						
SK20	0,55	1,00	0,55	1,00	0,55	0,55	SK20 F	0,35	0,60	0,35	0,60	0,35	0,35
SK0	0,13	0,22	0,13	0,22	0,13	0,13	SK0 F	0,13	0,22	0,13	0,22	0,13	0,13
SK01	0,22	0,38	0,22	0,38	0,22	0,22	SK01 F	0,22	0,38	0,22	0,38	0,22	0,22
SK25	0,50	0,90	0,50	0,90	0,50	0,50	SK25 F	0,50	0,90	0,50	0,90	0,50	0,50
SK33	0,80	1,60	1,00	1,60	0,80	1,00	SK33 F	1,00	1,60	1,00	1,60	0,80	1,00
SK30	0,80	1,40	0,70	1,40	0,70	0,70	SK30 F	0,80	1,40	0,70	1,10	0,70	0,70
SK300	1,40	1,50	1,40	1,50	1,40	1,40	SK300 F	1,40	1,50	1,40	1,50	1,40	1,40
SK330	1,50	1,58	1,50	1,58	1,50	1,50	SK330 F	2,00	1,58	1,50	2,80	1,50	1,50
SK200	0,80	1,30	0,80	1,30	0,80	0,80	SK200 F	0,60	1,04	0,60	1,04	0,60	0,60
SK010	0,38	0,60	0,38	0,60	0,38	0,38	SK010 F	0,38	0,60	0,38	0,60	0,38	0,38
SK250	1,20	1,50	1,40	1,50	1,40	1,40	SK250 F	1,40	1,50	1,40	1,50	1,40	1,40
SK000	0,24	0,41	0,24	0,41	0,24	0,24	SK000 F	0,24	0,41	0,24	0,41	0,24	0,24

 [L]							 [L]						
⇒ 6.1	M1	M2	M3	M4	M5	M6	⇒ 6.1	M1	M2	M3	M4	M5	M6
⇒ 6.1	H1	H6	H2	H5	H4	H3	⇒ 6.1	H1	H6	H2	H5	H4	H3
SK0182NB A	0,40	0,55	0,60	0,55	0,35	0,35							
SK0282NB A	0,70	1,00	0,80	1,10	0,90	0,90							
							SK1382NB A	1,30	2,30	1,40	2,10	2,00	1,90
 [L]							 [L]						
SK1282 A	0,90	1,30	0,90	1,20	0,95	0,95	SK2382 A	2,30	2,60	1,90	3,10	1,50	1,50
SK2282 A	1,65	2,40	1,90	2,00	1,80	1,80	SK3382 A	4,10	4,90	3,30	5,60	3,30	3,30
SK3282 A	3,15	4,10	3,25	4,10	3,15	3,15	SK4382 A	5,90	6,80	4,90	8,30	4,90	4,90
SK4282 A	4,70	6,10	4,75	5,40	4,70	4,70	SK5382 A	12,50	12,00	6,70	13,50	8,30	8,30
SK5282 A	7,50	8,80	7,50	8,80	7,20	7,20	SK1382 A	1,45	1,60	1,15	1,70	1,10	1,10
 [L]							 [L]						
SK6282 A	17,00	14,00	12,00	17,50	10,00	14,00	SK6382 A	16,50	13,00	9,60	18,00	14,00	12,50
SK7282 A	25,00	21,00	20,00	27,00	16,00	21,00	SK7382 A	22,00	20,00	16,00	25,00	23,00	22,00
SK8282 A	37,00	33,00	30,00	41,00	31,00	31,00	SK8382 A	34,00	32,00	25,00	38,00	35,00	30,00
SK9282 A	74,00	70,00	55,00	80,00	65,00	59,00	SK9382 A	73,00	70,00	45,00	74,00	65,00	60,00
 [L]							 [L]						
SK10282 A	90	90	40	90	60	82	SK10382 A	85	100	73	100	80	80
SK11282 A	165	160	145	195	100	140	SK11382 A	160	155	140	210	155	135
							SK12382 A	160	155	140	210	155	135

* ⇒ 38



 [L]												
⇒ 6.1	M1	M2	M3	M4	M5	M6	M1	M2	M3	M4	M5	M6
⇒ 6.1	B3	B6	B8	B3I	V5	V6	B5I	B5	B5III	B5II	V1	V3
							H1	H4	H2	H3	H5	H6
SK92072	0,40	0,60	0,50	0,50	0,40	0,40	0,40	0,60	0,50	0,50	0,40	0,40
SK92172	0,55	0,90	0,95	1,10	0,75	0,62	0,50	0,92	0,87	1,05	0,75	0,65
SK92372	0,90	1,30	1,45	1,60	1,20	1,20	1,15	1,50	1,20	1,75	1,15	1,15
SK92672	1,80	3,50	3,20	3,40	2,60	2,60	1,55	2,80	2,50	3,30	2,40	2,40
SK92772	2,30	4,50	4,60	5,30	4,10	4,10	2,75	4,40	4,50	5,85	3,50	3,50
 [L]												
SK9x072.1	0,39	0,93	0,79	1,02	0,49	0,62	0,39	0,93	0,79	1,02	0,49	0,62
SK9x172.1	0,60	1,17	0,94	1,37	0,65	0,85	0,60	1,17	0,94	1,37	0,65	0,85
SK9x372.1	1,00	1,97	1,65	2,14	1,12	1,34	1,00	1,97	1,65	2,14	1,12	1,34
SK9x672.1	1,80	3,23	2,71	4,20	2,02	2,45	1,80	3,23	2,71	4,20	2,02	2,45
SK9x772.1	2,72	4,63	3,70	5,40	2,93	3,25	2,72	4,63	3,70	5,40	2,93	3,25
 [L]												
SK9012.1	0,70	1,60	1,90	2,40	1,20	1,70	0,70	1,90	1,90	2,20	1,20	1,70
SK9016.1	0,70	1,60	1,90	2,40	1,20	1,70	0,70	1,90	1,90	2,10	1,20	1,70
SK9022.1	1,30	2,60	3,50	4,20	2,00	2,80	1,30	2,60	3,50	4,20	2,00	2,80
SK9032.1	1,70	4,80	6,40	6,70	4,10	5,10	1,90	5,20	6,40	7,30	3,30	5,10
SK9042.1	4,40	8,70	10,00	9,80	6,80	7,50	3,60	9,70	11,40	11,50	6,50	8,20
SK9052.1	6,50	16,00	19,00	21,50	11,00	15,50	7,50	16,50	20,00	23,50	11,50	18,00
SK9062.1	10,00	27,50	32,00	36,00	18,00	24,00	12,00	27,50	33,00	38,50	19,00	26,00
SK9072.1	10,00	27,50	32,00	36,00	18,00	24,00	12,00	27,50	33,00	38,50	19,00	26,00
SK9082.1	17,00	52,00	63,00	72,00	33,00	47,00	21,00	54,00	66,00	80,00	38,00	52,00
SK9086.1	29,00	73,00	85,00	102,00	48,00	62,00	36,00	78,00	91,00	107,00	53,00	76,00
SK9092.1	41,00	157,00	170,00	172,00	80,00	90,00	40,00	130,00	154,00	175,00	82,00	91,00
SK9096.1	70,00	187,00	194,00	254,00	109,00	152,00	80,00	187,00	193,00	257,00	113,00	156,00
 [L]												
SK9013.1	1,20	2,00	2,20	3,00	1,40	1,90	1,20	2,30	2,20	3,00	1,40	1,90
SK9017.1	1,20	2,00	2,20	3,00	1,40	1,90	1,20	2,30	2,20	3,00	1,40	1,90
SK9023.1	2,40	3,00	3,80	5,30	2,20	3,10	2,40	3,00	3,80	5,30	2,20	3,10
SK9033.1	3,30	6,60	7,00	7,80	4,30	5,10	3,80	5,70	6,90	8,50	3,60	5,60
SK9043.1	4,60	10,20	10,70	12,80	5,20	6,70	5,70	10,20	14,70	14,70	6,60	9,60
SK9053.1	10,00	17,00	20,00	24,20	11,50	16,50	12,50	18,00	21,50	26,50	13,00	17,00

 [L]							 [L]						
⇒ 6.1	M1	M2	M3	M4	M5	M6		M1	M2	M3	M4	M5	M6
⇒ 6.1	B3	B6	B8	B3I	V5	V6		B5I	B5	B5III	B5II	V1	V3
⇒ 6.1								H1	H4	H2	H3	H5	H6
SK02040	0,45	0,60	0,60	0,60	0,50	0,50	SK02040 A	0,40	0,80	0,65	0,60	0,50	0,50
SK02050	0,40	1,20	0,70	1,15	0,70	0,70	SK02050 A	0,45	1,10	0,90	1,10	0,80	0,80
SK12063	0,60	1,70	1,20	1,55	1,00	1,00	SK12063 A	0,50	1,45	1,20	1,40	1,10	1,10
SK12080	0,80	2,60	1,70	2,70	1,70	1,70	SK12080 A	0,90	3,10	3,00	3,00	2,20	2,20
SK32100	1,60	5,50	3,40	5,40	3,20	3,20	SK32100 A	1,50	5,20	3,80	5,30	3,80	3,80
SK42125	2,80	11,00	6,20	10,30	5,80	5,80	SK42125 A	3,20	12,90	6,10	10,50	6,30	6,30
 [L]							 [L]						
SK13050	0,95	1,55	1,10	1,45	0,95	0,95	SK13050 A	0,85	1,75	1,25	1,35	1,15	1,15
SK13063	1,30	2,30	1,60	2,00	1,25	1,25	SK13063 A	1,05	2,10	1,55	2,10	1,45	1,45
SK13080	1,70	3,20	2,10	3,30	1,95	1,95	SK13080 A	1,70	3,45	3,60	3,60	2,55	2,55
SK33100	2,10	7,60	4,00	6,50	3,70	3,70	SK33100 A	2,10	6,10	4,80	6,50	4,20	4,20
SK43125	7,80	14,00	7,20	13,50	6,70	6,70	SK43125 A	4,80	13,50	7,40	14,50	8,00	8,00
 [L]							 [L]						
SK02040 F	0,50	0,80	0,75	0,60	0,50	0,50							
SK02050 F	0,45	1,40	0,90	1,25	1,00	1,00	SK13050 F	0,90	1,80	1,15	1,75	1,25	1,25
SK12063 F	0,50	1,60	1,40	1,80	1,50	1,50	SK13063 F	0,95	2,10	1,65	2,15	1,75	1,75
SK12080 F	0,95	3,20	3,10	3,30	2,50	2,50	SK13080 F	1,40	4,20	3,35	3,80	2,75	2,75
SK32100 F	1,50	7,10	4,90	7,10	4,40	4,40	SK33100 F	2,30	7,60	5,50	7,80	4,85	4,85
SK42125 F	3,30	11,20	6,10	11,00	6,80	6,80	SK43125 F	4,30	14,50	7,10	12,10	7,70	7,70



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Bestelldaten: 1LE1501-2BB03-4FB4-Z
Ordering data: H20
Motor type: 1CV2220B

Kunden-Auftrags-Nr. / Client order no.:

Siemens-Auftrags-Nr. / Order no.:

Angebots-Nr. / Offer no.:

Bemerkung / Remarks:

Item-Nr. / Item no.:

Komm.-Nr. / Consignment no.:

Projekt / Project:

U	Δ / Y	f	P	P	I	n	M	NOM. EFF at ... load [%]			Power factor at ... load			I _A /I _N	M _A /M _N	M _K /M _N	IE-CL
[V]		[Hz]	[kW]	[hp]	[A]	[1/min]	[Nm]	4/4	3/4	2/4	4/4	3/4	2/4	I _A /I _N	T _f /T _N	T _B /T _N	
400	Δ	50	37,00	- / -	65,00	1470	240,0	92,7	93,5	93,5	0,88	0,85	0,78	6,6	2,3	2,9	IE2
690	Y	50	37,00	- / -	38,00	1470	240,0	92,7	93,5	93,5	0,88	0,85	0,78	6,6	2,3	2,9	IE2
460	Δ	60	42,50	- / -	65,00	1770	229,0	93,6	94,2	94,0	0,88	0,86	0,79	6,6	2,3	2,9	IE2
IM B5 / IM 3001			FS 225 S		280 kg		IP65		IEC/EN 60034		IEC, DIN, ISO, VDE, EN						

Mechanische Daten / Mechanical data		
Schalldruckpegel (Lp _{fA}) 50 Hz/60Hz (Last) Sound pressure level 50 Hz/60Hz (load)	66 db(A)	69 db(A)
Trägheitsmoment Moment of inertia	0,42 kg m²	
Lager AS BS Bearing DE NDE	6213 ZC3	6213 ZC3
Lagerlebensdauer Bearing lifetime	40000 h	
Schmiermittel Lubricants	Esso Unirex N3	
Nachschmiereinrichtung Regreasing device	Nein No	
Schmiernippel Grease nipple	- / -	
Art der Lagerung Type of bearing	Festlager NDE (BS) Locating bearing NDE	
Kondenswasserlöcher Condensate drainage holes	Ja (Standard) Yes (standard)	
Äußere Erdungsklemme External earthing terminal	Ja (Standard) Yes (standard)	
Vibrationsklasse Vibration class	A	
Isolation Insulation	155(F) nach 130(B) 155(F) to 130(B)	
Betriebsart Duty type	S1	
Drehrichtung Direction of rotation	bidirektional bidirectional	
Gehäusematerial Frame material	Grauguss cast iron	
Daten Stillstandsheizung Data of anti condensation heating	-/-	
Anstrich Coating	Normalanstrich Standard paint finish	
Farbe Color	RAL7030	
Motorschutz Motor protection	(B) 3 Kaltleiter PTC - für Abschaltung (B) 3 PTC thermistors - for tripping	
Kühlart Method of cooling	IC411 - Eigenbelüftet Oberflächengekühlt IC411 - self ventilated, surface cooled	

Anschlusskasten / Terminal box	
Klemmenkastenlage Terminal box position	oben top
Klemmenkastenmaterial Material of terminal box	Grauguss cast iron
Klemmenkastentyp Type of terminal box	TB1 L01
Gewinde Kontaktschraube Contact screw thread	M8
Max. Leiterquerschnitt Max. cross-sectional area	35,0 mm²
Kabeldurchmesser von ... bis ... Cable diameter from ... to ...	27,0 mm - 35,0 mm
Kabeleinführung Cable entry	2xM50x1,5-2xM20x1,5
Kabelverschraubung Cable gland	4 Stopfen 4 plugs

Sonderausführung / Special design	
H20	Schutzart IP65 IP65 degree of protection

Umgebungsbedingungen / Environmental	
Umgebungstemperatur	-20 °C - +40 °C
Ambient temperature	
Höhe über Meeresspiegel	1000 m
Altitude above sea level	

Explosionsschutz / Explosion protection	
Zündschutzart	- / -
Type of protection	

EG-Konformitätserklärung 664.30001.21

Hersteller:
Manufacturer:

Siemens AG
Industry Sector
Drive Technologies Division
Large Drives

Adresse:
Address:

Vogelweiherstr. 1 - 15
90441 Nürnberg
Germany

Produktbezeichnung :
Product designation:

Niederspannungsmotoren / Low-Voltage Motors

Typ / Type 1LE1 ..., 1PC1..., 1PC3 ...,
1LA5 ..., 1LA6 ..., 1LA7 ..., 1LA9 ...,
1LH5 ..., 1LH9 ...,
1LP1 ..., 1LP3 ..., 1LP4 ... 1LP5 ..., 1LP6 ..., 1LP7 ..., 1LP9 ...,
1PP1 ..., 1PP3 ..., 1PP4 ..., 1PP5 ..., 1PP6 ..., 1PP7 ..., 1PP9 ...,
1LF5 ..., 1LF7..., 1LF9 ...,
1LG4 ..., 1LG6 ...,

BG / FS: 56 M ... 315 L

Das bezeichnete Produkt stimmt mit den Vorschriften folgender Europäischer Richtlinien überein:

2006/95/EG Richtlinie des Europäischen Parlaments und des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten betreffend elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen

Die Übereinstimmung mit den Vorschriften dieser Richtlinien wird nachgewiesen durch die vollständige Einhaltung folgender Normen:

EN 60034-1*): 2004

EN 60204-1: 2006

*) mit allen relevanten Teilen / with all relevant parts

Das bezeichnete Produkt ist zum Einbau in eine andere Maschine bestimmt. Die Inbetriebnahme ist solange untersagt, bis die Konformität des Endproduktes mit der Richtlinie 2006/42/EG festgestellt ist.

Erstausgabe: 06.11.96
Siemens Aktiengesellschaft
Nürnberg, den 22.11.2010


Jürgen Amedick
Head of Business Segment Products


Martin Exss
Head of Products Quality Management

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Beschaffenheits- oder Haltbarkeitsgarantie nach §443 BGB. Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.

Kurzschlussläufermotoren fallen laut Leitfaden nicht unter die EMV-Richtlinie 2004/108/EG, somit ist keine CE-Kennzeichnung zur EMV-Richtlinie notwendig.

EC declaration of conformity

ENGLISH

The named product is in conformity with the requirements of the following European Directive:
2006/95/EC Directive of the European Parliament and the Council on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.

Conformity with the requirements of these Directives is testified by complete adherence to the following standards:

The named product is intended for fitting in another machine. Commissioning is prohibited until such time as the end product has been proved to conform to the provisions of Directive 2006/42/EC.

This Declaration does not give assurance of properties within the meaning of product liability. The safety instructions provided in the product documentation must be observed.

According to the guideline, squirrel-cage induction motors do not fall under the directives of EMC Guideline 2004/108/EC, and thus no CE identification for the EMC guideline is required.

Déclaration de conformité CE

FRANÇAIS

Le produit sus-mentionné est conforme aux prescriptions des Directives Européennes suivantes :
2006/95/CE Directive du Parlement Européen et du Conseil concernant le rapprochement des législations des États membres relatives au matériel électrique destiné à être employé dans certaines limites de tension

La conformité du produit sus-mentionné aux prescriptions de ces directives est démontrée par sa conformité intégrale aux normes suivantes :

Le produit sus-mentionné est destiné exclusivement à l'incorporation dans une autre machine. La mise en service est proscrite tant que la conformité du produit final avec la Directive 2006/42/CE n'a pas été constatée.

Cette déclaration n'est pas une assurance de qualités dans le sens de la responsabilité du produit. Les indications de sécurité de la documentation de produit sont à suivre.

Vu que, suivant le guide, les moteurs à rotor en court-circuit ne sont pas soumis à la réglementation CEM 2004/108/CE, un marquage CE ne s'avère pas nécessaire dans le cadre de la réglementation CEM.

Declaración de conformidad CE

ESPAÑOL

El producto designado cumple con las prescripciones de las siguientes directivas europeas:
2006/95/CE Directiva del Parlamento Europeo y del Consejo relativa a la aproximación de las legislaciones de los Estados miembros sobre el material eléctrico destinado a utilizarse con determinados límites de tensión

La conformidad con las prescripciones de estas Directivas queda justificada por haberse cumplido totalmente las siguientes normas:

El producto designado está destinado a la incorporación en otra máquina. No se permite la puesta en servicio hasta tanto no se haya comprobado que el producto final cumple con la Directiva 2006/42/CE.

Esta declaración no garantiza características según la responsabilidad sobre productos. Han de observarse las indicaciones de seguridad en la documentación del producto.

Según la guía, no se aplica la directiva de compatibilidad electromagnética 2004/108/CE para los motores con inducido en cortocircuito, por lo cual no se requiere un marcado CE para la directiva de compatibilidad electromagnética.

Dichiarazione di conformità CE

ITALIANO

Il prodotto indicato soddisfa le norme delle seguenti Direttive CE:
2006/95/CE Direttiva del Parlamento Europeo e del Consiglio concernente il ravvicinamento delle legislazioni degli Stati membri relative al materiale elettrico destinato ad essere adoperato entro taluni limiti di tensione

La conformità ai requisiti delle presenti direttive viene provata dal completo rispetto delle seguenti norme:

Il prodotto indicato è destinato ad essere integrato in un'altra macchina. Ai sensi della dichiarazione del costruttore la messa in servizio non è consentita fino a quando non è stabilita la conformità del prodotto finale alla Direttiva 2006/42/CE.

La presente dichiarazione non assicura le caratteristiche del prodotto ai sensi della legge per la responsabilità del produttore. Osservare le avvertenze relative alla sicurezza contenute nella documentazione relativa al prodotto.

Secondo la guida, i motori con rotore a gabbia di scoiattolo non rientrano nella direttiva 2004/108/CE sulla compatibilità elettromagnetica (EMC) e quindi non occorre nessun contrassegno CE relativo alla direttiva EMC.

EG-konformitetsförklaring

SVENSKA

Den märkta produkten överensstämmer med föreskrifterna i följande europeiska direktiv:
2006/95/EG Europaparlamentets och Rådets Direktiv om harmonisering av medlemsstaternas lagstiftning om elektrisk utrustning avsedd för användning inom vissa spänningsgränser

Överensstämmelse med föreskrifterna i dessa direktiv styrks genom det absoluta respekterandet av följande normer:

Den märkta produkten är ägnad att monteras i en annan maskin. Idrifttagandet är ej tillåtet innan ändprodukten konformitet med direktiv 2006/42/EC är fastställt.

Denna deklaration får inte uppfattas som försäkran om egenskaper enligt krav i produktansvar. Läs säkerhetsanvisningarna i den medlevererade produktdokumentationen.

Kortslutna motorer sorterar inte enligt handledningen under EMC-direktivet 2004/108/EC, alltså är ingen CE-märkning över EMC-direktivet nödvändig.

SIEMENS



SIMOTICS Low-voltage motors

GP, SD, DP

1LA, 1LE, 1LF, 1LG, 1LP, 1PC, 1PF, 1PK, 1PP, 1PQ, 2KG

Compact Operating Instructions

Ausgabe

02/2013

Deutsch 3

English..... 34

SIEMENS

SIMOTICS GP, SD, DP

Low-voltage motors

Kompaktbetriebsanleitung

1 Einleitung

1.1 Lesehinweis

Ikonen-Erklärung



Hinweis für die 1LE1-, 1MB1-, 1PC1-, 1PC3-Maschinen



Hinweis für 1LE1-, 1PC1- und 1PC3-Maschinen der Baugröße 80 und 90 mit zentraler Anschlusskastenarretierung

2 Sicherheitshinweise

2.1 Informationen für den Anlagenverantwortlichen

Diese elektrische Maschine ist nach den Vorgaben der Richtlinie 2006/95/EG ("Niederspannungsrichtlinie") konzipiert und gebaut und für den Einsatz in Industrieanlagen vorgesehen. Beim Einsatz der elektrischen Maschine außerhalb der Europäischen Gemeinschaft beachten Sie die landesspezifischen Vorschriften.

Befolgen Sie die örtlichen und branchenspezifischen Sicherheits- und Errichtungsvorschriften.

Die für die Anlage Verantwortlichen müssen Folgendes gewährleisten:

- Planungs- und Projektierungsarbeiten sowie alle Arbeiten an und mit der Maschine werden nur von qualifiziertem Personal ausgeführt.
- Die Betriebsanleitung ist bei allen Arbeiten stets verfügbar.

- Die technischen Daten sowie die Angaben über die zulässigen Montage-, Anschluss-, Umgebungs- und Betriebsbedingungen werden konsequent beachtet.
- Die spezifischen Errichtungs- und Sicherheitsvorschriften sowie die Vorschriften zur Benutzung persönlicher Schutzausrüstungen werden eingehalten.

Hinweis

Nehmen Sie für Planungs-, Montage-, Inbetriebsetzungs- und Service-Aufgaben die Unterstützung und Dienstleistungen des zuständigen Service Center in Anspruch.

In den einzelnen Kapiteln dieses Dokuments finden Sie Sicherheitshinweise, die Sie zu Ihrer eigenen Sicherheit, zum Schutz anderer Personen und zur Vermeidung von Sachschäden unbedingt einhalten müssen.

Beachten Sie die folgenden Sicherheitshinweise bei allen Tätigkeiten an und mit der Maschine.

2.2 Die fünf Sicherheitsregeln

Für Ihre persönliche Sicherheit sowie zur Vermeidung von Sachschäden halten Sie bei allen Arbeiten stets die sicherheitsrelevanten Hinweise und die folgenden fünf Sicherheitsregeln nach EN 50110-1 "Arbeiten im spannungsfreien Zustand" ein. Wenden Sie die fünf Sicherheitsregeln vor Beginn der Arbeiten in der genannten Reihenfolge an.

Fünf Sicherheitsregeln

1. Freischalten
Schalten Sie auch die Hilfsstromkreise frei, z. B. Stillstandsheizung
2. Gegen Wiedereinschalten sichern
3. Spannungsfreiheit feststellen
4. Erden und kurzschließen
5. Benachbarte, unter Spannung stehende Teile abdecken oder abschränken

Nach Abschluss der Arbeiten heben Sie die getroffenen Maßnahmen in der umgekehrten Reihenfolge wieder auf.

2.3 Qualifiziertes Personal

Alle Arbeiten an der Maschine dürfen nur von qualifiziertem Personal vorgenommen werden. Qualifiziertes Personal im Sinne dieser Dokumentation sind Personen, die folgende Voraussetzungen erfüllen:

- Sie sind aufgrund ihrer Ausbildung und Erfahrung befähigt, in ihrem jeweiligen Tätigkeitsgebiet Risiken zu erkennen und mögliche Gefährdungen zu vermeiden.

- Sie sind vom jeweils Verantwortlichen mit der Ausführung von Arbeiten an der Maschine beauftragt.

2.4 Sichere Handhabung elektrischer Maschinen



WARNUNG

Spannung führende Teile

Elektrische Maschinen weisen Spannung führende Teile auf.

Durch Entfernen der erforderlichen Abdeckungen, bei unsachgemäßem Einsatz der Maschinen, falscher Bedienung oder unzureichender Wartung können Tod, schwere Körperverletzung oder Sachschäden eintreten.

- Entfernen Sie Abdeckungen nur entsprechend den Vorschriften.
- Bedienen Sie die Maschinen sachgemäß.
- Warten Sie die Maschine regelmäßig.



WARNUNG

Rotierende Teile

Elektrische Maschinen weisen gefährliche rotierende Teile auf.

Durch Entfernen der erforderlichen Abdeckungen, bei unsachgemäßem Einsatz der Maschinen, falscher Bedienung oder unzureichender Wartung können Tod, schwere Körperverletzung oder Sachschäden eintreten.

- Entfernen Sie Abdeckungen nur entsprechend den Vorschriften.
- Bedienen Sie die Maschinen sachgemäß.
- Warten Sie die Maschine regelmäßig.
- Sichern Sie freie Wellenenden.



WARNUNG

Heiße Oberflächen

Elektrische Maschinen weisen heiße Oberflächen auf.

Durch Entfernen der erforderlichen Abdeckungen, bei unsachgemäßem Einsatz der Maschinen, falscher Bedienung oder unzureichender Wartung können Tod, schwere Körperverletzung oder Sachschäden eintreten.

- Lassen Sie die Maschine erst abkühlen, bevor Sie mit den Arbeiten an der Maschine beginnen.
- Entfernen Sie Abdeckungen nur entsprechend den Vorschriften.
- Bedienen Sie die Maschinen sachgemäß.

3 Beschreibung

3.1 Sprachausführungen im Internet

Sprachausführungen finden Sie im Internet

Internetseite: <http://www.siemens.com/motors>

Bei Bedarf von zusätzlichen Sprachausführungen wenden Sie sich an das Siemens Service Center.

Bestimmungsgemäße Verwendung der Maschinen

Diese Maschinen sind für gewerbliche Anlagen bestimmt. Sie entsprechen den harmonisierten Normen der Reihe EN / IEC 60034 (VDE 0530). Der Einsatz im Ex-Bereich ist verboten, sofern die Kennzeichnung auf dem Leistungsschild diesen Betrieb nicht ausdrücklich zulässt. Falls im Sonderfall - bei Einsatz in nicht gewerblichen Anlagen – andere/erhöhte Anforderungen gestellt werden (z. B. Berührung durch Kinder), sind diese Bedingungen bei der Installation anlagenseitig zu gewährleisten.

Hinweis

Maschinenrichtlinie

Niederspannungsmaschinen sind Komponenten zum Einbau in Maschinen im Sinne der aktuellen Maschinenrichtlinie. Die Inbetriebnahme ist so lange untersagt, bis die Konformität des Endprodukts mit dieser Richtlinie festgestellt ist (EN 60204-1 beachten!).

Fremdbelüftung (optional): Kühlart IC 416 nach EN / IEC 60034-6



! WARNUNG

Heiße Oberflächen

Der Betrieb der Maschine ohne Fremdlüfter führt zur Überhitzung. Körperverletzung und Sachschaden können die Folge sein.

Nehmen Sie die Maschine niemals ohne Fremdlüfter in Betrieb!

Eine drehzahlunabhängige Kühlung wird durch ein separat angetriebenes Lüfterrad (Fremdbelüftung) erreicht. Die Fremdbelüftung ist unabhängig vom Betriebszustand der Maschine.

Das Lüfterrad für den äußeren Kühlluftstrom wird von einer unabhängigen Baugruppe angetrieben und ist von der Lüfterhaube umschlossen.

3.2 Schutzart

Die Maschinen sind in der Schutzart gemäß Leistungsschild ausgeführt. Sie können in staubiger oder feuchter Umgebung aufgestellt werden.



! WARNUNG

Gefährliche Spannung

Kondenswasseröffnungen (optional)

Durch Einführen von Gegenständen in die Kondenswasserbohrungen kann die Wicklung beschädigt werden, es können Tod, schwere Körperverletzung und Sachschaden eintreten!

Beachten Sie zum Einhalten der Schutzart folgende Hinweise:

- Schalten Sie die Maschine spannungsfrei, bevor Sie die Kondenswasserbohrungen öffnen.
- Verschließen Sie die Kondenswasseröffnungen (z. B. mit T-Stopfen) vor Inbetriebnahme der Maschine.

Hinweis

Lagerung

Bei Einsatz oder Lagerung im Freien wird ein Überbau oder eine zusätzliche Abdeckung empfohlen.

- Vermeiden Sie eine Langzeiteinwirkung bei direkter intensiver Sonneneinstrahlung, Regen, Schnee, Eis oder Staub.
- Halten Sie gegebenenfalls Rücksprache bzw. stimmen Sie dies technisch ab.

Umgebungsbedingungen

Die Maschinen sind tropengeeignet.

Richtwert für Standardausführung 60 % relative Luftfeuchtigkeit bei Umgebungstemperatur (T_{amb}) 40 °C.

Umgebungstemperatur: -20 °C bis +40 °C

Aufstellhöhe: ≤ 1000 m

Luft mit normalem Sauerstoffgehalt, üblicherweise 21 % (V/V)

Bei abweichenden Umgebungsbedingungen gelten die Angaben auf dem Leistungsschild.

4 Einsatzvorbereitung

WARNUNG

Hebeösen verwenden

Die Maschine darf nur an den Hebeösen in einer ihrer Bauform entsprechenden Lage transportiert und gehoben werden, da sie sonst umkippen oder in der Hebeeinrichtung verrutschen kann.

Tod, schwere Körperverletzung oder Sachschäden können die Folge sein.

- Verwenden Sie alle vorhandenen Hebeösen an der Maschine.
- Ziehen Sie eingeschraubte Hebeösen fest an.
- Schrauben Sie Ringschrauben bis zu ihrer Auflagefläche ein.
- Wenn notwendig, verwenden Sie geeignete ausreichend bemessene Transportmittel wie Hebebänder (EN1492-1) und Zurrgurte (EN12195-2).

WARNUNG

Hängender Transport

Beim Anschlagen mit mehreren Transportmitteln müssen bereits zwei Stränge die ganze Last tragen können.

- Nutzen Sie zum Transport bzw. bei Installation zusätzliche, geeignete Tragmittel.
- Sichern Sie Tragmittel gegen Verrutschen.

Einlagerungszeit

Drehen Sie die Wellen 1-mal jährlich, damit dauerhafte Stillstandsmarkierungen vermieden werden. Bei längerer Einlagerungszeit verringert sich die Fettgebrauchsdauer (Alterung) der Lager.

Offene Lager

- Führen Sie bei offenen Lagern, z. B. 1Z, eine Überprüfung des Fettzustandes bei Lagerung über 12 Monate durch.
- Lässt die Überprüfung eine Entölung oder Verschmutzung des Fetts erkennen, tauschen Sie das Fett aus (Eindringen von Kondenswasser führt zu Konsistenzänderungen des Fetts).

Geschlossene Lager

- Tauschen Sie bei geschlossenen Lagern die Lager AS und BS nach 48 Monaten Einlagerungszeit aus.

5 Montage, Aufstellung

5.1 Sicherheitsrelevante Hinweise



WARNUNG

Heiße Oberflächen

Elektrische Maschinen weisen heiße Oberflächen auf.

Durch Entfernen der erforderlichen Abdeckungen, bei unsachgemäßem Einsatz der Maschinen, falscher Bedienung oder unzureichender Wartung können Tod, schwere Körperverletzung oder Sachschäden eintreten.

- Lassen Sie die Maschine erst abkühlen, bevor Sie mit den Arbeiten an der Maschine beginnen.
- Entfernen Sie Abdeckungen nur entsprechend den Vorschriften.
- Bedienen Sie die Maschinen sachgemäß.

Teile (Leitungen etc.) dürfen nicht am Maschinengehäuse anliegen!

ACHTUNG

Prüfen Sie vor Inbetriebnahme, dass

- durch geeignete Maßnahmen, ob kundenseitig die richtige Drehrichtung der Maschine eingestellt ist z. B. durch Entkuppeln von der Arbeitsmaschine!
- temperaturempfindliche Teile (Leitungen etc.) nicht am Maschinengehäuse anliegen!
- Kondenswasseröffnungen stets an der tiefsten Stelle des Motors angeordnet sind!

Hinweis

Beachten Sie technische Daten auf den Schildern am Maschinengehäuse!

5.2 Elektromagnetische Verträglichkeit

Hinweis

Bei stark ungleichen Drehmomenten (z. B. Antrieb eines Kolbenkompressors) wird ein nicht sinusförmiger Maschinenstrom erzwungen, dessen Oberschwingungen eine unzulässige Netzbeeinflussung und damit unzulässige Störaussendungen bewirken können.

Hinweis

Umrichter

- Bei Betrieb am Frequenzumrichter treten je nach Umrichterausführung (Typ, Entstörmaßnahmen, Hersteller) unterschiedlich starke Störaussendungen auf.
 - Vermeiden Sie eine Überschreitung der Grenzwerte nach EN / IEC 61000-6-3 beim Antriebssystem, bestehend aus Maschine und Umrichter.
 - Beachten Sie unbedingt die EMV-Hinweise des Umrichterherstellers.
 - Wenn eine abgeschirmte Maschinenzuleitung großflächig am Metallanschlusskasten der Maschine (mit Verschraubung aus Metall) leitend verbunden wird, ist die Abschirmung am wirksamsten.
 - Bei Maschinen mit eingebauten Sensoren (z. B. Kaltleitern) können umrichterbedingt Störspannungen auf der Sensorleitung auftreten.
-

5.3 Wuchtung

 VORSICHT
Vorsichtsmaßnahmen • Beachten Sie die allgemein erforderlichen Maßnahmen für den Berührungsschutz der Abtriebs Elemente. • Ziehen Sie die Abtriebs Elemente nur mit geeigneter Vorrichtung auf und ab. • Die Passfedern sind nur gegen Herausfallen während des Transports gesichert. Wenn Sie eine Maschine ohne Abtriebs Element in Betrieb nehmen, sichern Sie die Passfeder gegen Herausschleudern.

Die Läufer sind dynamisch ausgewuchtet. Die Wuchtgüte entspricht standardmäßig der Schwinggrößenstufe "A" an der kompletten Maschine. Die optionale Schwinggrößenstufe "B" ist auf dem Leistungsschild angegeben.

Die Vereinbarung über die Passfederart beim Auswuchten ist generell auf dem Leistungsschild und wahlweise stirnseitig am Wellenende gekennzeichnet.

Kennzeichnung:

- Standardmäßig wird mit halber Passfeder (Kennzeichen "H") gemäß ISO 8821 dynamisch gewuchtet.
- Kennzeichen "F" bedeutet, Wuchtung mit ganzer Passfeder (Option).
- Kennzeichen "N" bedeutet, Wuchtung ohne Passfeder (Option).

Hinweis

Gleichen Sie den Versatz an der Kupplung zwischen elektrischen Maschinen gegenüber Arbeitsmaschinen nach ISO 10816 aus.
Führen Sie die Fundamentgestaltung nach DIN 4024 aus.

5.4 Ausrichtung und Befestigung

Allgemein

Achten Sie bei der Ausrichtung und Befestigung auf:

- Gleichmäßige Auflage.
- Gute Fuß- bzw. Flanschbefestigung.
- Genaue Ausrichtung bei direkter Kupplung.
- Schmutzfreiheit der Befestigungsflächen.
- Beschädigungen der Lackierung und bessern Sie diese unmittelbar und fachgerecht aus.
- Vorhandenes Korrosionsschutzmittel und entfernen Sie dies mit Testbenzin.
- Aufbaubedingte Resonanzen mit der Drehfrequenz und der doppelten Netzfrequenz und vermeiden Sie dies.
- Ungewöhnliche Geräusche beim Drehen des Läufers von Hand.
- Kontrolle der Drehrichtung im ungekuppelten Zustand.
- Vermeidung von starrem Kuppeln.

Ebenheit der Auflageflächen für Fußmotoren

Baugröße (BG)	Ebenheit mm
≤ 132	0,10
160	0,15
≥ 180	0,20

6 Elektrischer Anschluss



WARNUNG

Beachten Sie folgende Sicherheitshinweise vor dem Anschließen der Maschine:

- Lassen Sie alle Arbeiten nur von qualifiziertem Fachpersonal an stillstehender Maschine vornehmen.
- Schalten Sie die Maschine frei und sichern Sie diese gegen Wiedereinschalten. Dies gilt auch für Hilfsstromkreise (z. B. Stillstandsheizung).
- Prüfen Sie die Spannungsfreiheit!
- Stellen Sie eine sichere Schutzleiterverbindung vor Beginn der Arbeiten her!
- Abweichungen des speisenden Netzes von den Bemessungswerten bei Spannung, Frequenz, Kurvenform, Symmetrie erhöhen die Erwärmung und beeinflussen die elektromagnetische Verträglichkeit.



WARNUNG

Netz mit nicht geerdetem Sternpunkt

Der Betrieb der Maschine an einem Netz mit nicht geerdetem Sternpunkt ist nur während selten auftretender Zeitabschnitte von kurzer Dauer zulässig, z. B. bis zum Fortschalten eines Fehlers (Erdschluss einer Leitung, EN 60034-1).

6.1 Anschlusskasten

6.1.1 Anschlusskasten Hinweise



GEFAHR

Gefährliche Spannung

Elektrische Maschinen weisen gefährliche Spannungen auf.

Wenn die Maschine nicht spannungsfrei geschaltet wird, tritt Tod oder schwere Verletzung ein.

Die Maschine darf bei Arbeiten an geöffnetem Anschlusskasten elektrisch nicht angeschlossen sein!

ACHTUNG**Sachschaden**

Beachten Sie folgende Hinweise um Sachschaden am Anschlusskasten zu vermeiden.

- Achten Sie darauf, dass die Bestandteile im Innenraum des Anschlusskastens z. B. Klemmenbrett, Kabelanschlüsse nicht beschädigt werden!
- Im Anschlusskasten dürfen sich keine Fremdkörper, Schmutz sowie Feuchtigkeit befinden.
Einführungen in den Anschlusskasten nach DIN 42925.
- Verschließen Sie weitere offene Einführungen mit O-Ringen oder geeigneten Flachdichtungen, den Anschlusskasten selbst mit der Originaldichtung staub- und wasserdicht.
- Beachten Sie die Anziehdrehmomente für Kabelverschraubungen und für sonstige Schrauben.
- Sichern Sie die Passfedern für den Probetrieb ohne Abtriebselemente.

Hinweis

Der Anschlusskasten muss staub- und wasserdicht verschlossen sein!

**WARNUNG****Gefährliche Spannung**

Durch das Lösen der Sicherheitstorschraube können Tod, schwere Körperverletzung oder Sachschäden eintreten!

Lösen Sie nicht die Sicherheitstorschraube gegenüber der mittleren Anschlussklemme, da diese eine leitende Verbindung zwischen Erdungsleiter und Gehäuse sicherstellt!

ACHTUNG

Zerstörung der Maschine

Nichtbeachtung der folgenden Maßnahmen führt zur Zerstörung der Maschine!

- Drehen Sie den Anschlusskasten nur, wenn die Anschlussleitungen noch nicht verlegt sind!
- Das Lösen der Sicherheitstorxschrauben zu beiden Seiten der äußeren Anschlussklemmen kann zur Zerstörung der Maschine führen!
- Lösen Sie vor dem Drehen des Anschlusskastens die drei großen Schnapphaken am Klemmenbrett. Halten Sie die Schnapphaken beim Drehen gedrückt und rasten Sie diese mithilfe eines Schraubendrehers danach wieder ein.

6.1.2 Optionsklemmenbrett (Stern-oder Dreieck-Schaltung)



ACHTUNG

Zerstörung der Maschine durch Lichtbogen am Optionsklemmenbrett

Nichtbeachtung dieses Hinweises führt zur Zerstörung der Maschine durch Lichtbogen.

Drücken Sie bei Änderung der Betriebsart den Jumper immer bis zum Grund des Steckplatzes ein und rasten Sie den roten Verriegelungshebel ein.

6.1.3 Frei herausgeführte Anschlussleitungen



! WARNUNG

Kurzschlussgefahr

Achten Sie bei Demontage und insbesondere bei Montage der Abdeckplatte darauf, dass die Anschlussleitungen nicht zwischen Gehäuseteilen und Abdeckplatte eingeklemmt werden!

VORSICHT

Im Anschluss-Sockel des Maschinengehäuses dürfen sich keine Fremdkörper, Schmutz sowie Feuchtigkeit befinden.

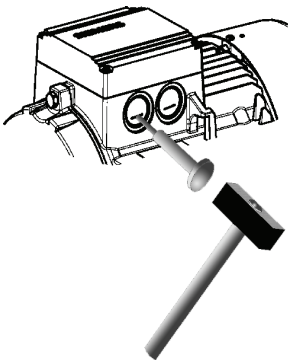
- Verschließen Sie die Einführungen in den Abdeckplatten (DIN 42925) und weitere offene Einführungen mit O-Ringen oder geeigneter Flachdichtungen.
- Verschließen Sie den Anschluss-Sockel des Maschinengehäuses mit der Originaldichtung der Abdeckplatte staub- und wasserdicht.
- Beachten Sie die Anziehdrehmomente für Kabelverschraubungen und für sonstige Schrauben.
- Sichern Sie die Passfedern für den Probetrieb ohne Antriebselemente.

6.1.4 Ausbrechöffnungen

Hinweis

Ausbrechöffnungen

- Schlagen Sie vorhandene Ausbrechöffnungen im Anschlusskasten sachgerecht aus.
- Beschädigen Sie nicht den Anschlusskasten sowie das Klemmenbrett, die Kabelanschlüsse, etc. im Innenraum des Anschlusskastens.



6.1.5 Montage und Verlegung



ACHTUNG

Sachschaden am Klemmenbrett

Halten Sie folgende Maßnahmen ein um Sachschaden am Klemmenbrett zu vermeiden:

- Lösen Sie Verschraubungen (EN 50262) nur bei geschlossenem Anschlusskasten.
- Ziehen Sie die Verschraubungen nur bei geschlossenem Anschlusskasten mit Nennmoment an.
- Ziehen Sie die Verschraubungen bei geöffnetem Anschlusskasten nur handfest an.
- Beim Anziehen der Verschraubungen müssen die drei großen Schnapphaken eingerastet sein!

6.2 Anziehdrehmomente

6.2.1 Kabelverschraubungen

Hinweis

Vermeiden Sie Beschädigungen am Kabelmantel!

Passen Sie die Anziehdrehmomente den Kabelmantelmaterialien an!

Für Anziehdrehmomente bei Kabelverschraubungen aus Metall und Kunststoff für direkten Anbau an der Maschine, sowie weiteren Verschraubungen (z.B. Reduzierungen) sind die entsprechenden Momente gemäß Tabelle anzuwenden.

Tabelle 6-1 Anziehdrehmomente für Kabelverschraubungen

	Metall ± 10% Nm	Kunststoff f ± 10% Nm	Klemmbereich in mm		O-Ring Schnur-Ø mm
			Standard -30 °C ... 100 °C	Ex -60 °C ... 105 °C	
			Ex -30 °C ... 90 °C		
M 12 x 1,5	8	1,5	3,0 ... 7,0	-	2
M 16 x 1,5	10	2	4,5 ... 10,0	6,0 ... 10,0	
M 20 x 1,5	12	4	7,0 ... 13,0	6,0 ... 12,0	
M 25 x 1,5			9,0 ... 17,0	10,0 ... 16,0	
M 32 x 1,5	18	6	11,0 ... 21,0	13,0 ... 20,0	
M 40 x 1,5			19,0 ... 28,0	20,0 ... 26,0	
M 50 x 1,5	20		26,0 ... 35,0	25,0 ... 31,0	
M 63 x 1,5			34,0 ... 45,0	-	

6.2.2 Anschlusskasten, Lagerschilde, Erdungsleiter, Blechlüfterhauben

Hinweis

Die Anziehdrehmomente gelten soweit keine anderen Werte angegeben sind!

Tabelle 6-2 Anziehdrehmomente für Schrauben am Anschlusskasten, Lagerschilden, Erdungsleiter-Schraubverbindungen

	Gewinde Ø		M 4	M 5	M 6	M 8	M 10	M 12	M 16	M20
	Nm	min	2	3,5	6	16	28	46	110	225
		max	3	5	9	24	42	70	165	340



Tabelle 6-3 Anziehdrehmomente für selbstfurchende Schrauben am Anschlusskasten, Lagerschilden, Erdungsleiter-Schraubverbindungen, Blechlüfterhauben

	Gewinde Ø		M 4	M 5	M 6
	Nm	min	4	7,5	12,5
		max	5	9,5	15,5

6.3 Allgemeines zum Leiteranschluss

Anschließbare Querschnitte je nach Klemmengröße (ggf. reduziert durch Größe der Leitungseinführungen)



! WARNUNG

Kurzschlussgefahr

Elektrische Maschinen weisen gefährliche Spannungen auf.

Wenn die entsprechenden Vorsichtsmaßnahmen nicht getroffen werden, kann Tod oder schwere Körperverletzung eintreten.

- Verlegen Sie die Anschlussleitungen nicht über den zentralen Dom des Klemmenbretts.
- Beachten Sie die Öffnungsrichtung und Einbaulage der Dachscheiben am Klemmenbrett.

6.4 Allgemeines zum Anschließen des Erdungsleiters

Hinweis

Der Erdungsleiterquerschnitt der Maschine muss EN / IEC 60034-1 entsprechen. Beachten Sie zusätzlich die Errichtungsbestimmungen, z. B. nach EN / IEC 60204-1.

6.5 Anschließen am Umrichter



VORSICHT

Das Standardisoliersystem ist so ausgelegt, dass ein Betrieb am Umrichter bei Netzspannungen bis 500V +10 % im motorischen Betrieb möglich ist. Setzen Sie für höhere Spannungen ein Sonderisoliersystem ein oder wenden Sie Sondermaßnahmen z. B. Ausgangsfilter an.



ACHTUNG

Anschluss von Maschinen an Frequenzumrichtern grundsätzlich mit geschirmten Maschinenzuleitungen! Die Abschirmung ist am wirksamsten, wenn sie großflächig am Metallanschlusskasten der Maschine mit Metallverschraubungen leitend verbunden wird.

Hinweis

EMV

Beachten Sie das Kapitel zur Einhaltung der elektromagnetischen Verträglichkeit.

Siehe Auflistung über zusätzliche Betriebsanleitungen: Weitere Dokumente (Seite 33)

6.6 Abschlussmaßnahmen

Vor dem Schließen des Anschlusskastens / Anschluss-Sockels des Maschinengehäuses kontrollieren Sie Folgendes:

- Führen Sie elektrische Anschlüsse im Anschlusskasten entsprechend den Angaben in den vorstehenden Abschnitten aus und ziehen Sie diese mit dem richtigen Drehmoment an.
- Luftstrecken zwischen nicht isolierten Teilen einhalten:
≥ 5,5 mm bis 690 V, ≥ 8 mm bis 1000 V.
- Vermeiden Sie abstehende Drahtenden!
- Um die Leitungsisolierung nicht zu beschädigen, ordnen Sie die Anschlussleitungen freiliegend an.
- Schließen Sie die Maschine entsprechend der vorgeschriebenen Drehrichtung an.
- Halten Sie das Anschlusskasteninnere sauber und frei von Leitungsresten.
- Halten Sie alle Dichtungen und Dichtflächen unbeschädigt und sauber.
- Verschließen Sie unbenutzte Öffnungen in den Anschlusskästen fachgerecht.

- Unbeschädigte Druckentlastungseinrichtung (je nach Anschlusskastentyp: Verguss von Schlitzen oder Überdruckmembran). Reparieren Sie Beschädigungen nur nach Rücksprache mit den für die Sicherheit der Anlage Verantwortlichen und nur mit Originalteilen.

7 Inbetriebnahme

7.1 Isolationswiderstand



! WARNUNG

Arbeiten an Starkstromanlagen

Lassen Sie diese Arbeiten nur von fachkundigem Personal ausführen. Montieren Sie vor der Inbetriebnahme Abdeckungen, die das Berühren von aktiven oder rotierenden Teilen verhindern oder zur richtigen Luftführung und damit zur wirkungsvollen Kühlung erforderlich sind.



! WARNUNG

Gefährliche Spannung an den Klemmen

Bei und unmittelbar nach der Messung des Isolationswiderstands der Wicklung haben die Klemmen teilweise gefährliche Spannungen. Bei Berührung können Tod, schwere Körperverletzung und Sachschäden die Folge sein.

Stellen Sie bei eventuell angeschlossenen Netzleitungen sicher, dass keine Netzspannung angelegt werden kann. Entladen Sie nach der Messung des Isolationswiderstandes die Wicklung durch Verbinden mit Erdpotenzial.

Prüfung des Isolationswiderstandes

ACHTUNG

Eine Prüfung des Isolationswiderstandes ist vor Inbetriebnahme sowie nach längerer Lagerung oder Stillstandszeit erforderlich! Beachten Sie vor Beginn der Messung des Isolationswiderstandes die Bedienungsanleitung des verwendeten Isolationsmessgeräts. Entfernen Sie zur Isolationsmessung bereits angeschlossene Kabel des Hauptstromkreises wieder von den Klemmen.

Hinweis

Wird der kritische Isolationswiderstand erreicht oder unterschritten, müssen die Wicklungen getrocknet bzw. bei ausgebautem Läufer gründlich gereinigt und getrocknet werden.

Beachten Sie nach dem Trocknen gereinigter Wicklungen, dass der Isolationswiderstand bei warmer Wicklung kleiner ist. Der Isolationswiderstand lässt sich nur nach Umrechnung auf die Referenztemperatur 25 °C richtig beurteilen.

Hinweis

Wenn der gemessene Wert nahe am kritischen Wert liegt, kontrollieren Sie den Isolationswiderstand in der Folgezeit in entsprechend kurzen Intervallen.

Isolationswiderstand messen

1. Beachten Sie vor Beginn der Messung des Isolationswiderstandes die Bedienungsanleitung des verwendeten Isolationsmessgeräts.
2. Entfernen Sie zur Isolationsmessung bereits angeschlossene Kabel des Hauptstromkreises von den Klemmen.
3. Messen Sie den Isolationswiderstand der Wicklung gegen das Maschinengehäuse möglichst bei einer Wicklungstemperatur von 20 ... 30 °C. Für andere Temperaturen gelten andere Werte für den Isolationswiderstand.
4. Warten Sie bei der Messung ab, bis der Endwert des Widerstandes erreicht ist. Das ist nach ca. einer Minute der Fall. Lesen Sie dann den Isolationswiderstand ab.

Grenzwerte des Isolationswiderstandes der Ständerwicklung

Die folgende Tabelle gibt die Messspannung sowie die Grenzwerte für den Mindestisolationswiderstand und den kritischen Isolationswiderstand der Ständerwicklung an.

Tabelle 7-1 Isolationswiderstand der Ständerwicklung bei 25 °C

	Bemessungsspannung $U_N < 2 \text{ kV}$
Messspannung	500 V
Mindestisolationswiderstand bei neuen, gereinigten oder in Stand gesetzten Wicklungen	10 MΩ
Kritischer spezifischer Isolationswiderstand nach langer Betriebszeit	0,5 MΩ / kV

Beachten Sie hierbei Folgendes:

- Bei Messung mit Wicklungstemperaturen $\neq 25\text{ °C}$ rechnen Sie den gemessenen Wert auf die Referenztemperatur 25 °C um, um den Vergleich mit vorstehender Tabelle zu machen.
 - Pro 10 K Temperaturanstieg halbiert sich der Isolationswiderstand.
 - Pro 10 K Temperaturabfall verdoppelt sich der Widerstand.
- Trockene, neuwertige Wicklungen haben typischerweise Isolationswiderstände von größer 100 ... 2000 M Ω , je nach Wicklungsgröße, Ausführung und Bemessungsspannung. Wenn der Isolationswiderstandswert in der Nähe des Mindestwerts liegt, dann können Feuchtigkeit und/oder Verschmutzung die Ursache sein.
- Während der Betriebszeit kann der Isolationswiderstand der Wicklungen durch Umwelt- und Betriebseinflüsse auf den kritischen Isolationswiderstand sinken. Der kritische Isolationswiderstand errechnet sich bei einer Wicklungstemperatur von 25 °C durch Multiplikation der Bemessungsspannung (kV) mit dem spezifischen kritischen Widerstandswert (0,5 M Ω / kV).

Beispiel:

Kritischer Widerstand für Bemessungsspannung $U_N = 690\text{ V}$:

$$690\text{ V} \times 0,5\text{ M}\Omega / \text{kV} = 0,345\text{ M}\Omega$$

Hinweis

Kritischer Isolationswiderstand wird erreicht oder unterschritten

Wenn der kritische Isolationswiderstand erreicht oder unterschritten wird, kann es zur Beschädigung der Isolation und zu Spannungsüberschlägen kommen.

- Wenden Sie sich an Ihr Service Center.
 - Wenn der gemessene Wert nahe am kritischen Wert liegt, dann kontrollieren Sie den Isolationswiderstand in der Folgezeit in entsprechend kurzen Intervallen.
-

Maßnahmen vor Inbetriebnahme

Prüfen Sie nach fachgerechter Montage und vor Inbetriebnahme der Anlage Folgendes:

- Ordnungsgemäße Montage und Ausrichtung der Maschine.
- Anschluss der Maschine entsprechend der vorgegebenen Drehrichtung.
- Übereinstimmung der Betriebsbedingungen mit den vorgesehenen Daten gemäß Schildangaben.
- Schmierung der Lager je nach Ausführung. Nachschmierung der Wälzlagermaschinen, die länger als 24 Monate eingelagert waren.

- Ordnungsgemäßer Anschluss und Funktion der eventuell vorhandenen Zusatzeinrichtungen für die Maschinenüberwachung.
- Prüfung der Lagertemperaturen bei Ausführung mit Lagerthermometern während des ersten Maschinenlaufs. Einstellung der Werte für Warnung und Abschalten an der Überwachungseinrichtung.
- Sicherstellung der entsprechend ausgelegten Steuerung und Drehzahlüberwachung damit keine höheren Drehzahlen (als die auf dem Leistungsschild zugelassenen) angesteuert werden.
- Richtige Einstellbedingungen der Abtriebelemente je nach Art (z. B. Ausrichten und Auswuchten von Kupplungen, Riemenkräfte bei Riemenantrieb, Zahnkräfte und Zahnflankenspiel bei Zahnradantrieb, radiales- und axiales Spiel bei gekuppelten Wellen).
- Einhaltung der Mindest-Isolationswiderstände sowie Mindest-Luftstrecken.
- Ordnungsgemäße Herstellung der Erdungs- und Potenzialausgleichsverbindungen.
- Anziehen aller Befestigungsschrauben, Verbindungselemente und elektrischen Anschlüsse mit den vorgeschriebenen Anziehdrehmomenten.
- Entfernen eingeschaubarer Hebeösen nach dem Aufstellen oder Sicherung gegen Lösen.
- Drehen des Läufers, ohne anzustreifen.
- Durchführung aller Berührungsschutzmaßnahmen für bewegte und spannungsführende Teile.
- Bei unbenutztem Wellenende Abdeckung des offenen Wellenendes und Sicherung der Passfeder gegen Herausschleudern.
- Betriebsbereitschaft des eventuell vorhandenen Fremdlüfters und Anschluss entsprechend der vorgeschriebenen Drehrichtung.
- Keine Beeinträchtigung der Kühlluftführung.
- Einwandfreie Funktion der eventuell vorhandenen Bremse.
- Einhaltung der angegebenen mechanischen Grenzdrehzahl n_{max} .

Wenn die Maschinenauslegung eine spezielle Zuordnung des Umrichters erfordert, sind entsprechende Angaben auf dem Leistungs- oder Zusatzschild enthalten.

Hinweis

Weitere Prüfungen sind gegebenenfalls entsprechend den besonderen anlagespezifischen Verhältnissen erforderlich.

8 Betrieb

Einschalten der Maschine mit Stillstandsheizung (Option)



VORSICHT

Vor jedem Einschalten muss sichergestellt sein, dass die (optionale) Stillstandsheizung ausgeschaltet wird.

Maschinenbetrieb



WARNUNG

Netz mit nicht geerdetem Sternpunkt

Der Betrieb der Maschine an einem Netz mit nicht geerdetem Sternpunkt ist nur während selten auftretender Zeitabschnitte von kurzer Dauer zulässig, z. B. bis zum Fortschalten eines Fehlers (Erdschluss einer Leitung, EN / IEC 60034-1).



WARNUNG

Abdeckungen nicht bei laufender Maschine entfernen

Rotierende oder spannungsführende Teile stellen eine Gefahr dar. Durch Entfernen der erforderlichen Abdeckungen können Tod, schwere Körperverletzung oder Sachschäden eintreten.

- Wenn Sie Abdeckungen entfernen müssen, schalten Sie die Maschine zuerst frei.
- Sorgen Sie dafür, dass Abdeckungen, die das Berühren von aktiven oder rotierenden Teilen verhindern oder die zur richtigen Luftführung und damit zur wirkungsvollen Kühlung erforderlich sind, oder die Schutzart der Maschine gewährleisten, während des Betriebs geschlossen sind.



VORSICHT

Die Oberflächen der Maschinen erreichen hohe Temperaturen, die bei Berührung zu Verbrennungen führen können.

ACHTUNG**Mindestbelastung Zylinderrollenlager**

Halten Sie unbedingt die radiale Mindestbelastung von Zylinderrollenlager von 30 % entsprechend Katalogangaben ein.

**WARNUNG****Störungen im Betrieb**

Veränderungen gegenüber dem Normalbetrieb, z. B. höhere Leistungsaufnahme, Temperaturen oder Schwingungen, ungewöhnliche Geräusche oder Gerüche, Ansprechen von Überwachungseinrichtungen usw. lassen erkennen, dass die Funktion beeinträchtigt ist. Es kann zu Störungen kommen, die mittelbar oder unmittelbar Tod, schwere Körperverletzung oder Sachschäden zur Folge haben können.

- Verständigen Sie umgehend das Wartungspersonal.
- Schalten Sie im Zweifelsfall die Maschine unter Beachtung der anlagenspezifischen Sicherheitsbedingungen sofort ab.

ACHTUNG**Korrosionsgefahr durch Kondenswasser**

Bei wechselnden Maschinen- und /oder Umgebungstemperaturen kann im Maschineninneren Luftfeuchtigkeit kondensieren.

- Sofern vorhanden, entfernen Sie die Verschluss-Schrauben zum Ablassen des Wassers in Abhängigkeit von den Umgebungs- und Betriebsbedingungen.
- Sofern vorhanden, montieren Sie anschließend wieder die Verschluss-Schrauben.

Wenn die Maschine mit Entwässerungsstopfen ausgerüstet ist, kann das Wasser selbsttätig ablaufen.

**WARNUNG****Maschinen mit Textillüfterhaube**

Der Maschinenlüfter ist nicht vollständig gegen Berührung geschützt. Verhindern Sie manuelles Eingreifen durch geeignete kundenseitige Maßnahmen, z. B. Einhausungen oder Absperrgitter.

8.1 Betriebspausen

Übersicht

Bei längeren Betriebspausen (> 1 Monat) Maschine regelmäßig, etwa einmal monatlich, in Betrieb nehmen oder zumindest Läufer drehen; vor dem Einschalten zur Wiederinbetriebnahme Abschnitt "Einschalten" beachten. Bei Maschinen mit Läuferhaltevorrichtung, diese vor dem Drehen des Läufers entfernen.

ACHTUNG

Bei Außerbetriebsetzung für einen Zeitraum größer als 12 Monate, geeignete Korrosionsschutz-, Konservierungs-, Verpackungs- und Trocknungsmaßnahmen durchführen.

Stillstandsheizung einschalten

Bei vorhandener Stillstandsheizung, diese in den Betriebspausen der Maschine einschalten.

Außer Betrieb nehmen

Details für notwendige Maßnahmen siehe Kapitel Einsatzvorbereitung (Seite 8).

Schmierung vor Wiederinbetriebnahme

ACHTUNG

Nachschmieren bei Inbetriebnahme, um bei Betriebspausen größer als 1 Jahr das Fett in den Lagern zu verteilen. Dabei muss sich die Welle drehen.
Beachten Sie für das Nachschmieren bei Nachschmiereinrichtung die Schmierschildangabe.
Siehe auch Kapitel Einsatzplanung - Lagerlebensdauer.

9 Instandhaltung



! WARNUNG

Sicherheitshinweise

- Stellen Sie vor Beginn jeder Arbeit an den Maschinen sicher, dass die Anlage vorschriftsmäßig freigeschaltet ist.
- Achten Sie neben den Hauptstromkreisen dabei auch auf vorhandene Zusatz- oder Hilfsstromkreise, insbesondere Heizeinrichtung!
- Einzelne Maschinenteile können Temperaturen höher als 50 °C erreichen! Bei Berührung können Sie sich verbrennen. Prüfen Sie vor dem Berühren die Temperatur der Teile.
- Achten Sie beim Reinigen mit Druckluft auf geeignete Absaugung und persönliche Schutzmaßnahmen (Schutzbrille, Atemfilter o. ä.)!
- Beachten Sie bei Einsatz chemischer Reinigungsmittel die Warn- und Verwendungshinweise des zugehörigen Sicherheitsdatenblatts. Chemische Mittel müssen für die Bauteile der Maschine verträglich sein, insbesondere bei den Kunststoffen.

Hinweis

Da die Betriebsverhältnisse sehr unterschiedlich sind, können nur allgemeine Fristen bei störungsfreiem Betrieb angegeben werden.

9.1 Wartung

9.1.1 Nachschmierung (optional)

Allgemein

Die Maschinen haben standardmäßig Wälzlager mit Fettdauerschmierung (UNIREX N3 - Fa. ESSO). Optional ist eine Nachschmiereinrichtung möglich. Entnehmen Sie in diesem Fall Angaben über Nachschmierfristen, Fettmenge, Fettsorte und gegebenenfalls weitere Daten dem Leistungsschild oder Schmierschild.

Hinweis

Das Mischen von verschiedenen Fettsorten ist nicht zulässig!

Bei längerer Einlagerungszeit verringert sich die Fettgebrauchsdauer der Lager. Prüfen Sie bei Lagerung über 12 Monate den Fettzustand. Falls die Überprüfung eine Entölung oder Verschmutzung des Fetts erkennen lässt, schmieren Sie vor der Inbetriebnahme sofort nach. Dauergeschmierte Lagerung siehe Kapitel Lagerung (Seite 29).

Hinweis

Nachschmieren

1. Reinigen Sie die Schmiernippel auf DE- und NDE-Seite.
 2. Pressen Sie das vorgeschriebene Fett und Fettmenge (gemäß Schildangaben) ein.
- Beachten Sie die Angaben auf dem Leistungs- und Schmierschild.
 - Die Nachschmierung sollte bei laufender Maschine (max. 3600 min⁻¹) erfolgen!
-

Die Lagertemperatur steigt zunächst merklich an, und sinkt nach Verdrängen des überschüssigen Fetts aus dem Lager wieder auf den Normalwert.

9.1.2 Reinigung

Reinigen der Schmierkanäle und Altfetträume

Das verbrauchte Fett sammelt sich jeweils außerhalb des Lagers im Altfettraum des äußeren Lagerdeckels. Entfernen Sie beim Lagerwechsel das Altfett.

Hinweis

Um das im Schmierkanal befindliche Fett zu erneuern, ist ein Zerlegen der Lagereinsätze erforderlich.

Reinigen der Kühlluftwege

Reinigen Sie regelmäßig die von Umgebungsluft durchströmten Kühlluftwege, z. B. mit trockener Druckluft.

Hinweis

Richten Sie niemals Druckluft in Richtung Wellenaustritt oder Maschinenöffnungen!

Um ungehinderten Kühlluftstrom zu gewährleisten, entfernen Sie regelmäßig bei Maschinen mit Textillüfterhaube Flusen, Stoffreste oder ähnliche Verschmutzungen insbesondere an der Luftdurchtrittsöffnung zwischen Lüfterhaube und Kühlrippen des Maschinengehäuses.

Hinweis

Die Reinigungsintervalle sind vom Grad der örtlich auftretenden Verschmutzung abhängig.



WARNUNG

Achten Sie insbesondere bei Reinigungsarbeiten mit Druckluft auf geeignete Absaugung und persönliche Schutzmaßnahmen (Schutzbrille, Atemfilter, ...)!

9.2 Instandsetzung

9.2.1 Instandsetzungshinweise

Qualifiziertes Personal

Inbetriebsetzung und Betrieb eines Geräts oder eine Maschine dürfen nur von qualifiziertem Personal vorgenommen werden. Qualifiziertes Personal im Sinne der sicherheitstechnischen Hinweise dieses Handbuchs sind Personen, welche die Berechtigung haben, Geräte, Systeme und Stromkreise gemäß des Standards der Sicherheitstechnik in Betrieb zu nehmen, zu erden und zu kennzeichnen.

Sicherheitsrelevante Hinweise

 WARNUNG
Stellen Sie vor Beginn der Arbeiten an der Drehstrommaschine, insbesondere vor dem Öffnen von Abdeckungen aktiver Teile sicher, dass die Drehstrommaschine bzw. die Anlage vorschriftsmäßig spannungsfrei geschaltet ist.

Hinweis

Bei notwendigem Transport der Maschine das Kapitel Einsatzvorbereitung beachten!

9.2.2 Lagerung



Entnehmen Sie die verwendeten Lager bis Baugröße 90 nur bei Sonderausführungen und ab Baugröße 100 generell dem Leistungsschild.

Lagerlebensdauer

Bei längerer Einlagerungszeit verringert sich die Fettgebrauchsdauer der Lager. Bei dauergeschmierten Lagern führt dies zu einer Reduzierung der Lagerlebensdauer. Ein Lager- oder Fetttausch wird bereits nach 12-monatiger Einlagerungszeit empfohlen, beträgt die Zeit mehr als 4 Jahre, tauschen Sie die Lager oder das Fett aus.

Lagerwechsel

Empfohlene Lagerwechselfrist unter normalen Betriebsbedingungen:

Tabelle 9-1 Lagerwechselfrist

Umgebungstemperatur	Betriebsweise	Lagerwechselfrist
40° C	horizontaler Kupplungsbetrieb	40 000 h
40° C	mit Axial- und Radialkräften	20 000 h

Hinweis

Besondere Betriebsbedingungen

Die Betriebsstunden reduzieren sich z. B. bei senkrechter Maschinenaufstellung, großen Schwingungs- und Stoßbelastungen, häufigem Reversierbetrieb, höherer Umgebungstemperatur, höheren Drehzahlen usw.

Hinweis

- Verwenden Sie die abgezogenen Lager nicht wieder!
 - Entfernen Sie vorhandenes verschmutztes Alt-Fett aus dem Lagerschild!
 - Ersetzen Sie Alt-Fett durch Neu-Fett!
 - Erneuern Sie bei Lagerwechsel die Wellendichtungen!
 - Fetten Sie die Kontaktflächen der Dichtlippen leicht!
-

9.2.3 Demontage

Hinweis

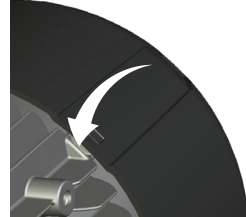
Kennzeichnen Sie vor Beginn der Demontage die jeweilige Zuordnung von Befestigungselementen sowie die Anordnung innerer Verbindungen für den Zusammenbau.

Lüfter

Achten Sie bei Lüfter mit Schnappmechanismen darauf, dass diese nicht beschädigt werden! Die Lüfter dazu im Bereich der Nabe auf eine Temperatur von ca. 50 °C erwärmen. Bei Beschädigung Neuteile anfordern.

Lüfterhaube

- Schnappöffnungen der Haube nacheinander vorsichtig aus den Schnappnasen aushebeln, Hebel nicht direkt unter dem Steg ansetzen (Bruchgefahr).
- Schnappmechanismen nicht beschädigen. Bei Beschädigung Neuteile anfordern.



Schutzdach, Drehimpulsgeber unter Schutzdach



Befestigungsschrauben an der Außenfläche des Schutzdachs lösen.

Keinesfalls die Distanzbolzen oder die Haltewinkel demontieren oder gewaltsam voneinander oder von der Haube trennen. Gewaltantes Entfernen oder Trennen kann zur Zerstörung der Distanzbolzen, der Verbindungselemente der Haltewinkel oder der Lüfterhaube führen.

9.2.4 Montage

Hinweis

Beschädigen Sie die aus dem Ständergehäuse ragenden Wicklungen beim Anbau des Lagerschildes nicht!

10 Ersatzteile

Allgemein

Geben Sie bei Ersatz- oder Reparaturteilbestellungen neben der genauen Bezeichnung der Teile auch stets den Maschinentyp und die Fabriknummer an.

A Anhang

A.1 Siemens Service Center

Details zur Ausführung dieser elektrischen Maschine sowie der zulässigen Betriebsbedingungen sind in dieser Anleitung beschrieben.

Field-Service-Einsätze und Ersatzteile

Wenn Sie Field-Service-Einsätze anfordern wollen oder Ersatzteile benötigen, dann wenden Sie sich an Ihren Vertriebspartner vor Ort. Er wird den Kontakt zu der zuständigen Servicestelle herstellen. Ihren lokalen Ansprechpartner finden Sie hier.

Technische Fragen oder weitere Informationen

Wenn Sie technische Fragen haben oder weitere Informationen benötigen, dann wenden Sie sich an das Siemens Service Center.

Bitte halten Sie dazu folgende Maschinendaten bereit:

- Maschinentyp
- Seriennummer

Diese Angaben finden Sie auf dem Leistungsschild der Maschine.

Servicenummern

Tabelle A-1 Kontaktdaten Siemens Service Center

Zeitzone	Telefon	Fax	Internet
Europa / Afrika	+49 911 895 7222	+49 911 895 7223	http://www.siemens.com/automation/support-request (http://www.siemens.de/automation/support-request)
Amerika	+1 423 262 2522	+1 423 262 2200	mailto:techsupport.sea@siemens.com
Asien / Pazifik	+86 1064 757 575	+86 1064 747 474	mailto:support.asia.automation@siemens.com

A.2 Weitere Dokumente

Betriebsanleitungen können auf folgender Internetseite abgerufen werden:

<http://www.siemens.com/motors>

Allgemeine Dokumentation

1.517.30777.30.000	Geber 1XP8001
5 610 00000 02 000	Operating_Instructions_Simotics GP, SD, DP, XP
5 610 00000 02 001	Operating_Instructions_Compact_Simotics GP, SD, DP
5 610 00000 02 002	Operating_Instructions_Compact_Simotics XP
5 610 00002 09 000	Inkrementalgeber 1XP8012-1x
5 610 00002 09 001	Inkrementalgeber 1XP8012-2x
5 610 70000 02 015	Fremdlüfter
5 610 70000 10 020	Federkraftbremse

Siemens AG
Industry Sector
Postfach 48 48
90026 NÜRNBERG

Low-voltage motors
56100000002001, 02/2013

SIEMENS

SIMOTICS GP, SD, DP

Low-voltage motors

Compact Operating Instructions

1 Introduction

1.1 Information for the reader

Explanation of the icons



Note for 1LE1, 1MB1, 1PC1, 1PC3 machines



Note for 1LE1, 1PC1 and 1PC3 machines, frame sizes 80 and 90 with central terminal box locking

2 Safety notes

2.1 Information for those responsible for the plant or system

This electric machine has been designed and built in accordance with the specifications contained in Directive 2006/95/EC ("Low-Voltage Directive") and is intended for use in industrial plants. Please observe the country-specific regulations when using the electric machine outside the European Community.

Follow the local and industry-specific safety and setup regulations.

The persons responsible for the plant must ensure the following:

- Planning and configuration work and all work carried out on and with the machine is only to be done by qualified personnel.
- The operating instructions must always be available for all work.

- The technical data as well as the specifications relating to the permissible installation, connection, ambient and operating conditions are taken into account at all times.
- The specific setup and safety regulations as well as regulations on the use of personal protective equipment are observed.

Note

Use the services and support provided by the appropriate Service Center for planning, installation, commissioning, and servicing work.

In the individual chapters of this document, you will find safety instructions that must be obeyed absolutely, for your own safety, to protect other people and to avoid damage to property.

Observe the following safety instructions for all activities on and with the machine.

2.2 The five safety rules:

For your personal safety and to prevent material damage when carrying out any work, always observe the safety instructions and the following five safety rules, according to EN 50110-1 "Working in a voltage-free state". Apply the five safety rules in the sequence stated before starting work.

Five safety rules

1. Disconnect the system.
Disconnect the auxiliary circuits, for example anti-condensation heating
 2. Prevent reconnection.
 3. Make sure that the equipment is at zero voltage
 4. Ground and short-circuit
 5. Cover or isolate nearby components that are still live.
- To energize the system, apply the measures in reverse order.

2.3 Qualified personnel

All work at the machine must be carried out by qualified personnel only. For the purpose of this documentation, qualified personnel is taken to mean people who fulfill the following requirements:

- Through appropriate training and experience, they are able to recognize and avoid risks and potential dangers in their particular field of activity.
- They have been instructed to carry out work on the machine by the appropriate person responsible.

2.4 The safe use of electrical machines



WARNING

Live parts

Electrical machines contain live parts.

Fatal or severe injuries and substantial material damage can occur if the required covers are removed or if the machines are not handled, operated, or maintained properly.

- Only remove covers in compliance with the applicable regulations.
- Operate the machines properly.
- Perform regular maintenance on the machine.



WARNING

Rotating parts

Electrical machines contain dangerous rotating parts.

Fatal or severe injuries and substantial material damage can occur if the required covers are removed or if the machines are not handled, operated, or maintained properly.

- Only remove covers in compliance with the applicable regulations.
- Operate the machines properly.
- Perform regular maintenance on the machine.
- Secure free-standing shaft extensions.



WARNING

Hot surfaces

Electrical machines have hot surfaces.

Fatal or severe injuries and substantial material damage can occur if the required covers are removed or if the machines are not handled, operated, or maintained properly.

- Allow the machine to cool down before starting any work on it.
- Only remove covers in compliance with the applicable regulations.
- Operate the machines properly.

3 Description

3.1 Language versions on the Internet

Language versions can be found on the Internet

Internet page: <http://www.siemens.com/motors>

If you require additional language versions, please contact the Siemens Service Center.

Intended use of the machines

These machines are intended for industrial installations. They comply with the harmonized standards of the series EN / IEC 60034 (VDE 0530). Their use in hazardous areas is forbidden unless the marking on the rating plate expressly permits this operation. If other/more wide-ranging demands (e.g. protection so that they cannot be touched by children) are made in special cases – i.e. use in non-industrial installations – these conditions must have been complied with in the plant or system itself when the motors are installed.

Note

Machine directive

Low-voltage motors are components designed for installation in machines in accordance with the current Machinery Directive. The system may not be commissioned until confirmation has been given that the final product is in conformance with this directive (observe EN 60204-1 !).

Forced ventilation (optional): Cooling IC 416 in accordance with EN / IEC 60034-6



WARNING

Hot surfaces

Operating the machine without external fan results in overheating. This may result in personal injury and material damage.

Never commission the machine without an external fan.

Cooling that does not depend on the speed is achieved by means of a separately driven fan wheel (forced ventilation). Forced ventilation does not depend on the operating state of the machine.

The fan wheel for the external flow of cooling air is powered by an independent module and is enclosed by the fan cover.

3.2 Degree of protection

The degree of protection the machines feature is stated on the rating plate. They can be installed in dusty or humid environments.



WARNING

Dangerous voltage

Condensation drain holes (optional)

Inserting objects into the condensation drain holes can damage the winding and can result in death, serious injury and damage to property!

Note the following to maintain the degree of protection:

- Switch off the machine so that it is in a no-voltage condition, before you open the condensation drain holes.
- Close the condensation drain holes (e.g. using T-plugs) before commissioning the machine.

Note

Storage

If the machines are used or stored outdoors, we recommend keeping them under a shelter or an additional cover.

- Avoid exposing them to direct, intense solar radiation, rain, snow, ice, or dust for extended periods.
- If necessary, please consult us or seek advice regarding technical issues.

Environmental requirements

The machines are suitable for operation in tropical climates.

Guide value for the standard version 60 % relative humidity at an ambient temperature of (T_{amb}) 40 °C.

Ambient temperature: -20 °C to +40 °C

Installation altitude: ≤ 1000 m

Air with normal oxygen content, usually 21 % (V/V)

If the environmental requirements are different from the details listed here, then the values on the rating plate will apply.

4 Preparing for use

WARNING

Use lifting eyes

The machine must only be transported and lifted using the lifting eyes, in a position that is appropriate for its type of construction. Otherwise, it could fall over or slip in the lifting tackle.

This can result in death, serious injury, or material damage.

- Use all the lifting eyes on the machine.
- Any eyes that are screwed in must be tightly fastened.
- Eyebolts must be screwed in right up to their supporting surface.
- If necessary, use suitable, sufficiently-sized transport equipment such as lifting straps (EN1492-1) and lashing straps (EN12195-2).

WARNING

Suspended transport

If several items of transport material are used for fastening, two straps must be able to carry the whole load.

- Use additional, suitable means of support for transport and during installation.
- Secure the support equipment to prevent it from slipping.

Storage time

Turn the shafts 1x every year to avoid bearing brinelling. Prolonged storage periods reduce the useful life of the bearing grease (aging).

Open bearings

- For open bearings e.g. 1Z, check the state of the bearing grease over 12 months.
- Replace the grease if it can be identified that the grease has lost oil content or has become dirty (ingress of condensation leads to consistency changes of the grease).

Closed bearings

- For closed bearings, replace the DE and NDE bearings after a storage time of 48 months

5 Mounting, installation

5.1 Safety instructions



WARNING

Hot surfaces

Electrical machines have hot surfaces.

Fatal or severe injuries and substantial material damage can occur if the required covers are removed or if the machines are not handled, operated, or maintained properly.

- Allow the machine to cool down before starting any work on it.
- Only remove covers in compliance with the applicable regulations.
- Operate the machines properly.

It must be ensured that parts (cables etc.) do not come into contact with the machine enclosure.

NOTICE

Before start-up, please check that

- the customer has set the correct direction of rotation of the machine - e.g. by decoupling from the driven machine - by taking appropriate measures!
- there are no temperature-sensitive parts (cables etc.), which are in contact with the machine enclosure.
- condensation drain holes are always located at the lowest point of the motor!

Note

Please note the technical data on the rating plates on the machine enclosure.

5.2 Electromagnetic compatibility

Note

If the torque levels are very unequal (e.g. when a reciprocating compressor is being driven), a non-sinusoidal machine current will be induced whose harmonics can have an impermissible effect on the supply system and cause impermissible interference emissions as a result.

Note**Converter**

- If operated with a frequency converter, the emitted interference varies in strength, depending on the design of the converter (type, interference suppression measures, manufacturer).
- Prevent the limit values stipulated by EN / IEC 61000-6-3 for the drive system (consisting of the machine and converter) from being exceeded.
- You must observe the EMC information from the manufacturer of the converter.
- The most effective method of shielding is to conductively connect a shielded machine supply cable to the metal terminal box of the machine (with a metal screw connection) over a large surface area.
- On machines with integrated sensors (e.g. PTC thermistors), disturbance voltages caused by the converter may occur on the sensor cable.

5.3 Balancing

CAUTION
--

Safety precautions

- | |
|--|
| <ul style="list-style-type: none"> • The general touch protection measures for drive output elements must be observed. • Output elements may only be attached or withdrawn using the correct equipment. • The feather keys are only secured against falling out during shipping. If you commission a machine without an output element, the feather keys must be secured to prevent them from being thrown out. |
|--|

The rotors are balanced dynamically. The balancing quality corresponds to vibration severity grade "A" for the complete machine as standard. The optional vibration severity grade "B" is indicated on the rating plate.

The declaration regarding the type of featherkey for balancing is generally marked on the rating plate and optionally on the face of the shaft end.

Designation:

- As a standard measure, balancing is carried out dynamically with a half featherkey (code "H") in accordance with ISO 8821.
- "F" means balancing with a whole featherkey (optional version).
- "N" means balancing without a featherkey (optional version).

Note

Measures conforming to ISO 10816 must be taken in order to compensate any offset between electrical machines and driven machines.
The foundation must be designed according to DIN 4024.

5.4 Alignment and fastening

General

When aligning and fastening the machine, please bear the following in mind:

- The machine must be level.
- Feet and flanges must be fastened securely.
- Alignment must be precise in the case of direct coupling.
- Fastening surfaces must be clean
- Look out for any damage to paint; this must be rectified immediately and correctly.
- Look out for traces of anti-corrosion protection agents; these must be removed using mineral turpentine.
- Look out for installation-related resonances with the rotating frequency and double line frequency; these must be prevented.
- Listen for unusual noises when turning the rotor manually.
- Check the direction of rotation with the machine decoupled.
- Avoid using rigid coupling measures.

Flatness of the supporting surfaces for conventional motors

Frame size (FS)	Flatness mm
≤ 132	0.10
160	0.15
≥ 180	0.20

6 Electrical connection



WARNING

Note the following safety information before connecting-up the machine:

- Only qualified and trained personnel should carry out work on the machine while it is stationary.
- Disconnect the machine from the power supply and take measures to prevent it being reconnected. This also applies to auxiliary circuits, e.g. anti-condensation heating.
- Check that the machine really is in a no-voltage condition.
- Establish a safe protective conductor connection before starting any work.
- If the incoming power supply system displays any deviations from the rated values in terms of voltage, frequency, curve form or symmetry, such deviations will increase the temperature and influence electromagnetic compatibility.



WARNING

Line supply with non-grounded neutral point

Operating the machine on a line supply system with a non-grounded neutral point is only permitted over short time intervals that occur rarely, e.g. the time leading to a fault being eliminated (ground fault of a cable, EN 60034-1).

6.1 Terminal box

6.1.1 Instructions for terminal boxes



DANGER

Dangerous voltage

Electric machines contain hazardous voltages.

If the machine is not de-energized and brought into a no-voltage condition, death or serious injury will occur.

When work is carried out on the machine with the terminal box open, it must not be electrically connected!

NOTICE

Damage to property

Note the following information to avoid damage to the terminal box.

- Make sure that the components inside the terminal box e.g. terminal board and cable connections) are not damaged!
- It must be ensured that there are no foreign bodies, dirt or moisture in the terminal box.
Cable entries into the terminal box according to DIN 42925.
- Close any additional open cable entries with O-rings or suitable flat gaskets, the terminal box itself must be sealed so that it is dust and water tight using the original seal.
- Please observe the tightening torques for cable glands and other screws.
- When performing a test run, secure the feather keys without output elements.

Note

The terminal box must be sealed so that dust and water cannot enter.



WARNING

Dangerous voltage

Loosening the safety torx screw can result in death, serious injury or material damage!

Do not loosen the safety torx screw with respect to the center terminal, as this ensures a conductive connection between the grounding conductor and frame!

NOTICE

Serious damage to the machine

Failure to observe these measures will result in serious damage to the machine!

- Do not rotate the terminal box unless the connection cables have not yet been laid.
- If you release the safety torx screw to both sides of the outer connecting terminals, this can destroy the machine!
- Remove the three large snap hooks on the terminal board before rotating the the terminal box. Keep the snap hooks pressed while rotating the terminal box and use a screwdriver to re-engage when finished.

6.1.2 Optional terminal board (star or delta circuit)



NOTICE

Arcing at the optional terminal board can destroy the machine

Failure to observe this information can result in destruction of the machine as a result of arcing.

To change the operating mode, always press the jumper fully into the base of the slot and use the red locking lever to ensure that it is engaged.

6.1.3 Protruding connection cables



WARNING

Short-circuit hazard

During disassembly and particularly when installing the cover plate, make sure that the connection cables are not clamped between enclosure parts and the cover plate.



CAUTION

It must be ensured that there are no foreign bodies, dirt, or moisture in the terminal base of the machine enclosure.

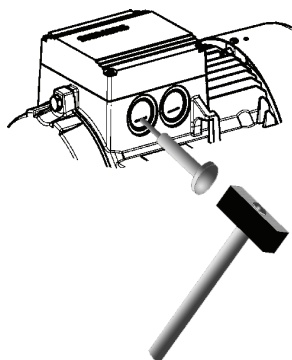
- Use O-rings or suitable flat gaskets to seal entries in cover plates (DIN 42925) and other open entries.
- Seal the terminal base of the machine enclosure using the original seal of the cover plate to prevent dust and water from entering.
- Please observe the tightening torques for cable glands and other screws.
- When performing a test run, secure the feather keys without output elements.

6.1.4 Knockout openings

Note

Knockout openings

- Knockout openings in the terminal box must be knocked out using appropriate methods.
- Take care not to damage the terminal box or its interior components (the terminal board, cable connections, and so on).



6.1.5 Installation and routing



NOTICE

Damage to terminal board

Observe the following measures to prevent damage to the terminal board:

- Remove the screw-type connections (EN 50262) only when the terminal box is closed.
- Tighten the screw-type connections to rated torque value only when the terminal box is closed.
- Tighten the screw-type connections only finger tight when the terminal box is open.
- Make sure that the three large snap hooks are engaged when tightening the screw-type connections!

6.2 Tightening torques

6.2.1 Cable glands

Note

Take care not to damage the cable jacket.

Tightening torques must be adapted to suit the type of cable jacket material in use.

You should refer to the table in order to find the correct tightening torque for any metal and plastic cable glands that are to be mounted directly on the machine, as well as for any other screw-type connections (such as adapters).

Table 6-1 Tightening torques for cable glands

	Metal ± 10% Nm	Plastic ± 10% Nm	Clamping range in mm		O ring Cord Ø mm
			Standard -30 °C ... 100 °C	Ex -60 °C ... 105 °C	
			Ex -30 °C ... 90 °C		
M 12 x 1,5	8	1,5	3,0 ... 7,0	-	2
M 16 x 1,5	10	2	4,5 ... 10,0	6,0 ... 10,0	
M 20 x 1,5	12	4	7,0 ... 13,0	6,0 ... 12,0	
M 25 x 1,5			9,0 ... 17,0	10,0 ... 16,0	
M 32 x 1,5	18	6	11,0 ... 21,0	13,0 ... 20,0	
M 40 x 1,5			19,0 ... 28,0	20,0 ... 26,0	
M 50 x 1,5	20		26,0 ... 35,0	25,0 ... 31,0	
M 63 x 1,5			34,0 ... 45,0	-	

6.2.2 Terminal boxes, end shields, grounding conductors, sheet metal fan covers

Note

The specified tightening torques are applicable unless other values are indicated.

Table 6-2 Tightening torques for screws on the terminal box, end shields, screw-type grounding conductor connections

	Thread Ø		M 4	M 5	M 6	M 8	M 10	M 12	M 16	M20
	Nm	min	2	3.5	6	16	28	46	110	225
		max	3	5	9	24	42	70	165	340



Table 6-3 Tightening torques for self-tapping screws on the terminal box, end shields, screw-type grounding conductor connections, sheet metal fan covers

	Thread Ø		M 4	M 5	M 6
	Nm	min	4	7.5	12.5
		Max.	5	9.5	15.5

6.3 General information on conductor connection

Cross-sections that can be connected depending on the size of the terminal (possibly reduced due to size of cable entries)



WARNING

Short-circuit hazard

Electric machines contain hazardous voltages.

If the appropriate precautions are not taken, death or serious physical injury can occur.

- Do not lay connection cables over the central dome of the terminal board.
- Observe the opening direction and the mounting position of the cover washers on the terminal board.

6.4 General information on connecting the grounding conductor

Note

The machine's grounding conductor cross-section must comply with EN / IEC 60034-1 .

Please also observe installation regulations such as those specified in EN / IEC 60204-1..

6.5 Connection to the converter



CAUTION

The standard insulation system is designed so that operation on the converter is possible for supply voltages up to 500 V +10% in motorized operation. Use a special insulation system or adopt special measures, e.g. output filter, for higher voltages.



NOTICE

Machines must always be connected to frequency converters using shielded machine supply cables. The most effective method of shielding is to conductively connect the cable to the metal terminal box of the machine (with metal screw connections) over a large surface area.

Note

EMC

Please observe the section containing instructions on ensuring electromagnetic compatibility.

See the list of additional operating instructions: Further documents (Page 64)

6.6 Final checks

Before closing the terminal box/terminal base of the machine enclosure, check the following:

- Establish the electrical connections in the terminal box in accordance with the details in the sections above and tighten with the correct torque.
- The clearances between non-insulated parts have been maintained:
 $\geq 5.5 \text{ mm}$ to 690 V, $\geq 8 \text{ mm}$ to 1000 V.
- Avoid protruding wire ends!
- In order not to damage the cable insulation, freely arrange the connecting cables.
- Connect the machine corresponding to the specified direction of rotation.
- Keep the inside of the terminal box clean and free from trimmed-off ends of wire.
- Ensure that all seals and sealing surfaces are undamaged and clean.
- Correctly and professionally close unused openings in the terminal boxes.
- The pressure relief device is undamaged (depending on the type of terminal box, this involves either cast-in slots or an overpressure diaphragm). Only repair damage after prior consultation with the person responsible for the safety of the equipment and use only original parts.

7 Commissioning

7.1 Insulation resistance



WARNING

Working on electrical power installations

Only appropriately trained personnel may carry out this work.

Before starting commissioning, install all covers that are designed to prevent active or rotating parts from being touched, or which are necessary to ensure correct air guidance and thus effective cooling.



WARNING

Hazardous voltage at the terminals

Dangerous voltages are sometimes present on the terminals during and immediately after measurement of the winding insulation resistance. Contact with these can result in death, serious injury or material damage.

If any power cables are connected, check to make sure line supply voltage cannot be connected. Once you have measured the insulation resistance, discharge the winding by connecting to the ground potential.

Checking the insulation resistance

NOTICE

The insulation resistance needs to be checked prior to start-up and again after any extended periods of storage or periods during which the equipment is not in operation. Before you begin measuring the insulation resistance, please read the operating manual for the insulation resistance meter you are going to use. Disconnect any main-circuit cables that are connected to the terminals before measuring the insulation resistance.

Note

If the critical insulation resistance is less than or equal to this value, the windings must be dried or, if the fan is removed, cleaned thoroughly and dried.

Please note that the insulation resistance of dried, clean windings is lower than that of warm windings. The insulation resistance can only be properly assessed after conversion to the reference temperature of 25 °C.

Note

If the measured value is close to the critical value, you must check the insulation resistance at suitably frequent intervals.

Measuring the insulation resistance

1. Before you begin measuring the insulation resistance, please read the operating manual for the insulation resistance meter you are going to use.
2. Disconnect any main circuit cables from the terminals before measuring the insulation resistance.
3. Where possible, measure the insulation resistance of the winding with respect to the motor enclosure when the winding temperature is between 20 ... 30 °C. Different insulation resistance values apply for other temperatures.
4. When measuring, wait until the final resistance value is reached. This is reached after approximately one minute. Then read off the insulation resistance.

Limit values of the stator winding insulation resistance

The following table indicates the measuring circuit voltage and the limit values for the minimum insulation resistance and the critical insulation resistance of the stator winding.

Table 7-1 Insulation resistance of the stator unwinding at 25 °C

	Rated voltage $U_{\text{rated}} < 2 \text{ kV}$
Measuring circuit voltage	500 V
Minimum insulation resistance for new, cleaned or repaired windings	10 MΩ
Critical specific insulation resistance after a long operating time	0,5 MΩ / kV

Note the following:

- If the measurements are performed at winding temperatures $\neq 25 \text{ °C}$, convert the measured value to the reference temperature of 25 °C in order to be able to compare the values with the table above.
 - The insulation resistance halves every time the temperature rises by 10 K.
 - The resistance doubles every time the temperature falls by 10 K.
- Dry, new windings have a typical insulation resistance of more than 100 ... 2000 MΩ depending on the winding size, design and rated voltage. An

insulation resistance value close to the minimum value could be due to moisture and/or dirt accumulation.

- During operation, the insulation resistance of the windings can fall to the critical insulation resistance due to ambient and operational influences. The critical insulation resistance value for a winding temperature of 25 °C can be calculated by multiplying the rated voltage (kV) by the specific critical resistance value (0,5 MΩ / kV).

Example:

Critical resistance for rated voltage $U_N = 690 \text{ V}$:

$$690 \text{ V} \times 0,5 \text{ M}\Omega / \text{kV} = 0,345 \text{ M}\Omega$$

Note

Critical insulation resistance reached or fallen below

If the critical insulation resistance is reached or fallen below, this can result in damage to the insulation or voltage flashovers.

- Contact your Siemens Service Center.
 - If the measured value is close to the critical value, you must check the insulation resistance at suitably frequent intervals.
-

Measures before commissioning

Once the system has been correctly installed, you should check the following prior to commissioning:

- The machine has been assembled and aligned correctly.
- The machine has been connected so that it rotates in the direction specified.
- The operating conditions match the data specified on the rating plate.
- The bearings have been lubricated as appropriate for the version used. Rolling-contact bearing machines which have been in storage for more than 24 months have been relubricated.
- Any supplementary machine monitoring equipment has been connected correctly and is functioning as it should.
- For versions with bearing thermometers, the bearing temperatures must be checked during the machine's first period of operation. The warning and shutdown values are set on the monitoring device.
- Appropriately configured control and speed monitoring functions ensure that the machine cannot exceed the permissible speeds specified on the rating plate.

- The output elements have the correct settings for their type (e.g. alignment and balancing of couplings, belt forces in the case of a belt drive, tooth forces and tooth face clearance in the case of toothed-wheel power output, radial and axial clearance in the case of coupled shafts).
- The minimum insulation resistance and minimum clearance values have been adhered to.
- The grounding and equipotential bonding connections have been established correctly.
- All fixing screws, connection elements, and electrical connections have been tightened to the specified torques.
- Lifting eyes that were screwed in have been removed following installation or secured to prevent them becoming loose.
- The rotor can turn without coming into contact with the stator.
- All touch protection measures for both moving and live parts have been implemented.
- In cases where the shaft extension is not being used and is, therefore, exposed, it has been covered and the feather key has been secured to prevent it from being thrown out.
- If being used, the external fan is ready for operation and connected so that it rotates in the direction specified.
- The flow of cooling air is not obstructed.
- If a brake is being used, it is functioning correctly.
- The specified mechanical limit speed $n_{\max}$ is adhered to.

If the design of the machine requires the converter to be assigned in a particular way, the relevant information will be provided on the rating plate or an additional label.

Note

It may be necessary to perform additional checks and tests in accordance with the specific situation on site.

8 Operation

Switching on the machine with anti-condensation heating (optional)



CAUTION

Before switching on, always make sure that the (optional) anti-condensation heating is switched off.

Machine operation



WARNING

Line supply with non-grounded neutral point

Operating the machine on a line supply system with a non-grounded neutral point is only permitted over short time intervals that occur rarely, e.g. the time leading to a fault being eliminated (ground fault of a cable, EN / IEC 60034-1).



WARNING

Do not remove covers when the motor is running

Rotating or live parts are dangerous. Death, serious injury, or material damage can result if the required covers are removed.

- De-energize the machine and bring it into a no voltage condition before removing any covers.
- Ensure that any covers, which are designed to prevent active or rotating parts from being touched, which are necessary to ensure correct air guidance and thus effective cooling, or which guarantee the degree of protection of the machine, remain closed during operation.



CAUTION

The surfaces of the machines can reach high temperatures, which can lead to burns if touched.

NOTICE

Minimum load for cylindrical roller bearings

Be sure to comply with the minimum radial load of 30% of the cylindrical roller bearings in accordance with catalog data.

 WARNING
Faults during operation

Deviations from conditions during normal operation, such as an increase in power consumption, temperatures or vibrations, unusual noises or odors, tripping of monitoring devices, etc., indicate that the machine is not functioning properly. This can cause faults which can result in eventual or immediate death, severe injury or material damage.

- Immediately inform the maintenance personnel.
- If you are in doubt, immediately switch off the machine, being sure to observe the system-specific safety conditions.

NOTICE**Risk of corrosion due to condensation**

When changing machines and/or ambient temperatures, air humidity can condense within the machines.

- If available, remove the screw plugs to drain the water depending on the ambient and operating conditions.
- Reinsert them afterwards.

If the machine is equipped with drainage plugs, the water can drain away automatically.

 WARNING
Machines with textile fan covers

The machine fan is not completely protected against contact.

The customer must put suitable measures in place, e.g. housings or protective grating, to prevent manual intervention.

8.1 Stoppages

Overview

If the machine remains out of service for an extended period of time (> 1 month), it should be commissioned regularly (around once a month) or, at the very least, the rotor should be turned. Please refer to the instructions in the section titled "Switching on" before recommissioning the machine. If a rotor locking device has been fitted to the machine, you must remove it before the rotor starts to turn.

NOTICE

If the machine is to be out of service for a period in excess of 12 months, you must take suitable anti-corrosion, mothballing, packaging, and drying measures.

Switching on the anti-condensation heater

If an anti-condensation heater is provided, switch it on during the machine stoppages.

Taking the machine out of service

For details of measures that need to be implemented, please refer to Section Preparing for use (Page 39).

Lubricating before recommissioning**NOTICE**

The machine must be relubricated during commissioning if it has been out of service for more than 1 year, in order to ensure that the grease is distributed throughout the bearings. The shaft must rotate for the grease to be distributed. Please observe the information on the lubricant plate if carrying out relubrication using relubrication equipment.
See also the section titled "Application planning - Bearing lifetime".

9 Maintenance



WARNING

Safety instructions

- Before starting work on the machines, make sure that the plant or system has been disconnected in a manner that is compliant with the appropriate specifications and regulations.
- In addition to the main currents, make sure that supplementary and auxiliary circuits, particularly in heating devices, are also disconnected.
- Certain parts of the machine may reach temperatures above 50 °C. Physical contact with the machine could result in burn injuries! Check the temperature of parts before touching them.
- When carrying out cleaning using compressed air, make sure that appropriate methods of extracting fumes are in place and that personal protective gear such as gloves, goggles, face masks, or similar are worn.
- If you are using chemical cleaning agents, observe the instructions and any warnings provided in the relevant safety data sheet. Chemical agents must be compatible with the machine's components, especially if these contain plastics.

Note

Operation characteristics can vary widely. For this reason, only general maintenance intervals can be specified here.

9.1 Maintenance

9.1.1 Regreasing (optional)

General

As a standard feature, the machines have rolling-contact bearings which are permanently lubricated with grease (UNIREX N3, made by ESSO). A regreasing device is possible as an option. In this case, you can find information about relubrication intervals, quantities and types of grease, and, if required, additional data on the rating plate or lubricant plate.

Note

Do not mix different types of grease!

Prolonged storage periods reduce the useful life of the bearing grease. Check the condition of the grease if the equipment has been in storage for more than 12 months. If the grease is found to have lost oil content or to be contaminated, the machine must be immediately relubricated before commissioning. For information on permanently-greased bearings, please refer to the section titled Bearings (Page 60).

Note

Regreasing

1. Clean the grease nipples at the drive end and non-drive end.
 2. Press in the type and quantity of grease specified (see rating/lubricant plate data).
 - Please observe the information on the rating and lubricant plates.
 - Regreasing should be carried out when the machine is running (max. 3600 rpm)!
-

The bearing temperature rises sharply at first, then drops to the normal value again when the excess grease is displaced out of the bearing.

9.1.2 Cleaning

Cleaning the greasing channels and used grease chambers

The used grease collects outside each bearing in the used grease chamber of the outer bearing cap. When replacing bearings, remove the used grease.

Note

You have to separate the active parts of the bearings to replace the grease that is in the greasing channel.

Cleaning the cooling air passages

Regularly clean the cooling air passages through which the ambient air flows, e.g. using dry compressed air.

Note

Never direct compressed air in the direction of the shaft outlet or machine openings.

In the case of machines with textile fan covers, regularly remove fluff balls, fabric remnants, and similar types of contamination (particularly at the air passage opening between the fan cover and cooling fins of the machine enclosure) to ensure that the cooling air can flow without obstruction.

Note

The frequency of the cleaning intervals depends on the local degree of contamination.

WARNING
--

Particularly when carrying out cleaning using compressed air, make sure you use suitable extraction equipment and wear personal protective gear (safety goggles, respiratory filter, etc.).

9.2 Repair

9.2.1 Instructions for repair

Qualified personnel

Only appropriately qualified persons should be deployed to commission and operate equipment. Qualified persons, as far as the safety instructions specified in this manual are concerned, are those who have the necessary authorization to commission, ground and identify/tag equipment, systems and circuits in accordance with the relevant safety standards.

Instructions relevant to safety

WARNING
--

Before you begin working on the three-phase machine, in particular before you open the covers of active parts, make sure that the three-phase machine or system is properly isolated from the supply.

Note

If it is necessary to transport the machine, carefully observe the information provided in Chapter Preparing for use !

9.2.2 Bearings



Take the bearing used up to frame size 90 only for special versions, and generally for frame size 100 and higher from the rating plate.

Bearing lifetime

Prolonged storage periods reduce the useful lifetime of the bearing grease. In the case of permanently lubricated bearings, this leads to a shorter bearing lifetime. Bearing or grease replacement is recommended after a storage time of 12 months, for longer than four years, replace the bearings or grease.

Replacing bearings

Recommended interval after which bearings are to be replaced under normal operating conditions:

Table 9-1 Bearing replacement intervals

Ambient temperature	Principle of operation	Bearing replacement intervals
40° C	Horizontal coupling operation	40 000 h
40° C	With axial and radial forces	20 000 h

Note

Special operating conditions

Examples of factors that can reduce operating hours are vertical machine installation, high vibrational and impact loads, frequent reversing, higher ambient temperature, higher speeds, etc.

Note

- Do not reuse bearings that have been removed.
- Remove any existing contaminated old grease from the bearing shield!
- Replace old grease with new grease!
- Replace the shaft seals when the bearings are replaced.
- Lightly grease the contact surfaces of the sealing lips!

9.2.3 Dismantling

Note

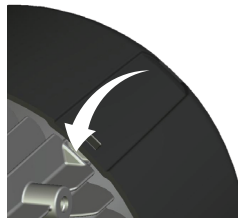
Before commencing disassembly, you should mark how each of the fastening elements has been assigned, as well as how internal connections are arranged, for re-assembly purposes.

Fan

Take care not to damage the snapping mechanisms on fans that are equipped with these. To ensure this, the fans should be heated to a temperature of approximately 50 °C around the area of the hub. If any damage is caused, request new parts.

Fan cover

- Carefully lever the snap openings on the cover out of the snap-in lugs one after the other; do not apply the lever directly under the web (risk of breakage).
- Do not damage the snap mechanisms. If any damage is caused, request new parts.



Canopy; incremental encoder under the canopy



Loosen the fixing screws on the external surface of the protective cover.

Under no circumstances should the spacing bolts or the mounting bracket be disassembled or forcibly separated from each other or the cover. Forcibly removing or separating can destroy the distance bolts, the connecting elements of the mounting bracket or the fan cover.

9.2.4 Installation

Note

Avoid damaging the windings protruding out of the stator enclosure when fitting the end shield.

10 Spare parts

General

In addition to the exact part designation, please specify the machine type and the serial number in all orders for spare parts and repair parts.

A Appendix

A.1 SIEMENS Service Center

Details regarding the design of this electrical machine and the permissible operating conditions are described in these instructions.

Field service visits and spare parts

If you wish to request a field service call or order spare parts, please contact your local Siemens sales office. This office will contact the responsible service center on your behalf. You can find your local contact partner here.

Technical queries or additional information

If you have any technical queries or you require additional information, please contact the Siemens Service Center.

Please have the following machine data ready:

- Machine type
- Serial number

You can find this data on the rating plate of the machine.

Service numbers

Table A-1 Siemens Service Center contact details

Time zone	Telephone	Fax	Internet
Europe / Africa	+49 911 895 7222	+49 911 895 7223	http://www.siemens.com/automation/support-request (http://www.siemens.de/automation/support-request)
Americas	+1 423 262 2522	+1 423 262 2200	mailto:techsupport.sea@siemens.com
Asia / Pacific	+86 1064 757 575	+86 1064 747 474	mailto:support.asia.automation@siemens.com

A.2 Further documents

These operating instructions can also be obtained at the following Internet site:

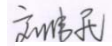
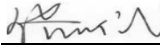
<http://www.siemens.com/motors>

General Documentation

1.517.30777.30.000	1XP8001 encoder
5 610 00000,02 000	Operating_Instructions_Simotics GP, SD, DP, XP
5 610 00000,02 001	Operating_Instructions_Compact_Simotics GP, SD, DP
5 610 00000,02 002	Operating_Instructions_Compact_Simotics XP
5 610 00002,09 000	Incremental encoder 1XP8012-1x
5 610 00002,09 001	Incremental encoder 1XP8012-2x
5 610 70000,02 015	External fan
5 610 70000,10 020	Spring-loaded brake

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WUHAN KAI DI ELECTRIC POWER ENVIRONMENTAL CO.,LTD.



Erection Work, Operating and Maintenance Instructions

Machine: **Centrifugal pump S**

TRANSLATION OF THE ORIGINAL DOCUMENT

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TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	Use	1
1.2	Standards and guidelines	1
1.3	Use of manual	2
1.4	Warranty and liability	3
1.5	Name and address of the manufacturer	4
1.6	Copyright	4
2	SAFETY	1
2.1	General safety regulations	1
2.2	Danger and warning signs	1
2.3	Intended use	2
2.4	General remarks on machine/plant safety	3
2.5	Duties of the operator	4
2.6	General duties of personnel	6
2.7	Safety devices	7
2.8	Personal protective apparel	9
2.9	Safety at the machine installation site	10
2.10	Temperature	10
2.11	Noise	11
2.12	Electrical equipment	12
2.13	Fluids (liquids, gases, vapour or smoke)	12
2.14	Oils, lubricants and cleaning agents	13
2.15	Chemicals	13
3	TECHNICAL DESCRIPTION	1
3.1	General description	1
3.1.1	Field of application	1
3.1.2	Design	2
3.2	Main components	3
3.2.1	Centrifugal pump with base frame	3
3.3	Types of seal	5
3.4	Sealing water data	17
3.5	Type specification	19
3.5.1	Applicable standards	19

3.5.2	Model designation	19
3.6	Application limiting values	20
3.7	Technological description	23
3.8	V-belt drive	24

4 ERECTION WORK and TRANSPORT..... 1

4.1	General	1
4.2	Safety instructions	1
4.3	Haulage	2
4.4	Storage	6
4.5	Installation.....	7
4.6	Foundation drawing	11
4.7	Instruments	15
4.8	Electrical equipment	15
4.9	Cold test	16

5 START-UP

5.1	General	1
5.2	Safety instructions	1
5.3	Prerequisites for start-up.....	2
5.4	Start-up	3
5.5	Certificates	4

6 OPERATION

6.1	General	1
6.2	Safety instructions	1
6.3	Control via DCS	2
6.4	Starting	2
6.5	Checks after initial start-up	3
6.6	Normal operation	4
6.7	Specification of centrifugal pump (delivery head and flow rate) 5	
6.8	Shutdown	6
6.9	Operating malfunctions and troubleshooting	7

7	MAINTENANCE	1
7.1	General	1
7.2	Safety instructions	1
7.3	Regular maintenance	2
7.4	Maintenance schedule	4
7.5	Fasteners	5
7.6	Lubrication	7
7.6.1	Oil lubrication	7
7.6.2	Grease lubrication	10
7.7	Aligning the coupling	12
7.8	Installing and removing the pull-out unit	13
7.9	Changing the impeller and the front lining	16
7.10	Turning the impeller	19
7.11	Changing the shaft seals	20
7.11.1	Changing the single standard mechanical seal	20
7.11.6	Changing the stuffing box packing and the shaft protection sleeve	31
7.12	Changing the anti-friction bearings with oil lubrication	37
7.13	Changing the anti-friction bearings with grease lubrication	40
7.14	Disassembly and disposal	43
8	TECHNICAL DATA	1
8.1	Spare parts	1
8.2	Types of anti-friction bearing	2
8.3	Rotary shaft seals	3
8.4	Data sheet	3
8.5	Characteristic curve	3
9	SUPPLIER DOCUMENTATION	1
9.1	Coupling	1
9.2	Shaft seal	1

1 INTRODUCTION

This manual is part of the ANDRITZ AG technical documentation for the machine. It is intended to provide the operator with the basic knowledge required for proper, safe and economical use of the equipment delivered by ANDRITZ AG. Observing these instructions helps avoid hazards and reduce repair and downtime costs, as well as increasing the reliability and useful life of the machines.

1.1 Use

Target group

This operating manual is intended for users with knowledge of mechanical engineering and is for the exclusive use of the operator and his personnel.

Personnel entrusted with work on the machine must have read and understood these operating instructions and comply with them. This refers in particular to the following tasks:

- Handling, starting and stopping
- Troubleshooting
- Maintenance and upkeep
- Transportation
- Maintenance and disposal of process materials, cleaning of machine and the area around the machine

In particular, the following must be considered:

- Chapter on SAFETY,
- Safety instructions contained in various other chapters

Supplementary instructions

The plant operator shall complete this manual by adding national regulations on occupational health and safety, and on environmental protection.

Instructions on any special operational conditions concerning work organization, sequence of work/operations and the personnel assigned to the job shall also be added. This includes instructions regarding obligatory supervision and notification requirements.

Safekeeping

Keep the entire operating manual near the place where the machine is installed and within easy reach.

1.2 Standards and guidelines

The pump is delivered together with a CE declaration of conformity according to Machinery Directive 2006/42/EC Annex II, 1.A. It is confirmed that European standards (harmonized) EN 809 and EN ISO 12100, Parts 1 and 2, have been observed. Auxiliary electrical equipment

supplied, such as motors, measuring instruments, ... carry a CE marking (if they fall within the scope of a guideline, for example the low-voltage or EMV guideline).

1.3 Use of manual

Presentation

- Chapter and paragraph headings are printed in capitals in the body text:

Chapter on SAFETY

- Designations for display and operating elements are written in inverted commas in the body text:

Operate switch "xxx"

- Lists without numbering do not require operations to be carried out in a certain order.

Pictograms

The following pictograms are used in the operating instructions:



Warning signs

Warning signs are shown with an explanation of the type of hazard.

The meanings of the different graduations of hazards are described in the Chapter on SAFETY.



Marks an instruction on handling of the machine or system.



Marks a useful piece of information



Marks a cross-reference to another Chapter with absolute path indication.

e.g. ➡ /CENTRIFUGAL PUMP S/SAFETY

Work steps

Work steps are presented in tables. Work steps are numbered and must be carried out in the order specified.

Item numbers**411.2**

The item numbers shown in this format refer to the assembly drawing and the parts list.

Numbering of pages, tables and figures

Pages	Consecutive numbering of chapters	2-1
Tables	Tab.+ Consecutive numbering in Chapters	Tab. 2-1
Figures	Fig. + Consecutive numbering in Chapters	Fig. 2-1

Abbreviations

Tab.	Table
Fig.	Figure

1.4 Warranty and liability

ANDRITZ AG's general terms of delivery and sale shall apply.

ANDRITZ AG shall accept no warranty or liability for claims for personal injury or material damage if caused by one or more of the following:

- Use of the machine/system for any purpose other than its designated use
- Non-conformity of erection work, start-up and handling of the machine/system
- Non-observance of the safety instructions in the manual
- Non-authorised structural changes to the machine/system
- Non-observance of the maintenance and upkeep instructions

In the event of a claim for repair under guarantee, ANDRITZ AG reserves the right to assess the damage to the machine/system.

1.5 Name and address of the manufacturer

ANDRITZ AG
Stattegger Strasse 18
A-8045 Graz

Our Service Department will be pleased to assist you and can be contacted at:

ANDRITZ AG
Stattegger Strasse 18
A-8045 Graz

Service department for pumps

Tel.: +43/316-6902-2706
Fax: +43/316-6902-413
e-mail: Johann.Strasser@andritz.com

In case of emergency outside working hours:

Tel.: +43 316 6902-0

1.6 Copyright

The operating manual is protected by copyright. All usual rights reserved. It must not be wholly or partly reproduced without authorization by ANDRITZ AG. Non-compliance will result in damages claims and may have consequences under criminal law. All rights shall also be reserved for any patents granted, registration of trade marks and technical modifications without prior notification.

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2 SAFETY

2.1 General safety regulations

The chapter on safety contains general safety regulations which must be observed when working on the machine/plant.

These are supplemented by additional safety instructions for individual activities and which are provided in the relevant chapters of the manual. These are highlighted in the text with special warning signs.

Safety instructions on components not supplied by ANDRITZ AG are contained in the descriptions provided by the component suppliers (▶ /CENTRIFUGAL PUMP/SUPPLIER DOCUMENTATION). The safety instructions supplement ANDRITZ AG's operating instructions.

All safety instructions must be observed. Non-observance of the safety instructions can lead to personal injury, damage to the environment, and/or material damage.

2.2 Danger and warning signs

The entire SAFETY chapter is of extreme importance and relevant to safety. Thus, the information in this chapter is not marked with special danger symbols.

In the Chapters on ERECTION WORK, START-UP, OPERATION, and MAINTENANCE in the present manual, warnings are marked by a pictogram. The following warning signs are used:



This symbol indicates that there may be a risk to life and limb.

Non-compliance with the warning signs may lead to serious health problems or even fatal injuries, and can cause extensive damage to property.



This symbol indicates that there is an imminent health risk, as well as a risk of environmental pollution and of damage to property.

Non-compliance with the warning signs may cause moderate health problems and/or extensive environmental pollution and damage to property.



This symbol gives warning of a dangerous situation.

Non-observance of these signs may cause environmental pollution and damage to property.

Further symbols and pictograms used are described in the INTRODUCTION chapter

2.3 Intended use

The centrifugal pump should only be used according to the specifications forming part of the purchase order.

Any change in the application must be checked by the operator and, if necessary, approved by ANDRITZ AG.

Non-observance of the application can lead to environmental or property damage, or to personal injury.

Any modifications to the scope of supply made without the agreement of ANDRITZ AG are considered contrary to the designated use.

The term designated use also covers adherence to the operating instructions, compliance with the operating, inspection and maintenance conditions and with the regulations on cleaning and upkeep.

The limit values stated in the operating instructions should not be exceeded under any circumstances.

If not otherwise specified, the pump is intended for use in pumping water or water containing paper stock or pulp.



Please also observe the type specification (➡ /TECHNICAL DESCRIPTION/TYPE SPECIFICATION Chapter 3.5), and the operating limits (➡ /TECHNICAL DESCRIPTION/OPERATING LIMITS Chapter 3.6)

2.4 General remarks on machine/plant safety

Instructions mounted directly on the centrifugal pump must always be observed and maintained in fully legible condition.

- Direction of rotation arrow (1), rating plate (2)
see Fig. 2-1
- Labelling by operator (e.g. medium, temperature, etc.)
- Labelling for connections

The centrifugal pump has been built in accordance with state-of-the-art standards and the recognized safety rules. Nevertheless, its use may constitute a risk to life and limb of the user or of third parties, or cause damage to the machine/plant and to other material assets.

The centrifugal pump may only be operated when in perfect condition and with due consideration to safety and the risks involved. All protective devices and the emergency stop equipment must be in place and fully functional.

Malfunctions and unforeseen changes at the centrifugal pump must be remedied immediately.

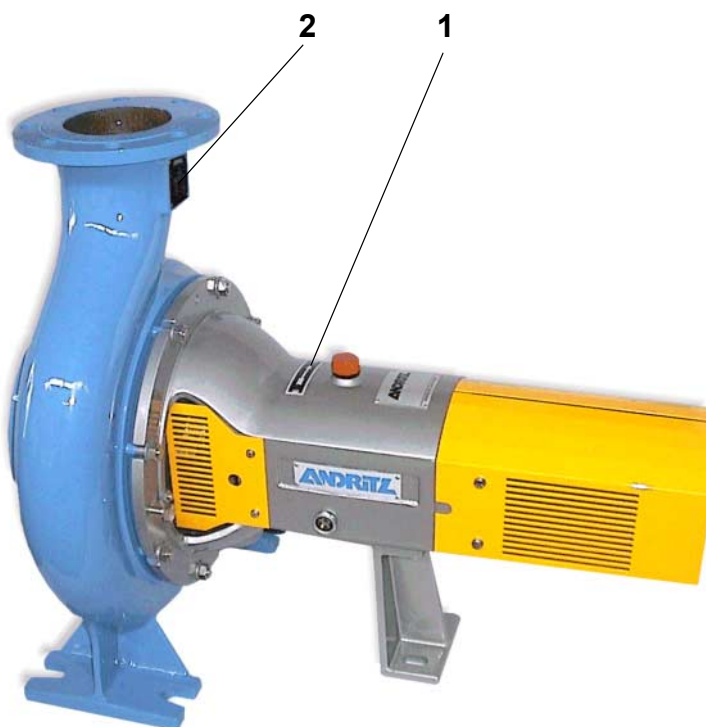


Fig. 2-1 Remarks

2.5 Duties of the operator

Designated use	The operator of the centrifugal pump is responsible for its designated use.
Work instructions	In addition to the operating instructions, the applicable legal regulations in the user countries and other rules governing safety at work, health and environmental protection must be observed and personnel instructed in these matters.
Qualification of personnel assigned	The centrifugal pump may only be operated, maintained and serviced by authorized, skilled personnel with hands-on training. The minimum legal age must be taken into account. Any person undergoing training, serving an apprenticeship or being instructed must not work on the centrifugal pump except under the supervision of an experienced person.
Instruction	The user's operating and maintenance personnel will be instructed by manufacturer's personnel or his contractual distributor upon completion of installation work. The user undertakes to have new, additional operating and maintenance personnel instructed in machine operation and maintenance of the centrifugal pump to the same extent and applying the same care, and with due consideration to the safety instructions. Workers entrusted with the transportation, erection work and start-up of the centrifugal pump must have read and understood the operating instructions, especially the chapter on SAFETY, the safety instructions concerning a certain activity, as well as the safety instructions issued by sub-suppliers.
Definition of areas of responsibility	The operator is responsible for: • defining the responsibilities of the machine operator and defining who is authorised to issue instructions, • definition of the contents and of responsibility for keeping the records on functioning and any failure of the monitoring equipment (log book), • personnel areas of responsibility in terms of operating, tooling, maintenance and upkeep.

Inspections and tests

The operator must:

- check at regular intervals whether the safety instructions and regulations governing work on the centrifugal pump are observed.
- carry out regular training to confirm the level of knowledge of the operating and maintenance personnel.

Attachment of safety features

The user shall ensure that the following equipment, regulations, symbols and instructions are mounted in the production area:

- Safety devices and regulations (see Section 2.7)
- Fire prevention regulations
- Markings on the floor for vehicle routes, protective fencing and danger areas (yellow)
- Barriers and covers
- Handrails (foot, centre and chest height)
- Emergency lighting
- EMERGENCY OFF switch or a mains disconnecter having the same effect and marked as such (e.g. maintenance switch acc. to EN1037).
- Repair switches at drive motors
- Information signs – fire prevention equipment
- Information signs – emergency phone number
- Direction signs – exits
- Direction signs – escape routes
- Information signs – first aid post

High-voltage protection

The operator shall provide suitable earthing and high-voltage protection equipment.

2.6 General duties of personnel

To avoid personal injury and material damage, all persons working on the plant shall observe the following safety instructions:

- Observe the safety instructions in the operating regulations and on the centrifugal pump itself.
- Stop and secure the centrifugal pump in case of a safety-relevant functional disorder. Report disorders and have them repaired immediately.
- All safety-critical modes of operation are prohibited.
- Use only the machine accesses, paths and passages intended for this purpose.
- Do not touch moving and rotating parts and/or reach out beyond them.
- Keep the machine and the workplace clean. Do not place tools or other objects on the centrifugal pump.
- Do not wear any garments/pieces of jewellery which might get stuck on rotating/moving pump parts, This includes ties, scarves, rings and necklaces.
- Do not wear long hair loose.
- Familiarise yourself with the function and any failure of machine monitoring equipment (log book) before starting work.
- No smoking at the centrifugal pump.
- Wear personal protective apparel when working on the machine/plant (see section 2.8).
- Due to the high temperatures, high pressure and humidity, people wearing glasses may find that their glasses steam up, thus exposing the wearer to a risk of injury.
- The operating personnel must be acquainted with the safety data sheets in order to be able to recognise how dangerous the chemicals can be.
- In order to identify the risks of high pressure (up to 16 bar), the personnel must know the technical data of the centrifugal pump, as well as its place of installation.

2.7 Safety devices

The centrifugal pump must not be operated without effective safety equipment.

Safety equipment must not be circumvented, dismantled or made unserviceable during operations. The safety equipment is there to protect operating personnel.

Safety equipment and access thereto must be kept clear.

Safety covers

The centrifugal pump must not be operated without safety covers mounted.

Check in particular that the coupling guard does not have any deformations!

Fig. 2-2 shows the protective covers at the centrifugal pump.

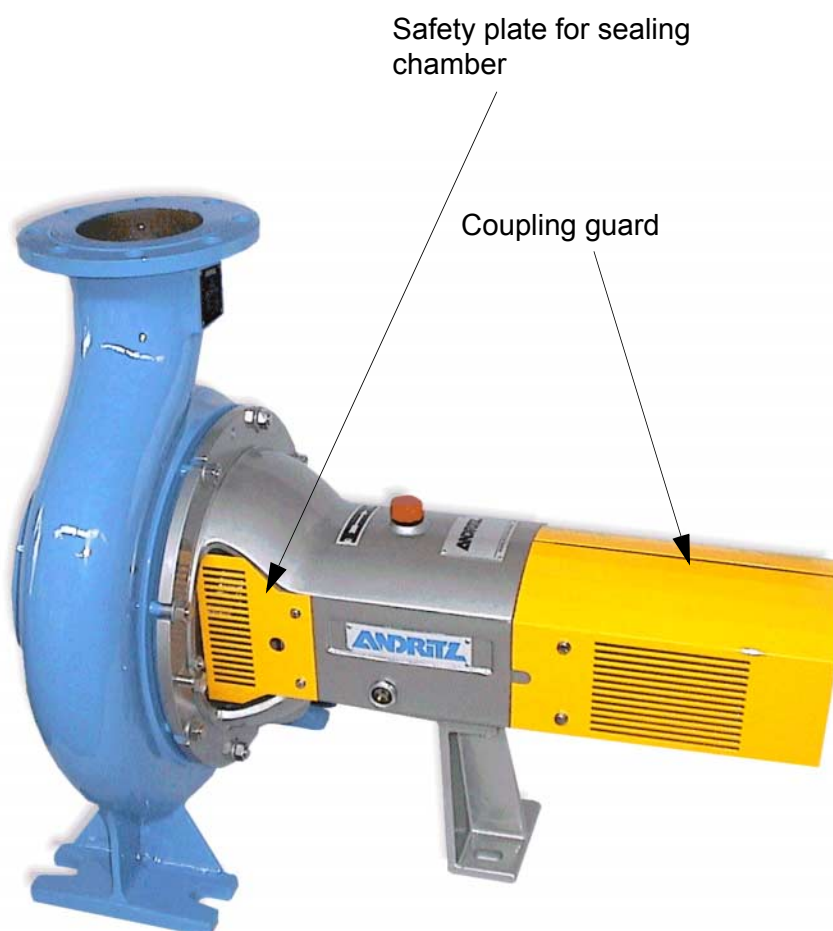


Fig. 2-2 Safety covers at the centrifugal pump

Emergency-off switch, safety shutdown

The pump is usually part of a plant or system. The operator is responsible for installation of EMERGENCY OFF/STOP devices so that the pump/plant can be brought to a halt in an emergency.

**Indicative, warning
and prohibiting
signs**

Information, warning and prohibiting signs must be observed. They must be checked regularly for legibility and completeness and they must not be removed or obstructed.



Hot surface

Chemicals:

If the pump is used in the chemicals sector, the operator must mount appropriate safety instructions on the plant.

Examples of signs required where chemicals are used:



Warning against toxic
substances



Caustic substances!

2.8 Personal protective apparel

General protection equipment

Use and always carry personal protective equipment in accordance with local regulations or those of the plant operator.

It should be compulsory to wear hard-toed boots throughout the entire premises.

In addition to the regulations applying, we recommend using the following safety equipment for certain work.

Activity	Safety equipment		
Time spent in the immediate vicinity of the machine while it is running			
Inspection and cleaning work, as well as field installation and maintenance for which parts of the machine have to be removed.			
			

Tab. 2-1 Recommended safety equipment for certain work

Key to symbols

	Protective clothing to prevent the pulp from coming into contact with the skin		Safety shoes as protection against foot injuries
	Gloves to prevent hand injuries		Ear protection to prevent damage to hearing
	Eye protection to prevent eye injuries		Standard hard hat as protection against head injuries

Tab. 2-2 Purpose of the safety equipment

2.9 Safety at the machine installation site

Adequate lighting must be provided (industrial lighting).

The foundations must be sized to withstand the loads caused by the centrifugal pump. The customer will be provided with a load plan.

The pump must be easily accessible. The operator must provide safe means of access (e.g. ladders, platforms ...).

The area around the machine and the marked escapes are to be kept clear. The area around the machine must be marked as a danger zone.

Make sure that the machine and the surrounding area are kept clean. In particular, oil and grease on the floor and on machine elements may cause slipping. Thus, they present a considerable risk of injuries, particularly in combination with tools.

The floor around the centrifugal pump must be provided with a non-slip finish.

In order to prevent any falls from or damage to the machine, it is forbidden to climb onto machine elements or on the machine (except for the treading areas provided). Use ladders or similar equipment in accordance with recognized standards.

Ramps, platforms and lifts must be used to avoid injury or excessive physical effort.

2.10 Temperature

As the temperature of the medium can exceed 73°C, the housing and covers prevent direct contact with the medium. Danger symbols mounted on the machine warn against the hot surface. It is compulsory to wear personal safety equipment in the immediate vicinity!

The operator is responsible for informing new personnel on the danger of burns and for implementing further safety measures, e.g. insulation or access restrictions.

No maintenance work should be carried out until the hot surface has cooled down.

2.11 Noise

The total noise emissions from all machines in the production room can restrict spoken communication and impair hearing.

The machine is designed such that no operating personnel is required in the immediate vicinity of the machine during normal operation. Appropriate hearing protection should be worn throughout maintenance and adjusting work while the machine is running.

Pump type	dB 1000 rpm	dB 1500 rpm	dB 3000 rpm
S80-265	70	75	82
S100-265	70	75	83
S125-265	70	75	83
S100-350	74	78	85
S125-350	74	78	85
S150-330	74	78	85
S125-400	75	79	86
S150-400	74	79	86
S200-380	74	79	
S150-470	78	82	
S200-470	78	82	
S250-430	80	84	
S350-470	81	85	
S500-600	82		

Tab. 2-3 Noise level

2.12 Electrical equipment

All work on the electrical equipment, without exception, must be carried out by skilled electricians.

Any form of contact with electrical equipment may cause fatal injuries.

Before beginning any maintenance or repair work, the operator must disconnect the energy supply to all drives securely. This can be achieved with a service switch, lockable racks in the MCC, or with other suitable measures that comply with the safety regulations.

Employees performing work on live parts should be accompanied by an assistant who can operate the emergency switch if necessary.

Users of medical electronic equipment, such as pacemakers, must not enter the electric danger zone.

Earthing

Machine must be earthed to avoid electrostatic loading. Machine, gears and motors must be connected to the earthing system.

Proper earthing must be restored after conducting maintenance work (e.g. check and set the earthing resistance).

2.13 Fluids (liquids, gases, vapour or smoke)

Unintentional chemical reactions may occur in the medium during a prolonged standstill and hazardous fumes may be produced.

The machine must be thoroughly cleaned after prolonged stoppages.

The area must be adequately ventilated.

Before beginning work on the machine, ensure that no liquids, gases, vapours or smoke can enter the working area from feed pipes, discharge pipes or shafts.

If it is not possible to reliably exclude the risk of liquids, gases, vapours or smoke flowing in, all persons working in the danger zone must be equipped with a safety harness and a safety rope. Each worker must be monitored by a second person outside the danger zone.

It must always be possible to evacuate a worker from the danger zone without delay.

Any leakage (e.g. at the shaft seal) of hazardous media (e.g. explosive, toxic, hot) must be drained off in such a way that there is no risk to individuals, nor to the environment. Any legal regulations must be observed.

2.14 Oils, lubricants and cleaning agents

The safety instructions for the products concerned must be observed when handling oil, grease and other chemical substances.

Suitable skin protection is required when handling aggressive media. See manufacturers' information for the type of skin protection required.

Also observe relevant requirements for disposal.

2.15 Chemicals

The centrifugal pump can be used in the chemical sector (except in chlorine bleaching and in the chlorine dioxide area) of the pulp and paper industry.

The following chemicals can be pumped:

- Hydrogen peroxide H_2O_2
- Caustic soda (sodium hydroxide) (NaOH)
- Silicate
- DTPA

Hydrogen peroxide (H_2O_2) and caustic soda (NaOH) can irritate or even burn the skin and mucous membrane, particularly the eyes, and can also lead to inflammations of the respiratory system.

In addition, please note that hydrogen peroxide (H_2O_2) is not combustible, but enhances the combustibility of other substances.

Reactions

In reactions with other substances, hydrogen peroxide (H_2O_2) and caustic soda (NaOH) can lead to highly exothermic reactions, heat generation, danger of ignition or generating of inflammable gases or vapours, even to a risk of explosion.

Safety data sheets

If chemicals are used, the measures prescribed in the safety data sheets for the individual chemicals must be observed.

The user shall be responsible for the following, among other things:

- Staff wearing personal safety attire, particularly adequate eye protection
- Installing water connections and emergency showers in order to rinse the eyes or skin under running water in the event of an emergency and have a source of drinking water if any chemicals are inadvertently swallowed
- Providing medical treatment in emergencies
- Preventing any chemical reactions that can lead to a risk of fire or explosion
- Regular training on the properties and handling regulations for the chemicals used

- Mounting of safety signs on the plant (e.g. "Warning against toxic and corrosive substances")
- Mounting a means of flushing out the pump
e.g.: Flange in the inlet pipe for cleaning aggressive media out of the pump
- Interlocking the chemicals feed so that no more chemicals can flow into the pump when the pump is shutdown
- Emptying the vent line safely to prevent possible contact with chemicals

3 TECHNICAL DESCRIPTION

3.1 General description

3.1.1 Field of application

The centrifugal pump is used in continuous operation to pump specified liquids and various pulps in the paper industry.
(see chapter headed Technical Data)

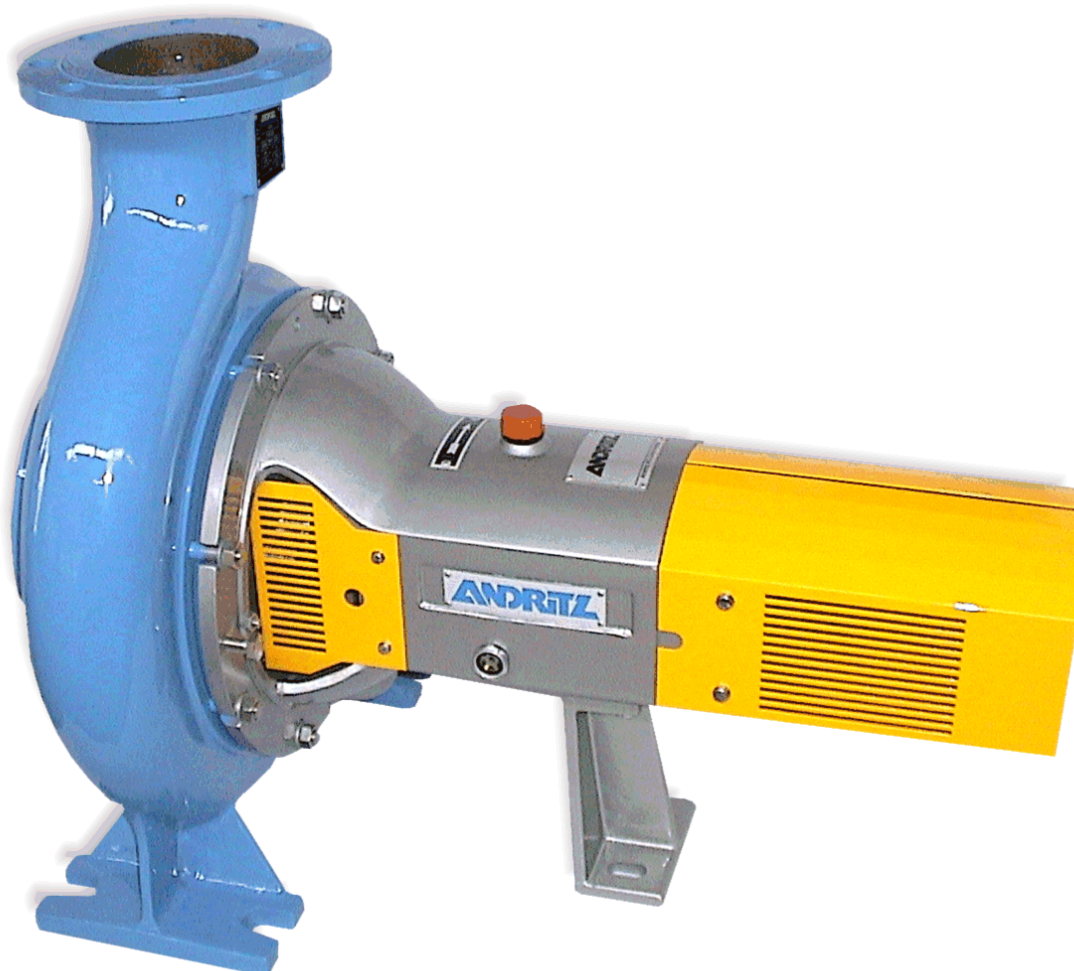


Fig. 3-1 Centrifugal pump

3.1.2 Design

Spiral casing centrifugal pump in process design. The impeller, the wear lining, the casing cover and the stuffing box body with the shaft seals and the bearing support can be assembled and disassembled without detaching the suction and delivery pipes.

Impeller (230)	<u>Function</u>: Accelerating the medium by charging it with energy. <u>Design</u>: Open three-vane or six-vane impeller with good efficiency
Spiral casing (102)	<u>Function</u>: Guiding the medium with a favourable flow pattern. Converting the speed energy into pressure energy. <u>Design</u>: • Pressure-sealed, single-flow pump casing with delivery and suction channels. • Suction and delivery flanges. • Hold the bearing housing with bearing assembly, shaft and impeller.
Pump shaft (211)	<u>Function</u>: Holding the impeller, shaft seal, bearing assembly and coupling. Transmitting the drive energy to the impeller and thus, to the medium. <u>Design</u>: Sturdily dimensioned drive shaft
Bearing assembly	<u>Function</u>: Interface between stationary and rotating parts. Absorption of axial and radial forces. <u>Design</u>: Impeller side Cylinder roller bearing (322) with plastic cage (steel cage optional). Drive side. Two angular contact ball bearings (320) with plastic cage (steel cage optional).
Shaft seal	Depending on operating requirements, there is a choice of six different shaft seals: • Single standard mechanical seal • Tandem standard mechanical seal • Stuffing box packing • Back-to-Back standard mechanical seal • Dynamic shaft seal • Andritz cartridge mechanical seal - single • Andritz cartridge mechanical seal - tandem

3.2 Main components

3.2.1 Centrifugal pump with base frame

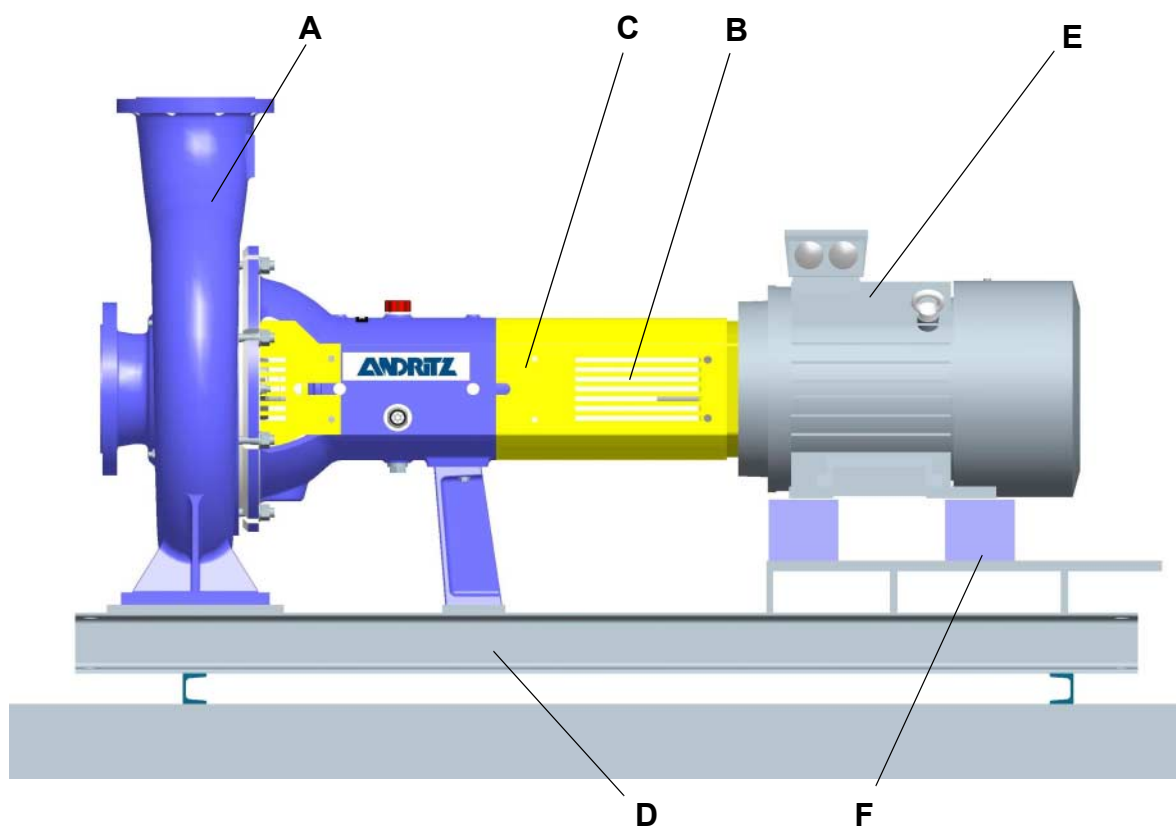


Fig. 3-2 Main components of the centrifugal pump

Item	Component	Item	Component
A	Centrifugal pump, complete	E	Motor (800)
B	Coupling (840)	F	Spacer (592)
C	Coupling guard (681)		
D	Base frame (891)		

Tab. 3-1 Main components of the centrifugal pump

3.2.2 Centrifugal pump

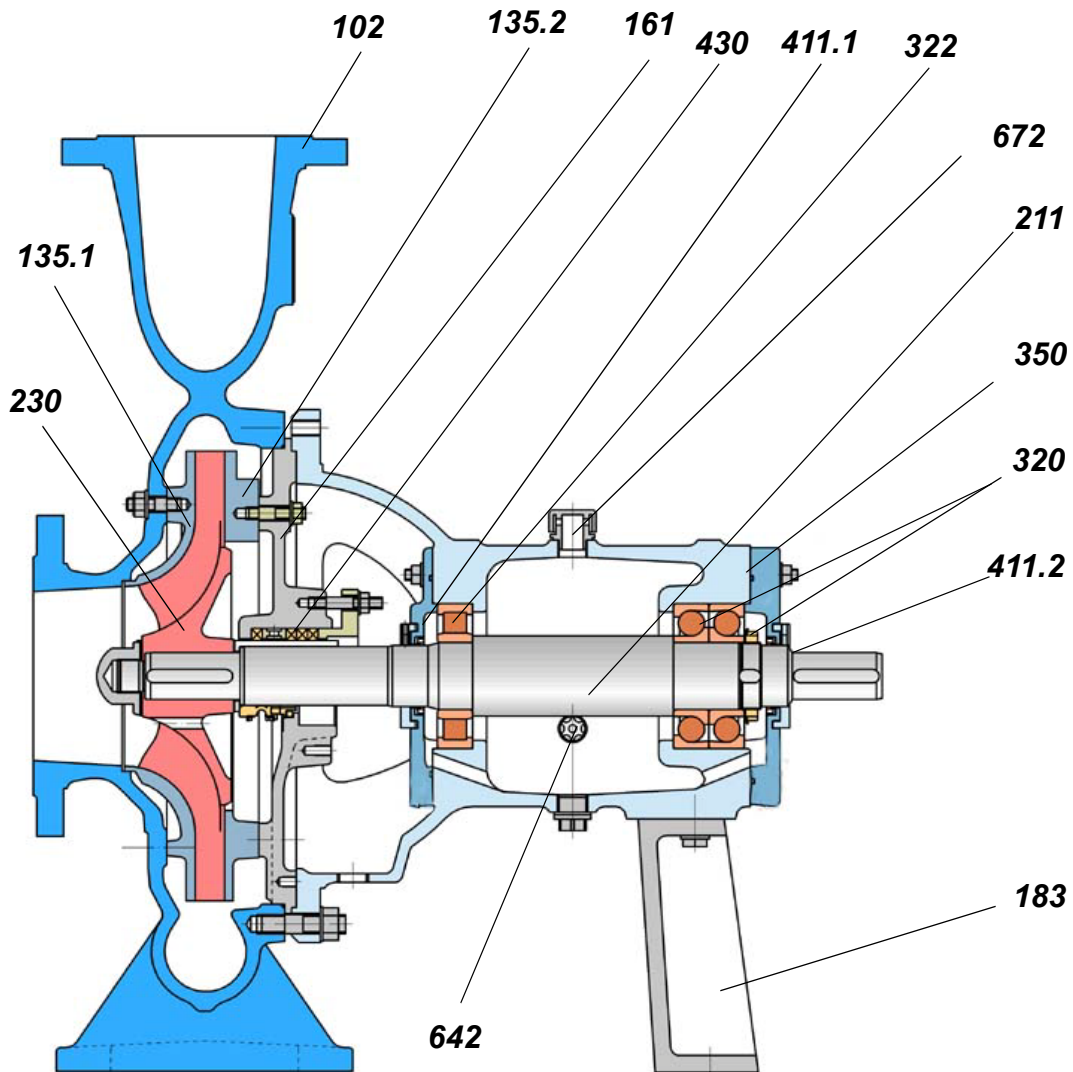


Fig. 3-3 Main section - centrifugal pump

Item	Component	Item	Component
102	Spiral casing	322	Cylindrical roller bearing
135.1	Front lining	161	Casing cover
230	Impeller	411	Rotary shaft seals
430	Shaft seal	672	Vent screw
350	Bearing housing	642	Oil level indicator
211	Shaft	183	Supporting leg
320	Roller bearing	135.2	Rear lining

Tab. 3-2 Principal section S-pump

3.3 Types of seal

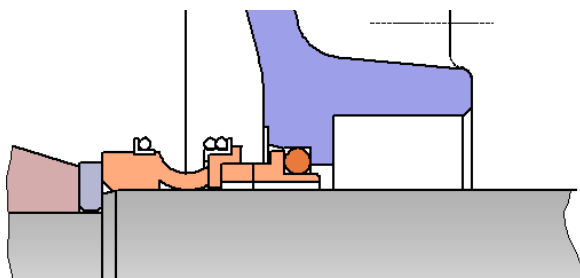


Fig. 3-4 Single standard mechanical seal

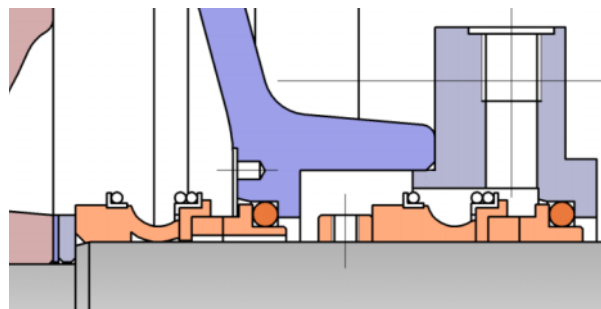


Fig. 3-8 Tandem standard mechanical seal

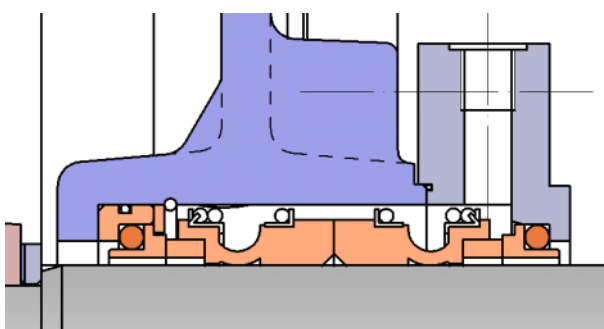


Fig. 3-5 Back-to-Back, standard mechanical seal

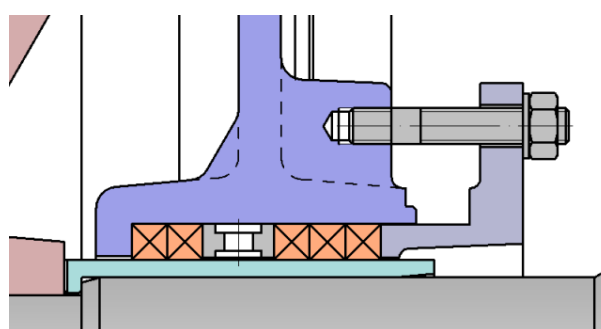


Fig. 3-9 Stuffing box

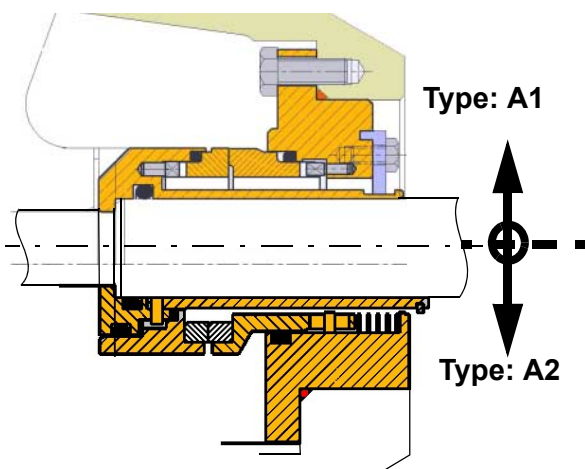


Fig. 3-6 Andritz cartridge mechanical seal - single

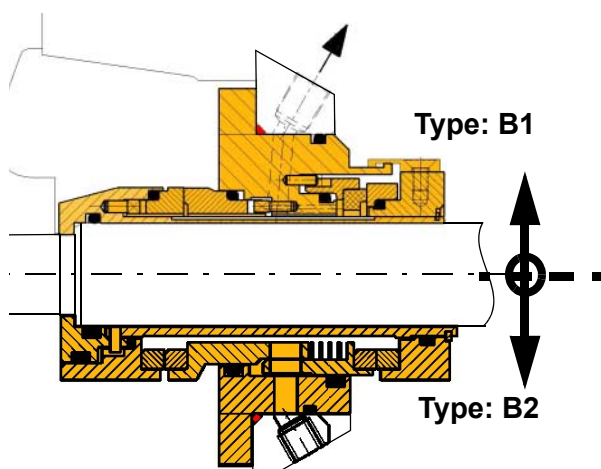


Fig. 3-10 Andritz cartridge mechanical seal - tandem

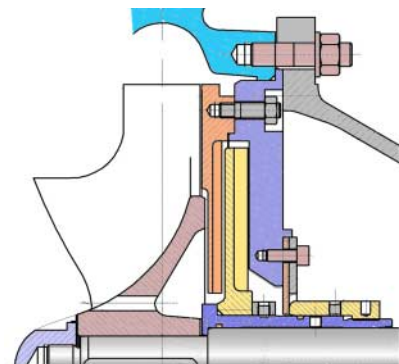


Fig. 3-7 Dynamic shaft seal

3.3.1 Single standard mechanical seal

Function: Seal between medium and the atmosphere. The mechanical seal is lubricated by the medium to be pumped.

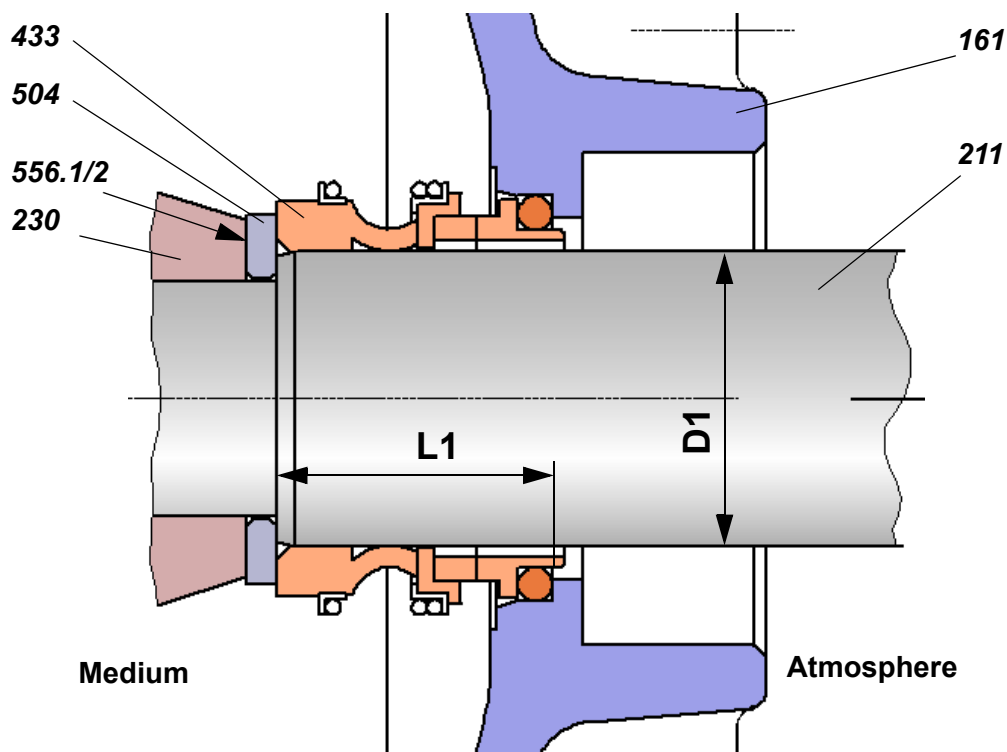


Fig. 3-11 Single standard mechanical seal

Item	Component	Item	Component
433	Mechanical seal	161	Casing cover
504	Spacer ring	211	Pump shaft
556	Spacer plate	230	Impeller

Tab. 3-3 Single standard mechanical seal

Bearing support size	28-S3	38-S3	42-S3	55-S3	80-S3
Shaft diameter D1[mm]	38	48	53	65	90
L1[mm]	45	45	47,5	52,5	65

Tab. 3-4 Sizes - Single standard mechanical seal

3.3.2 Andritz cartridge mechanical seal - single

Function: Seal between medium and the atmosphere. The mechanical seal is lubricated by the medium to be pumped.

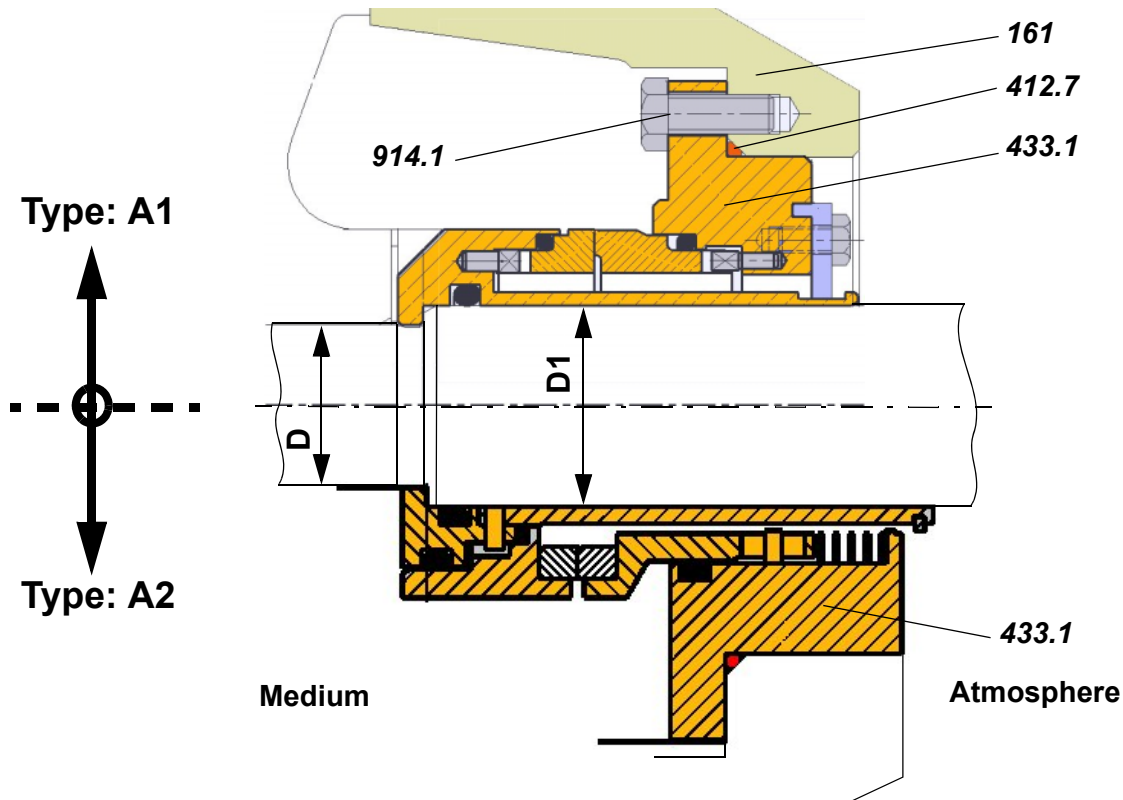


Fig. 3-12 Andritz cartridge mechanical seal - single

Item	Component	Item	Component
161	Casing cover	412.7	O-ring
433.1	Mechanical seal	914.1	Screw

Tab. 3-5 Andritz cartridge mechanical seal - single

Application limits:

T max: 100°C
p max: 16 bar
n max: 3000 r.p.m. (3600 r.p.m. at 60 Hz)

3.3.3 Andritz cartridge mechanical seal - tandem

Function: Seal between the medium and the atmosphere by sealing water between the medium-side and the atmospheric-side seal in order to guarantee functioning of the mechanical seal within special application limits.

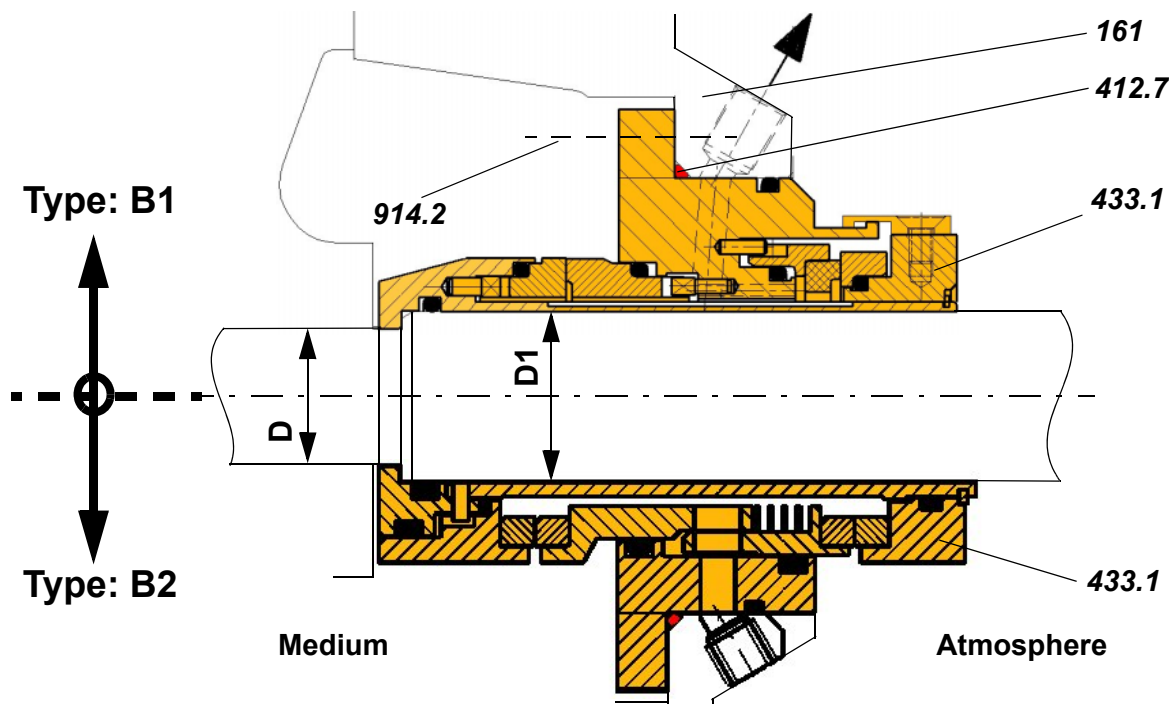


Fig. 3-13 Andritz cartridge mechanical seal - tandem

Item	Component	Item	Component
161	Casing cover	412.7	O-ring
433.1	Mechanical seal	914.2	Screw

Tab. 3-6 Andritz cartridge mechanical seal - tandem

Application limits:

T max: 180°
p max of medium: 25 bar
p max of sealing water: 12 bar
n max: 3000 r.p.m. (3600 r.p.m. at 60 Hz)

Monitoring

In order to guarantee proper operation, the sealing water must be monitored with suitable monitoring units according to the diagrams (Fig. 3-17, Fig. 3-18).

Sealing water connection and monitoring for the tandem standard mechanical seal:

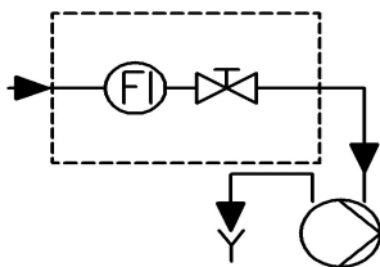


Fig. 3-14 Unpressurised

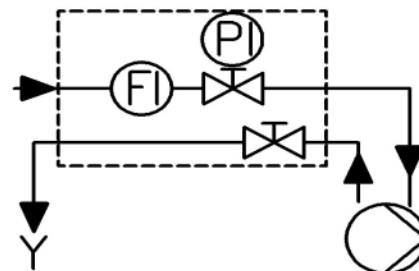


Fig. 3-15 Pressurised

Flow rate

The required sealing water flow rate is shown in Figure Fig. 3-23.

Sealing water pressure

Sealing water pressure. 0.5 - 12 bar

3.3.4 Tandem standard mechanical seal

Function: Seal between medium and the atmosphere. Sealing water between the medium-side and the atmospheric-side seal guarantees functioning of the mechanical seal within special application limits.

Seal design type MG12/MG12:

Mechanical seal on the medium side is lubricated by the medium. If there is no medium, the seal is lubricated from the liquid tank on the atmospheric side by means of a thermo-siphon and/or continuous external flushing.

The pressure in the sealing water system must be limited to 1 bar to prevent the mechanical seal on the medium side from opening.

Seal design type 587SP/S39-502 or 587SP/S39-2100:

It is recommended to use a pressurized sealing water system in order to guarantee that the two mechanical seals are lubricated with appropriate sealing liquid. If the sealing water pressure fails, the mechanical seal on the medium side is lubricated by the medium being pumped and the mechanical seal on the medium side does not open.

Medium

Atmosphere

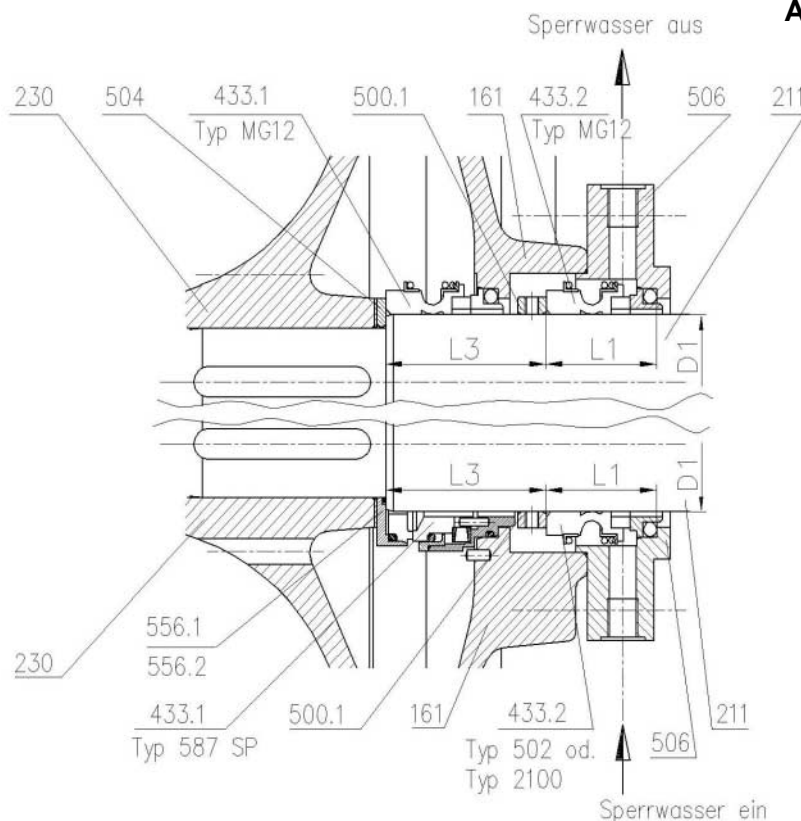


Fig. 3-16 Tandem standard mechanical seal

Item	Component	Item	Component
433.1/2	Mechanical seal	161	Casing cover
504	Spacer ring	211	Pump shaft
506	Retaining ring	230	Impeller
500.1	Set collar	556.1/2	Spacer plate

Tab. 3-7 Tandem standard mechanical seal

Bearing support size	28-S3	38-S3	42-S3	55-S3	80-S3
D1[mm]	38	48	53	65	90
L1[mm]	45	45	47,5	52,5	65
L3[mm]	65	66	68	74,5	90,5

Tab. 3-8 Sizes - Tandem standard mechanical seal

Sealing water pressure

Seal design: Unpressurised mechanical seal Type MG12/MG12

The mechanical seal on the medium side is lubricated by the flow medium. If there is no flow medium, it is lubricated by the sealing water on the atmospheric side.

Sealing water pressure. 1 bar max.

Seal design: Pressurised mechanical seal Type 587SP/S39-502 or Type 587SP/S39-2100

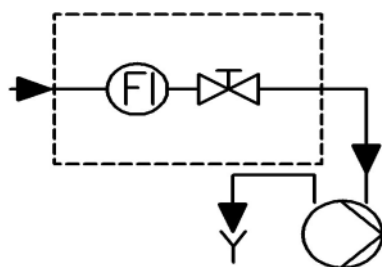
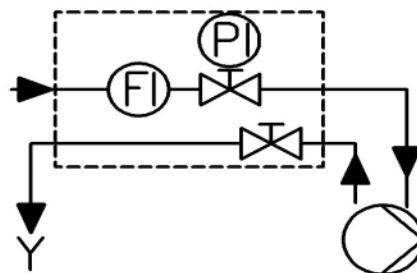
The required sealing water pressure for the pressurised mechanical seal, Type 587SP/S39, is shown in Tab. 3-9:

Bearing size	n=1000 rpm	n=1500 rpm	n=3000 rpm
28-S3	0,7 bar + P	1,5 bar + P	5,0 bar + P
38-S3	1,2 bar + P	2,5 bar + P	6,0 bar + P
42-S3	1,5 bar + P	3,0 bar + P	8,0 bar + P
55-S3	1,8 bar + P	3,5 bar + P	
80-S3	2,0 bar + P	3,5 bar + P	
	P = Feed pressure		

Tab. 3-9 Sealing water pressure for mechanical seal - Type 587SP

Monitoring

In order to guarantee proper operation, the sealing water must be monitored with suitable monitoring units according to the diagrams (Fig. 3-17, Fig. 3-18).

Sealing water connection and monitoring for the tandem standard mechanical seal:**Fig. 3-17** Unpressurised**Fig. 3-18** Pressurised**Flow rate**

The required sealing water flow rate is shown in Figure Fig. 3-23.

3.3.5 Back-to-Back standard mechanical seal

Function: Seal between medium and the atmosphere. Sealing water between the medium-side and the atmospheric-side seal guarantees functioning of the mechanical seal within special application limits.

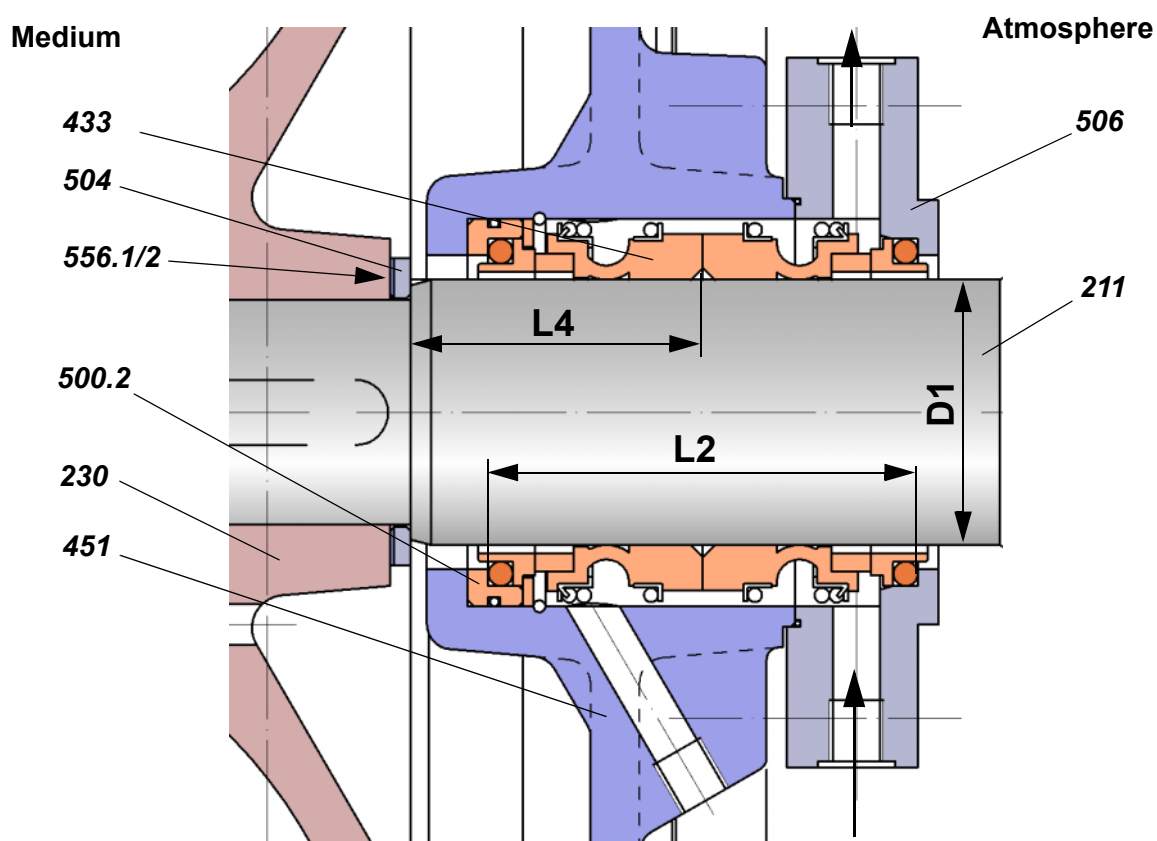


Fig. 3-19 Tandem standard mechanical seal

Item	Component	Item	Component
433	Mechanical seal	451	Stuffing box housing
504	Spacer ring	211	Pump shaft
566	Spacer plate	230	Impeller
500.2	Support ring		

Tab. 3-10 Tandem standard mechanical seal

Bearing support size	28-S3	38-S3	42-S3	55-S3	80-S3
D1[mm]	38	48	53	65	90
L2[mm]	90	90	95	105	130
L4[mm]	61	67	62,5	71,5	77

Tab. 3-11 Sizes - Tandem standard mechanical seal

Monitoring

In order to guarantee proper operation, the sealing water must be monitored with suitable monitoring units according to the diagram (Fig. 3-20).

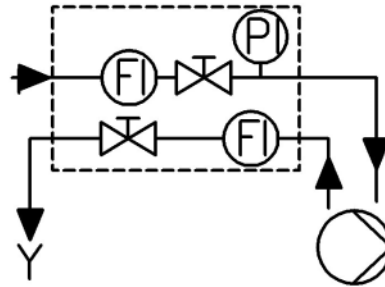
Sealing water connection and monitoring for the Back-to-Back standard mechanical seal:

Fig. 3-20 Monitoring - stuffing box

Mechanical seal:

Data on the limit values for the mechanical seal with regard to pressure and temperature can be found in the manufacturer's operating manual.

➡ /KREISELPUMPE S/SUPPLIER DOCUMENTATION/...

3.3.6 Stuffing box

Function: Seal between medium to be conveyed and the atmosphere, formed by packing rings and sealing water.

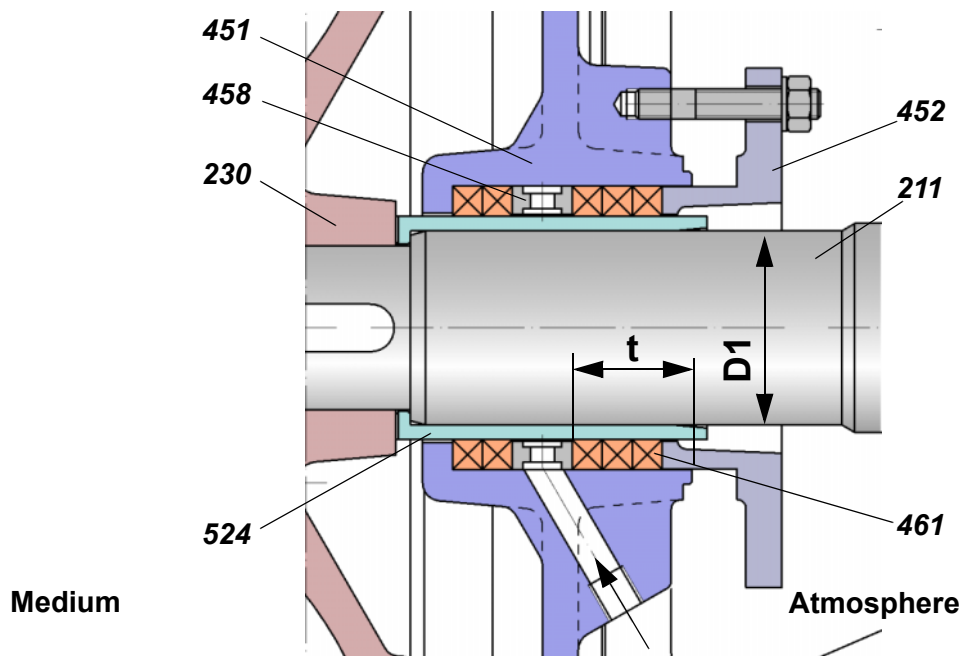


Fig. 3-21 Stuffing box

Item	Component	Item	Component
451	Stuffing box housing	461	Gland packing
452	Stuffing box gland	524	Shaft protection sleeve
458	Locking ring	211	Pump shaft
230	Impeller		

Tab. 3-12 Stuffing box

Bearing support	28-S3	38-S3	42-S3	55-S3	80-S3
D1[mm]	38	48	53	65	90
t [mm]	36	36	40	40	56
Packing [mm]	10	10	10	10	12
Approx. packing length [mm]	190	230	245	275	380
No. [pcs.]	1+3	1+3	1+3	2+3	2+4
Sealing water quantity [l/min]	2	2	2	3	3

Tab. 3-13 Sizes - stuffing box

Sealing water pressure

Bearing size	n=1000 rpm	n=1500 rpm	n=3000 rpm
28-S3	0,7 bar + P	1,5 bar + P	5,0 bar + P
38-S3	1,2 bar + P	2,5 bar + P	6,0 bar + P
42-S3	1,5 bar + P	3,0 bar + P	8,0 bar + P
55-S3	1,8 bar + P	3,5 bar + P	
80-S3	2,0 bar + P	3,5 bar + P	
P = Feed pressure			

Tab. 3-14 Sealing water pressure to stuffing box

Flow rate

Bearing support	28-S3	38-S3	42-S3	55-S3	80-S3
Flow rate [l/min]	2	2	2	3	3

Tab. 3-15 Sealing water flow to stuffing box

Monitoring

In order to guarantee proper operation, the sealing water must be monitored with suitable monitoring units according to the diagram (Fig. 3-22).

Sealing water connection and monitoring for the stuffing box:

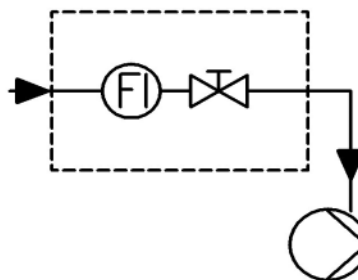


Fig. 3-22 Unpressurised

3.4 Sealing water data

Data

Quality	Pure water Mechanical contamination: 80 microns max.
Temperature	10°C min. - 30°C max.
Solids content	2 mg/l max.

Tab. 3-16 Sealing water data

Flow rate

Required sealing water flow rate for mechanical seals:

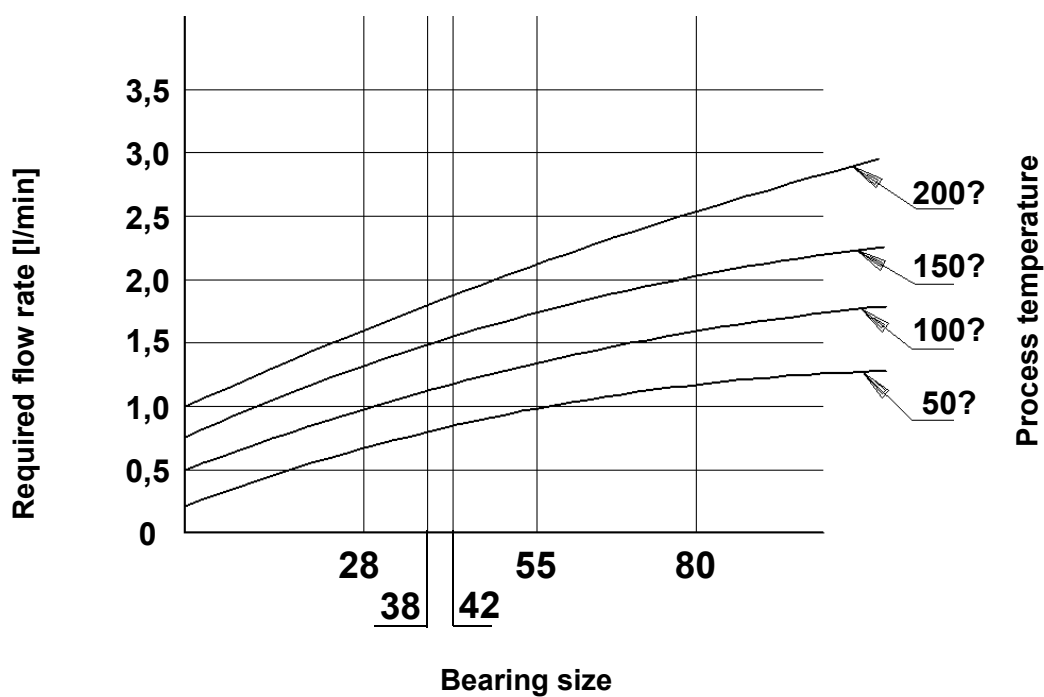


Fig. 3-23 Required sealing water flow rate for mechanical seals

3.4.1 Dynamic shaft seal

Function: Seal between medium to be conveyed and atmosphere by means of hydraulic counter-pressure. The hydraulic counter-pressure is generated by a special second impeller. During shutdown the seal is provided by a shutdown seal.

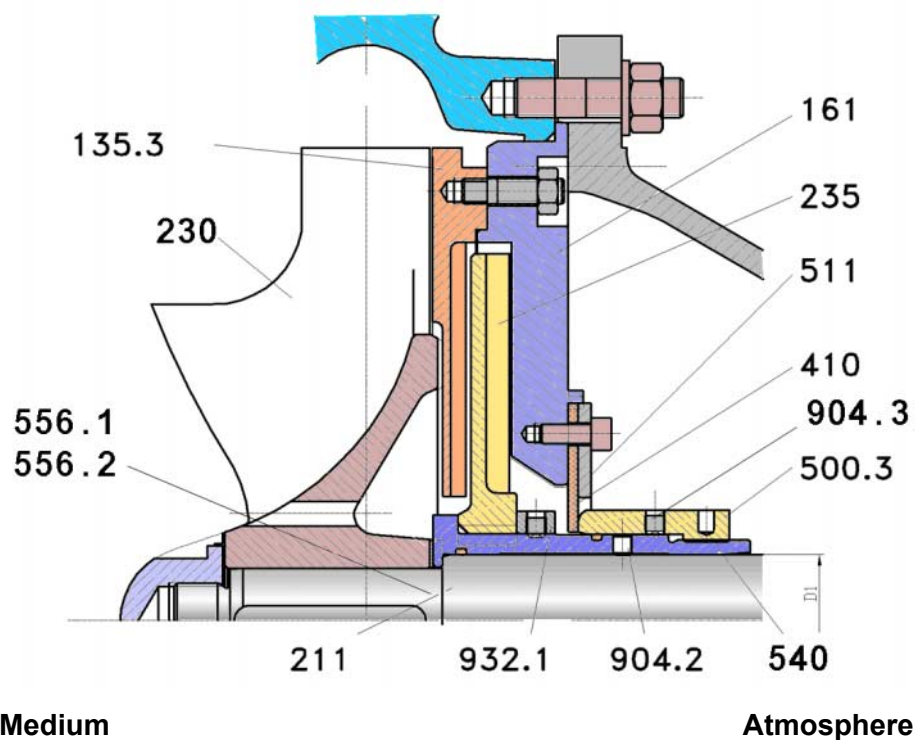


Fig. 3-24 Dynamic shaft seal

Item	Component	Item	Component
230	Impeller	511	Support ring
211	Pump shaft	540	Bush
135.2	Rear lining - Dynaseal	932.1	Clamping ring
161	Housing cover - Dynaseal	904.2	Set screw
235	Impeller	904.3	Locking screws
410	Maintenance seal	556.1	Spacer plate
500.3	Set collar	556.2	Spacer plate

Tab. 3-17 Dynamic shaft seal

Bearing support	28-S3	38-S3	42-S3	55-S3	80-S3
D1[mm]	38	48	53	65	90
ΔP [kW]	1,2*	1,5*	2,0*	2,2*	2,5**

Tab. 3-18 Shaft diameter and additional required shaft power for dynamic seal at *1500 rpm / ** 1200 rpm

3.5 Type specification

3.5.1 Applicable standards

Dimensions	ISO 2858
Design	ISO 5199
Inspection (Q, H, NPSH)	ISO 9906 Class II
Product safety	EN 809, EN ISO 12100-1 and EN ISO 12100-2
Flanged drilling	ISO 2084, PN 10 (DIN 2501, SFS 2123)
	ISO 2084, PN 16 (DIN 2501, SFS 2123)
	ISO 2084, PN 25
Special flange bore	JIS B2210 10K
Special flange bore	JIS B2210 16K
Special flange bore	ANSI B 16.1 Class 125
Special flange bore	ANSI B 16.5 Class 150

3.5.2 Model designation

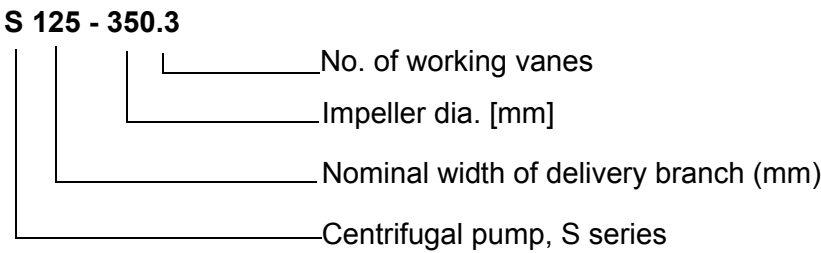


Fig. 3-25 Type code

Name plate

Each centrifugal pump has a type plate mounted on the spiral casing showing the main pump data.

	Q	Flow rate (m ³ /h)
	H	Head (m)
	P	Motor output (kW)
	n	Motor speed (rpm)
	C	Consistency (%)
	T	Temperature (°C)

Fig. 3-26 Name plate

3.6 Application limiting values

Shaft seal	The application limit for the appropriate shaft seal must be requested in writing from the pump manufacturer or can be obtained from the data sheet (see Chapter on "Technical Data").
Material to be conveyed/medium	The centrifugal pump S is used to pump non-combustible liquids and pulps. Before planning the use of combustible liquids (solvent, petrol, alcohol, etc), it is essential to consult ANDRITZ AG beforehand! Lower flashpoints of combustible liquids can lead to hazards due to fire or explosion.
Zone allocation	The S centrifugal pump is not intended for use in a potentially explosive environment/atmosphere. The S centrifugal pump is intended for use outside a zone, according to guideline 1999/92/EG (gases/vapours and dust). A change of zone, e.g. to Zone 22 or Zone 2, must be documented in writing and can entail additional costs or delays in delivery.

3.6.1 Loads on connecting branches

Permitted loads on connecting branches

The permitted loads on connecting branches according to the table (Tab. 3-19) must be observed.

- Force in **N**
- Torque in **Nm**

As a general principle, the suction and delivery pipes must be connected up stress-free. We recommend checking this item before initial start-up.

Nevertheless, it is inevitable that certain forces and moments will occur during operation

The values given are valid for stainless steel. For greycast iron those values have to be multiplied with the factor 0,5..

Pump type	Forces [N]		Moments [Nm]	
	F_y	$F_x = F_z$	M_{xy}	$M_{zx} = M_{zy}$
S80-265	1750	1435	650	400
S100-265	2345	1890	650	400
S125-265	2765	2240	650	400
S100-350	2345	1890	850	550
S125-350	2765	2240	850	550
S150-330	3500	2835	850	550
S125-400	2765	2240	1200	650
S150-400	3500	2835	1200	650
S200-380	4690	3780	1200	650
S150-470	3500	2835	1600	850
S200-470	4690	3780	1600	850
S250-430	5845	4725	1600	850
S350-470	8155	6580	2100	1100
S500-600	11620	9415	3000	1500

Tab. 3-19 Permitted loads on connecting branches

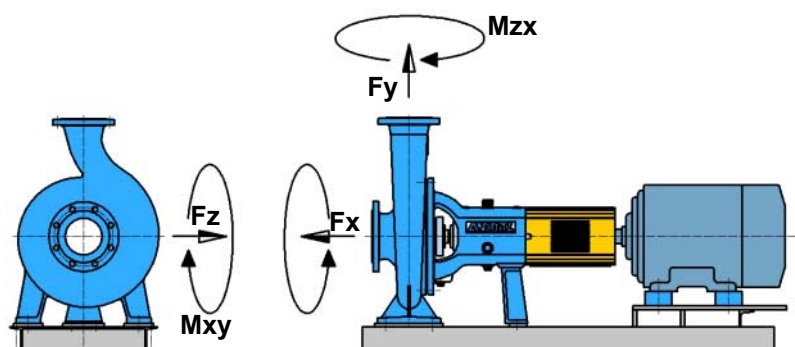


Fig. 3-27 Permitted loads on connecting branches

3.7 Technological description

Definition

The centrifugal pump is used for an application according to the purchase order specification to convey specified media for the purpose of increasing the pressure. The centrifugal pump should only be used according to the manufacturer's instructions. If any changes are made and the pump is to be used for an application not specified, the manufacturer must be contacted beforehand.



Fig. 3-28 Centrifugal pump

Supply of medium

The medium reaches the impeller through a suction pipe that connects up to the horizontal axial flange.

Pressure increase

The medium is drawn in by the single-flow impeller in axial direction.

In the impeller, the medium undergoes radial acceleration - thus obtaining speed energy - due to the rotational energy and the shape of the blades (changing from axial to radial). In the spiral casing the speed energy is converted into pressure energy. The medium then enters the delivery pipe, which is connected to the vertical outlet flange.

3.8 V-belt drive

Mounting the V-belt

Please note the following when installing the V-belt and/or the drive motor:

Installation clearance x/y Fig. 3-29

Please note that the spacing of the V-belt pulleys must be reduced so that the belts can be installed without being damaged.

Since the centre distance widens later during operation due to the belt stretching, this fact must be taken into account right away during erection work.

Centre distance of belt pulleys:

Minimum setting range: $x = 25 \text{ mm}$, $y = 20 \text{ mm}$

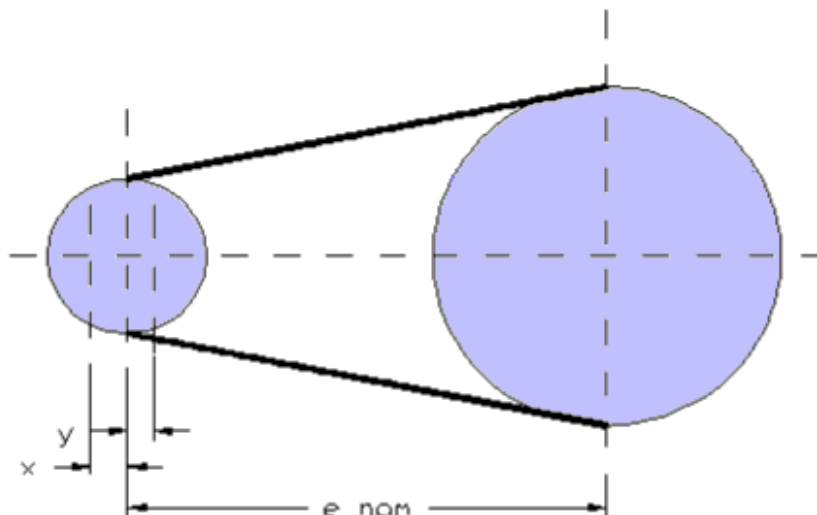


Fig. 3-29 Mounting the V-belt

Belt pre-tension

The correct belt pre-tension is immensely important in obtaining perfect power transmission and achieving the normal belt service life. Too little or too much pre-tension frequently leads to the belts failing prematurely. Overstretching the V-belts often leads to bearing damage at the drive or machine.

Check the belt pre-tension via the depth of impression of the run.

Simplified belt pre-tensioning

This simplified pre-tensioning method is intended to make maintenance work on the V-belt drives easier for the fitter if the most important technical data are not known and the optimum pre-tension cannot be calculated as a result.

With this "simplified method", only the pulley diameter and the centre distance are required. This process does not apply to raw-edged V-belts.

$$Ea \sim \frac{E \cdot e}{100} = \frac{2.3 \cdot e}{100} = \sim 20 \text{ mm}$$

The test force $f = 50 \text{ N}$ should be applied at right angles in the centre of the run. The drive must be tensioned until the calculated depth of impression is obtained.

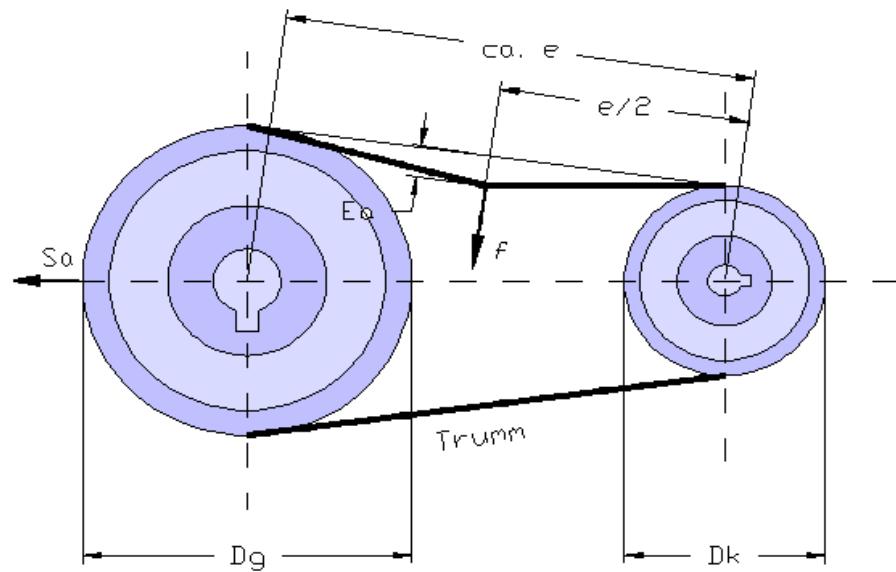


Fig. 3-30 Belt pre-tension

4 ERECTION WORK and TRANSPORT

4.1 General

This chapter describes certain steps for transport, storage and installation of the centrifugal pump, which may be the responsibility of the operator.

Activities that are carried out by ANDRITZ AG, including works assembly, are not the subject of this description.

4.2 Safety instructions



Do not disregard the safety regulations.

If the safety regulations are disregarded, this may cause a risk to life and limb and damage to the machine or its components.

All safety instructions in this section must be strictly observed!

General safety instructions

All applicable accident prevention regulations must be observed.

Do not exceed permissible crane loads and weights on lifting gear and ropes/shackles. Secure loads against falling down.

Do not step or walk below suspended loads! Standing below suspended loads can have fatal consequences and thus is strictly forbidden!

Jolts must be avoided. This refers especially to the handling of pre-assembled machines.

Qualification of personnel assigned

Transport and unloading of the machine are to be carried out by personnel specially familiar with such work.

Workers entrusted with lifting and conveying equipment must have the national qualifications required.

Erection work may only be carried out by trained, skilled personnel.

Personal protective apparel

The following protective equipment must be worn when carrying out installation and transport work:

- Hard hat
- Protective gloves
- Protective shoes
- Goggles

Tools

Only use tools of a reputable brand and in good condition for any work performed on the centrifugal pump.

4.3 Haulage



During transport of the centrifugal pump or loading/unloading (pump may fall).

The loading equipment must bear the name of the manufacturer, the type of material and the permitted load!

Do not lift machine and transport crates except at the points marked for lifting by crane or forklift!

Do not step or walk below suspended loads!

Delivery

The centrifugal pump is supplied pre-assembled. Machine components and auxiliary materials are packed in crates.

Transport sizes and weights are stated in the shipping documents.

Acceptance

- Check whether supply is complete (against shipping documents and packing lists) and in perfect condition.
- In the event of transport damage or short supply, do not accept goods but notify forwarder and ANDRITZ AG's shipping department.
- If there is a hidden defect or any damage, notify forwarder and ANDRITZ AG's shipping department within two weeks from the date of receipt of the goods.

Lifting the entire centrifugal pump

After being fully unwrapped, the entire centrifugal pump should only be lifted as follows:

- The complete centrifugal pump should only be raised if the lifting devices have been attached under the suction pipe and at the motor plate.
- The lifting devices must be short enough to prevent the pump from tilting.



Take care to maintain the balance

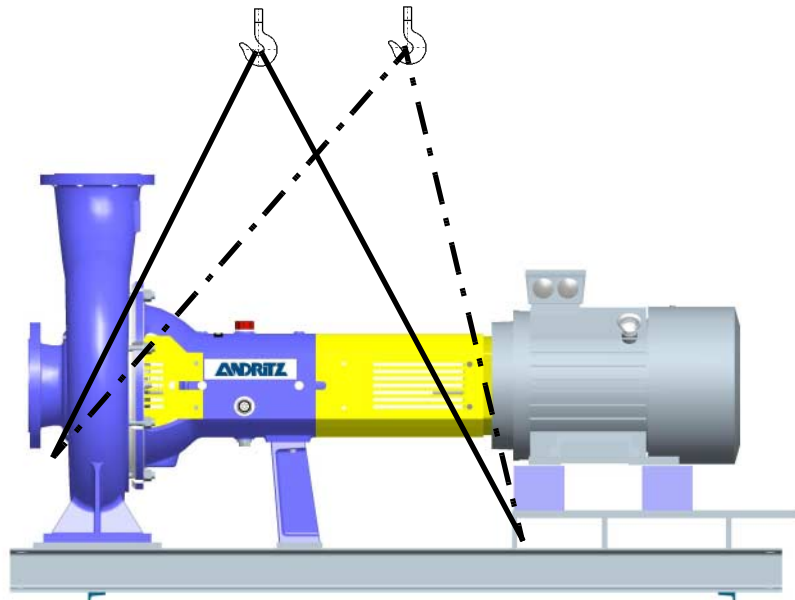


Fig. 4-1 Lifting the entire centrifugal pump



Never lift the entire pump at the bearing support window only.
This could cause a risk to life and limb and damage to the pump.

Lifting the centrifugal pump with free shaft

The centrifugal pump with free shaft should only be raised as follows:

- The pump should only be lifted if the lifting devices have been mounted under the suction branch and at the shaft end.
- The lifting devices must be short enough to prevent the pump from tilting.



Take care to maintain the balance.

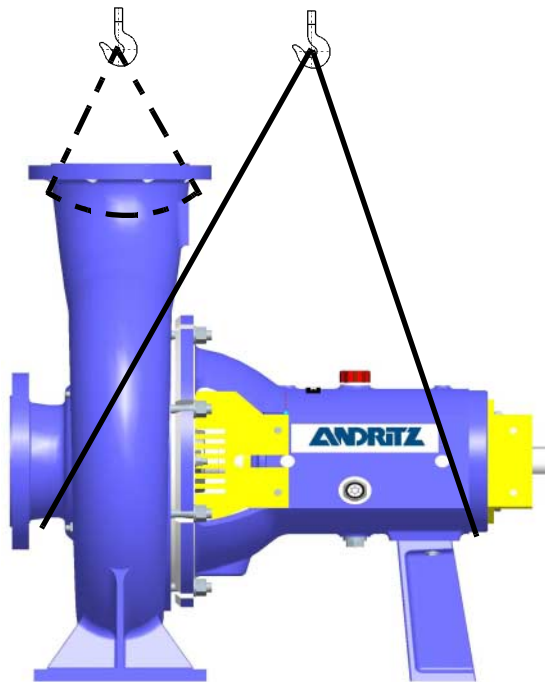
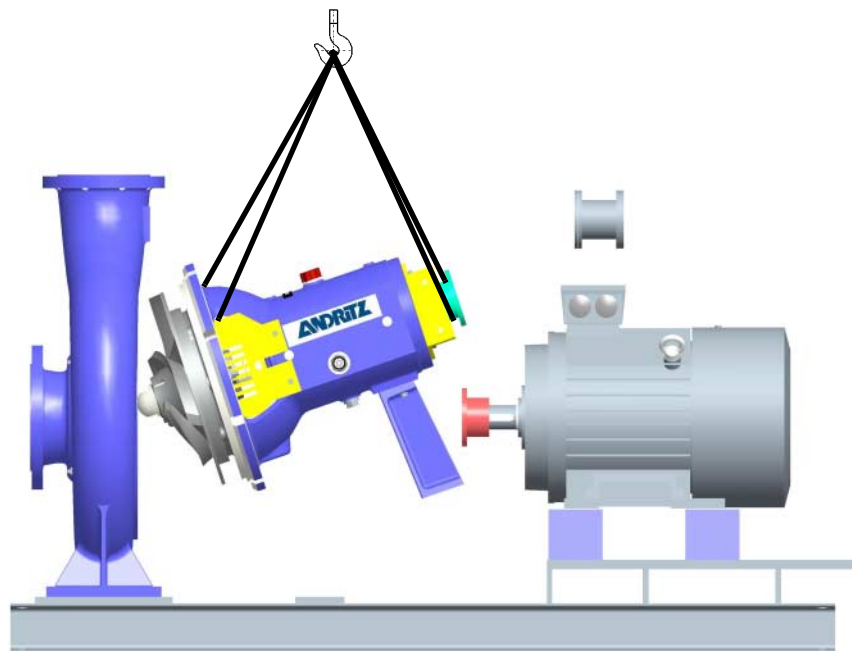


Fig. 4-2 Lifting the centrifugal pump

Lifting the pull-out unit**Attach lifting slings at the points marked in Fig. 4-3:**

- Through the bearing support windows
- Between the coupling half and the bearing cover (360.2)
- Secure sling to lifting hook and tension slightly.

**Take care to maintain the balance.****Fig. 4-3** Lifting the pull-out unit

4.4 Storage

Observe the following instructions for storage up to the beginning of erection work:

- Store the centrifugal pump with suitable weather protection. In particular, avoid wide variations in temperature and ensure that the equipment is kept clean.
- If there is no oil or grease in the bearing housing, it must be filled with oil or grease, as required, to protect the bearing assembly against corrosion. The bearings are dispatched complete with a first grease filling if they are to be installed at the customer's plant.
- If the bearings have oil lubrication, they are protected by preserving oil for approx. 6 months.
- Packaging should not be removed until field installation work begins.
- Rotate the pump shaft manually once every 4 weeks to avoid any damage to the shaft bearings.

Long-term storage

If the pump is to be stored for more than six months before erection work begins, please observe the following storage instructions:

- Incidentals should be protected against damage and unauthorised withdrawal by storing in a lockable room.
- Empty all liquids (water and residual pulp) out of the centrifugal pump.
- If the centrifugal pump has a casing of grey cast iron and a stuffing box packing, remove the packing cord and coat the stuffing box body with an anti-rust agent.
- If the bearings have oil lubrication, they are protected by preserving oil for approx. 6 months. After this period a new preserving layer must be applied.



Fresh grease must be filled into the bearing housing if the pump has been in storage for some time before start-up.

Anti-rust agents must be removed entirely.

If the pump is oil-lubricated, it is sufficient to simply top up with operating oil. The first oil change, however, must be carried out after approximately 200 operating hours.

4.5 Installation

General

Installation takes place in accordance with the sequence plan defined by ANDRITZ AG.



Disregarding the sequence plan and the installation instructions may result in hazardous situations causing a danger to life and limb, as well as machine damage.

The sequence of erection work is important and must be strictly observed!

Completion of the various steps must be documented in the certificate of completion of erection work.



The sequence of erection work is shown in step-by-step tables. The individual activities are numbered according to the sequence in which they are to be performed.

Preservation

Those machine components which are not corrosion-resistant should be protected against corrosion with preserving grease.

The preservative grease need not be removed.

Required documentation at installation site

The following supplementary documentation must be available at the beginning of installation work:

- Foundation and arrangement drawing
- Assembly drawings
- Documentation on electrical, measuring and control equipment
- Parts lists
- Packing lists for each individual consignment

Space requirement for erection work, operation and maintenance will be defined together with the ANDRITZ AG representative in charge before the beginning of field installation work.

Ambient temperature during field installation should not be less than 10-15°C.



Due to the centrifugal pump or components of the centrifugal pump falling during transport on installation site.

Raise centrifugal pump according to the transport instructions in Section 4.3.

Do not step or walk below suspended loads!



Limbs can be trapped or crushed during installation.

Wear your personal protective apparel.

4.5.1 Mounting the centrifugal pump

Foundation

The foundation should be made according to ANDRITZ AG's foundation plan.

The following preparations have to be made prior to placing the centrifugal pump on the foundation:

- Mark axes and elevations on the foundation.
- Check the workmanship of the foundation before beginning erection work.

Mounting and foundation work

The item numbers in the table (Tab. 4-1) refer to Figure Fig. 4-4

Step	Activity
1	Lift centrifugal pump onto the foundation and place on the support rails. Height of support rails: 50 - 100 mm ➡ Raise the centrifugal pump according to Section 4.3, Fig. 4-1 Align axes and height of the pump according to the plant requirements.
2	Transfer the fastening points from the base frame to the foundation. Drill block holes and insert dowels.
3	Insert the threaded rod (Item 5) from above and screw on 2 washers and 2 hexagon nuts (Items 4, 6) between the foundation and the base frame. Screw threaded rod (Item 5) into the drilling anchor and tighten with the fastening nut (Item 6).
4	Raise pump unit with the setting nuts (Item 4) and remove the support rails.
5	Set the pump unit with setting nuts and tighten on the base frame with the fastening nuts (Item 3).
6	Cut off and debur the threaded rod with 5 mm allowance (see Fig. 4-4).
7	Grout base frame in up to the top edge of the special section tube with non-shrinking cast concrete and leave to set (approx. 2 days). At least concrete strength category according to EN206-1. C16/20

Tab. 4-1 Mounting and foundation work

Step	Activity
8	Mounting the motor: Draw the drilling coupling half flush onto the motor stub and secure on the feather key with a set screw. Mount motor on motor base frame (893). If there are no fastening threads in the motor base frame, transfer the bore holes from the motor and drill the threads accordingly. The axle height of the motor is established by the spacers (898.1). If the centrifugal pump is ordered specifying the motor, the correct spacers will be mounted.

Tab. 4-1 Mounting and foundation work**WARNING**

Transport devices that are forgotten may result in risks to life and limb and in damage to the machine.
Dismount all transport devices.

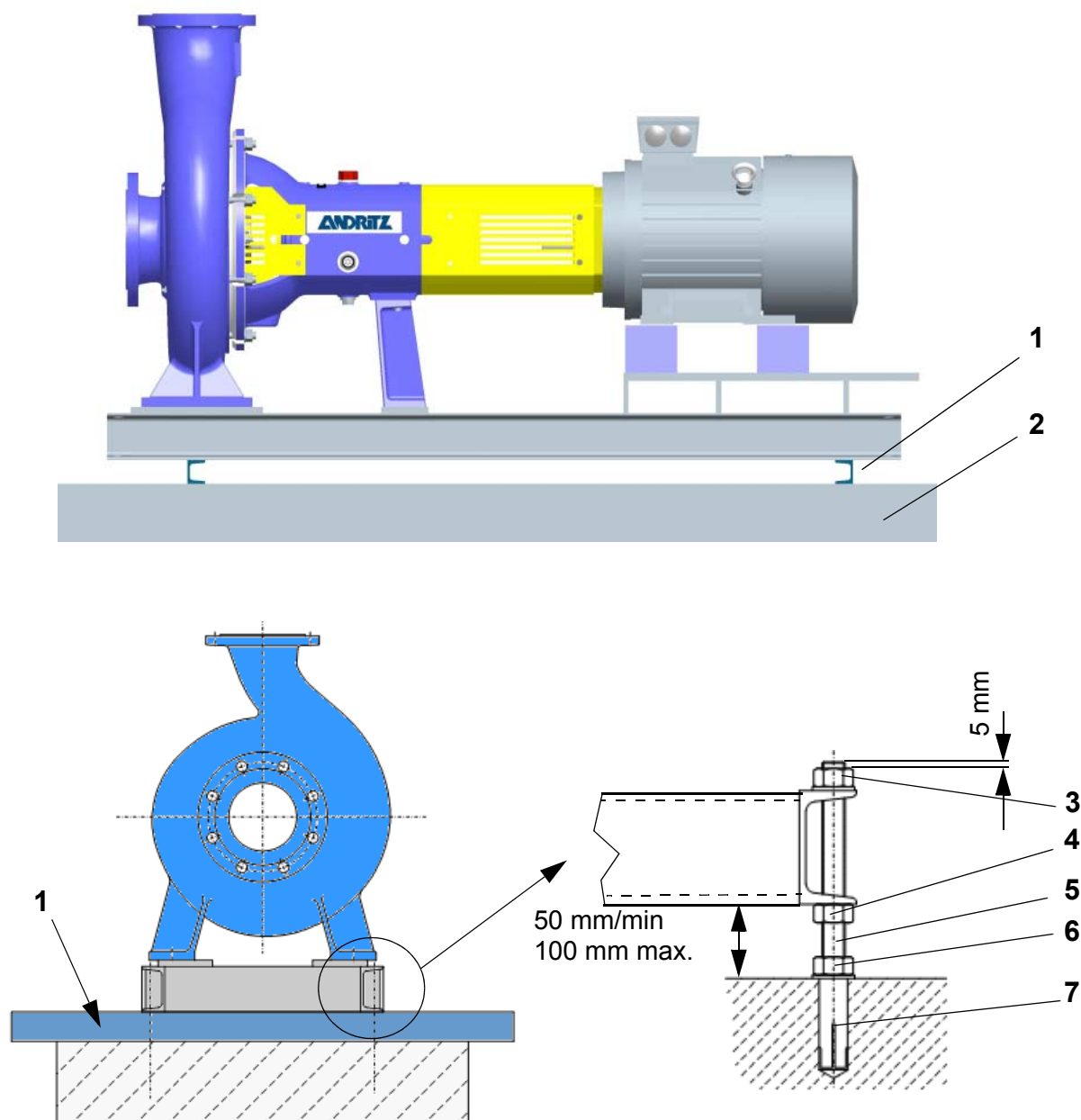


Fig. 4-4 Mounting and foundation work

Item	Component	Item	Component
1	Support rails	5	Threaded rod
2	Foundation	6	Fastening nuts
3	Fastening nuts	7	Flush anchor
4	Adjusting nut		

4.6 Foundation drawing

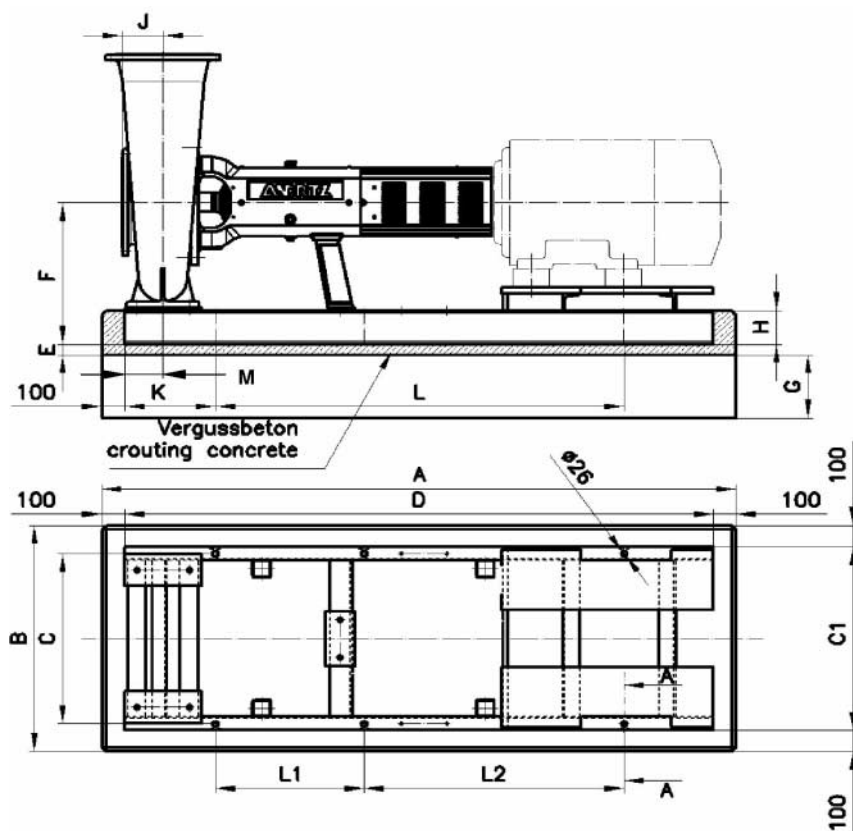


Abb. 4-5 Foundation drawing (dimensions in mm binding)

Type	A	B	C	C1	D	E _{min}	E _{max}	F	G	H	J	K	L	L1	L2	M
S80-265	1425	650	405	450	1225	50	300	330	300	80	130	25	1175			140
S100-265	1425	650	405	450	1225	50	300	330	300	80	130	25	1175			
S125-265	1425	650	405	450	1225	50	300	330	300	80	130	25	1175			
S100-350	1700	750	500	550	1500	50	300	425	300	100	130	25	1450			160
S125-350	1700	750	500	550	1500	50	300	425	300	100	130	25	1450			
S150-330	1700	750	500	550	1500	50	300	425	300	100	130	25	1450			
S125-400	1880	800	550	600	1680	50	300	468	300	100	150	25	1630			190
S125-400.2	2200	970	715	770	2000	50	300	502	300	120	150	145		480	935	145
S150-400	1880	800	550	600	1680	50	300	468	300	100	150	25	1630			190
S150-400.2	2200	970	715	770	2000	50	300	502	300	120	150	145		480	935	145
S200-380	1880	800	550	600	1680	50	300	468	300	100	150	25	1630			190
S150-470	2370	970	715	770	2170	50	150	542	300	120	160	340		385	1005	145
S200-470	2370	970	715	770	2170	50	150	542	300	120	160	340		385	1005	
S250-430	2370	970	715	770	2170	50	150	542	300	120	160	340		385	1005	
S350-470	2795	1070	805	870	2595	50	150	672	300	160	180	400		655	1145	170
S500-600	3095	1300	1030	1100	2895	50	150	830	300	200	340	220		1305	1305	220

Tab. 4-1 Dimensions - foundation drawing

4.6.1 Pipework



.. if pipework is not mounted professionally.

This can result in risks to life and limb and in damage to the machine.

Under no circumstances should the centrifugal pump be used to support a pipe!



If there is risk of dangerous backflow after the pump is shut down, a reflux check device must be installed in the delivery pipe!

When planning the pipework, a supplement must be included for thermal expansion.

Support

Pipes should always be mounted stress-free. During erection work, ensure that the pipes are supported in such a way that no forces, vibrations or weight can be transferred to the pump.

Maximum permitted forces and torques that the pump can absorb can be found in the Chapter headed "Technical Description" under "Permitted load on supports".

The suction and delivery pipes should be supported in such a way that the weight of the pipe is not transferred to the centrifugal pump.

4.6.2 Aligning the coupling

Data on the coupling used (tolerances, application limits, aligning information, etc.) can be found in the manufacturer's operating instructions.

➡ /KREISELPUMPE S/ SUPPLIER DOCUMENTATION/COUPLING

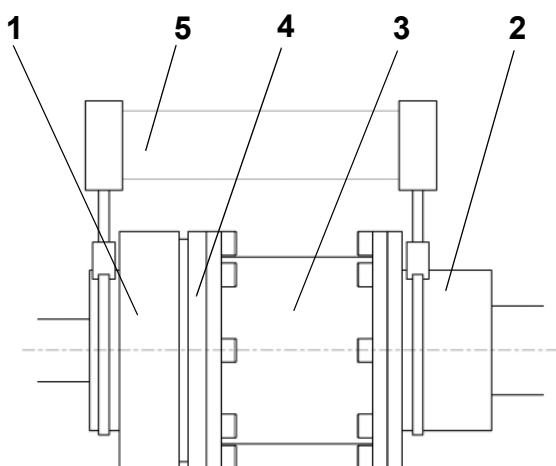


Fig. 4-6 Electronic aligning

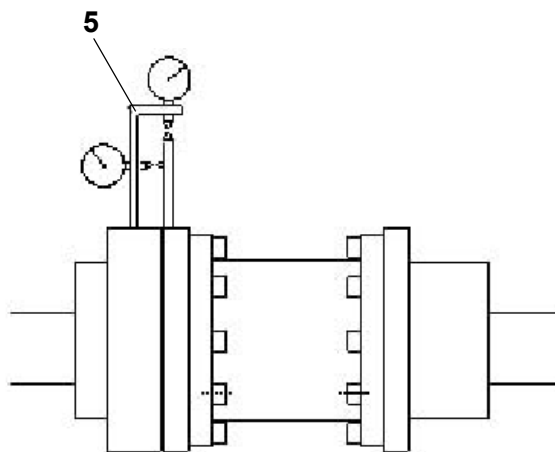


Fig. 4-7 Conventional aligning

Item	Component	Item	Component
1	Hub - pump side	4	Flexible part
2	Hub - motor side	5	Coupling aligning device
3	Spacer sleeve		

The coupling must be aligned with a suitable device.

The tolerances observed when aligning the coupling are to be recorded in the erection work report on the coupling.

After the coupling has been set, it must be fitted with a coupling guard according to the regulations issued by the authorities.

Suction pipe

The following must be observed at the suction pipe:

- The suction pipe should be kept as short as possible to keep pipe friction losses to a minimum.
- Run a pressure test to check the pipe for leaks.
- The suction pipe should be mounted horizontal or sloping slightly downwards towards the centrifugal pump.
- If a reducing piece is installed directly upstream of the centrifugal pump, the narrowing section thereof should always be at the bottom (Fig. 4-8).
- Inlet points in the suction pipe should be located at a distance from the centrifugal pump suction flange that is equivalent to a minimum of 3 times the diameter of the suction pipe.
- If a cleaning port is provided in the suction pipe, the following points relevant to safety must be observed:
 - The port may only be opened when the pump is at a standstill
 - If chemicals are used, flush out properly before opening.
 - For safety reasons, the pump must be prevented from starting up before it is opened (lockable maintenance switch or mains disconnecter)
- Safety equipment ➡ see Chapter 2.8.

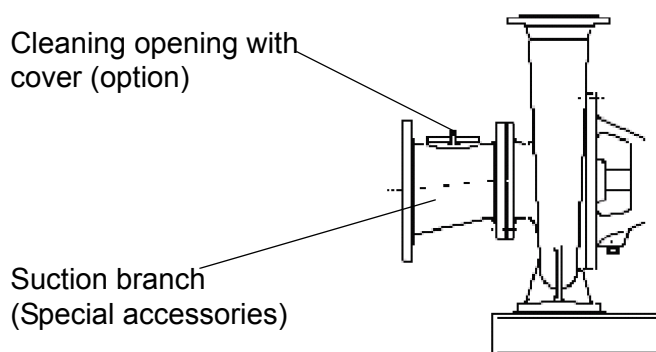


Fig. 4-8 Suction pipe

After connecting up the suction and delivery pipes stress-free, check alignment of the unit and rotate the impeller by hand.

4.7 Instruments

- According to the manufacturers' instructions, the sealing water monitoring unit is to be connected to the sealing water system and to the connections provided at the centrifugal pump.
- Special accessories (temperature monitoring, vibration measurements, etc.) are to be connected up to the centrifugal pump according to the manufacturer's instructions. Please contact ANDRITZ AG if you have special requirements.

4.8 Electrical equipment

Motor and instruments are to be connected up according to the operating instructions provided by the appropriate supplier.

➡ /KREISELPUMPE S/ SUPPLIER DOCUMENTATION/...

The electrical equipment must be installed such that there is no risk of injury to personnel, nor of damage to machines. All regulations in this respect must be observed.

Earthing

In addition to protective earthing, the following measures must be observed to protect machine components:

- Shielded power cables (3-core) with separate protective earth cable for frequency inverter drives. The shield for high frequency is to be applied to the motor and to the frequency converter.
- All machine parts and frequency-inverter fed motors are to be connected with earthing straps.
- The non-drive side of the motor must have insulated bearings.
- Frequency inverter outlets are fitted with du/dt filters.
- The regulations issued by the manufacturer of the frequency inverter must be observed.

Specified cable:

NYCWY for all frequency inverter drives.

NYCWY is used as power and control cable in all plants, buildings, outdoors, underground, and in water. The use of NYCWY cables is described in VDE 0298 Part 1, the current carrying capacity in HD 603 S1 and VDE 0276 Part 1000.

Design: Single or multi-wire conductors, with concentric, ceander-shaped, uninsulated copper wire, counter-coil made of copper strip under the outer covering. PVC-core insulation, different core colours according to VDE 0293, common core shielding, outer covering of PVC, standard colour black, flame retardant. Cable configuration according to VDE 0295/IEC 60228.

Technical data:

Minimum bending radius	12 x cable diameter
Temperature range	
on installation.	-5°C to +50°C
after installation	-40°C to +70°C
Nominal voltage (U ₀ /U)	0.6/1.0 kV
Test voltage	4 kV
Identification code of core	VDE 0293

4.9 Cold test

Prerequisites**The following utilities must be available:**

- Electric power
- Water

Lubrication

- First filling of lubricant and recording of all further lubrication procedures according to the section on "Lubrication" in the MAINTENANCE chapter.



Machine may be damaged if inappropriate oil or grease grades are used as first filling.

Only use oils or greases with the properties listed in the lubrication schedules.

Cold test

The cold test is to be carried out together with the customer's authorised representative.

The work steps listed in the cold test certificate shall be carried out for the cold test, and documented.

➡ /ANNEX/CERTIFICATES AND BLOCK DIAGRAMS

The cold test should be performed according to the following table:

Step	Activity
1	To avoid damage to the impeller and the shaft seal, check the pump for any debris. Check by rotating the pump manually through one complete revolution before start-up.
2	Visual check on the pump, particularly the coupling guard, for any deformations.

Tab. 4-2

Step	Activity
3	Check whether the bearings have been filled with lubricant. Re-lubricate as described in the Chapter on "Maintenance".
4	Turn on the sealing water supply (tandem mechanical seal, packing).
5	Check direction of rotation without medium: • Remove the intermediate sleeve of the coupling (see section 4.6.2). • Switch the motor on and off briefly in order to check the direction of rotation. • The motor must rotate in the direction of the arrow provided on the pump casing. • Lock out motor • Remove the intermediate sleeve of the coupling according to section 4.6.2. • Mount coupling guard
6	Check direction of rotation with medium: • Fill chest, open suction and delivery valves • Open sealing water pipe • Switch the motor on and off briefly in order to check the direction of rotation. • The motor must rotate in the direction of the arrow provided on the pump casing. Caution: Rotating parts, e.g. the coupling! • Mount coupling guard
7	Fill chest, open suction and delivery valves so that the pump is filled with the medium.
8	Switch motor on and observe for a brief period to see whether everything is running properly.

Tab. 4-2

Final inspection

The customer and the erection work supervisor shall conduct a final inspection of the installation on completion of the cold tests.

Certificates

The following certificates are issued after completion of the ISO cold test:

- Cold test certificate
- Certificate of completion of erection work.

5 START-UP

5.1 General

Initial start-up of the centrifugal pump is to be prepared and carried out by the Contractor or by ANDRITZ AG personnel. Start-up takes place in accordance with the start-up sequence plan and ANDRITZ AG's start-up routines.

i Practical training at the machine should also be provided during start-up. Participants must receive instruction on the theory beforehand.

5.2 Safety instructions



DANGER

Do not disregard the safety regulations.

If safety regulations are disregarded, this may cause a risk to life and limb and damage to the machine or its components.

All safety instructions in this section must be strictly observed!

General safety instructions

Start-up shall be supervised by ANDRITZ AG's start-up manager or by the Purchaser.

All applicable accident prevention regulations must be observed.

Qualification of personnel assigned

Start-up may only be carried out by skilled workers with the appropriate training.

Personal protective apparel

The following protective equipment must be worn when carrying out start-up and erection work:

- Hard hat
- Protective shoes
- Goggles
- Gloves must be worn when handling aggressive media such as oil, cleaning agent, chemicals, lubricants, white water, etc.

5.3 Prerequisites for start-up

The following must be checked before start-up:

Check for leaks

The pump and pipework must be leakproof before start-up.

Leaks, particularly in the suction pipe, can reduce performance of the pump substantially and cause difficulties during start-up.

Sense of rotation of motor

Before start-up, check that the motor is rotating in the right direction (see section headed "Cold test" in the "Erection Work" Chapter).



Before checking the sense of rotation of the motor, it is essential to remove the coupling spacer.

The motor must rotate in the direction of the arrow provided on the motor casing.

Free rotation

The pump must be able to rotate freely.

Check by rotating the pump manually through one complete revolution.

Aligning the coupling

Check whether the coupling has been aligned properly (see record).

Lubrication

Before start-up, check the lubricant (oil or grease) to be used for the pump and the drive bearing.



.. if the pump is not lubricated correctly!

This can result in risks to life and limb and in damage to the machine.

The pump should never be operated without a suitable lubricant!



If the pump is kept in storage for a longer period before being put into operation, dirt and water may enter the pump in the meantime. If there are substantial fluctuations in temperature, there may be some condensation.

Shaft seal and sealing water

Turn on sealing water supply and set the pressure and the flow rate.

5.4 Start-up

**DANGER**

**Machine may be damaged if incorrect start-up procedures are used.
All electric interlocks must be functional and checked.**

Starting the centrifugal pump

If all preliminary requirements (see Chapter 5.3) have been met, the pump can then be started up according to the following table:

Step	Activity
1	The valve in the suction pipe is fully open. Suction pipe and pump casing must be filled with the medium to be pumped.
2	The valve in the delivery pipe is closed or open, as required.
3	Start up pump and open delivery side valve.
4	If there is a stuffing box, check whether sufficient liquid is escaping. If not, the stuffing box gland must be slackened right away. If the packing material still becomes too hot after the gland has been slackened, the operator must shut down the pump and look for the cause of the problem. When the stuffing box has been running for approx. 10 minutes without any problems, it can then be tightened again moderately. To set the stuffing box, see Chapter on "Maintenance".

Tab. 5-1 Starting the centrifugal pump

**DANGER**

If the pump is run dry!

This can result in risks to life and limb and in damage to the machine.

The pump should never be allowed to run dry under any circumstances, not even briefly.

First trial run

Functioning of the pump must be monitored carefully during the first few hours in operation.

Particular attention must be paid to the following:

- temperature of the shaft seal (stuffing box packing)
- required amount of sealing water and required sealing water pressure to the shaft seal
- bearing temperature and vibration
- pressure and flow rate in the pump



If there are any unusual noises, it is essential to look for the cause without delay and then eliminate the problem!

After start-up, the centrifugal pump is handed over to the mill operator in a complete, reliable condition and ready for operation.

5.5 Certificates

The following certificates must be completed and signed after start-up:

- Start-up certificate
- Provisional acceptance certificate

6 OPERATION

6.1 General

This chapter describes the activities required for starting, operating and stopping the centrifugal pump. Possible malfunctions and troubleshooting methods are also presented.

6.2 Safety instructions



Do not disregard the safety regulations.

If safety regulations are disregarded, this may cause a risk to life and limb and damage to the machine or its components.

All safety instructions in this section must be strictly observed!

General safety instructions

All applicable accident prevention regulations must be observed.

It is not permitted to operate the centrifugal pump without all the required safety devices.

Qualification of personnel assigned

The equipment may only be operated by qualified personnel.

Operating personnel must know where the emergency switches and the escape routes are located.

Operating personnel must be instructed in the function and possible failure of machine monitoring equipment, and in carrying out maintenance and inspection work (shift log book, maintenance inspection records).

Personal protective apparel

The following personal protective equipment/apparel shall be used when performing work on the machine (e.g. troubleshooting):

- Hard hat
- Protective gloves
- Protective shoes
- Goggles

6.3 Control via DCS

The centrifugal pump can be started up and operated entirely from the DCS.

There is no permanent workplace provided at the pump.

6.4 Starting

Prerequisites

All preliminary requirements for start-up must be fulfilled before switching on the pump.

Please refer to: "Start-up" chapter

Before starting the centrifugal pump, the following parameters must be fulfilled:

- The valve in the suction pipe must be fully open.
- Suction pipe and pump casing must be filled with the medium to be pumped.



If the pump is run dry!

This can result in risks to life and limb and in damage to the machine.

The pump should never be allowed to run dry under any circumstances, not even briefly.

- The shaft seal must have an adequate supply of sealing water. Sealing water quantities: see chapter headed "Description"
- With stuffing box seals, there must be sufficient sealing water escaping from the stuffing box. (30 - 80 drops/min)



Immediately after starting up the pump, open the valve in the delivery pipe far enough to obtain the desired flow rate.

The required flow rate can be set using the valve on the delivery side!

If the operating pressure (see instruments) is not obtained within a short time, the pump must be stopped again and the cause of the problem found!

Automatic starting When using the group start, all necessary steps are carried out automatically with the DCS.

Manual start-up Carry out the following steps for manual start-up:

Step	Activity
1	Open suction-side valve
2	Switch on motor
3	Open delivery-side valve

Tab. 6-1 Manual start-up

6.5 Checks after initial start-up

The following items must be checked after initial start-up:

- temperature of the shaft seal
- required amount of sealing water and required sealing water pressure to the shaft seal
- bearing temperature and vibration
- pressure and flow rate in the pump



If there are any unusual noises, it is essential to look for the cause without delay and then eliminate the problem!

6.6 Normal operation



Do not operate without all safety devices ON.

While the machine is in operation the operating personnel should record the relevant data (shift record and data sheets).

Activities during normal operations

once a week

The following work has to be performed weekly in normal operation:

Component	Activity
Centrifugal pump, complete	Visual check (sealing water, etc.)

Tab. 6-2 Activities to be performed every week

Details of further maintenance work can be found in the maintenance calendar (➡ Chapter 7.4)

6.7 Specification of centrifugal pump (delivery head and flow rate)

Sizing

The pump sizing (delivery head/flow rate) refers to the values shown on the pump's type plate.

The values obtainable for head and flow rate can be read off the impeller diameter and the defined operating speed is shown in the performance diagram.

If the impeller diameter or speed of the pump is changed, the duty point moves to a different performance curve for head and flow rate.

Performance change during operation

The power consumption point on the curve can be changed by opening or closing the valve in the delivery pipe further or by altering the pump speed.



Do not operate the pump with the valves closed as this may cause damage to the pump!

Too low NPSH_{plant} value can cause damage to the impeller!

Changing the operating parameters

If the operating parameters for which the pump has been sized are changed, the following should also be considered:

- All parameters for the pump (pressure, impeller diameter, ...) were sized for the original duty point. These factors should be fully checked for the new operating conditions.
- For continuous operation, a minimum flow rate is required. The curve shown in the performance diagram for the required suction pressure (set NPSH_{pump}) begins at the point of the permitted continuous minimum flow rate.
- The inlet characteristics of the system (actual NPSH_{plant}), as well as the drive motor and shaft outputs must always be checked under changed operating conditions.
- The efficiency of the pump is the deciding factor in its overall service life, thus the power requirement of the pump must be checked.
- The performance diagram is based on values with clean water. If other liquids are pumped, the data on delivery head and flow rate, as well as power requirement, may change. These factors were taken into account when the pump was originally selected and should also be considered in the light of the new operating conditions.

6.8 Shutdown

Automatic shutdown

When using the group stop, all necessary steps are carried out automatically by the DCS.

Brief manual shutdown

Carry out the following steps to shut the centrifugal pump down manually for a brief period:

Step	Activity
1	Stop pump motor
2	Close the valve in the delivery pipe if necessary



Do not switch on the motor during reverse motion by the pump!

Manual shutdown, e.g. for service purposes

Carry out the following steps to shut the pump down manually for a longer period:

Step	Activity
1	Stop pump motor
2	Close the valve in the delivery pipe
3	Close the valve in the suction pipe
4	Relieve the pressure in the pump and drain it
5	Flush the pump out if aggressive media are pumped
6	Close sealing water feed



If there is a danger of the pump liquid freezing, the pump and pipes should be emptied!

6.9 Operating malfunctions and troubleshooting

Malfunction	Possible cause	Remedy
Pump is not pumping medium	Insufficient pre-filling of pump Steam bubbles forming in suction pipe ($NPSH_{plant}$)	Repeat pre-filling of the pump and suction pipe
	Pressure difference between inlet pressure and steam pressure is too low	Check the suction pipe
	Air inlet in the suction pipe, suction port or shaft seal	Check the suction pipe and the shaft seal
	Suction pipe, suction valve or impeller are clogged	Check the suction pipe and the entire pump for clogging
	Speed too low	Check the preliminary speed requirements
	Flow resistance in the pipe is greater than the delivery head generated at the pump	Check the resistance in the pipe
Insufficient delivery head	Unexpected air/gas content in pumping medium	Contact ANDRITZ AG for further instructions
	Unexpectedly high viscosity in the medium	Contact ANDRITZ AG for further instructions
	Suction pipe, suction valve or impeller are clogged	Check the suction pipe and the entire pump for clogging
	Speed too low	Check the speed requirements
	Wrong direction of rotation	Change sense of rotation of the motor
	Flow resistance in the pipe is greater than the delivery head generated at the pump	Check and minimise the pipe resistance
	Pump parts coming into contact with the medium are worn, damaged or clogged	Check the pump and change any worn or damaged parts if necessary
	Delivery-side valve partly open or closed	Open valve

Tab. 6-3 Operating malfunctions and troubleshooting

Malfunction	Possible cause	Remedy
Inadequate or irregular flow rate	Steam bubbles forming in the suction pipe	Repeat pre-filling of the pump and suction pipe
	Wrong direction of rotation	Change sense of rotation of the motor
	Net positive suction height ($NPSH_{plant}$) is too low	Check whether the suction valve is fully open and the suction pipe clear
	Pressure difference between $NPSH_{plant}$ and $NPSH_{pump}$ is too low	Check the suction pipe
	Air inlet in the suction pipe, suction port or shaft seal	Check the suction pipe and the shaft seal
	Unexpected air/gas content in pumping medium	Contact ANDRITZ AG for further instructions
	Unexpectedly high viscosity in the medium	Contact ANDRITZ AG for further instructions
	Suction pipe, suction valve or impeller are clogged	Check the suction pipe and the entire pump for clogging
	Flow resistance in the pipe is greater than the delivery head generated at the pump	Check the resistance in the pipe
	Pump parts coming into contact with the medium are worn, damaged or clogged	Check the pump and change any worn or damaged parts if necessary
	Bearing damaged	Disassemble the pump and change the bearings

Tab. 6-3 Operating malfunctions and troubleshooting

Malfunction	Possible cause	Remedy
High power loss	Speed too high	Check the motor speed
	Wrong direction of rotation	Check the sense of rotation of the motor
	Flow resistance in the pipe is greater than the delivery head generated at the pump	Check the resistance in the pipe
	Unexpected specific gravitation in pumping medium	Contact ANDRITZ AG for further instructions
	Unexpectedly high viscosity in the medium	Contact ANDRITZ AG for further instructions
	Pump shaft bent or running off centre	Replace the pump shaft and bearing
	Rotating objects or pump parts causing friction in the pump	Disassemble and check the inside of the pump
	Pump parts coming into contact with the medium are worn, damaged or clogged	Check the pump and change any worn or damaged parts if necessary
	Bearing damaged.	Disassemble the pump and change the bearings

Tab. 6-3 Operating malfunctions and troubleshooting

Malfunction	Possible cause	Remedy
Excessive noise and/or vibration	Pressure difference between $NPSH_{\text{plant}}$ and $NPSH_{\text{pump}}$ is too low	Check the suction pipe
	Unexpected air/gas content in pumping medium	Contact ANDRITZ AG for further instructions
	Air inlet in the suction pipe, suction port or shaft seal	Check the suction pipe and the shaft seal
	Suction pipe, suction valve or impeller are clogged	Check the suction pipe and the entire pump for clogging
	Flow resistance in the pipe is greater than the delivery head generated at the pump	Check the resistance in the pipe
	The pump flow rate is below the permitted minimum level (cavitation)	Check the requirements of the pump system
	The foundation is too weak	Reinforce the foundation
	Pump is subjected to additional load if the pipe is not adequately supported	Check pipe support
	Pump and motor are not in true alignment	Check pump/motor alignment or re-align
	Pump shaft broken or running off centre	Replace the pump shaft and bearing
	Rotating objects or pump parts causing friction in the pump	Disassemble and check the inside of the pump
	Pump parts coming into contact with the medium are worn, damaged or clogged	Check the pump and change any worn or damaged parts if necessary
	Bearing worn or loose	Disassemble the pump and replace the bearings if necessary
	Insufficient or excessive lubrication	Check that pump has appropriate lubrication
	Impeller damaged or unbalanced	Disassemble the pump and replace the impeller if necessary

Tab. 6-3 Operating malfunctions and troubleshooting

Malfunction	Possible cause	Remedy
Excessive wear on bearing	Pump and motor are not in true alignment	Check pump/motor alignment or re-align
	Pump shaft broken or running off centre	Replace the pump shaft and bearing
	Rotating objects or pump parts causing friction in the pump	Disassemble and check the inside of the pump
	Impeller damaged or unbalanced	Disassemble the pump and replace the impeller if necessary
	Insufficient or excessive lubrication	Check that pump has appropriate lubrication
	Bearing not installed properly or dirty	Replace bearing assembly if necessary and check the lubricating system for contamination
	Wrong bearing or not the original bearing mounted in the pump	Mount new original bearing
Pump overheating/jamming	Delivery-side valve closed	Open valve
	Insufficient pre-filling of pump	Repeat pre-filling of the pump and suction pipe
	Pressure difference between $NPSH_{\text{plant}}$ and $NPSH_{\text{pump}}$ is too low	Check the suction pipe
	The pump flow rate is below the permitted minimum level (cavitation)	Check the requirements of the pump system
	Pump and motor are not in true alignment	Check pump/motor alignment or re-align
	Bearing worn or loose	Disassemble the pump and replace the bearings if necessary
	Pump shaft broken or running off centre	Replace the pump shaft and bearing
	Impeller damaged or unbalanced	Disassemble the pump and replace the impeller if necessary
Pump overheating/jamming	Rotating objects or pump parts causing friction in the pump	Disassemble and check the inside of the pump
	Flow resistance in the pipe is greater than the delivery head generated at the pump	Check and minimise the pipe resistance

Tab. 6-3 Operating malfunctions and troubleshooting

7 MAINTENANCE

7.1 General

This chapter describes the maintenance and upkeep of the centrifugal pump, which is the responsibility of the machine operator.

All activities mentioned in this chapter must be performed at the correct time.

The ANDRITZ AG service department is at your disposal for troubleshooting, as well as for extensive maintenance and repair work.

➡ /KREISELPUMPE S/ INTRODUCTION

Operators trained and authorized by ANDRITZ AG may also carry out repairs on site after obtaining consent from ANDRITZ AG.

7.2 Safety instructions



Do not disregard the safety regulations.

If the safety regulations are disregarded, this may cause a risk to life and limb and damage to the machine or its components.

All safety instructions in this section must be strictly observed!

General safety instructions

All applicable accident prevention regulations must be observed.

Sufficient space for maintenance work must be included right away in the arrangement drawing.

Maintenance and start-up work should only be performed when the equipment is at a standstill; all feed pipes must be closed off beforehand.

If the pump has been opened, it must be started up again as described in the "START-UP" Chapter.

Do not exceed permissible crane loads and weights on lifting gear and ropes/shackles. Secure loads against falling down.

Do not step or walk below suspended loads! Standing below suspended loads can have fatal consequences and thus is strictly forbidden!

The machine must be thoroughly cleaned before carrying out any maintenance work.

If chemicals are used, it is essential to flush out the pump before performing any maintenance work in order to avoid chemical burns.

Use only original spare parts.

It is forbidden to repair leaks and defects by plugging, hammering, painting or impregnating!

Power supply	Before beginning any maintenance or repair work the operator must disconnect the energy supply to all drives securely. This can be achieved with a maintenance switch, lockable racks in the MCC, or with other suitable measures that comply with the safety regulations. If required, a record must be made of this work.
Lighting	The operator shall ensure that adequate lighting is provided (with extra-low voltage bulbs) during service and repair work.
Qualification of personnel assigned	Maintenance and upkeep must be carried out by specially trained, skilled personnel only. All work on the electrical equipment, without exception, must be carried out by skilled electricians.
Personal protective apparel	The following protective equipment must be worn when carrying out cleaning and maintenance work: • Hard hat • Protective gloves • Protective shoes • Goggles

7.3 Regular maintenance



Regular monitoring of operations and performance by the centrifugal pump will allow the operator to detect any need for maintenance and repairs in good time. This guarantees a high level of efficiency, a trouble-free operating sequence, and minimises the maintenance costs!

The discharge pressure, flow rate and power consumption should be monitored continuously.

For machines operating continuously (24 hours/day, 7 days/week), a prescheduled maintenance period every twelve weeks is recommended. During these periods the machine should be shut down, thoroughly cleaned and checked for wear (visual check).

Machines operating less than 24 hours a day should undergo these routine checks and be cleaned at each shutdown.

General machine checks

The following checks should be made when the machine has been shut down:

Component	Checks
Shaft seal	Leaks and wear
Bearing assembly	Lubricant quantity
Static seals	Leaks
Coupling	Wear on the coupling pads
Complete pump	Visual check

Tab. 7-1 General machine checks

In the course of general machine checks, all additional units should also be checked to guarantee that the entire plant functions satisfactorily. For these checks, the attached maintenance and upkeep instructions provided by the manufacturer must be observed.

➡ /KREISELPUMPE S/ SUPPLIER DOCUMENTATION

Malfunctions and inadmissible changes found during these checks must be rectified immediately.

Cleaning

Clean the pump by hosing down or brushing when it is at a standstill.



Contact with the medium to be pumped may cause skin damage and burning.

Persons handling the medium to be pumped should not suffer from an allergic condition to such substances.

Personal protective apparel must be worn!



Do not use caustic agents for cleaning.

Make sure no water, steam or other cleaning medium enters electrical plant components.

7.4 Maintenance schedule

In addition to the work outlined below, operating staff must also carry out maintenance and the work required for normal operations.

➡ /KREISELPUMPE S/ OPERATION/NORMAL OPERATION

Monthly

The following maintenance work is to be carried out at monthly intervals.

Component	Activity
Bearings	• Check temperature • Measure vibrations • Check lubricant quantity • Check for strange noises
Spiral casing	• Check for corrosion and wear
Shaft with bearing	• Check for smooth running
Coupling	• Check alignment • Check pads for wear
Shaft seal	• Check for leaks • Check for wear
Dynamic seal	• Check the shutdown seal
Pipework	• Check for leaks
Complete pump	• Check for leaks • Clean

Tab. 7-2 Monthly maintenance work

6-monthly

The following maintenance work is to be carried out at 6-monthly intervals.

Component	Activity
Complete pump	• Check mounting of pump on the foundation • Visual check of the complete pump (shaft seal, etc.)
Motor	• Check mounting of motor on the foundation

Tab. 7-3 6-monthly maintenance work

Annually

The following maintenance work is to be carried out at annual intervals.

Component	Activity
Complete pump	• Complete service according to instructions from ANDRITZ AG (Grease change/oil change, impeller check, etc.)

Tab. 7-4 Annual maintenance work

7.5 Fasteners

Screw/bolt material

Bolts and screws are manufactured in several classes of material. The heads of these screws and bolts are marked to show the strength class. Damaged or lost fasteners should only be replaced with fasteners of the same material.

Check

Unless they are suitably tightened, screws/bolts can work loose or fail under operating conditions. This is why all connecting screws/bolts must be checked in the course of maintenance work.

- During the first six months: every 2 to 2½ months
- After the first six months: 6-monthly

Tighten

During checks and maintenance work it is imperative to tighten all connecting screws/bolts to the torque specified for each one in the drawings or in the table below.

Pre-stressing forces and tightening torques in the table apply to standard screwed/bolted connections. Please contact ANDRITZ AG if you have special requirements.

The thread and screw head should be lubricated with an appropriate lubricant (for example Molyslide Plus from Loctite).

SET SCREWS															
	Pre-stressing forces for erection work (kN)							μ	Tightening torques (Nm)						
	5,6	8,8	A4-50	A4-70	A4-80	C3-80	A2-70		5,6	8,8	A4-50	A4-70	A4-80	C3-80	A2-70
M8	7	15	5	11	14	15	11	0,1	8	17	6	12	16	17	12
								0,125	10	21	7	15	19	21	15
								0,14	11	23	7	16	21	23	16
M10	11	24	8	17	23	24	17	0,1	16	34	11	24	32	34	24
								0,125	19	41	13	29	38	41	29
								0,14	21	45	15	32	42	45	32
M12	16	35	12	25	33	35	25	0,1	27	58	19	41	54	58	41
								0,125	33	70	23	49	66	70	49
								0,14	36	77	25	54	72	77	54
M16	31	65	21	46	61	65	46	0,1	66	140	46	99	132	140	99
								0,125	80	170	56	120	160	170	120
								0,14	88	188	62	133	177	188	132
M20	48	102	33	72	95	102	72	0,1	129	275	90	193	258	275	193
								0,125	156	334	110	235	313	334	235
								0,14	173	369	121	259	346	369	259
M24	69	147	48	103	137	147	103	0,1	222	474	156	333	444	474	333
								0,125	269	575	189	404	539	575	404
								0,14	298	635	209	447	596	635	447
M30	109	233	77	109	219	233	164	0,1	443	945	310	443	-	945	664
								0,125	538	1149	377	538	-	1149	808
								0,14	596	1271	417	596	-	1271	894
M36	159	340	111	159	319	340	239	0,1	767	1637	537	767	-	1637	1151
								0,125	934	1992	654	934	-	1992	1401
								0,14	1034	2205	724	1034	-	2205	1551
M42	219	466	153	328	437	466	328	0,1	1223	2609	-	-	-	2609	1835
								0,125	1490	3178	-	-	-	3178	2235
								0,14	1650	3520	-	-	-	3520	2475
M48	287	612	201	431	574	612	431	0,1	1841	3928	-	-	-	3928	2762
								0,125	2245	4789	-	-	-	4789	3367
								0,14	2487	5305	-	-	-	5305	3730
M56	-	-	-	-	-	-	594	-	-	-	-	-	-	-	-
								-	-	-	-	-	-	-	-
								-	-	-	-	-	-	-	-

Tab. 7-5 Tightening Torques and Pre-stressing Forces for Rigid Screws (Normal thread)



Wrong torque tightening may cause machine damage and hazards leading to personal injury.

The pre-loads and tightening torques shown in the drawings and in the above table must be observed.

7.6 Lubrication

7.6.1 Oil lubrication



During works assembly the bearings and the oil chamber are filled with a preserving oil providing protection for approximately 6 months.

Before start-up, oil must be filled up to the middle of the oil inspection glass according to the table (Tab. 7-6).

There is no need to remove the preserving oil.

Lubricating oil brands

Lubricating oils	
Viscosity: 64 cST at 40°C (ISO VG68)	
Manufacturer	Type
BP	BP Energol HLP 68
Esso	Teresso 68
Mobil	D.T.E. Heavy Medium
Shell	Shell Tellus Oil S 68
Castrol	Hyspin AWS 68

Tab. 7-6 Lubricating oil brands



If the surface temperature of the bearing housing rises above 60°, ANDRITZ AG should be consulted.



Bearing damage may be caused by using the wrong oil!
Use only oil grades according to Tab. 7-6.
Do not mix different brands or grades of oil.

Required oil quantity, depending on bearing support size

Bearing size	Pump type	Oil quantity (litres)
28-S3	S80 - 265	1
	S100-265	
	S125-265	
38-S3	S100-350	1,5
	S125-350	
	S150-330	
42-S3	S125-400	2,5
	S150-400	
	S200-380	
55-S3	S150-470	4
	S200-470	
	S250-430	
80-S3	S350-470	9
	S500-600	

Tab. 7-7 Required oil quantities

Oil change

The oil changing intervals according to table (Tab. 7-8) must be observed.

Pump speed (n)	Oil change interval
The first oil change is to be carried out after approximately 200 operating hours.	
1000-1800 rpm	Annually
3000-3600 rpm	6-monthly

Tab. 7-8 Oil change intervals

The oil should be changed according to the following table:

Step	Activity
1	Open hexagon head screw plug (903) and drain the used oil off into a container (suitable size for the oil quantity).
2	Screw in hexagon head screw plug (903) again with a new sealing ring (411.3).
3	Dispose of used oil according to the appropriate regulations.
4	Fill in the fresh oil at the vent screw (672) up to the middle of the oil level glass (642).

Tab. 7-9 Oil change

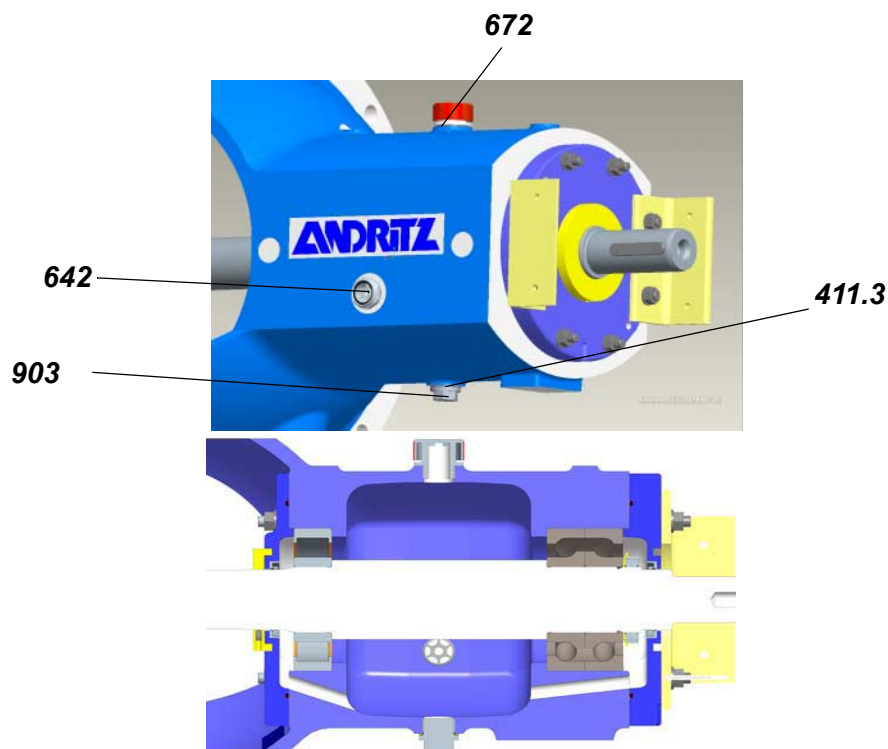


Fig. 7-1 Oil lubrication, bearing support section

7.6.2 Grease lubrication



The bearings are filled with grease during works assembly.
Lubricating intervals, see Tab. 7-11!

Grease types

The following lubricating greases should be used for operating conditions at which the surface temperature of the bearing housing is less than +60°C:

Manufacturer	Type
Exxon	EXXON Beacon 2
Mobil	Mobilux EP2
Shell	SHELL Alvania RL3
SKF	SKF LGMT2
FAG	FAG Arcanol MULTI 3

Tab. 7-10 Grease types



If the surface temperature of the bearing housing rises above +60°C, ANDRITZ AG should be consulted.

Lubrication

The bearings should be re-greased according to the following table.

Bearing assembly	First lubrication (g)		Re-lubricating (g)		Re-lubricating interval ¹⁾ (hour) Bearing housing temperature < 60°C			
	Impeller side	Coupling side	Impeller side	Coupling side	740 rpm	980 rpm	1480 rpm	2950 rpm
28-S3	60	110	30	50	16000	12000	8000	3000
38-S3	100	180	50	80	14000	10000	6500	2500
42-S3	140	240	40	70	12000	8000	6000	2000
55-S3	250	500	50	110	10000	7500	5000	-
80-S3	330	880	70	170	8500	6000	3500	-
¹⁾ Each 15°C increase in the surface temperature reduces the lubricating interval by half								

Tab. 7-11 Lubrication schedule



Bearing damage may be caused by incorrect lubrication.
Do not mix different brands or grades of grease.
Use only grease grades according to Tab. 7-10.

Grease change

All old grease should be cleaned out of the bearing housing after approximately 24,000 operating hours. Then fill the bearing with fresh grease.

The grease in the bearings is to be changed according to the following table:

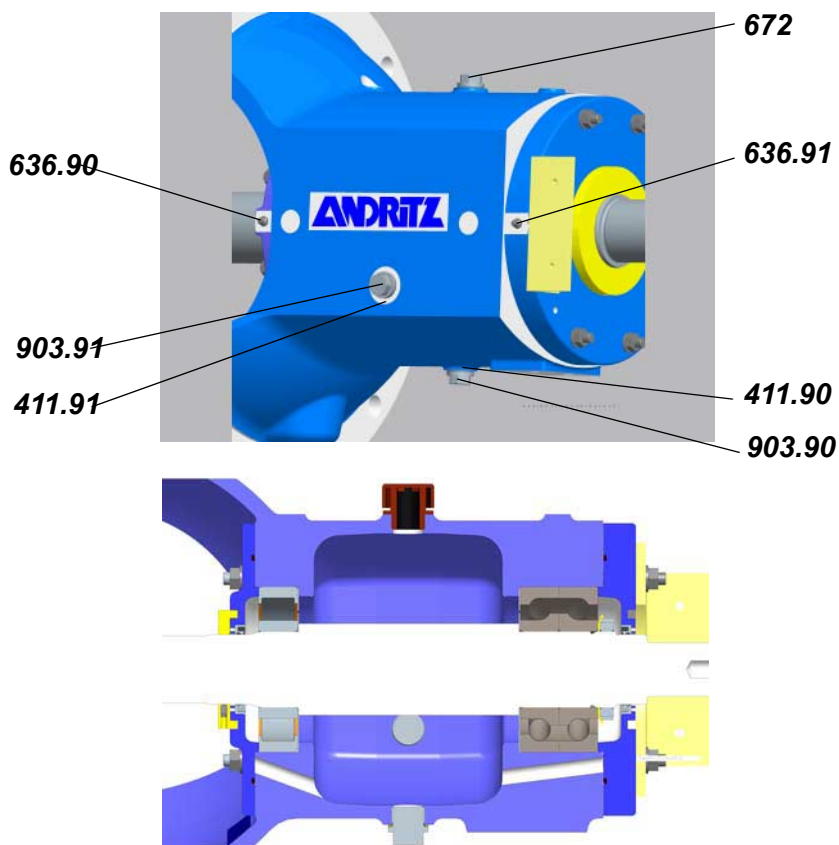


Fig. 7-2 Grease lubrication at the bearing, bearing support section

Step	Activity
1	Remove the screwed drain plug (903.90).
2	Extract the old grease by suction through the bore holes (903.90). Use a suction device with a flexible suction pipe to extract the grease.
3	Insert the screwed drain plug (903.90) with new sealing rings (411.91).
4	Top up with fresh grease at the grease nipples (636.90/91). Grease grade and quantity are should in the Tables (Tab. 7-10 , Tab. 7-12).

Tab. 7-12 Grease change

7.7 Aligning the coupling

The coupling alignment must be checked after each of the following assembly steps and corrected if necessary:

- after mounting and before grouting in the pump
- after grouting in
- after installing the pipework
- after the trial run with water
- when the bearing support is replaced by a new bearing support

If the alignment changes during production, the pump can also be aligned at operating temperature.

The coupling must be aligned as described in the chapter on "Erection Work".

➡ /KREISELPUMPE S/ ERECTION/ Aligning the coupling

Aligning tolerances

Permitted tolerances:

➡ /KREISELPUMPE S/ SUPPLIER DOCUMENTATION/COUPLING and MOTOR MANUFACTURER

Check

The coupling pads should be checked at least every 4000 to 6000 operating hours.

7.8 Installing and removing the pull-out unit

Preparations

The following parts must be prepared before starting to disassemble the pull-out unit:

- Tools
- Lifting gear
- Belts, ropes
- Replacement parts

The pump must be thoroughly cleaned before carrying out any maintenance work.

Complete the following work before starting to remove the unit itself:

Step	Activity
1	Shut down all drives at all poles and secure against accidental start.
2	Remove the hoses leading to the shaft seal.
3	Remove coupling guard (681).
4	Remove the intermediate coupling piece (840) after detaching the screws.

Tab. 7-13 Activities before removal



**Limbs can be trapped or crushed during disassembly work.
Wear your personal protective apparel.**

7.8.1 Removing the pull-out unit

The pull-out unit comprises the complete bearing support (**330**), casing cover (**161**), the shaft seal (**430**), and impeller (**230**).

Remove the pull-out unit according to the table below.

Step	Activity
1	Detach bolts (920.3) connecting to the spiral casing (102).
2	Detach bolts (901.3) connecting to supporting leg (183).
3	Remove safety plate (680).
4	Attach lifting slings according to Fig. 7-3: • Through the bearing support windows • Between the coupling half and the bearing cover (360.2) • Secure sling to lifting hook and tension slightly. Caution: Take care to maintain the balance
5	Push the pull-out unit out with the forcing screws (901.2).
6	Set the pull-out unit down in the assembly area.

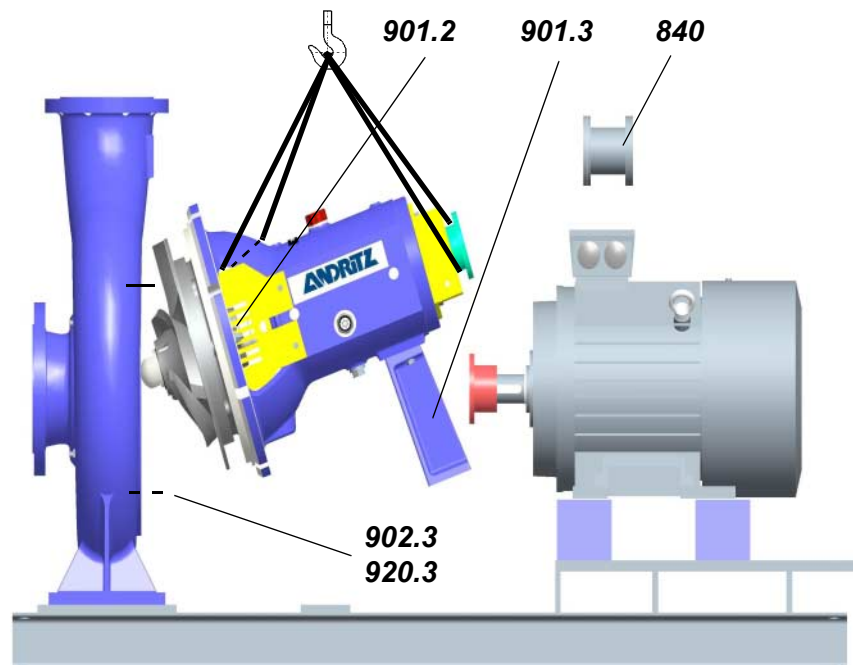
Tab. 7-14 Removing the pull-out unit

Fig. 7-3 Lifting the pull-out unit

7.8.2 Mounting the pull-out unit

Install the pull-out unit according to the following table:

Step	Activity
1	Check the impeller (230) and the front lining (135.1) visually for any defects.
2	Rotate the shaft manually through a complete revolution and check that it is running smoothly.
3	Replace O-ring (412.1) and grease lightly with silicone grease.
4	Turn forcing screws (901.2) back.
5	Attach lifting sling according to Tab. 7-14.
6	Install pull-out unit in the spiral casing (102) and secure with the nuts (920.3).
7	Screw in support leg bolts (901.3) and tighten.
8	Rotate pump manually through a complete revolution and check that it rotates freely and smoothly. If the pump does not rotate smoothly, check the gap between the impeller (230) and the front lining (135.1).
9	Mount the coupling reduction sleeve (840) and check the alignment.
10	Mount coupling guard (681) and safety plate (680).

Tab. 7-15 Mounting the pull-out unit

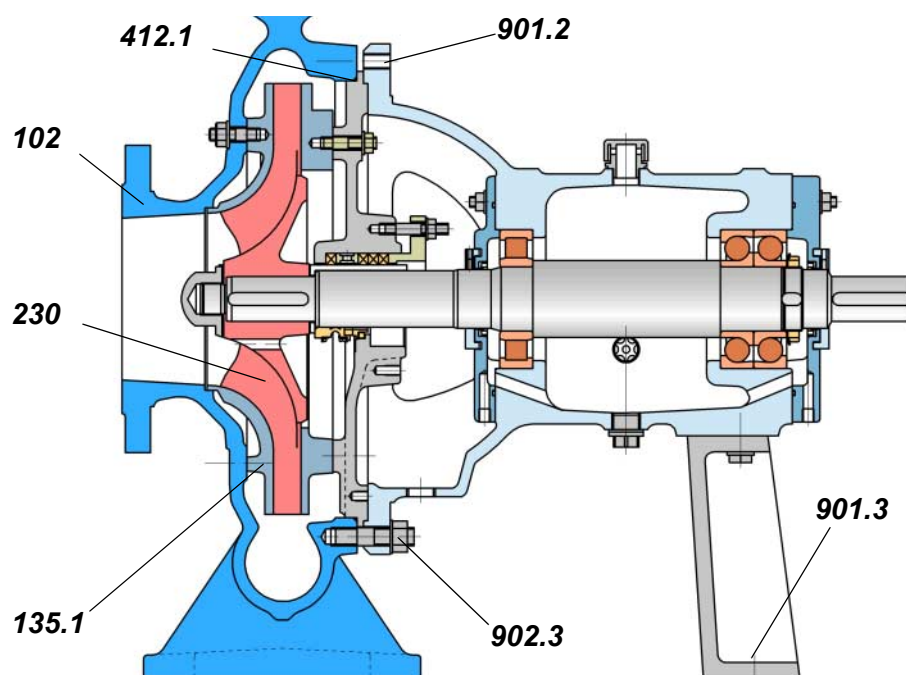


Fig. 7-4 Mounting the pull-out unit

7.9 Changing the impeller and the front lining

Due to special relevance to safety-issues a close description of step 2 in Tab. 7-17 is outlined before the general guideline for the impeller-change.

Step	Description
1	Place the exchange unit on solid ground to prevent it from turning over.
2	Position the impeller such that the contact surfaces for the striking-face-wrench are in horizontal position.
3	Secure the impeller/ pump shaft against turning. (e.g. with a solid block of wood)
4	If possible, cover sharp and worn edges of the working vanes with a cloth.
5	Loosen the impeller nut with a striking-face-wrench.

Tab. 7-16 Opening the impeller nut



When hitting the striking-face-wrench the wrench may slip off the impeller nut and therefore cause a dangerous situation. Hold the wrench with one hand to prevent it from slipping off the nut.

Proceed according to the following table when changing the impeller (**230**) and the front lining (**135.1**):



Limbs can be trapped or crushed during disassembly work.



Injury by the impeller!
Impellers may have very sharp edges, especially when they are worn.
Wear protective clothing and gloves!

Step	Procedure
1	Shut down pump according to Chapter on "Operation".
2	Remove pull-out unit according to Section 7.8.1.
3	Open locking plate (931.1) and impeller nut (922).
4	Pull off impeller (230) by pushing it off the casing cover (161).

Tab. 7-17 Changing the impeller and the front lining

Step	Procedure
5	Detach bolts (920.1) at the front lining (135.1).
6	Push front lining out with forcing screws.
7	Set up pull-out unit vertically with the impeller side up
8	Mount new impeller (230) so that there is a gap of 0.5 - 0.7 mm between the casing cover (161) and the vanes on the back of the impeller. This gap is obtained by inserting spacers (556.1/2) of various thicknesses (0.3 - 1.0 mm). Mount new lockwasher (931.1), tighten impeller nut (922) and secure.
9	Place front lining on the impeller and measure dimension "X". Measure dimension "Y" in the spiral casing. Dimension "Y" must be 0.5 to 0.7 mm larger than dimension "X". If the gap is larger than 0.7 mm, insert spacers (400.1/2/3) until the gap measures 0.5 to 0.7 mm.
10	Screw stud bolts (902.1) into the lining and mount the required spacers. Insert new O-ring (412.1) and lubricate well with silicone grease. Turn back forcing screws and mount front lining in spiral casing (102). Tighten bolts with torque wrench.
11	Mount pull-out unit according to Section 7.8.2.
12	Start up pump according to Chapter on "Operation".

Tab. 7-17 Changing the impeller and the front lining

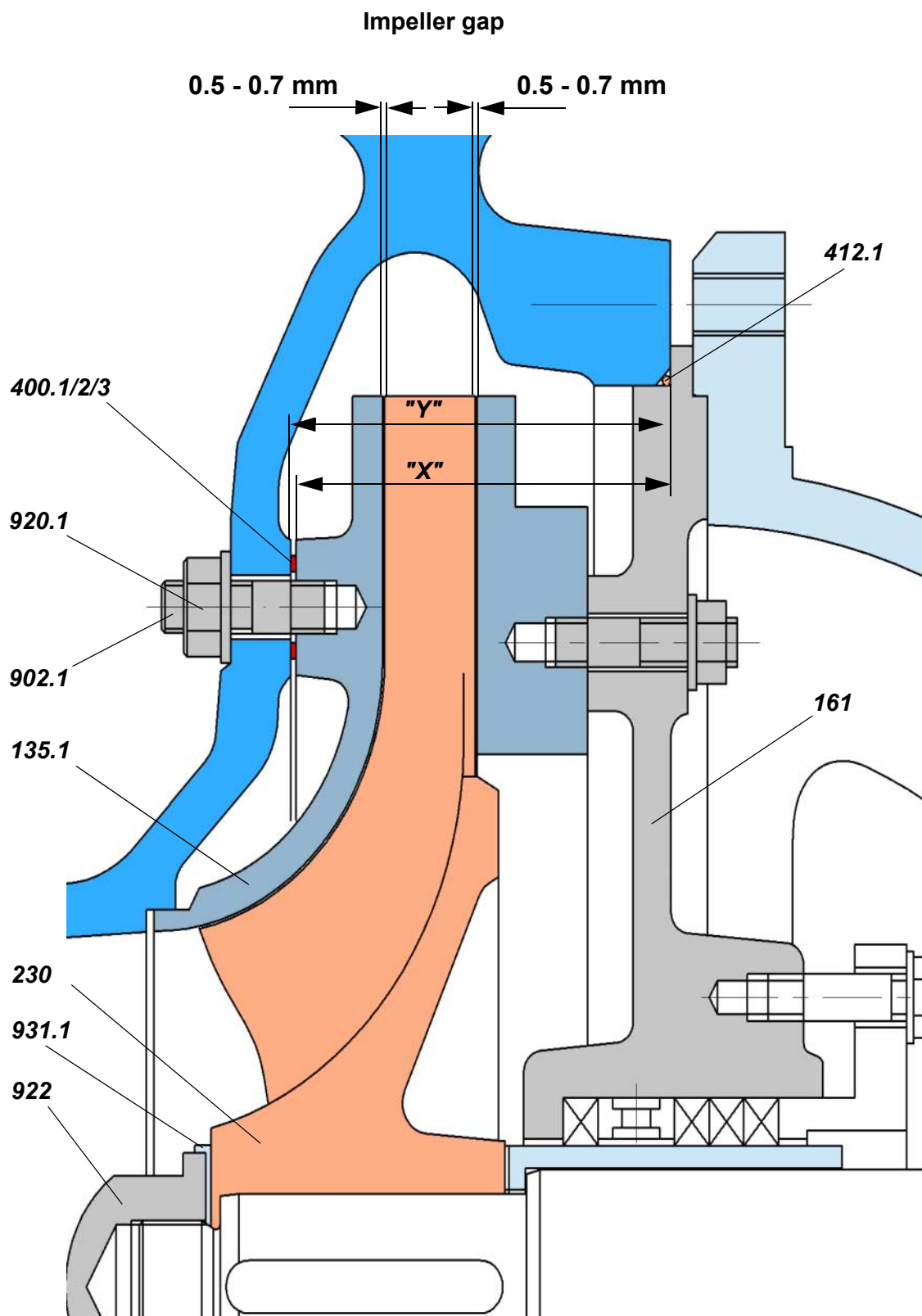


Fig. 7-5 Changing the impeller

7.10 Turning the impeller

The various pump service data are obtained by using different impeller diameters. The required diameter for various service data can be found in the pump characteristic diagram or in the data sheet. Before changing an impeller, it must be turned down to the required impeller diameter first of all.

When turning down the impeller vanes, proceed according to the following table:

Step	Procedure
1	Use spare impeller (always has full diameter and is balanced).
2	Determine the required diameter from the documentation or the new diameter from the characteristic curve.
3	Mark the new diameter on the vane, mill down to the impeller base (leave impeller base with full diameter) and debur.
4	Impellers for speed $n=3000$ rpm and impellers with full diameter greater than 400 mm must be statically rebalanced.

Tab. 7-18 Turning the impeller

7.11 Changing the shaft seals



During inspection of the shaft seal, checking for leaks, tightening the stuffing box, etc., there is a risk of being pulled in, caught up or crushed by the rotating shaft.

The machine should only be disassembled by qualified and authorized personnel.

7.11.1 Changing the single standard mechanical seal

To avoid greater damage, the mechanical seal must be replaced immediately if there is leakage on the atmospheric side.



If hot and aggressive pumping medium leaks, this may cause a risk to life and limb and damage to the machine or its components.

Change the mechanical seal (**433.1**) according to the following table:

Step	Procedure
1	Shut down pump according to Chapter on "Operation".
2	Remove pull-out unit according to Section 7.8.1.
3	Remove impeller as per Section 7.9.
4	Pull spacer plates (556.1/2) and spacer ring (211) off the shaft.
5	Remove the mechanical seal.
6	Inspect seal and try to find the reason for the fault (dry running, wear, etc.). If necessary, consult specialists at the seal supplier company.
7	Install new seal according to the instructions provided by the seal suppliers. see: ➡ /KREISELPUMPE S/ SUPPLIER DOCUMENTATION/ ...
8	Mount spacers (556.1/2) and impeller (230). Check gap between vanes on the back of the impeller and the casing cover (161) (0.5-0.7 mm).
9	Mount impeller according to Section 7.9.
10	Mount pull-out unit according to Section 7.8.2.
11	Start up pump according to Chapter on "Operation".

Tab. 7-19 Changing the single standard mechanical seal

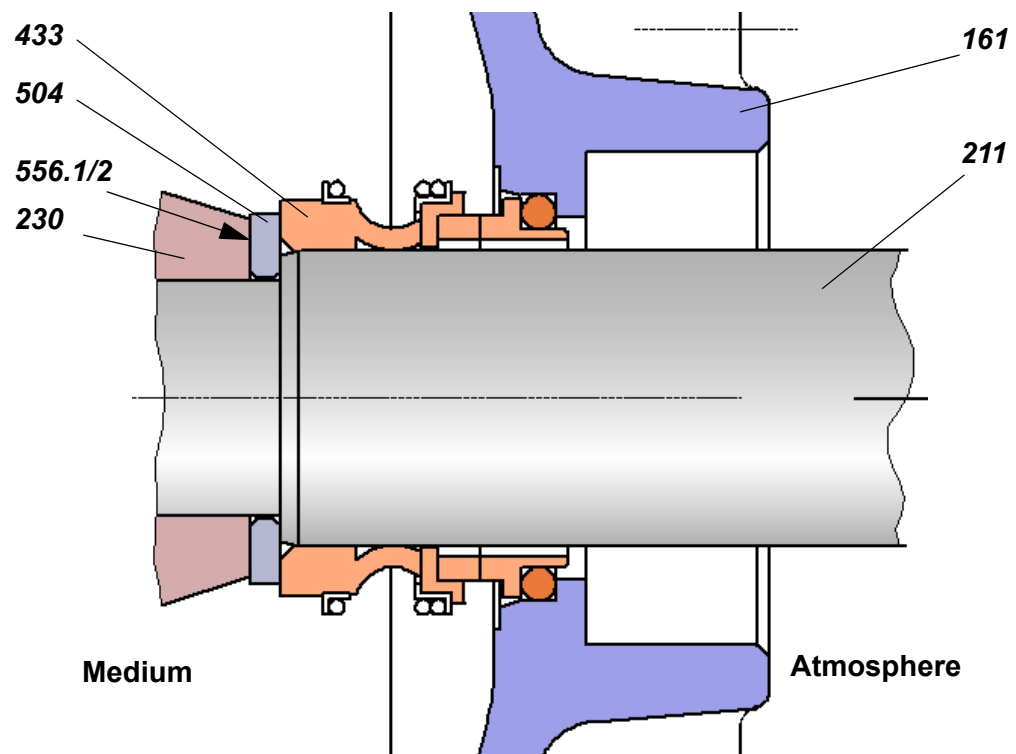


Fig. 7-6 Single standard mechanical seal

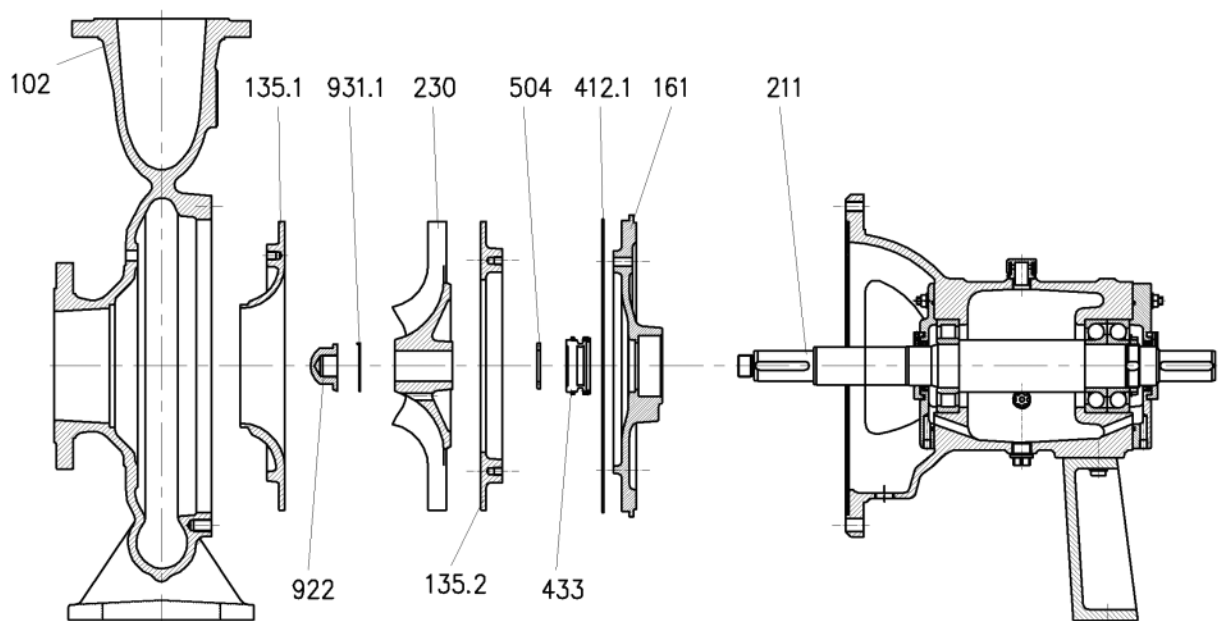


Fig. 7-7 Single standard mechanical seal

7.11.2 Changing the tandem standard mechanical seal

The pump must always be shut down under the following conditions in order to avoid serious damage,:

- Sealing water leaking on the atmospheric side
- Abnormal consumption of sealing water
- Drop in sealing water pressure
- Conveying medium in the sealing water



If hot and aggressive pumping medium leaks, this may cause a risk to life and limb and damage to the machine or its components.

Change the mechanical seal (**433.1**) according to the following table:

Step	Procedure
1	Shut down pump according to Chapter on "Operation".
2	Remove pull-out unit according to Section 7.8.1.
3	Remove impeller as per Section 7.9.
4	Pull spacer plates (556.1/2) and spacer ring (211) off the shaft.
5	Remove mechanical seal on medium side.
	Changing the atmospheric-side mechanical seal:
6	Detach nuts (920.5) at the retaining ring (506) and push the retaining ring off the housing cover (161).
7	Detach nuts (920.4) and remove the housing cover (161) from the bearing support (330).
8	Detach set screw (904.1) and pull the set collar (500.1) off the shaft.
9	Remove retaining ring (506) with mechanical seal (433.2).
10	Inspect seal and try to find the reason for the fault (dry running, wear, etc.). If necessary, consult specialists at the seal supplier company.
11	Install new seal according to the instructions provided by the seal suppliers. Please refer to: ➡ /KREISELPUMPE S/ SUPPLIER DOCUMENTATION/ ...
12	Mount set collar (500.1) according to Tab. 7-21 (dimension L3) on the shaft and secure with the set screw (904.1).
13	Mount the housing cover (161) on the bearing support (330). Mount retaining ring (506) on the housing cover.

Tab. 7-20 Changing the tandem standard mechanical seal

Step	Procedure
14	Install mechanical seal on the medium side according to the instructions provided by the seal suppliers. Please refer to: ➔ /KREISELPUMPE S/ SUPPLIER DOCUMENTATION/ ..
15	Mount spacers (556.1/2) and impeller (230). Check gap between vanes on the back of the impeller and the casing cover (161) (0.5-0.7 mm).
16	Mount impeller according to Section 7.9.
17	Mount pull-out unit according to Section 7.8.2.
18	Start up pump according to Chapter on "Operation".

Tab. 7-20 Changing the tandem standard mechanical seal

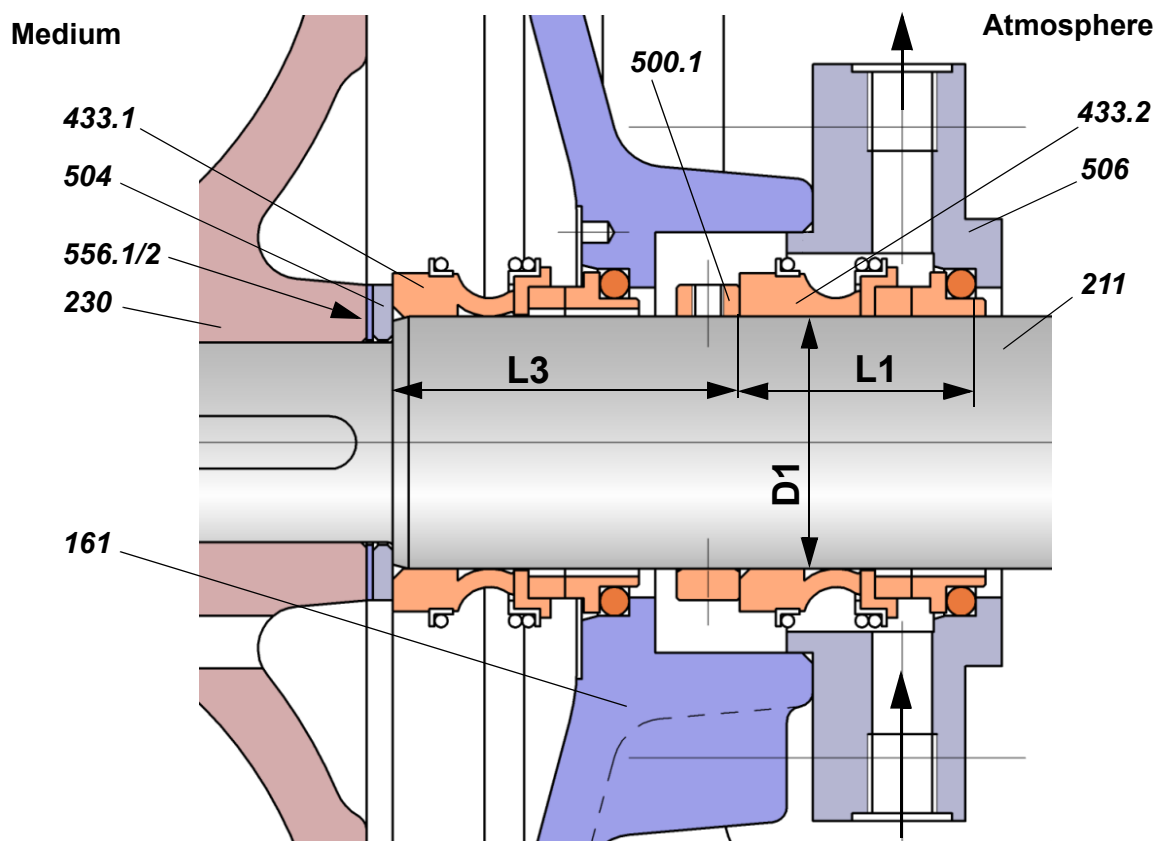


Fig. 7-8 Tandem standard mechanical seal

Setting dimensions

Bearing cover size	D1	L1	L3
28-S3	38	45	65
38-S3	48	45	66
42-S3	53	47,5	68
55-S3	65	52,5	74,5
80-S3	90	65	90,5

Tab. 7-21 Setting dimension for adjusting ring

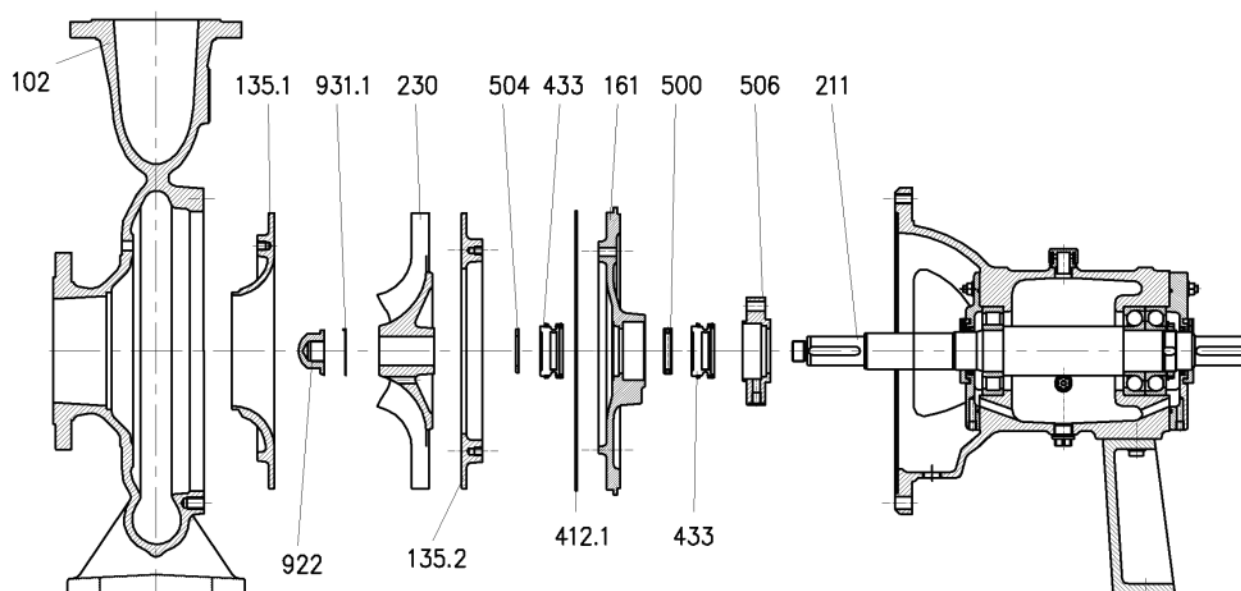


Fig. 7-9 Tandem standard mechanical seal

7.11.3 Changing the Back-to-Back standard mechanical seal

The pump must always be shut down under the following conditions in order to avoid serious damage,:

- Sealing water leaking on the atmospheric side
- Abnormal consumption of sealing water
- Drop in sealing water pressure
- Conveying medium in the sealing water



If hot and aggressive pumping medium leaks, this may cause a risk to life and limb and damage to the machine or its components.

Change the mechanical seal (**433.1**) according to the following table

Step	Procedure
1	Shut down pump according to Chapter on "Operation".
2	Remove pull-out unit according to Section 7.8.1.
3	Remove impeller as per Section 7.9.
4	Pull spacer plates (556.1/2) and spacer ring (211) off the shaft.
5	Push off the nuts (920.5) at the retaining ring (506) and push the retaining ring off the gland housing (451).
6	Detach nuts (920.4) and remove the gland housing (451) from the bearing support (330).
7	Remove the mechanical seal (433).
8	Inspect seal and try to find the reason for the fault (dry running, wear, etc.). If necessary, consult specialists at the seal supplier company.
9	Install new seal according to the instructions provided by the seal suppliers. Please refer to: ➡ /KREISELPUMPE S/ SUPPLIER DOCUMENTATION/ ...
10	Mount the gland housing (451) on the bearing support (330). Mount retaining ring (506) on the housing cover.
11	Mount spacers (556.1/2) and impeller (230). Check gap between vanes on the back of the impeller and the casing cover (161) (0.5-0.7 mm).
12	Mount impeller according to Section 7.9.
13	Mount pull-out unit according to Section 7.8.2.
14	Start up pump according to Chapter on "Operation".

Tab. 7-22 Changing the Back-to-Back standard mechanical seal

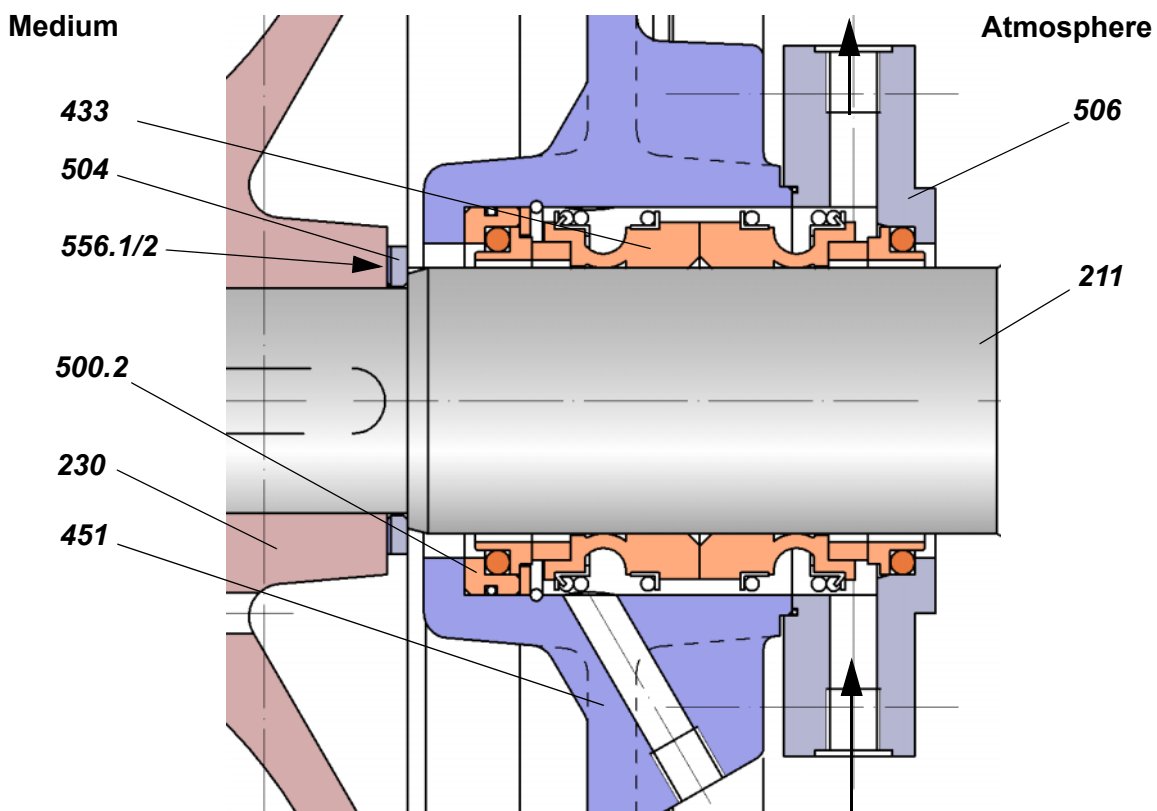


Fig. 7-10 Tandem standard mechanical seal

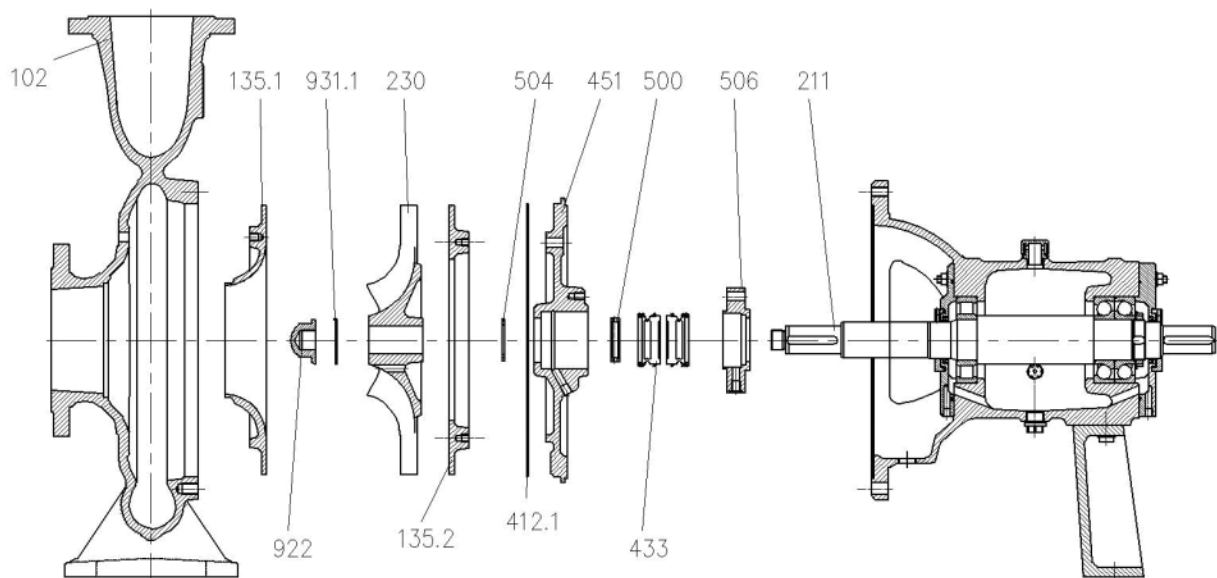


Fig. 7-11 Back-to-Back standard mechanical seal

7.11.4 Changing the Andritz cartridge mechanical seal - single

To avoid greater damage, the mechanical seal must be replaced immediately if there is leakage on the atmospheric side.



If hot and aggressive pumping medium leaks, this may cause a risk to life and limb and damage to the machine or its components.

Change the mechanical seal (**433.1**) according to the following table:

Step	Procedure
1	Shut down pump according to Chapter on "Operation".
2	Remove pull-out unit according to Section 7.8.1.
3	Remove impeller as per Section 7.9.
4	Undo fastening screws (914.1). Remove cartridge (433.1) by means of forcing screws. Caution: Take care not to lose the spacer plates (566.1/2).
5	Inspect seal and try to find the reason for the fault (dry running, wear, etc.). If necessary, consult specialists at the seal supplier company.
6	Clean all parts and mount a new seal.
7	Push cartridge with O-ring (412.7) over the shaft and install. Lubricate O-ring beforehand with soap solution or special non-seizing compound.
8	Secure cartridge in casing cover (161) with the bolts (914.1).
9	Mount spacers (566.1/2) and impeller (230). Check gap between vanes on the back of the impeller and the casing cover (161) (0.5-0.7 mm).
10	Mount impeller according to Section 7.9.
11	Mount pull-out unit according to Section 7.8.2.
12	Start up pump according to Chapter on "Operation".

Tab. 7-23 Changing the Andritz cartridge mechanical seal - single

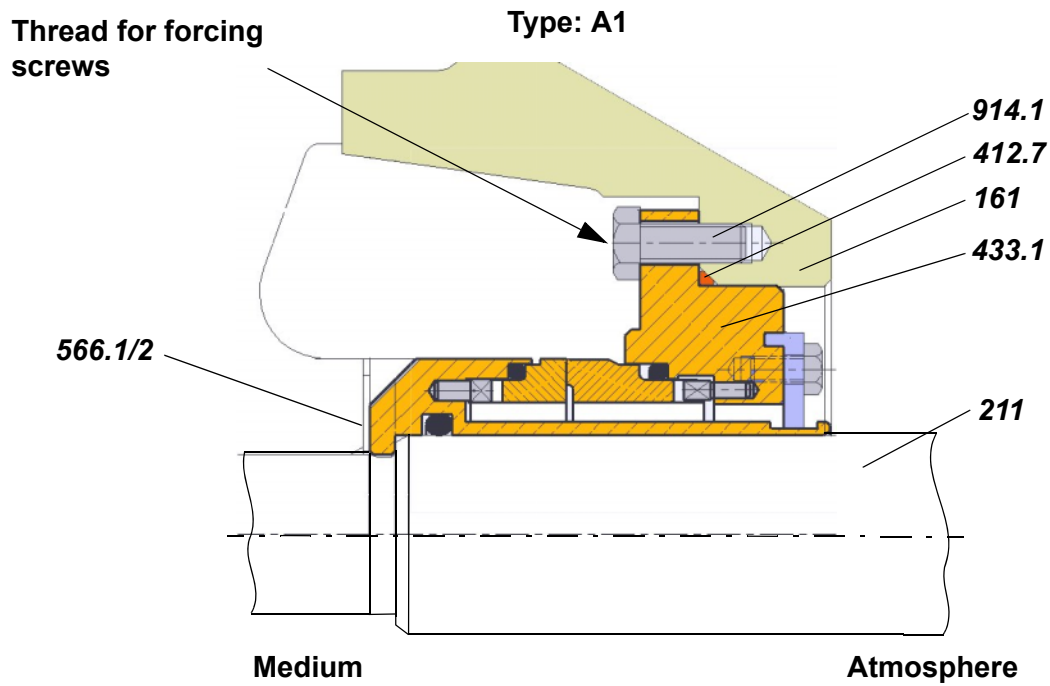


Fig. 7-12 Andritz cartridge mechanical seal - single, type A1

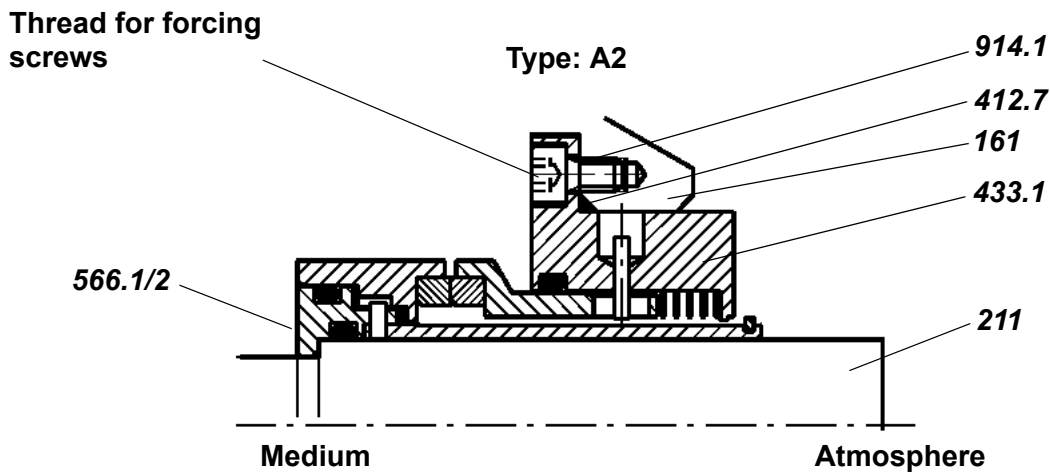


Fig. 7-13 Andritz cartridge mechanical seal - single, type A2

7.11.5 Changing the Andritz cartridge mechanical seal - tandem

The pump must always be shut down under the following conditions in order to avoid serious damage,:

- Sealing water leaking on the atmospheric side
- Abnormal consumption of sealing water
- Drop in sealing water pressure
- Conveying medium in the sealing water



If hot and aggressive pumping medium leaks, this may cause a risk to life and limb and damage to the machine or its components.

Change the mechanical seal (**433.1**) according to the following table:

Step	Procedure
1	Shut down pump according to Chapter on "Operation".
2	Remove pull-out unit according to Section 7.8.1.
3	Remove impeller as per Section 7.9.
4	Undo fastening screws (914.1). Remove cartridge (433.1) by means of forcing screws.
5	Clean all parts and mount a new seal.
6	Push cartridge with O-ring (412.7) over the shaft and install. Lubricate O-ring beforehand with soap solution or special non-seizing compound.
7	Secure cartridge in casing cover (161) with the bolts (914.1).
8	Mount impeller according to Section 7.9.
9	Mount pull-out unit according to Section 7.8.2.
10	Start up pump according to Chapter on "Operation".

Tab. 7-24 Changing the Andritz cartridge mechanical seal - tandem

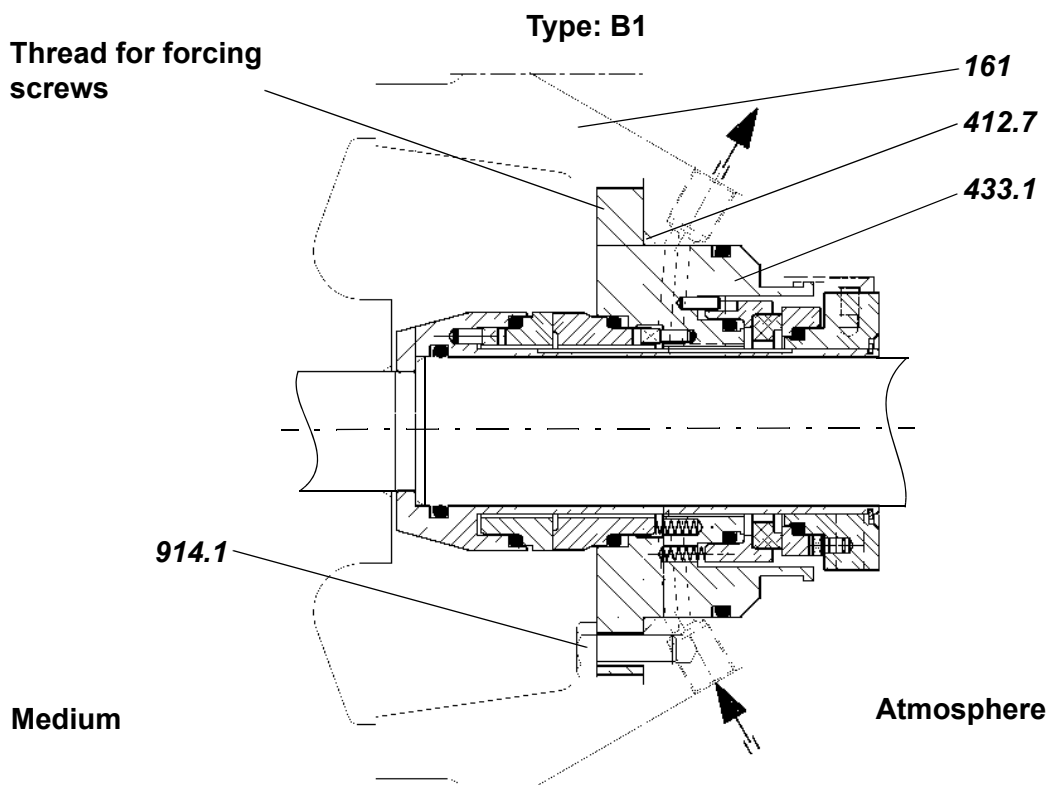


Fig. 7-14 Changing the Andritz cartridge mechanical seal - single, type B1

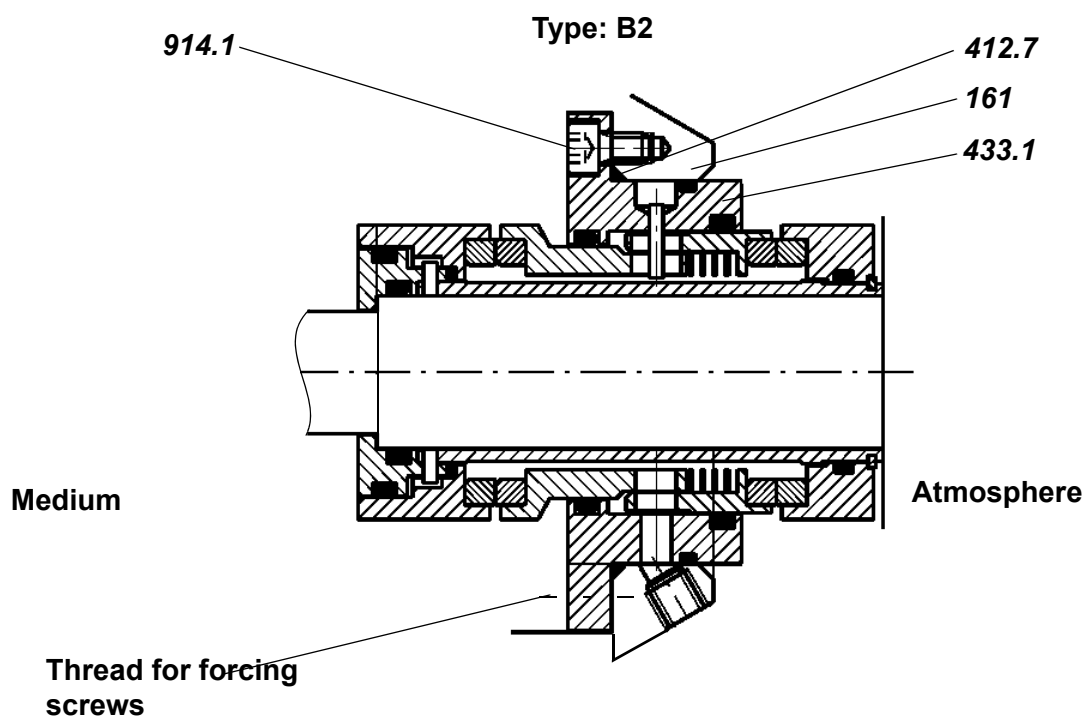


Fig. 7-15 Changing the Andritz cartridge mechanical seal - single, type B2

7.11.6 Changing the stuffing box packing and the shaft protection sleeve

The stuffing box packing is a wear part. When the stuffing box gland (452) is approximately 5 mm from the parallel surface of the gland housing (451), the packing must be changed.

Removing the gland packing

When changing the stuffing box packing (461) and shaft protection sleeve (524), proceed according to the following table:

1	Shut down pump according to Chapter on "Operation".
2	Remove pull-out unit according to Section 7.8.1.
3	Remove impeller as per Section 7.9.
4	Undo the nuts (920.5) and pull back the stuffing box gland (452).
5	Remove old stuffing box packings (461) and pull out the sealing water ring (458).
6	Clean the stuffing box gland, set collar and packing area thoroughly.
7	Check shaft protection sleeve (524) and replace if worn. Notches or grooves on the surface of the shaft protection sleeve cause excessive wear on the gland packing!
8	Remove spacers (556.1/2) and shaft protection sleeve (524).
9	Lubricate new shaft protection sleeve (524) using special grease and push onto the shaft up to the shaft collar.

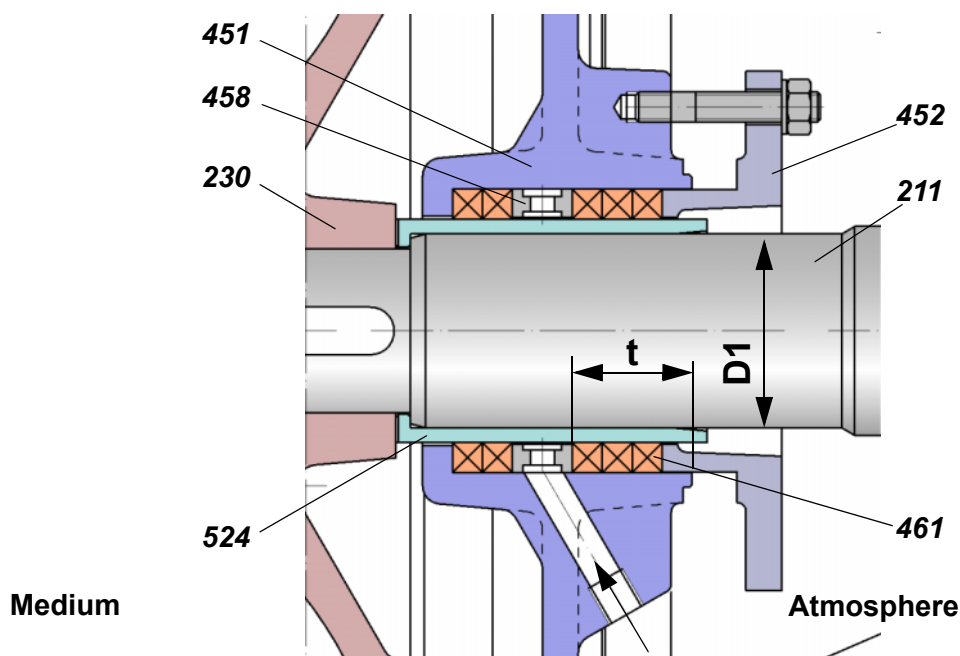


Fig. 7-16 Stuffing box

Installing the gland packing

Proceed according to the following table when installing the gland packing:

Step	Procedure
1	Mark gland packing (see Fig. 7-17) and cut to the appropriate length. Keep stuffing box clean, do not stretch or squash stuffing box when measuring and cutting.
2	Wrap the gland packing round the shaft protection sleeve, then push the first packing ring into the stuffing box, starting at the butt joint. The ends of the ring must form a butt joint with no gap.
3	Push the first packing ring right in using a suitable tool.
4	Install the remaining packing rings and the sealing water ring (458). Mount the remaining packing rings with the butt joints offset by 120 degrees.
5	When the stuffing box gland (452) has been installed, tighten all screws evenly according to the following setting guidelines.
6	Mount impeller according to Section 7.9, Step 8
7	Mount pull-out unit according to Section 7.8.2.
8	Start up pump according to Chapter on "Operation"

Tab. 7-25 Installing the gland packing

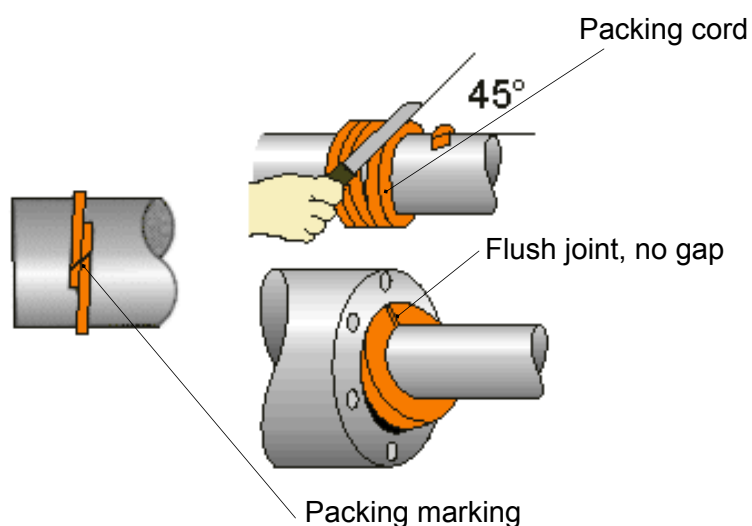


Fig. 7-17 Marking the gland packing

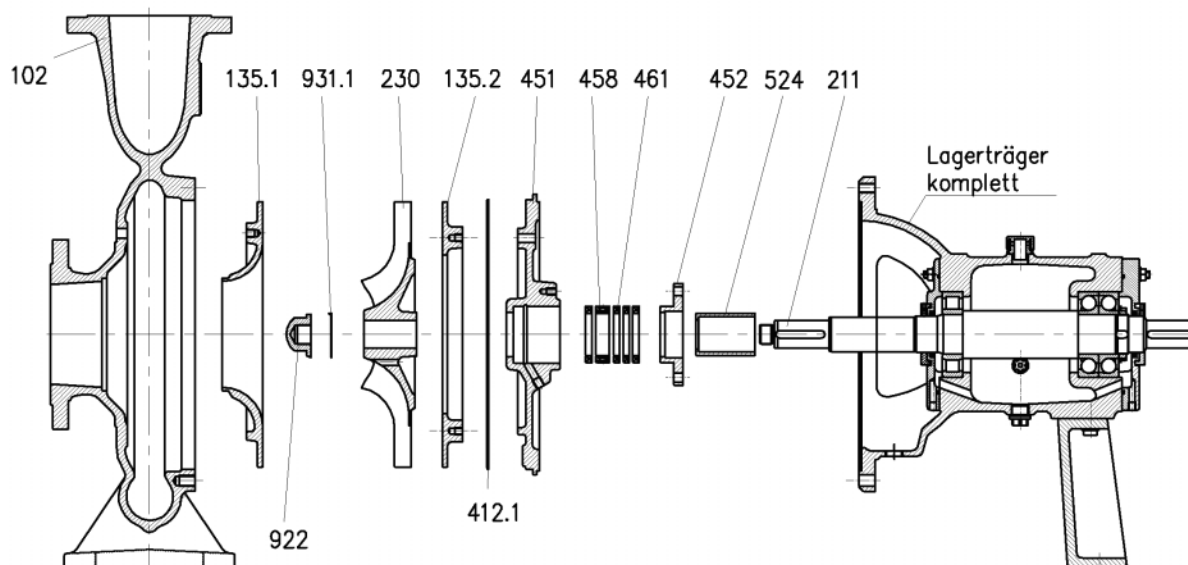


Fig. 7-18

Setting the stuffing box

The following settings must be observed:

- Never tighten the stuffing box gland so far that drainage of sealing water is brought to a complete halt. At least a few drops should drain off per minute in order to avoid excessive friction and wear on the shaft.
- Set the stuffing box such that the shaft protection sleeve at the stuffing box gland is always moist.
- The stuffing box should be checked every 15 minutes during the first few hours in operation.
- The stuffing boxes should leak excessively at start-up and be adjusted for a normal slow leak after the running-in period (approx. 12 hrs).
- Loosen the screws at the stuffing box gland if the stuffing box overheats.
- Do not tighten gland nuts more than 1/6 of a turn in 15 minutes running time.



The stuffing box will be damaged if the stuffing box gland is screwed too tight.

Only use the tools intended for this purpose!

7.11.7 Changing the dynamic shaft seal



If hot and aggressive pumping medium leaks, this may cause a risk to life and limb and damage to the machine or its components.

Maintenance seal

Change the maintenance seal according to the following table:

Step	Procedure
1	Shut down pump according to Chapter on "Operation".
2	Remove pull-out unit according to Section 7.8.1.
3	Remove impeller as per Section 7.9.
4	Pull spacer plates (556.1/2) off the shaft.
5	Loosen the screws (904.3) and remove the adjusting ring (500.3).
6	Loosen the screws (904.2) at the bush (540).
7	Pull complete sealing unit (rear lining, housing cover, impeller, maintenance seal, and bush) off the pump shaft.
8	Remove stay ring (511) and maintenance seal (410).
9	Clean all parts and mount a new maintenance seal. Before assembly, check all wear parts and replace with new parts if required.
10	Installing the complete sealing unit.
1	Mount the spacer rings (556.1/2). Check gap between vanes on the back of the impeller and the casing cover (161) (0.5-0.7 mm).
2	Mount impeller according to Section 7.9.
3	Mount pull-out unit according to Section 7.8.2.
4	Start up pump according to Chapter on "Operation"

Tab. 7-26 Changing the maintenance seal

Setting the maintenance seal

Step	Procedure
1	Loosen the screws (904.3) at the adjusting ring (500.3).
2	Turn the adjusting ring (500.3) clockwise until the gap between the maintenance seal (511) and the adjusting ring (500.3) is closed. (No leak)
3	Tighten bolts (904.3) evenly (synchronously) to avoid the adjusting ring being displaced.

Tab. 7-27 Setting the maintenance seal

Impeller

Proceed according to the following table when changing the impeller:

Step	Procedure
1	Shut down pump according to Chapter on "Operation".
2	Remove pull-out unit according to Section 7.8.1.
3	Remove impeller as per Section 7.9.
4	Pull spacer plates (556.1/2) off the shaft.
5	Loosen the screws (904.3) and remove the adjusting ring (500.3).
6	Loosen the screws (904.2) at the bush (540).
7	Pull complete sealing unit (rear lining, housing cover, impeller, maintenance seal, and bush) off the pump shaft.
8	Detach rear lining (502) from housing cover (161).
9	Remove clamping ring (932.1).
10	Change impeller (235). Clean all parts and mount a new maintenance seal. Before assembly, check all wear parts and replace with new parts if required.
11	Installing the complete sealing unit.
1	Mount the spacer rings (556.1/2). Check gap between vanes on the back of the impeller and the casing cover (161) (0.5-0.7 mm).
2	Mount impeller according to Section 7.98
3	Mount pull-out unit according to Section 7.8.2.
4	Start up pump according to Chapter on "Operation"

Tab. 7-28 Changing the impeller

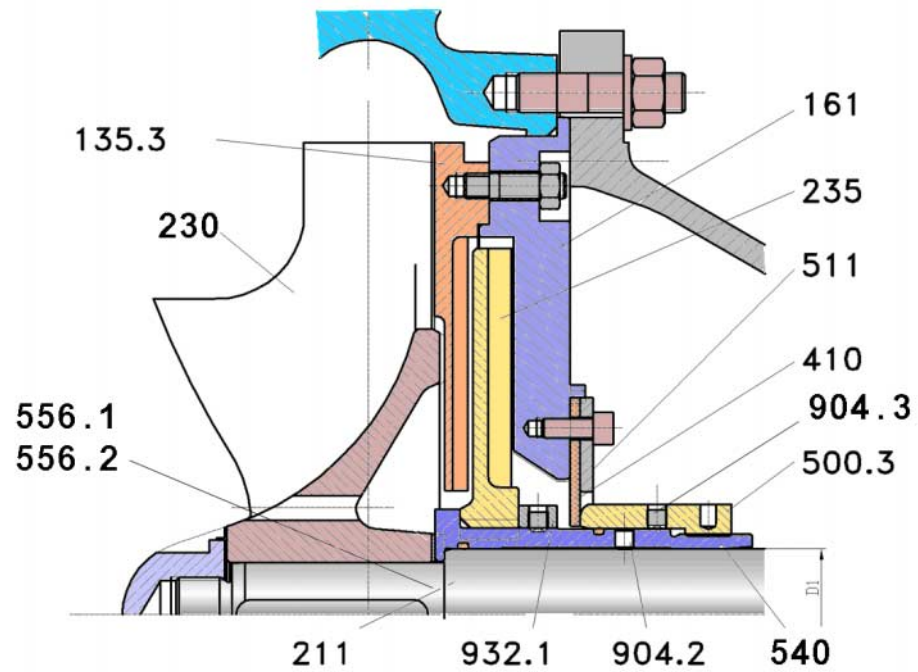


Fig. 7-19 Dynamic shaft seal

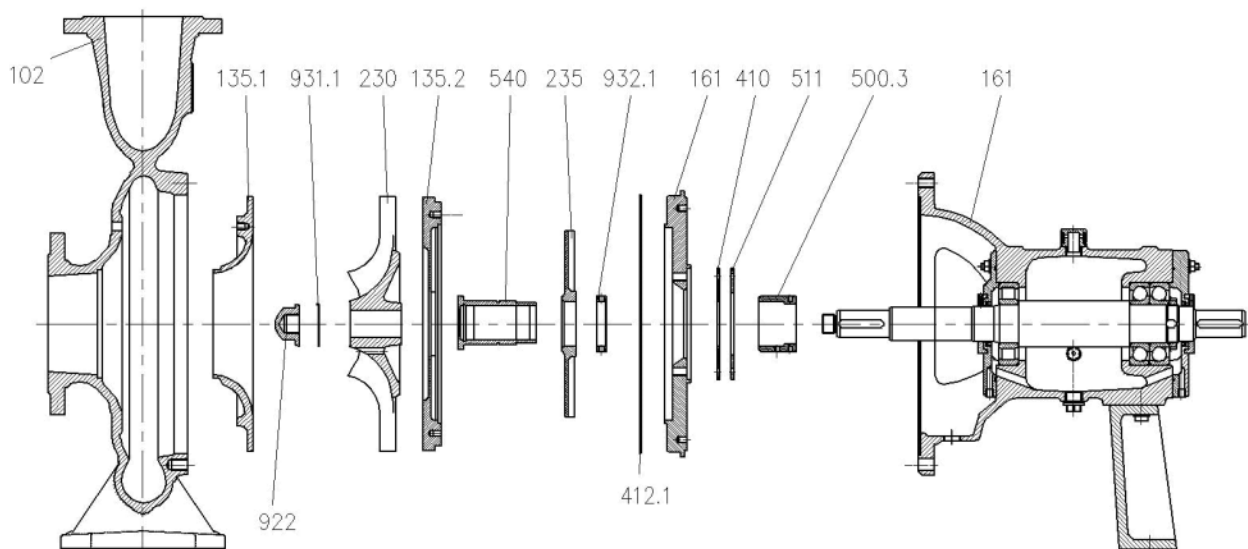


Fig. 7-20 Dynamic shaft seal

7.12 Changing the anti-friction bearings with oil lubrication

The anti-friction bearings are designed for continuous operation under full load for approximately 50000 operating hours. Higher bearing temperature and vibration at the bearing support are a sign of impending bearing damage. If these symptoms occur, the bearing must be changed.

Change the anti-friction bearings according to the following table:

Step	Procedure
1	Shut down pump according to Chapter on "Operation".
2	Remove pull-out unit according to Section 7.8.1.
3	Remove impeller as per Section 7.9.
4	Dismount shaft seal according to Chapter 7.11.
5	Remove housing cover (161) and gland housing (451).
6	Remove splash rings (507.90 and 507.91), bearing cover (360.1, 360.2) and mounting angle (732). Install the bearing vertically with the coupling side upwards.
7	Detach locking plate (931.2) and locking nut (923).
8	Dismount shaft, including anti-friction bearing parts, using lifting gear.
9	Remove the remaining anti-friction bearing parts from the bearing housing. Remove the bearing parts on the shaft using the pull-out unit.
10	Clean all parts to be re-used and prepare new parts (anti-friction bearings, radial seals).
11	Pull the inner ring of the cylindrical roller bearing (322) onto the shaft by heating (approx. 80°C). Tighten the inner rings of the angular contact ball bearings (320) using the lock nut (923) and secure (931.2).
12	Place the outer ring of the cylindrical roller bearing (322) in the bearing housing.
13	Mount bearing cover (360.1) with new O-ring (412.90) and new radial shaft seal (411.1). CAUTION: The raised area in the bearing cover must be at the 6 o'clock position. (see Fig. 7-22)
14	Install the bearing housing vertically with the coupling side upwards.
15	Insert the first outer ring of the angular contact ball bearing (321) and the first anti-friction bearing cage.

Tab. 7-29 Changing the anti-friction bearings

Step	Procedure
16	Place the second anti-friction bearing cage and the second outer ring on the shaft. Raise shaft vertically on the coupling side with ring bolt and fit from above by turning into the bearing housing.
17	Mount bearing cover (360.2) with new O-ring (412.91) and new radial shaft seal (411.2). CAUTION: Set gap between coupling-side bearing cover (360.2) and bearing housing to 0.1 to 0.2 mm with shim material (551.1) such that the outer rings of the anti-friction bearings (fixed bearings) are secured. (see Fig. 7-21) The groove in the bearing cover (360.2) must be at the 6 o'clock position. (see Fig. 7-22)
18	Mount and tighten the splash rings (904.90/904.91).
19	Check shaft by rotating it manually.
20	Fill bearing support with oil according to Section 7.6.1. If the pump is to be stored for more than 2 weeks, the bearing support should be filled 100% with preserving oil, then rotate the shaft through one revolution and drain off the oil. This preserving measure is adequate for approximately 1 year.
21	Re-install the bearing support in reverse order.

Tab. 7-29 Changing the anti-friction bearings



**Limbs can be trapped or crushed during installation work.
Wear your personal protective apparel.**

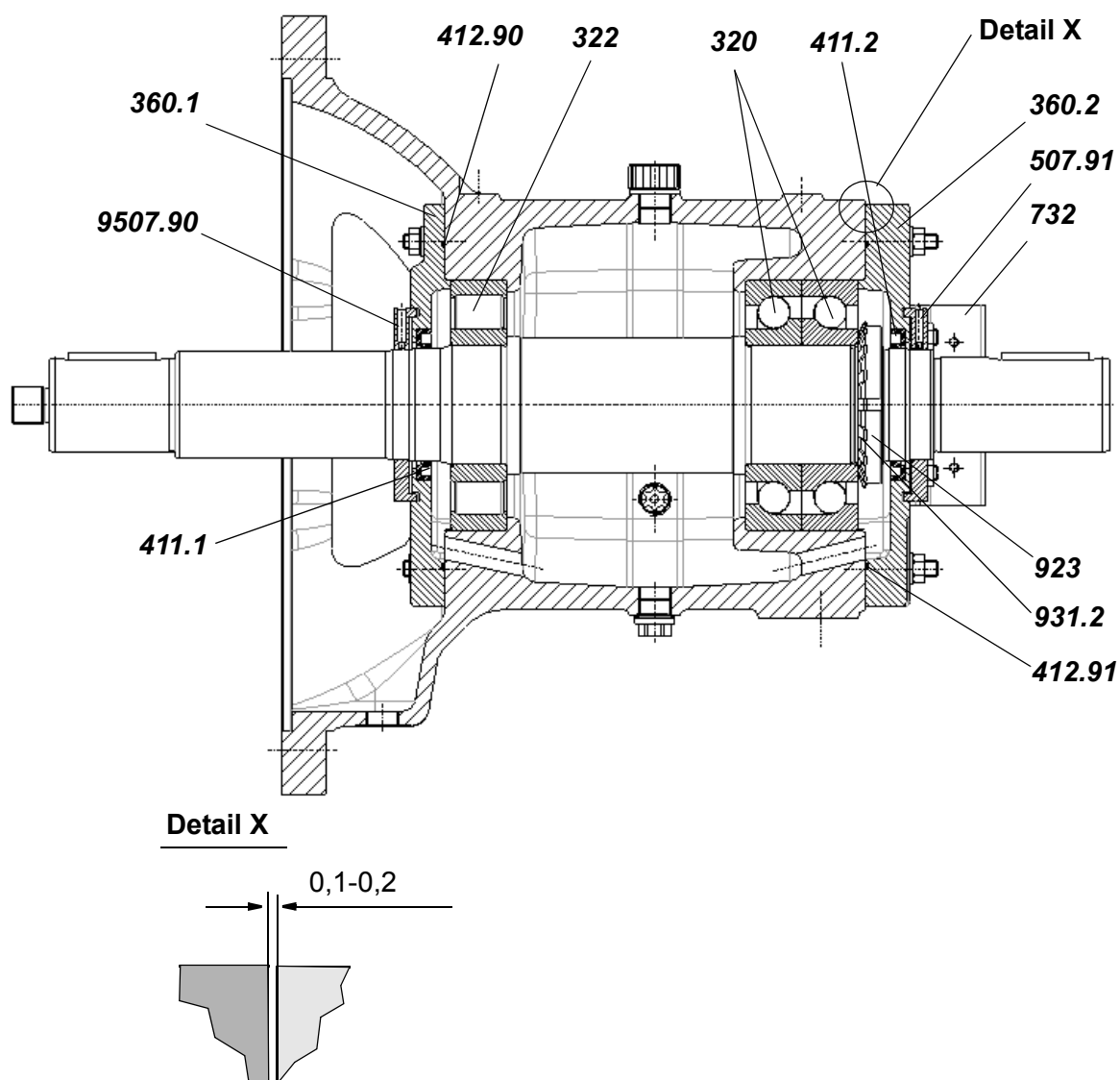


Fig. 7-21 Changing the anti-friction bearings

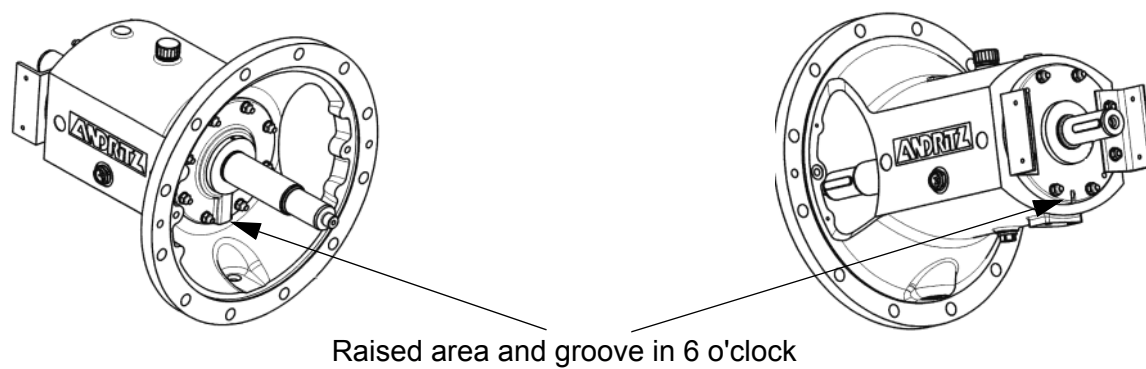


Fig. 7-22 Bearing cover

7.13 Changing the anti-friction bearings with grease lubrication

The anti-friction bearings are designed for continuous operation under full load for approximately 50000 operating hours. Higher bearing temperature and vibration at the bearing support are a sign of impending bearing damage. If these symptoms occur, the bearing must be changed.

Change the anti-friction bearings according to the following table:

Step	Procedure
1	Shut down pump according to Chapter on "Operation".
2	Remove pull-out unit according to Section 7.8.1.
3	Remove impeller as per Section 7.9.
4	Dismount shaft seal according to Chapter 7.11.
5	Remove housing cover (161) and gland housing (451).
6	Remove splash rings (507.90 and 507.91), bearing cover (360.1, 360.2) and mounting angle (732). Install the bearing vertically with the coupling side upwards.
7	Detach locking plate (931.2) and locking nut (923).
8	Dismount shaft, including anti-friction bearing parts, using lifting gear.
9	Remove the remaining anti-friction bearing parts from the bearing housing. Remove the bearing parts on the shaft using the pull-out unit.
10	Clean all parts to be re-used and prepare new parts (anti-friction bearings, radial seals).
11	Pull the inner ring of the cylindrical roller bearing (322) onto the shaft by heating (approx. 80°C). Tighten the inner rings of the angular contact ball bearings (320) using the lock nut (923) and secure (931.1).
12	Place the outer ring of the cylindrical roller bearing (322) in the bearing housing.
13	Mount bearing cover (360.1) with new O-ring (412.4) and new radial shaft seal (411.1). CAUTION: The raised area in the bearing cover must be at the 3 o'clock or 9 o'clock position. (see Fig. 7-24)
14	Install the bearing housing vertically with the coupling side upwards.
15	Insert the first outer ring of the angular contact ball bearing (320) and the first anti-friction bearing cage.

Tab. 7-30 Changing the anti-friction bearings

Step	Procedure
16	Place the second anti-friction bearing cage and the second outer ring on the shaft. Raise shaft vertically on the coupling side with ring bolt and fit from above by turning into the bearing housing.
17	Mount bearing cover (360.2) with new O-ring (412.91) and new radial shaft seal (411.2). CAUTION: Set gap between coupling-side bearing cover (360.2) and bearing housing to 0.1 to 0.2 mm with shim material (551.91) such that the outer rings of the anti-friction bearings (fixed bearings) are secured. (see Fig. 7-23) The groove in the bearing cover (360.2) must be at the 3 o'clock or 9 o'clock position. (see Fig. 7-24)
18	Mount and tighten the splash rings (507.90/507.91).
19	Check shaft by rotating it manually.
20	Fill and lubricate bearing with grease according to Section 7.6.2.
21	Re-install the bearing support in reverse order.

Tab. 7-30 Changing the anti-friction bearings



**Limbs can be trapped or crushed during installation work.
Wear your personal protective apparel.**

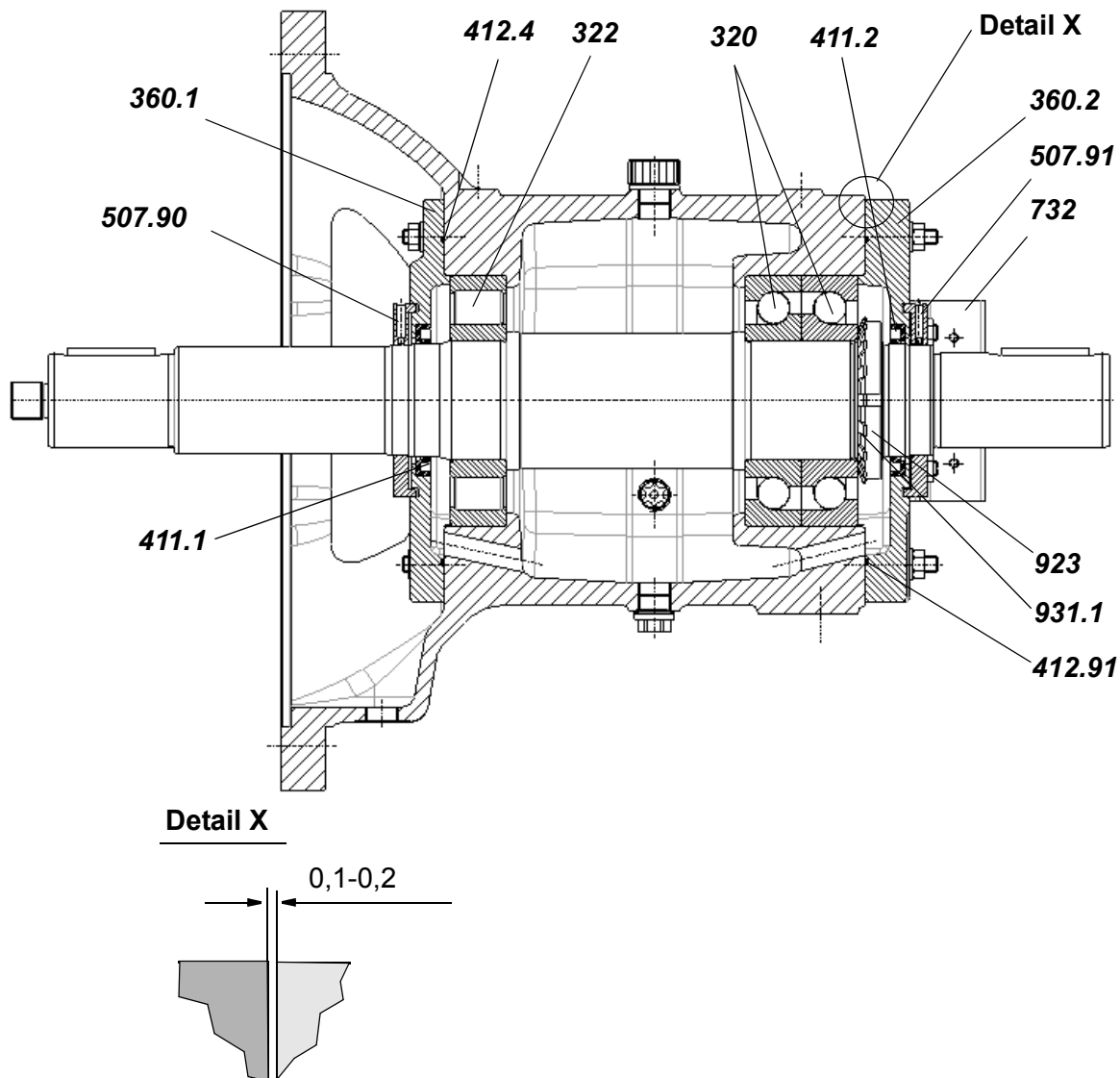


Fig. 7-23 Changing the anti-friction bearings

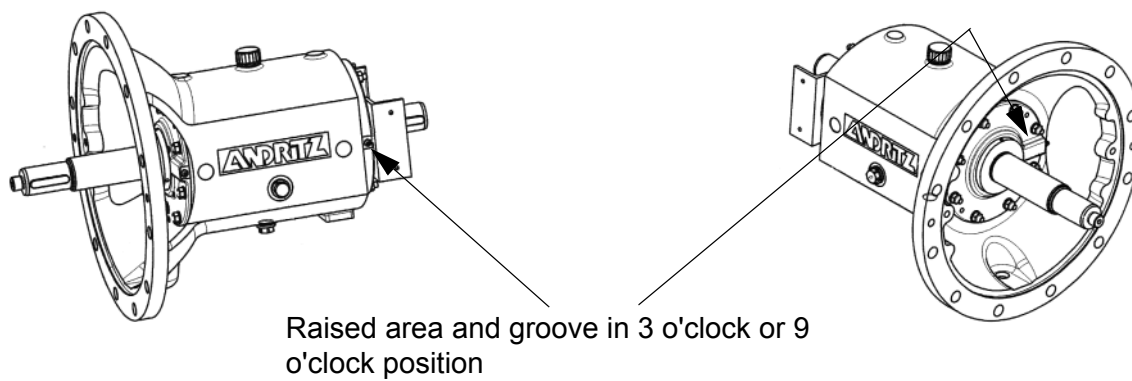


Fig. 7-24 Bearing cover

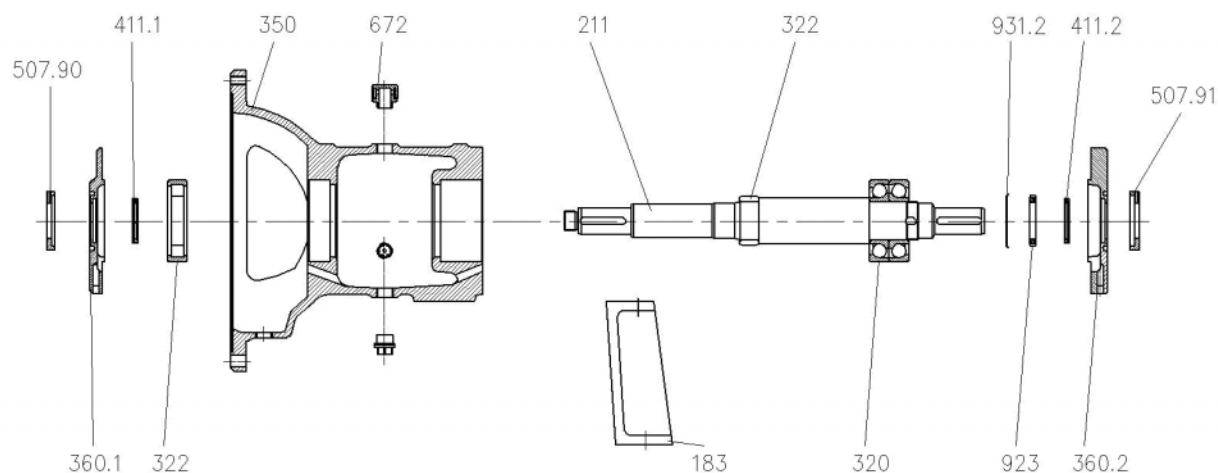


Fig. 7-25 Changing the anti-friction bearings

7.14 Disassembly and disposal



The machine must be disconnected from the power source before disassembly!
The machine should only be disassembled by qualified and authorized personnel.

If the machine/plant is to be shut down, the following must be taken into account for subsequent disposal:

Machine parts

- The machine components must be disassembled according to the various materials, lubricant fillings and various forms of contamination.
- The materials must be disposed of in accordance with the applicable legislation on waste disposal.
- Proof must be brought of the properties and the disposal route of the various materials according to the applicable regulations on proof of recovery and disposal (e.g. statement and entry in register).

Plastic parts

- Limitations due to the material used

- Limitations due to contact with the process water (contamination)
- Limitations due to contact with the ambient air (contamination)

Compile the necessary documents before disposal and dispose of the materials according to the regulations, observing the documents.



Plastic parts are flammable.

Observe the local fire protection regulations. When separating the materials, do not work with welding devices or equipment that generates sparks.

Additives

Oil, utilities and cleaning agents must also be disposed of according to the local provisions and in compliance with the appropriate manufacturer regulations.

Other metal groups to be separated are:

- Surface-treated sheet steel, such as powder-coated or wet-painted covers, etc.
- Surface-coated construction steel, such as rotating parts, gratings, bolts, etc.
- Copper (electrical grade copper or silver-coated electrical grade copper), such as busbars, connecting straps, connections pieces, etc.
- Cables
- Built-in units

8 TECHNICAL DATA

8.1 Spare parts

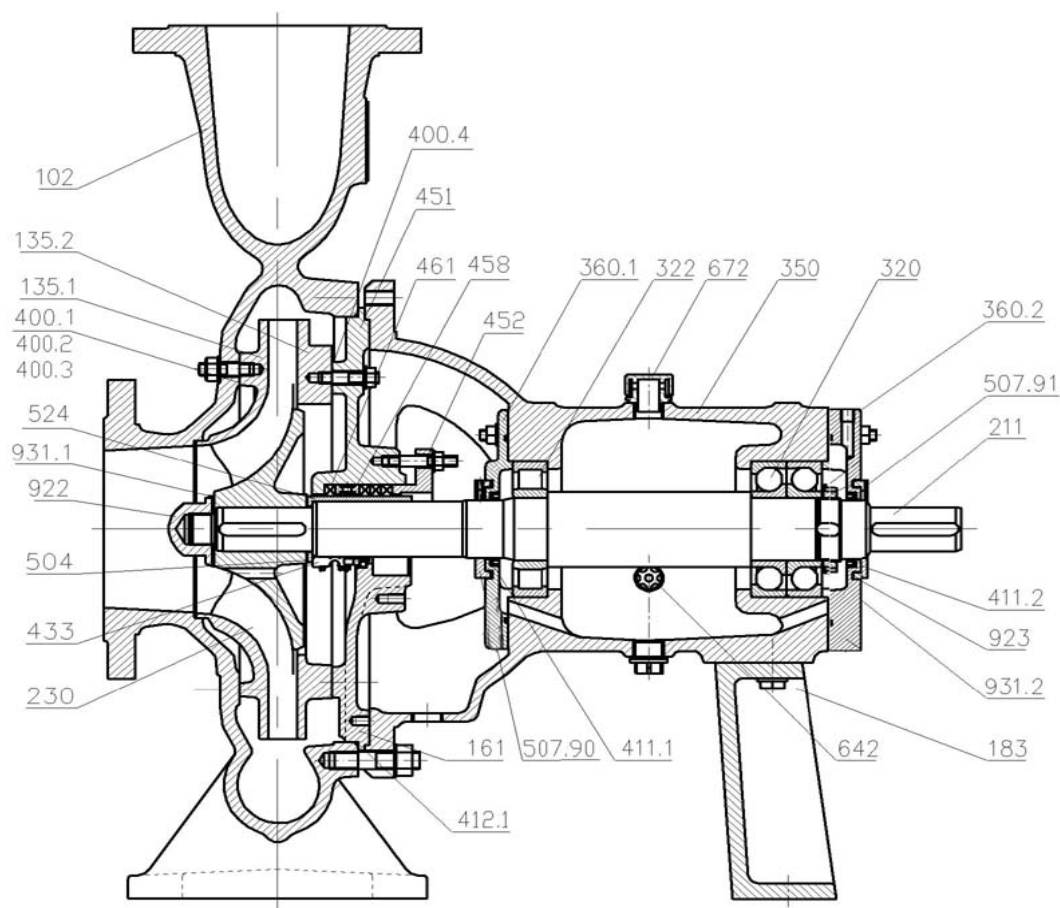


Fig. 8-1 Spare parts

Item	pcs.	Spare part	Item	pcs.	Spare part
102	1	Spiral casing	411.2	1	Radial sealing ring, coupling side
135.1	1	Front lining	412.1	1	Housing o-ring seal
135.2	1	Rear lining	433	1	Mechanical seal
161	1	Casing cover	451	1	Stuffing box body
183	1	Supporting leg	452	1	Stuffing box gland
211	1	Pump shaft	458	1	Sealing water ring
230	1	Impeller	461	4	Stuffing box packing
320	2	Anti-friction bearing, coupling side	504	1	Spacer ring and spacer plates
322	1	Anti-friction bearing, pump side	524	1	Shaft protection sleeve

Tab. 8-1

Item	pcs.	Spare part	Item	pcs.	Spare part
350	1	Bearing housing	642	2	Oil level indicator
360.1	1	Bearing cover, pump side	672	1	Vent plug
360.2	1	Bearing cover, coupling side	922	1	Impeller nut
400.1	4	PTFE seal 1mm	923	1	Shaft nut
400.2	4	PTFE seal 0,5 mm	931.1	1	Lockwasher for impeller nut
400.3	12	PTFE seal 0,3 mm	931.2	1	Lockwasher for impeller nut
400.4	12	PTFE seal 0,3 mm	507.90	1	Splash ring, pump side
411.1	1	Radial sealing ring, pump side	507.91	1	Splash ring, coupling side

Tab. 8-1

8.2 Types of anti-friction bearing

Bearing size	Pump type	pcs.	Pump-side bearing	pcs.	Coupling-side bearing
Size 28	S80-265	1	NU 308 ECP/C3	2	7308 BECBP
	S100-265				
	S125-265				
Size 38	S100-350	1	NU 310 ECP/C3	2	7310 BECBP
	S125-350				
	S150-330				
Size 42	S125-400	1	NU 312 ECP/C3	2	7312 BECBP
	S150-400				
	S200-380				
Size 55	S150-470	1	NU 316 ECP/C3	2	7316 BECBP
	S200-470				
	S250-430				
Size 80	S350-470	1	NU 320 ECP/C3	2	7320 BECBP
	S500-600				

8.3 Rotary shaft seals

Bearing size	Pump type	Pump-side	Coupling-side
Size 28	S80-265	ASL 38 x 5 x 7	ASL 35 x 47 x 7
	S100-265		
	S125-265		
Size 38	S100-350	ASL 48 x 62 x 8	ASL 45 x 60 x 8
	S125-350		
	S150-330		
Size 42	S125-400	ASL 55 x 70 x 8	ASL 55 x 70 x 8
	S150-400		
	S200-380		
Size 55	S150-470	ASL 70 x 90 x 10	ASL 70 x 90 x 10
	S200-470		
	S250-430		
Size 80	S350-470	ASL 95 x 120 x 12	ASL 95 x 120 x 12
	S500-600		

8.4 Data sheet

see attachments

8.5 Characteristic curve

see attachments

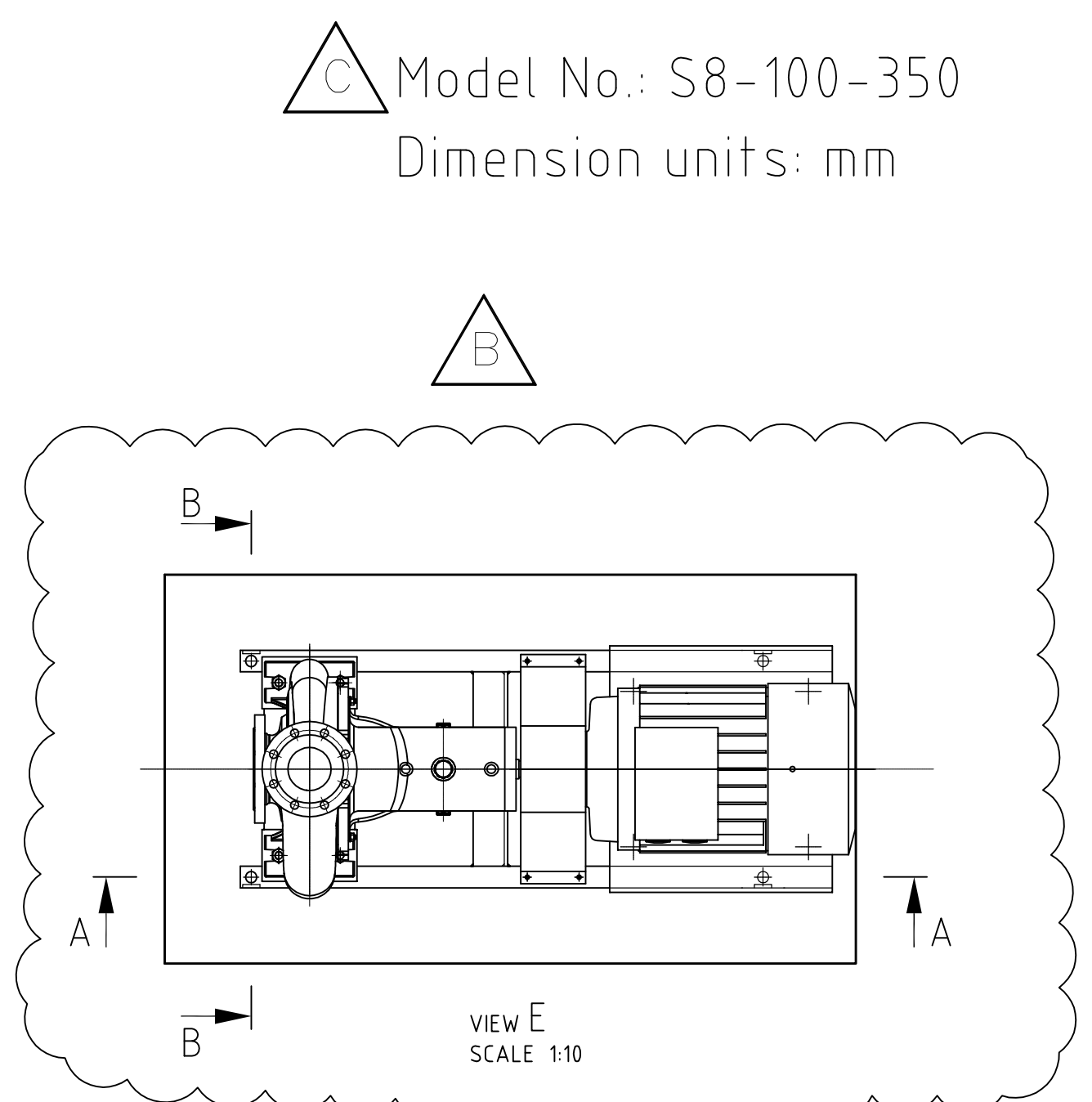
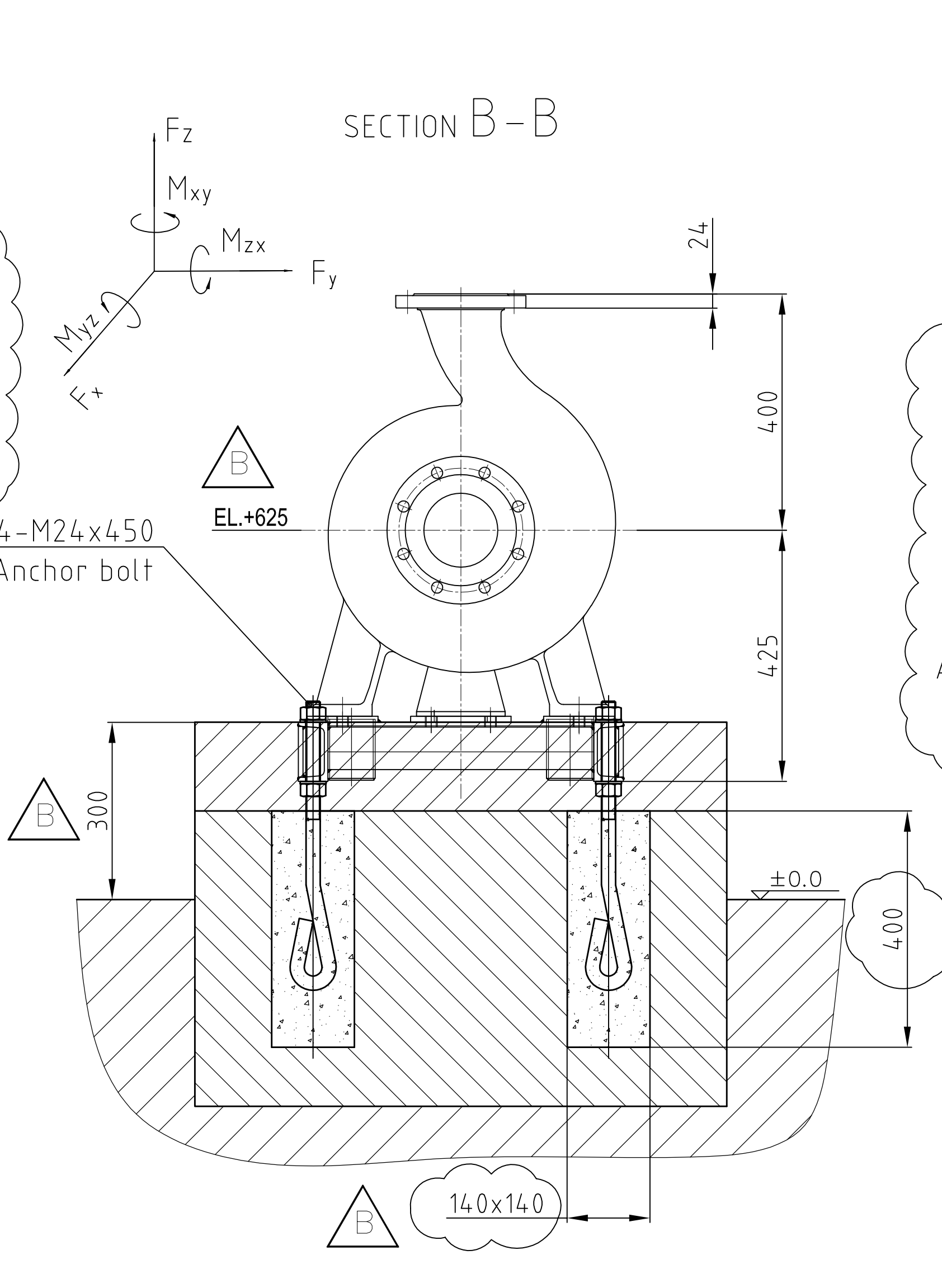
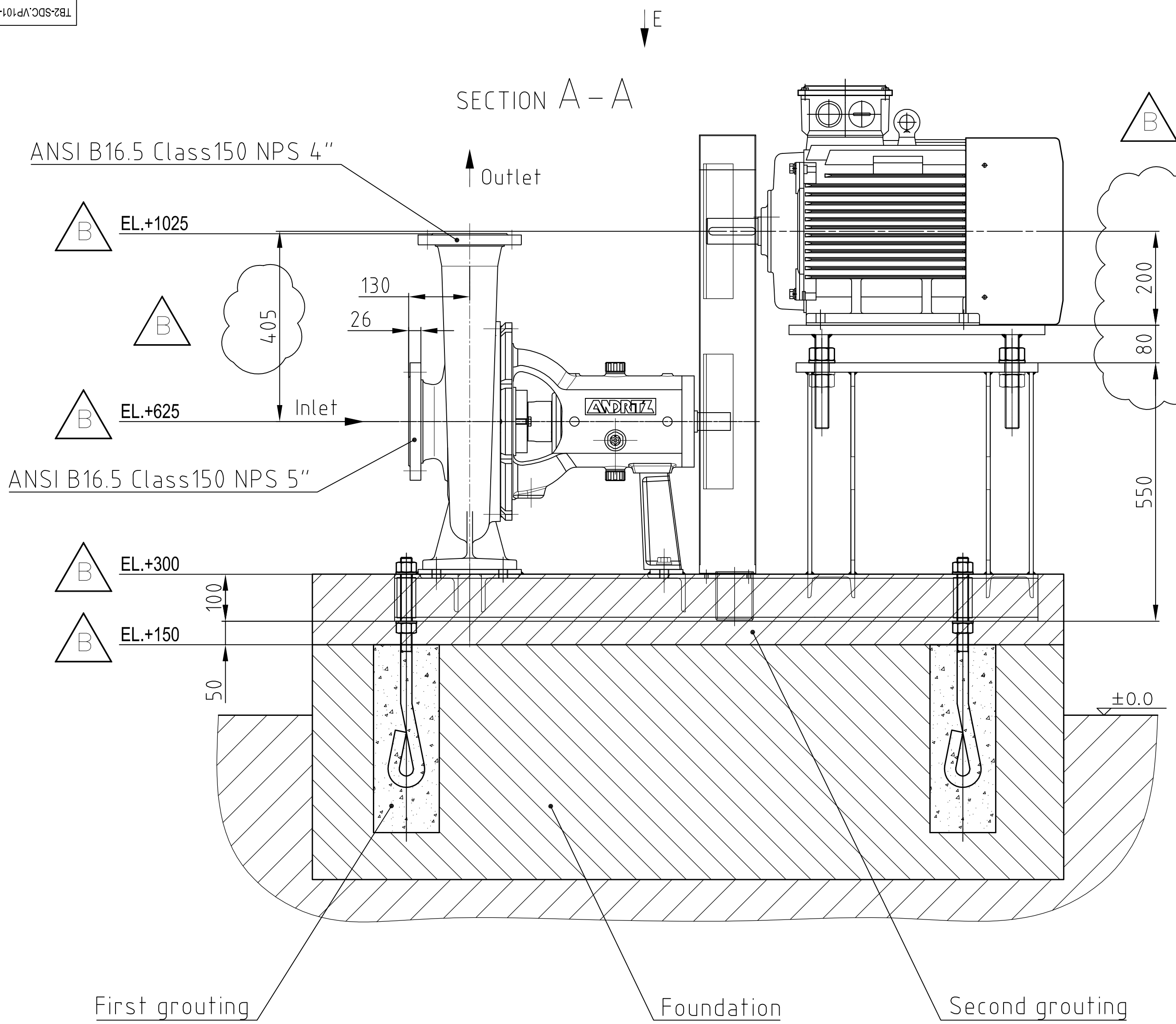
9 SUPPLIER DOCUMENTATION

9.1 Coupling

see Datasheet

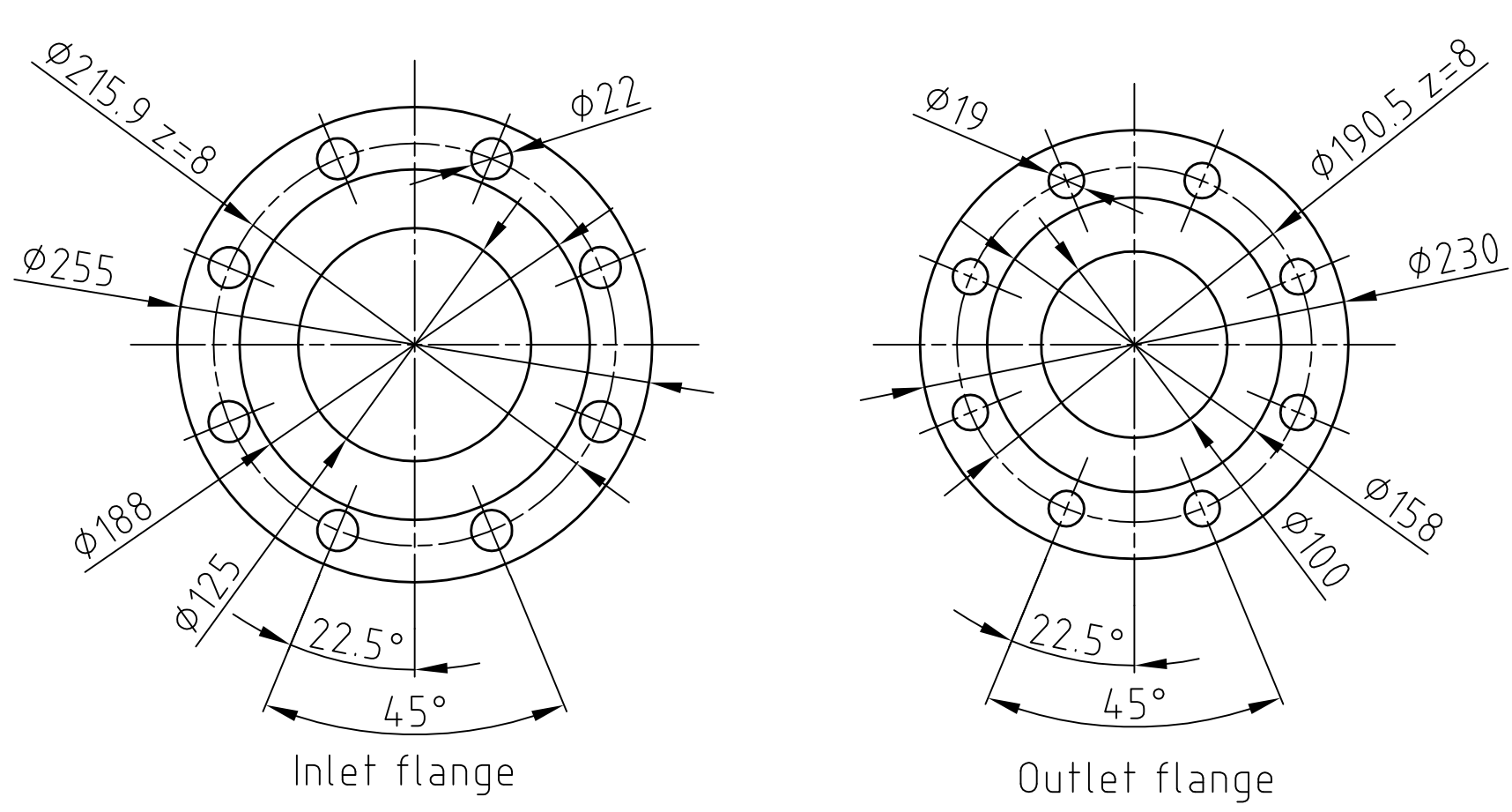
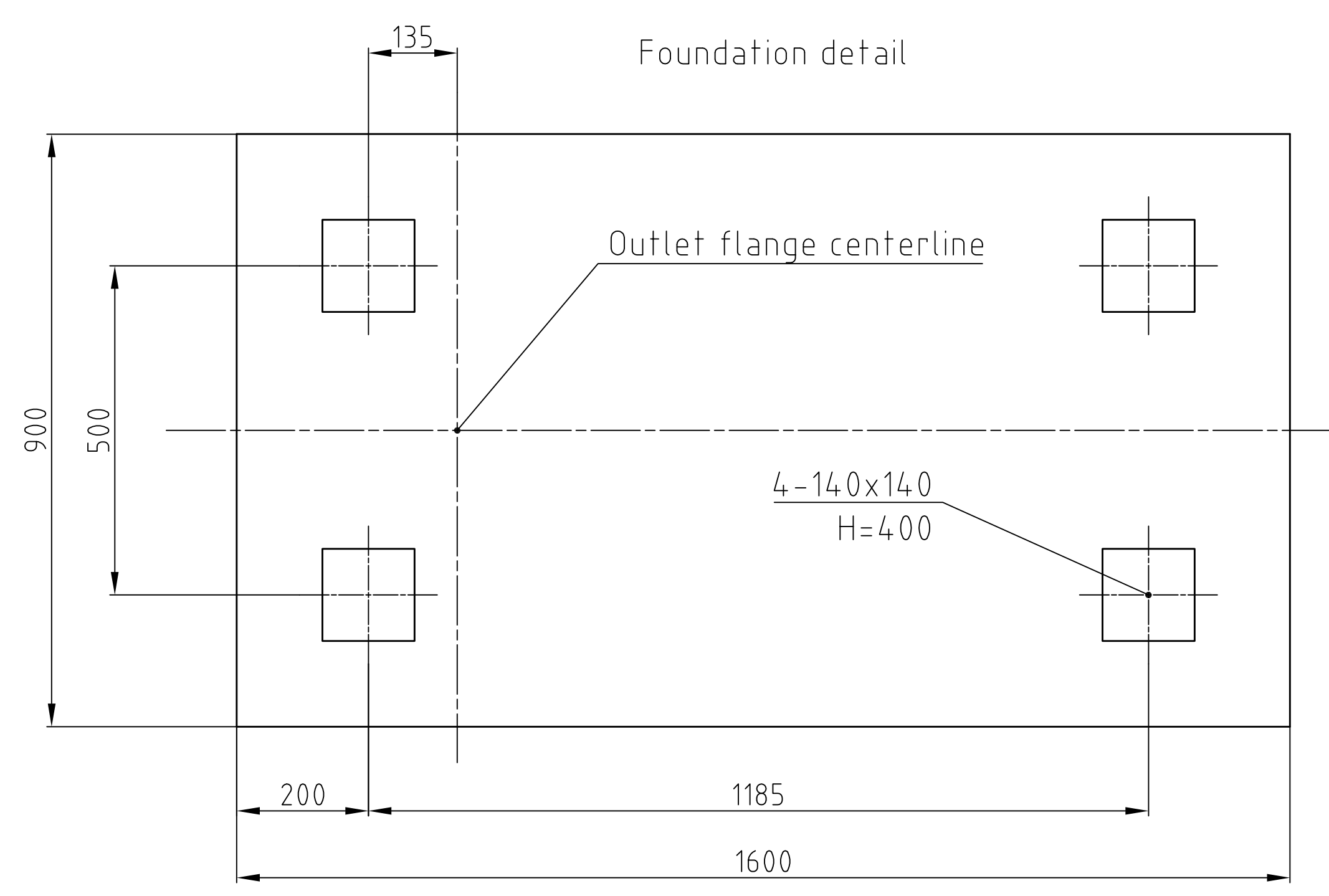
9.2 Shaft seal

see Datasheet



Allowed Load For Pump's Flanges		
Suction flange	Fx	+/-3.95KN
	Fy	+/-3.55KN
	Fz	+/-3.2KN
	Mxy	+/-1900NM
	Myz	+/-2100NM
	Mzx	+/-1500NM
Discharge flange	Fx	+/-3KN
	Fy	+/-2.7KN
	Fz	+/-3.35KN
	Mxy	+/-1450NM
	Myz	+/-1750NM
	Mzx	+/-1250NM

Item	Motor	Speed ratio	Driver pulley	Driven pulley	Belt type	Heaviest part weight(kg)	Weight with motor(kg)	Static load with motor (KN)	Dynamic load with motor (KN)
14HTK81AP001	30kw-4p	1.00	3SPB315	3SPB315	SPB1800	352	591	5.8	8.7
14HTK81AP002	30kw-4p	1.00	3SPB315	3SPB315	SPB1800	352	591	5.8	8.7



Thai Binh 2 Power Plant FGD Project

ISSUE TO PVC FOR REFERENCE

DOCUMENT SUBMISSION STATUS:

NOTE:

2014.8.12	Modify acc. to customer's suggestion	WHJ	ZHQ	ZHQ		
2014.3.24	Modify acc. to customer's suggestion	WHJ	ZHQ	ZHQ		
2014.1.9	Add the information of flange load	WHJ	ZHQ	ZHQ		
REV	DATE	DESCRIPTION	DRWN	CHKD	REVO	APRD

OWNER: VIETNAM OIL AND GAS GROUP (PJV)

EPC CONTRACTOR: PETROVIETNAM CONSTRUCTION JOINT STOCK CORPORATION (PVC)

POWER ISLAND PACKAGE SUPPLIER: SOJLITZ CORPORATION

PROJECT TITLE: THAI BINH2 THERMAL POWER PLANT 2 x 600MW

DRAWING TITLE: M10 FGD Plant Outline Drawing Of Limestone Slurry Pump

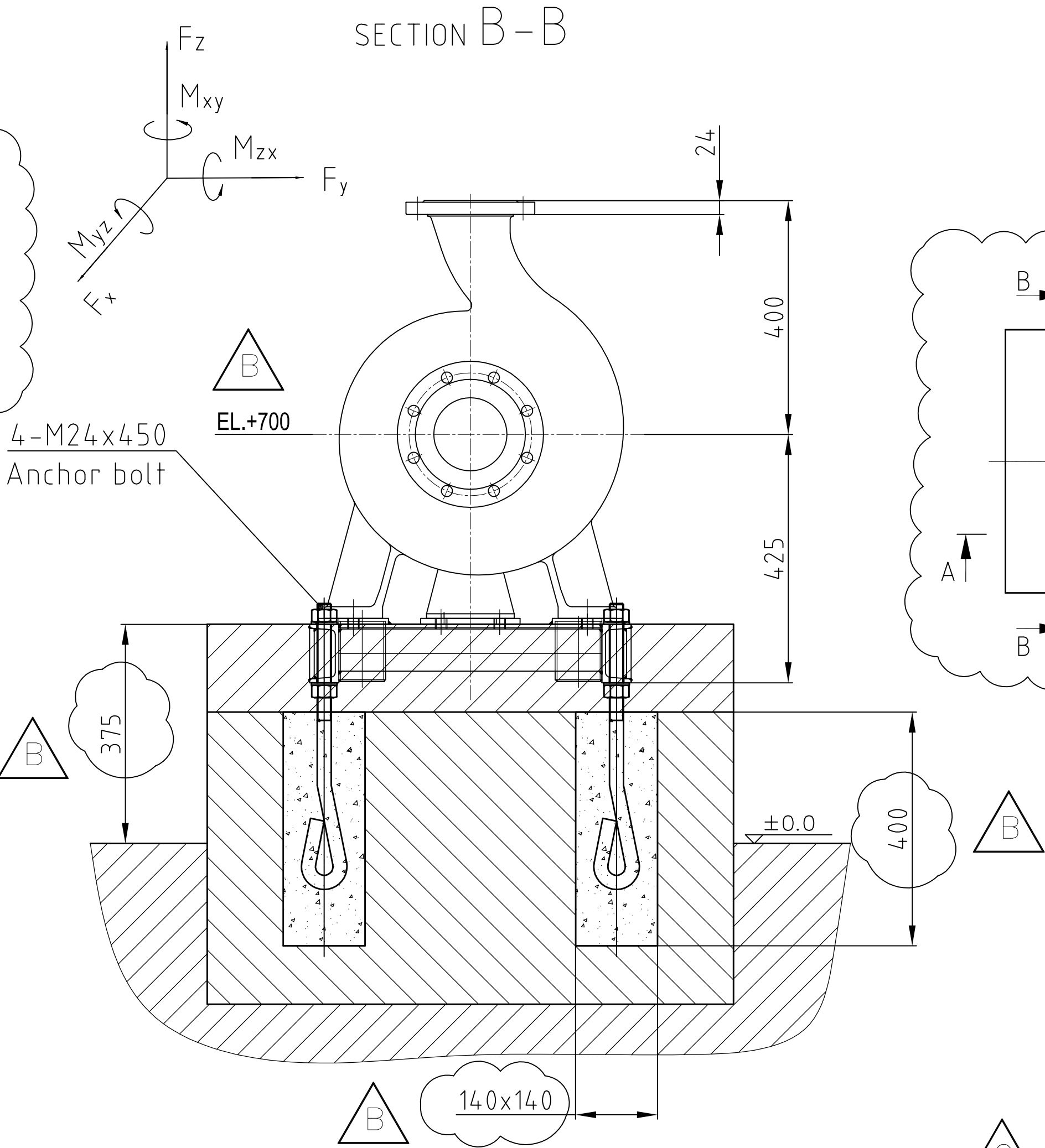
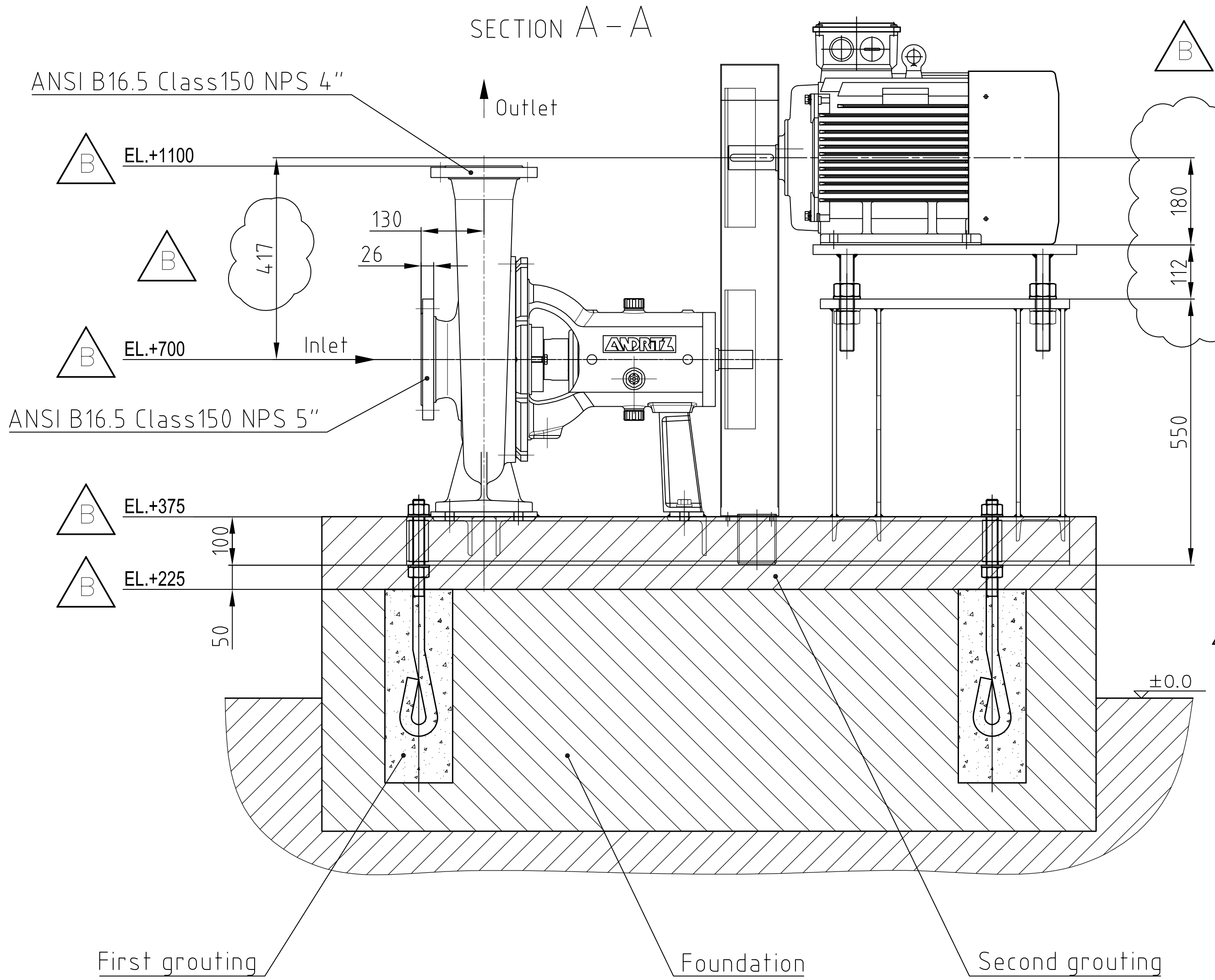
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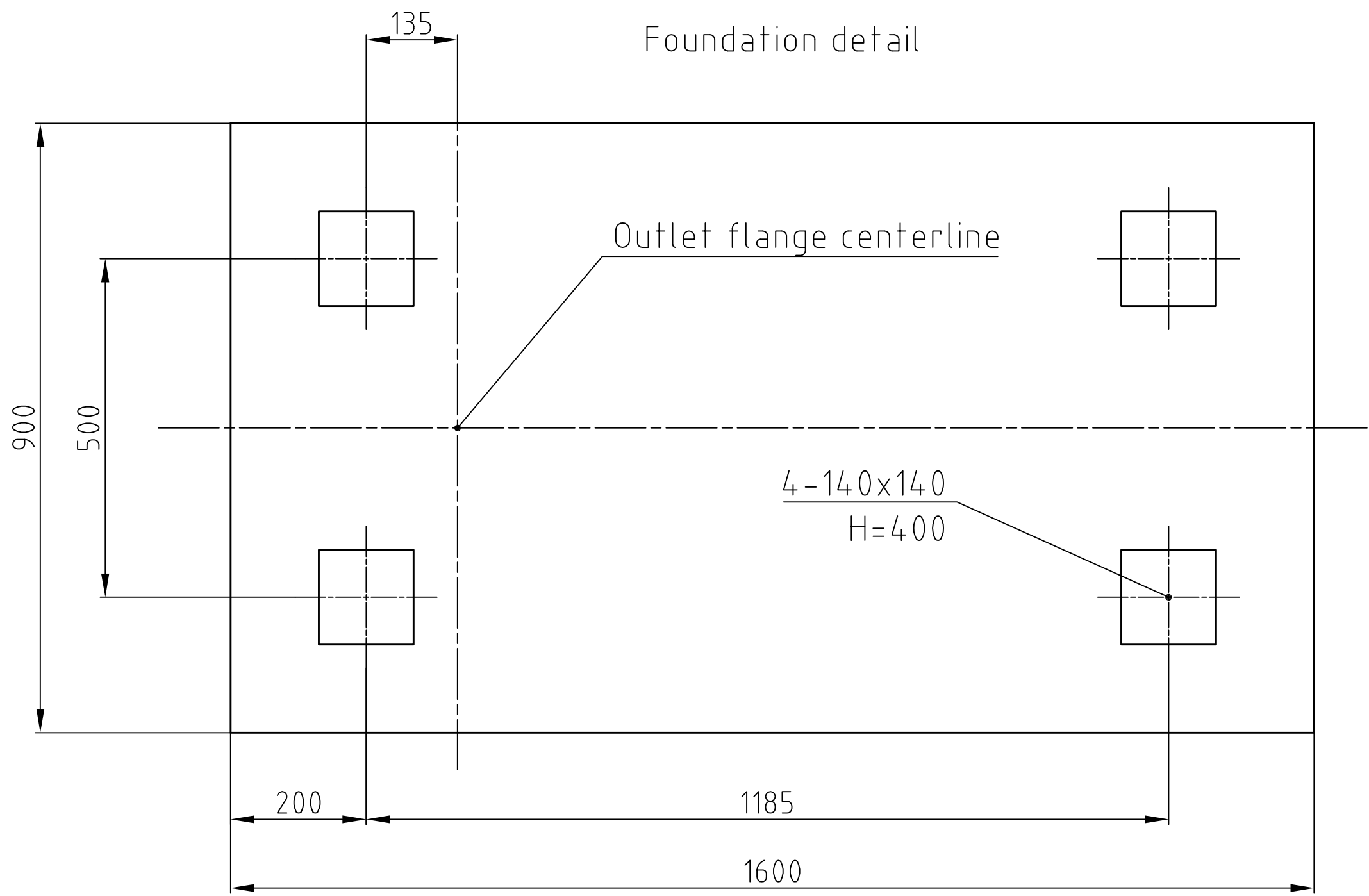
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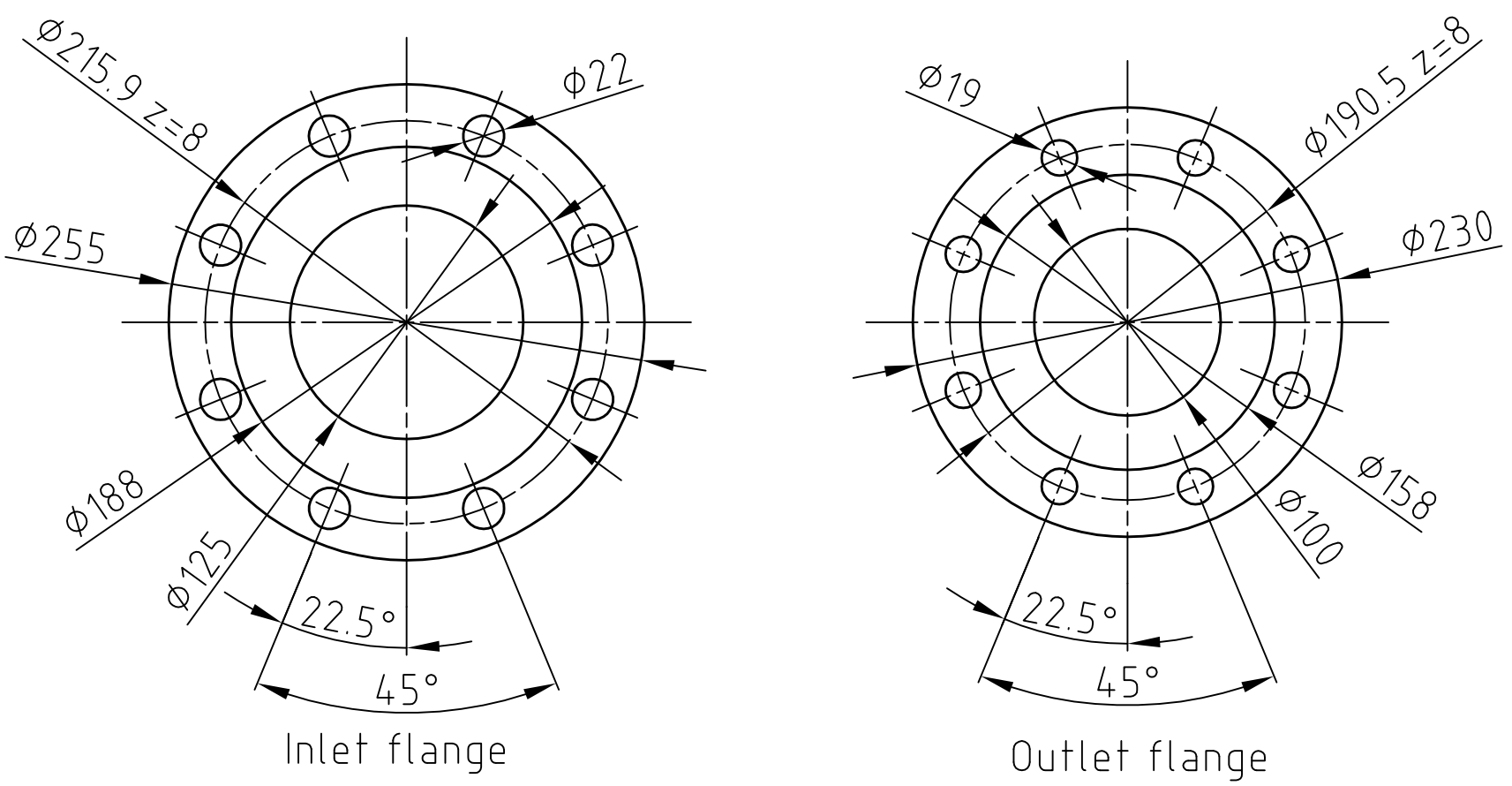
Model No.: S8-100-350
Dimension units: mm



Allowed Load For Pump's Flanges		
Suction flange	Fx	+/-3.95KN
	Fy	+/-3.55KN
	Fz	+/-3.2KN
	Mxy	+/-1900NM
	Myz	+/-2100NM
Discharge flange	Mzx	+/-1500NM
	Fx	+/-3KN
	Fy	+/-2.7KN
	Fz	+/-3.35KN
	Mxy	+/-1450NM
	Myz	+/-1750NM
	Mzx	+/-1250NM



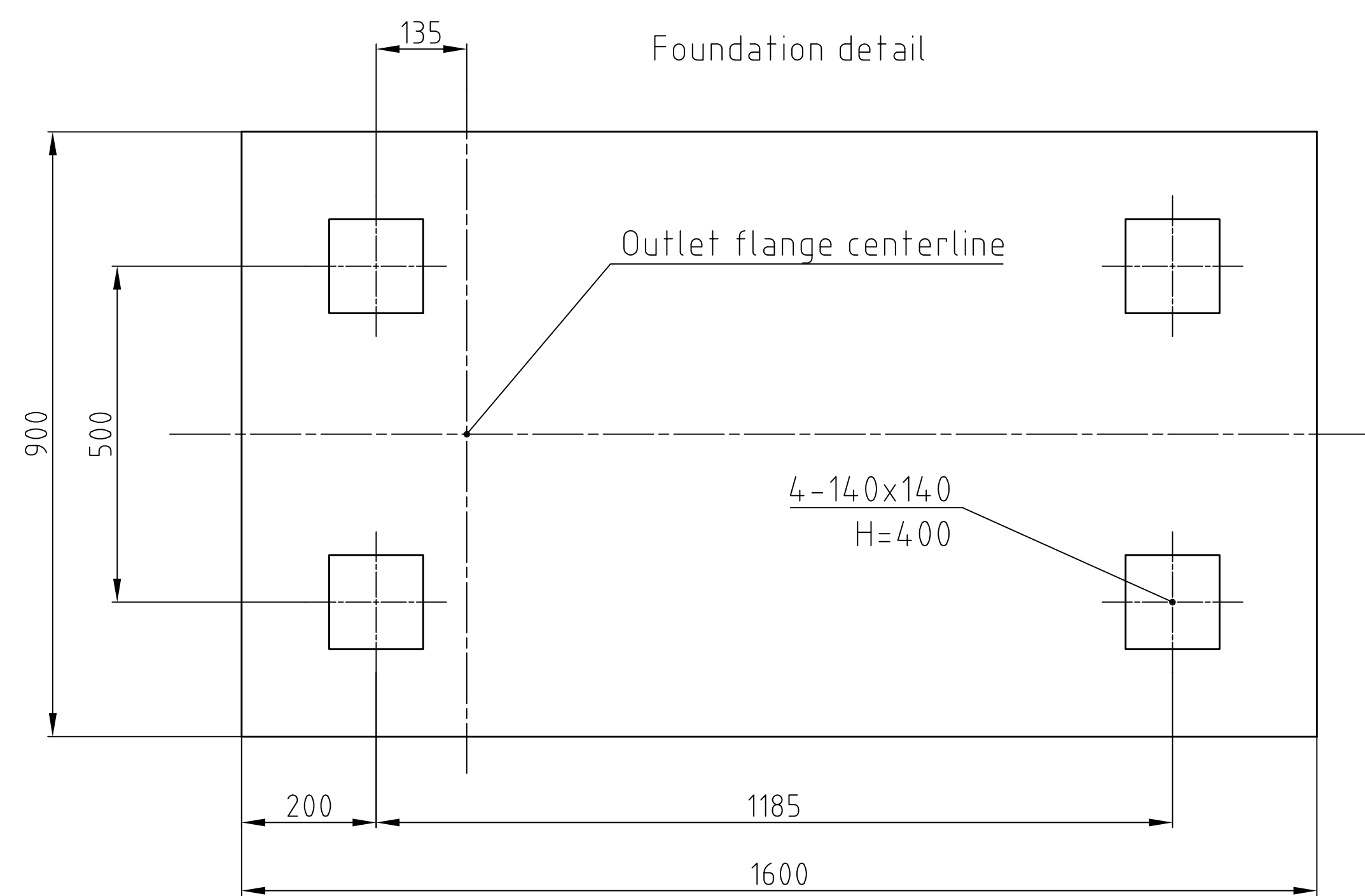
Item	Motor	Speed ratio	Driver pulley	Driven pulley	Belt type	Heaviest part weight(kg)	Weight with motor(kg)	Static load with motor (KN)	Dynamic load with motor (KN)
04HTK21AP001	22kw-4p	1	3SPB180	3SPB180	SPB1400	352	533	5.2	7.8
04HTK21AP002	22kw-4p	1	3SPB180	3SPB180	SPB1400	352	533	5.2	7.8
04HTK51AP001	22kw-4p	1	3SPB180	3SPB180	SPB1400	352	533	5.2	7.8
04HTK51AP002	22kw-4p	1	3SPB180	3SPB180	SPB1400	352	533	5.2	7.8
04HTK71AP001	22kw-4p	1	3SPB180	3SPB180	SPB1400	352	533	5.2	7.8
04HTK71AP002	22kw-4p	1	3SPB180	3SPB180	SPB1400	352	533	5.2	7.8



Thai Binh 2 Power Plant FGD Project

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DOCUMENT SUBMISSION STATUS:						
NOTE:						
△	2014.8.12	Modify acc. to customer's suggestion	WHJ	ZHO	ZHO	
△	2014.3.24	Modify acc. to customer's suggestion	WHJ	ZHO	ZHO	
△	2014.1.9	Add the information of flange load	WHJ	ZHO	ZHO	
REV	DATE	DESCRIPTION	DRWN	CHKD	REVO	APRD
OWNER		OWNER'S CONSULTANT		REVO		
						
VIETNAM OIL AND GAS GROUP (PJV)		FICHTNER		PJV POWER FCC		
EPC CONTRACTOR		EPC CONTRACTOR'S CONSULTANT				
						
PETROVIETNAM CONSTRUCTION JOINT STOCK CORPORATION (PVC)		WORLEYPARSONS				
POWER ISLAND PACKAGE SUPPLIER		DAELIM				
						
SOJITZ CORPORATION		DAELIM INDUSTRIAL CO., LTD.				
PROJECT TITLE						
THAI BINH2 THERMAL POWER PLANT 2 x 600MW						
DRAWING TITLE						
M10 FGD Plant Outline Drawing Of Limestone Slurry Pump						
SIGNED BY: DATE:						
B1P SUPPLIER						
BARCOCK & WILCOX BEIRING CO., LTD.						
B1P SUB-SUPPLIER						
WUHAN KAIER ELECTRIC POWER ENVIRONMENTAL CO., LTD.						
DRAWING NO.						
TB2-SDC-V/P101-00HTF-AM10-DFN-7001						
JOB NO.						
110180						
SCALE						
1/3						
REV NO.						
0						
11						
FILE NAME TB2-SDC-V/P101-00HTF-AM10-DFN-7001 Rev B						



DOCUMENT SUBMISSION STATUS: FC							
NOTE:							
0	31 Jul 2014	FOR CONSTRUCTION	Fan Yang	Chen zeqing	Li Jiahu		
B	15 May 2014	FOR APPROVAL	Fan Yang	Chen zeqing	Li Jiahu		
A	24 Jan 2014	FOR APPROVAL	Fan Yang	Chen zeqing	Li Jiahu		
REV.	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED	APPROVED	
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EPC CONTRACTOR  PETROVIETNAM CONSTRUCTION JOINT STOCK CORPORATION (PVC)			EPC CONSTRUCTOR'S CONSULTANT  WorleyParsons resources & energy WORLEYPARSONS				
POWER ISLAND PACKAGE SUPPLIER  SOJITZ CORPORATION			 DAELIM INDUSTRIAL CO., LTD.				
PROJECT TITLE THAI BINH 2 THERMAL POWER PLANT 2 x 600MW							
DRAWING / DOCUMENT TITLE M10 FGD PLANT Technical Specification / Data Sheet of Slurry, Water & Sump Pumps							
BIP SUPPLIER:  BABCOCK & WILCOX BEIJING CO., LTD.		BIP SUB-SUPPLIER:  WUHAN KAI DI ELECTRIC POWER ENVIRONMENTAL CO.,LTD.		FUNCTION	NAME	SIGN	DATE
				DRWN	Fan Yang		31 Jul 2014
				CHKD	Chen zeqing		31 Jul 2014
				APPD	Li Jiahu		31 Jul 2014
DOCUMENT NO: TB2-SDC.VP101-00HTL-M-M10-SPC-7001				No of page:	8	Scale	Rev. 0

P.O NO.	110180-1600-101-001-A01
ITEM NO.	ALL
ITEM DESCRIPTION	Boiler and Boiler BOP
DOCUMENT NO.	TB2-SDC.VP101-00HTL-M-M10-SPC-7001
DOCUMENT TITLE	M10 FGD PLANT Technical Specification / Data Sheet of Slurry, Water & Sump Pumps
REV NO.	0

Daelim's Approval Status

Daelim Industrial Co., Ltd.	
Job No.	110180
	A - APPROVED
	B - APPROVED WITH COMMENTS
	C - RETURNED FOR CORRECTION
	D - REJECTED
	N - NOT APPLICABLE(REFERENCE ONLY)
SIGNED BY :	DATE :
DIC'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.	

BIP SUPPLIER:  BABCOCK & WILCOX BEIJING COMPANY LTD.	BIP SUB-SUPPLIER:  WUHAN KAIDI ELECTRIC POWER ENVIRONMENTAL CO.,LTD.
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Document Review Comment Sheet

Daelim's Ref. No : TB2-DIC-BWBC-T-0944

No.	Document No.	Rev	Title	Purpose	Approval Status
1	TB2-SDC.VP101-00HTL-M-M10-SPC-7001	B	M10 FGD PLANT Technical Specification / Data Sheet of Slurry, Water & Sump Pumps	AP	B
2	TB2-SDC.VP101-00HTL-M-M10-LST-7001	B	M10 FGD Plant List of Applicable Code and Standard of Slurry Pump and Water Pump	AP	C
3	TB2-SDC.VP101-00HTQ-M-M10-DGA-7001	B	M10 FGD PLANT GA for Process Water Pump A/B	AP	B
4	TB2-SDC.VP101-00HTQ-M-M10-DGA-7002	B	M10 FGD PLANT GA for Mist Eliminator Wash Pump A/B	AP	B
5	TB2-SDC.VP101-00HTL-M-M10-DGA-7001	B	M10 FGD PLANT GA for Gypsum Slurry Bleed Pump A/B	AP	B
6	TB2-SDC.VP101-00HTL-M-M10-DGA-7002	B	M10 FGD PLANT GA for Waste Water Hydroclone Feed Pump A / B	AP	C
7	TB2-SDC.VP101-00HTL-M-M10-DGA-7003	B	M10 FGD PLANT GA for Waste Water Pump A / B	AP	C
8	TB2-SDC.VP101-00HTL-M-M10-DGA-7004	B	M10 FGD PLANT GA for Gypsum Slurry Pump A/B	AP	C
9	TB2-SDC.VP101-00HTL-M-M10-DGA-7005	B	M10 FGD PLANT GA for Reclaim Water Tank Pump A / B	AP	B
10	TB2-SDC.VP101-00HTL-M-M10-DGA-7006	B	M10 FGD PLANT GA for Emergency Slurry Pump	AP	C
11	TB2-SDC.VP101-00HTL-M-M10-DGA-7007	B	M10 FGD PLANT GA for Absorber Area Sump Pump A / B	AP	B
12	TB2-SDC.VP101-00HTL-M-M10-DGA-7008	B	M10 FGD PLANT GA for Limestone Slurry Preparation Area Sump Pump A / B	AP	B
13	TB2-SDC.VP101-00HTL-M-M10-DGA-7009	B	M10 FGD PLANT GA for Gypsum Dewatering Area Sump A/B	AP	B
No.	Daelim's Comments		Vendor's Response		
I	TB2-SDC.VP101-00HTL-M-M10-DGA-7001		M10 FGD PLANT GA for Gypsum Slurry Bleed Pump A/B		
1.12	Key plan and plant north indication shall be shown, In key plan, please focus the FGD area majority. 2nd comment: If then, please add the reference drawing no. to know where this equipment will be installed.		1st reply: The key plan and plant north indication has been shown in the "M10 FGD PLANT FGD GENERAL ARRANGEMENT DRAWING". Please refer to TB2-SDC.VP101-00100-M-M10-DGA-0001~0016. 2nd reply: Agree.		
1.1	To revise to right drawing no.		Agree.		
1.2	Dimension is differ from DFN-6002 drawing. DFN-6002 drawing indicates 450mm. To check and revise it.		Agree. The anchor bolt hole shall be 400mm. Vendor will revise loading data drawing.		
1.3	PVC, PVN's comment will be forwarded separately when we receive, and it shall be reflected in the next version.		Noted, but please be informed if the owner's additional comment is not issued to BWBC/KDPE within due date, the vendor print will be deemed approved by SDC/PVC/Owner, and it can be issued "For Final."		
2	TB2-SDC.VP101-00HTL-M-M10-DGA-7002		M10 FGD PLANT GA for Waste Water Hydroclone Feed Pump A / B		
2.1	Dimension is differ from DFN-9001. DFN-9001 drawings indicates 450mm. To check and revise one of two drawings.		Revised.		
2.2	bottom of anchor box level shall be over top of floor concrete level. To change the top of foundation level.		Revised.		
2.3	To indicate right drawing no.		Agree		
3	TB2-SDC.VP101-00HTL-M-M10-DGA-7003		M10 FGD PLANT GA for Waste Water Pump A / B		

No.	Daelim's Comments	Vendor's Response
	Same comment with TB2-SDC.VP101-00HTL-M-M10-DGA-7002.	Agree
4	TB2-SDC.VP101-00HTL-M-M10-DGA-7004	M10 FGD PLANT GA for Gypsum Slurry Pump A/B
	Same comment with TB2-SDC.VP101-00HTL-M-M10-DGA-7002.	Agree
5	TB2-SDC.VP101-00HTL-M-M10-DGA-7005	M10 FGD PLANT GA for Reclaim Water Tank Pump A / B
5.1	Same comment with TB2-SDC.VP101-00HTL-M-M10-DGA-7001.	Agree. The anchor bolt hole shall be 400mm. Vendor will revise loading data drawing.
5.2	PVC,PVN's comment will be forwarded separately when we receive, and it shall be reflected in the next version.	Agree
6	TB2-SDC.VP101-00HTL-M-M10-DGA-7006	M10 FGD PLANT GA for Emergency Slurry Pump
	Same comments on TB2-SDC.VP101-00HTL-M-M10-DGA-7002 shall be applied.	Agree. The anchor bolt hole shall be 400mm. Vendor will revise loading data drawing.
7	TB2-SDC.VP101-00HTL-M-M10-DGA-7007	M10 FGD PLANT GA for Absorber Area Sump Pump A /B
7.1	The level differ from DFN drawing,to check and revise one of two drawings.	Revised.
7.2	The dimension shall be bigger than minimum concrete edge distance. To change the dimension as per bolt type.(expantion bolt ,anchor bolt,chemical anchor)	The distance required by pump is same with the concreete edge distance. No need change the design.
7.3	PVC,PVN's comment will be forwarded separately when we receive, and it shall be reflected in the next version.	Refer to 1.3.
7.4	To indicate right drawing no.	Agree
8	TB2-SDC.VP101-00HTL-M-M10-DGA-7008	M10 FGD PLANT GA for Limestone Slurry Preparation Area Sump Pump A / B
	PVC,PVN's comment will be forwarded separately when we receive, and it shall be reflected in the next version.	Refer to 1.3.
9	TB2-SDC.VP101-00HTL-M-M10-DGA-7009	M10 FGD PLANT GA for Gypsum Dewartering Area Sump A/B
	PVC,PVN's comment will be forwarded separately when we receive, and it shall be reflected in the next version.	Refer to 1.3.
10	TB2-SDC.VP101-00HTL-M-M10-LST-7001	
	Current pending issue for GB code application need to be dissolved ASAP.	According to the contract L-1,L-3 requirement, GB material can be used in FGD system. Please note that according to the contract requirement L-1,L-3 (Application code and standard for boiler BOP), GB material has been confirmed. GB material is a part of contract requirement, it does not need to owner's approval.

No.	Daelim's Comments	Vendor's Response
11	TB2-SDC.VP101-00HTL-M-M10-SPC-7001	
11.1	PVC,PVN's comment will be forwarded separately when we receive, and it shall be reflected in the next version.	Refer to 1.3.
11.2	Suction velocity seems high and also it is different in compare to equipment calculation,Please check it.	This suction velocity is calculated based on pump suction size. As for equipment head calculation, the velocity is calculated based on pipe system dimension.
12	TB2-SDC.VP101-00HTQ-M-M10-DGA-7001	
12.1	Same comments on TB2-SDC.VP101-00HTL-M-M10-DGA-7001 shall be applied.	Agree
12.2	PVC,PVN's comment will be forwarded separately when we receive, and it shall be reflected in the next version.	Refer to 1.3.
13	TB2-SDC.VP101-00HTQ-M-M10-DGA-7002	
13.1	Same comments on TB2-SDC.VP101-00HTL-M-M10-DGA-7001 shall be applied.	Agree
13.2	PVC,PVN's comment will be forwarded separately when we receive, and it shall be reflected in the next version.	Refer to 1.3.

* Legend

Purpose:

AP - For Approval

RE - For Reference

FF - For Final / FC - For Construction

F - Final / AB - As Built

INFO - For Information

Approval Status:

A - Approved

B - Approved with Comments

C - Returned for Correction

D - Rejected

N - Reference Only

Thai Binh 2 Thermal Power Plant Project - PEB Comment for Transmittal Ref. No TB2-SDC-PEB-TV-3127
Document Review Comment Sheet

PEB Ref. No : TB2-PEB-SDC-M10-TVI-04875

No.	Document No.	Rev	Title	Purpose	Review Status	
					In	Out
1	TB2-SDC.VP101-00HTL-M-M10-DGA-7001	B	FGD - Gypsum Slurry Bleed Pump	RE		IB
2	TB2-SDC.VP101-00HTL-M-M10-DGA-7002	B	FGD - WW Hydroclone Feed Pump	RE		IB
3	TB2-SDC.VP101-00HTL-M-M10-DGA-7003	B	FGD - Waste Water Pump	RE		IB
4	TB2-SDC.VP101-00HTL-M-M10-DGA-7004	B	FGD - Gypsum Slurry Pump	RE		IB
5	TB2-SDC.VP101-00HTL-M-M10-DGA-7005	B	FGD - Reclaim Water Tank Pump	RE		IB
6	TB2-SDC.VP101-00HTL-M-M10-DGA-7006	B	FGD - Emergency Slurry Pump	RE		IB
7	TB2-SDC.VP101-00HTL-M-M10-DGA-7007	B	FGD - Absorber Area Sump Pump	RE		IB
8	TB2-SDC.VP101-00HTL-M-M10-DGA-7008	B	FGD - LS Prep Area Sump Pump	RE		IB
9	TB2-SDC.VP101-00HTL-M-M10-DGA-7009	B	FGD - Gypsum Dewatering Sump Pump	RE		IB
10	TB2-SDC.VP101-00HTL-M-M10-LST-7001	B	FGD - Slurry & Water Pump Codes and Standards	AP		A
11	TB2-SDC.VP101-00HTL-M-M10-SPC-7001	B	FGD - Slurry & Water Pump Technical Specification	AP		C
12	TB2-SDC.VP101-00HTO-M-M10-DGA-7001	B	FGD - Process Water Pump	RE		IB
13	TB2-SDC.VP101-00HTO-M-M10-DGA-7002	B	FGD - ME Wash Water Pump	RE		IB
No.	TB2PEB's comment	Item Status	Contractor's Response			
I	GENERAL COMMENTS					
1	NEW COMMENT - Show grounding connections for all pump/motor drawings.					
1	TB2-SDC.VP101-00HTL-M-M10-DGA-7001					
1.1	Side View - Identify pump inlet and outlet, drive belt guard, bearing, base plate, motor lifting lug and motor electrical terminal box.	CLOSED	Revised			
1.2	K Direction View - Delete this. It is confusing. Replace with the following: Shaft Seal Water Inlet/Outlet Connections Connection Type: G 1/4" Pipe Diameter: 0.518" Threads per Inch: 19 Tap Size: 11.8mm	CLOSED	K Direction View indicated the position of the Shaft Seal Water Connections, and others Revised			
1.3	Flange Details - Show the entire flange face view and provide dimensions.	CLOSED	Revised			
1.4	Provide anchor bolt specification information.	CLOSED	Revised			

Thai Binh 2 Thermal Power Plant Project - PEB Comment for Transmittal Ref. No TB2-SDC-PEB-TV-3127

1.5	Equipment Specification: - Revise "47m" to "45m H2O" - Revise "525" to "Xiangfan 525" - Indicate number of motor phases - Indicate motor model number - Provide model number of motor pulley - Provide model number of pump shaft pulley - Provide belt specification / type information - Provide individual weights of pump assembly and motor. PEB Response - (1) PID indicates pump head at 47m. (4) Motor model number shall be provided. (7) Belt specification information must be provided.	OPEN	1 .Revised 2.It is Xiangyang 525, Revised. 3.Revised. 4.PLease see"equipment specification ,the type of motor". 5.Revised. 6.Revised. 7.See belt specification type information 8.Revised KDPE reply: (1)As per the EQUIPMENT SIZING CALCULATIONS(DOCUMENT NO: TB2-SDC.VP101-00100-M-M10-CAL-0001),gypsum slurry pump head should be 42m. Vendor has updated the P&ID drawing, please refer to TB2-SDC.VP101-01HTD-M-M10-PID-0003 Rev.1. (4)Please refer to pump drawings, the "EQUIPMENT SPECIFICATION" data sheet has indicated the information of the motor model number. (7) Please refer to pump drawings, the "EQUIPMENT SPECIFICATION" data sheet has indicated the information of the belt.
1.6	Equipment List - Provide motor tag numbers.	CLOSED	Revised
1.7	D-6 - Water is intended as seal water, not flush water. Seal water is continuous when pump is in operation and when in standby mode. Revise to; Shaft Seal Water Requirements - Clean Filtered Water - Temperature Range: __oC to __oC - Pressure Range: 1-2 barg - Minimum Flow: 10 liters/min - Seal water is required continuously while pump is in operation and while a pump is in standby mode. - Reference Pump Operating Instructions for Additional Requirements.	CLOSED	Revised
1.8	Add Note - "Dimensions shown are in millimeters (mm)"	CLOSED	Revised
2	TB2-SDC.VP101-00HTL-M-M10-DGA-7002		
2.1	See Comments for Drawing "DGA-7001". PEB Response - See Detailed Comment 1.5.	OPEN	Revised KDPE reply: See Detailed reply 1.5.
3	TB2-SDC.VP101-00HTL-M-M10-DGA-7003		
3.1	See Comments for Drawing "DGA-7001". PEB Response - See Detailed Comment 1.5.	OPEN	Revised KDPE reply: See Detailed reply 1.5.
4	TB2-SDC.VP101-00HTL-M-M10-DGA-7004		
4.1	See Comments for Drawing "DGA-7001". PEB Response - See Detailed Comment 1.5.	OPEN	Revised KDPE reply: See Detailed reply 1.5.
4.2	Revise Drawing Title to "Gypsum Slurry Tank Pump A/B".		It will be matched with P&ID
5	TB2-SDC.VP101-00HTL-M-M10-DGA-7005		

Thai Binh 2 Thermal Power Plant Project - PEB Comment for Transmittal Ref. No TB2-SDC-PEB-TV-3127

5.1	See Comments for Drawing "DGA-7001". PEB Response - See Detailed Comment 1.5.	OPEN	Revised KDPE reply: See Detailed reply 1.5.
6	TB2-SDC.VP101-00HTL-M-M10-DGA-7006		
6.1	See Comments for Drawing "DGA-7001". PEB Response - See Detailed Comment 1.5.	OPEN	Revised KDPE reply: See Detailed reply 1.5.
6.2	Revise Drawing Title to "Emergency Slurry Tank Pump A/B".	CLOSED	It will be matched with P&ID
7	TB2-SDC.VP101-00HTL-M-M10-DGA-7007		
7.1	See Comments for Drawing "DGA-7001". PEB Response - See Detailed Comment 1.5.	OPEN	Revised KDPE reply: See Detailed reply 1.5.
7.2	"Min. Installment Dimension" - What is this intended to show? Review, clarify and revise to be more specific.	CLOSED	It is requirement for the dimension of sump.
7.3	Provide pump inlet pipe diameter and wall thickness.	CLOSED	Revised.
7.4	Show pump inlet pipe screen and vertical dimensions.	CLOSED	Revised.
7.5	Indicate pump inlet and outlet.	CLOSED	Revised.
7.6	B-7 - Indicate flange shown as "Discharge Flange"	CLOSED	Revised.
7.7	Indicate details how motor is bolted to the pump assembly.	CLOSED	Revised.
	NEW COMMENTS		
7.8	C-6 - Revise "Baseboard" to "Base Plate".		Revised.
7.9	Indicate the minimum level where the pump will automatically stop,		Please see "Max running liquid level"
8	TB2-SDC.VP101-00HTL-M-M10-DGA-7008		
8.1	See Comments for Drawing "DGA-7001". PEB Response - See Detailed Comment 1.5.	OPEN	Revised KDPE reply: See Detailed reply 1.5.
9	TB2-SDC.VP101-00HTL-M-M10-DGA-7009		
9.1	See Comments for Drawing "DGA-7001". PEB Response - See Detailed Comment 1.5.	OPEN	Revised KDPE reply: See Detailed reply 1.5.
12	TB2-SDC.VP101-00HTQ-M-M10-DGA-7001		
12.1	See Comments for Drawing "DGA-7001". PEB Response - See Detailed Comment 1.5.	OPEN	Revised KDPE reply: See Detailed reply 1.5.
13	TB2-SDC.VP101-00HTQ-M-M10-DGA-7002		
13.1	See Comments for Drawing "DGA-7001". PEB Response - See Detailed Comment 1.5.	OPEN	Revised KDPE reply: See Detailed reply 1.5.
10	TB2-SDC.VP101-00HTL-M-M10-LST-7001		
10.1	Introduction - Revise to "... and Chinese Standards to be applied to this project.". Delete the remaining wording.	CLOSED	Revised
10.2	Will a pump performance test utilizing water be performed? If so, indicate the testing procedure standard.	CLOSED	Yes, The standard of the testing is EN ISO 9906, and the procedure please see EN
	NEW COMMENT		
10.3	Include codes to ensure the quality of the pump materials of construction. ASTM specs or equivalent.		Revised
10.4	Need to add codes regarding the bearings.		Revised
11	TB2-SDC.VP101-00HTL-M-M10-SPC-7001		
11.1	Document Title - Revise "...Slurry Pump & Water Pump" to "... Slurry, Water & Sump Pumps"	CLOSED	Revised

Thai Binh 2 Thermal Power Plant Project - PEB Comment for Transmittal Ref. No TB2-SDC-PEB-TV-3127

11.2	Section I - Provide a separate section for "Sump Pumps" and observe all related comments for Section I. Sump pumps are not horizontal centrifugal pumps.	CLOSED	Revised
11.3	I.1, Head - Revise "m" to "m H2O".	CLOSED	It should be H(L).
11.4	I.1 - Revise to "Typical Operating Range" and revise temperature range shown.	CLOSED	Revised
11.5	I.1 - Revise Application to "Pumps are designed to convey liquids containing suspended solids, which are abrasive and corrosive, and have potentially high scaling properties".	CLOSED	Slurry and Sump pums revised ,and Water pumps not suitable.
11.6	I.1, Material - List the two (2) materials used for the this project. For example, Chromium Alloy (ASME designation), 304 Stainless (ASME designation), 316L Stainless (ASME designation) and 45#....	CLOSED	Revised
11.7	I.1 - How can operating temperature be lower than the medium (liquid) temperature of 100C? Review, clarify and revise as required.	CLOSED	It is design temperature
11.8	I.1 - Delete information regarding rotation direction. Not a part of a specification,	CLOSED	Revised
11.9	I.1 - Add information regarding fluid and range of suspended solids.	CLOSED	Revised
11.10	I.2 - Revise to "Water pumps are cantilevered horizontal, single-stage centrifugal pumps. Pumps are designed for fluids with relatively low erosive properties and with suspended solids content less than 5%".	CLOSED	Revised
11.11	See Comment for Section I.1.	CLOSED	
11.12	Provide three (3) separate tables for... 1. Slurry Pumps 2. Water Pumps 3. Sump Pumps ... and provide table in landscape format.	CLOSED	Revised
11.13	Data Sheet - Provide the following information; 1. Pump Tag Numbers 2. P&ID Number 3. Pump Manufacturer 4. Design Code 5. Pump RPM 6. Coupling Type - Direct 7. Shaft Orientation - Horizontal / Vertical 8. Range of Solids (%). 9. Design Temperature & Pressure 10. Operating Temperature & Pressure 11. Corrosion Allowance (mm) PEB Response - (2) P&ID information not provided.	OPEN	Revised KDPE reply: The refer to P&ID information has been provided on the updated drawings.
11.14	Item 1 - Revise "Name of Pump" to "Pump Description".	CLOSED	Revised
11.15	Data Sheet, Type - Delete the word "pump".	CLOSED	Revised
11.16	Data Sheet, Items 9 & 10 - Provide ASME designation	CLOSED	Revised
12	TB2-SDC.VP101-00HTQ-M-M10-DGA-7001		
12.1	See Comments for Drawing "DGA-7001". PEB Response - See Detailed Comment 1.5.	OPEN	Revised KDPE reply: See Detailed reply 1.5.
13	TB2-SDC.VP101-00HTQ-M-M10-DGA-7002		

Thai Binh 2 Thermal Power Plant Project - PEB Comment for Transmittal Ref. No TB2-SDC-PEB-TV-3127

13.1	See Comments for Drawing "DGA-7001".	OPEN	Revised.
	PEB Response - See Detailed Comment 1.5.		KDPE reply: See Detailed reply 1.5.

Thai Binh 2 Thermal Power Plant Project - PEB Comment for Transmittal Ref. No TB2-SDC-PEB-TV-3127

No.	Owner/PMC's comment	Item Status	Contractor's Response								
I	General Comments										
1	All GA drawings shall have to print out under A2 size.		Agree.								
2	To clarify which drawing type shall be shown the weights of equipment and when will you submit them?		Please refer to pump drawings, the "EQUIPMENT SPECIFICATION" data sheet has indicated the information of the weights.								
II	Detail Comment										
1	TB2-SDC.VP101-00-HTL-M-M10-DGA-7001 to 7009										
1.1	See general comment		See general reply.								
2	TB2-SDC.VP101-00-HTL-M-M10-LST-7001										
2.1	No further comment		Noted.								
3	TB2-SDC.VP101-00-HTL-M-M10-SPC-7001										
3.1	Slurry pump must be manufactured by one of the following manufacturer <table><tr><td>Sub-supplier</td><td>Technical Licensor</td></tr><tr><td>→ KSB AG</td><td>Germany</td></tr><tr><td>→ Weir Minerals Australia Ltd</td><td>Australia</td></tr><tr><td>→ Andritz Technologies Ltd</td><td>Australia</td></tr></table> Xiang Yang Wu Er Wu Pump Industry Co.,Ltd shall not approved by the Owner	Sub-supplier	Technical Licensor	→ KSB AG	Germany	→ Weir Minerals Australia Ltd	Australia	→ Andritz Technologies Ltd	Australia		Please note that as per the contract L1, L3, "Wet ball mill recycle pumps and limestone slurry addition pumps" were required to use KSB AG, Weir Minerals Australia Ltd or Andritz Technologies Ltd. That means limestone slurry pumps shall use these manufactures. As for Other Pumps' manufacture can be use as Shijiazhuang Industrial Pump Factory Co., Ltd, Jiangsu Faer Machinery Manufacturing Co., Ltd or XiangFan 525 Pump Industry Co., Ltd. If all the pumps use above mentioned manufacturers, the delivery schedule and commercial issues should be discussed.
Sub-supplier	Technical Licensor										
→ KSB AG	Germany										
→ Weir Minerals Australia Ltd	Australia										
→ Andritz Technologies Ltd	Australia										
3.2	To add missing in the unit of suction and discharge flow velocity		Please refer to the slurry pumps data sheet item "Suction flow velocity" and "Discharge flow velocity".								
3.3	Page 5/8: item 16 is mistake, to check and correct		Revised								
3.4	According section 5 of EPC contract, all slurry pump shall be of Corrosion and erosion resistant alloy, heavy-duty type and shall be complete with all component parts and appurtenances necessary for a well-integrated system. This datasheet showed the corrosion Allowance is zero, this is not acceptable. PVC/Subcontractor is requested to check and recalculate.		Revised.								
3.5	Water pump and sum pump must be manufactured by one of the following manufacturer → Shijiazhuang Industrial Pump Factory Co., Ltd. → Jiangsu Faer Machinery Manufacturing Co.,Ltd. → Xiang Fan 525 Pump Industry co., Ltd. Xiang Yang Wu Er Wu Pump Industry Co.,Ltd shall not approved by the Owner		Due to XianFan City change its name to XiangYang City, the company name has changed as Xiangyang Wu Er Wu Pump Industry Co., Ltd. from 1st Jan., 2013, owned the original management and operation personnel, production and technical personnel and all business. Brief description of name change: due to city name change, the company name has changed as per the requirement of administrative order made by the policy maker. Please refer to attached file "Letter for Company Name Change".								

I. Slurry, Water & Sump Pumps SPECIFICATION

1. Slurry pump

Slurry pumps are single stage, single suction, cantilever, horizontal centrifugal pump. Pumps are designed for transferring corrosive medium containing solid..

Typical Operating Range

- Capacity: 31~210 m³/h
- Head: 25~60m (L)
- Temperature range shown: 0~60°C
- Range of suspended solids: 2.1-30%
- Range of Fluid: 70-97.9%

Application: Pumps are designed to convey liquids containing suspended solids, which are abrasive and corrosive, and have potentially high scaling properties

Material: Chromium alloy, nickel steel, stainless steel, duplex stainless steel, Hastelloy and other alloy steel. For example ,Cr30(F30%CrMo) , 45# [\(GB/T699-1999\)](#).



- Operation: Continuous

2 .Water pump

Water pumps are cantilevered horizontal, single-stage centrifugal pumps. Pumps are designed for fluids with relatively low erosive properties and with suspended solids content less than 5%.

Typical Operating Range

- Capacity: 160~210 m³/h
- Head: 50~60m H₂O
- Temperature range shown: 0~60°C

Application: LCP series pumps are widely used in chemical industry, fertilizer, metallurgy, petrochemical power paper making, food, pharmacy, synthetic fiber, etc

Material: Chromium alloy, nickel steel, stainless steel, duplex stainless steel, Hastelloy and other alloy steel. For example ,304 Stainless(ASTM A351 Gr.CF8), 45# [\(GB/T699-1999\)](#).



- Operation: Continuous



3. Sump pump

Sump pumps are single-stage single-suction cantilever vertical centrifugal pumps, which are designed in the light to multiphase flow exoterica and practice experience for transporting the medium with solid.

Typical Operating Range

- Capacity: 33~50m³/h
- Head: 25~30m (L)
- Temperature range shown: 0~60℃
- Range of suspended solids: 20-30%
- Range of Fluid: 70-80 %

Application: Pumps are designed to convey liquids containing suspended solids, which are abrasive and corrosive, and have potentially high scaling properties

Material: Chromium alloy, nickel steel, stainless steel, duplex stainless steel, Hastelloy and other alloy steel.

Material: Chromium alloy, nickel steel, stainless steel, duplex stainless steel, Hastelloy and other alloy steel. For example ,Cr30(F30%CrMo) , **2205 (ASTM A276)**.



- Operation: Continuous



II. Slurry, Water & Sump Pumps DATA SHEET:

1. Slurry pumps DATA SHEET;

No.	Specification				
1	Pump Description	Gypsum Slurry Bleed Pump A/B	Waste Water Hydroclone Feed Pump A/B	Waste Water Pump A/B	Gypsum Slurry Pump A/B
2	Location/Service	Outdoor	Indoor	Indoor	Outdoor
3	Mean Environment Temperature(°C) & mean humidity(%)	23.3&86	23.3&86	23.3&86	23.3&86
4	Pump Tag Numbers	14HTL11AP001 14HTL11AP002 24HTL11AP001 24HTL11AP002	04HTM31AP001 04HTM31AP002	04HTS31AP001 04HTS31AP002	04HTL31AP001 04HTL31AP002
5	Number of pumps per units, operating/Stand- by	2/2	1/1	1/1	1/1
6	Type	Centrifugal			
7	Model No.	LCF100/350I	LCF50/350N2I	LCF50/350N1I	LCF65/310I
8	Capacity (m³/h)	79	32	31	36
9	Head (m L)	42	37	26	16
10	Motor rating (kW/V/Phase)	37/400/3	18.5/400/3	15/400/3	11/400/3
11	Efficiency at design point (%)	45	35	26	35
12	Impeller tip speed (m/s)	25	24.7	21.3	16.06
13	Pump RPM	1370	1385	1360	990
14	Suction flow velocity	1.24	2.67	2.59	1.98
15	Discharge flow velocity	2.79	4.52	4.38	3.01
16	Casing and Impeller Materials	Cr30 (F30%CrMo)	Cr30 (F30%CrMo)	Cr30 (F30%CrMo)	Cr30 (F30%CrMo)



17	Shaft Material	45# <u>(GB/T699-1999)</u>	45# <u>(GB/T699-1999)</u>	45# <u>(GB/T699-1999)</u>	45# <u>(GB/T699-1999)</u>
18	P&ID Number	<u>TB2-SDC.VP101-01HTD-M-M10-PI</u> <u>D-0003</u>	<u>TB2-SDC.VP101-00HTM-M-M10-PI</u> <u>D-0001</u>	<u>TB2-SDC.VP101-00HTM-M-M10-</u> <u>PID-0002</u>	<u>TB2-SDC.VP101-00HTL-M-M10-PI</u> <u>D-0002</u>
19	Pump Manufacturer	XiangYang Wu Er Wu Pump Industry Co.,Ltd			
20	Design Code	EN ISO 5199	EN ISO 5199	EN ISO 5199	EN ISO 5199
21	Coupling Type	Belt	Belt	Belt	Belt
22	Shaft Orientation - Horizontal / Vertical	Horizontal	Horizontal	Horizontal	Horizontal
23	Range of Solids (%).	20%	2.1%	2%	20%
24	Design Temperature(°C) & Pressure(MPa)	100&1.0	100&1.0	100&1.0	100&1.0
25	Operating Temperature(°C) & Pressure((MPa)	55&0.63	55&0.5	55&0.76	55&0.65
26	Corrosion Allowance (mm)	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>

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No.	Specification		
1	Pump Description	Reclaim Water Tank Pump A/B	Emergency Slurry Pump
2	Location/Service	Indoor	Outdoor
3	Mean Environment Temperature(°C) & mean humidity(%)	23.3&86	23.3&86
4	Pump Tag Numbers	04HTL71AP001 04HTL71AP002	04HTT11AP001
5	Number of pumps, Operating/ Stand- by	1/1	1/0



6	Type	Centrifugal	
7	Model No.	LCF150/350	LCF100/300I
8	Capacity (m³/h)	230	147
9	Head (m L)	32	25
10	Motor rating (kW/V/Phase)	55/400/3	30/400/3
11	Efficiency at design point (%)	50	50
12	Impeller tip speed (m/s)	27.1	21.3
13	Pump RPM	1450	1400
14	Suction flow velocity	2.03	3.32
15	Discharge flow velocity	3.61	5.19
16	Casing and Impeller Materials	Cr30 (F30%CrMo)	Cr30 (F30%CrMo)
17	Shaft Material	45# (<u>GB/T699-1999</u>)	45# (<u>GB/T699-1999</u>)
18	P&ID Number	<u>TB2-SDC.VP101-00HTL-M-M10-P</u> <u>ID-0001</u>	<u>TB2-SDC.VP101-00HTT-M-</u> <u>M10-PID-0001</u>
19	Pump Manufacturer	XiangYang Wu Er Wu Pump Industry Co.,Ltd	
20	Design Code	EN ISO 5199	EN ISO 5199
21	Coupling Type	Belt	Belt
22	Shaft Orientation	Horizontal	Horizontal
23	Range of Solids (%).	3%	20%
24	Design Temperature(°C) & Pressure(MPa)	100&1.0	100&1.0
25	Operating Temperature(°C) & Pressure((MPa)	55&0.43	55&0.4
26	Corrosion Allowance (mm)	2	2

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2. Water pumps DATA SHEET;

No.	Specification		
1	Pump Description	Process Water Pump A/B	Mist Eliminator Wash Pump A/B
2	Location/Service	Outdoor	Outdoor
3	Mean Environment Temperature(°C) & mean humidity(%)	23.3&86	23.3&86
4	Pump Tag Numbers	04HTQ11AP001 04HTQ11AP002	14HTQ10AP001 14HTQ10AP002 24HTQ10AP001 24HTQ10AP002
5	Number of pumps, Operating/ Stand- by	1/1	2/2
6	Type	Centrifugal	
7	Model No.	LCP80-250	LCP80-250
8	Capacity (m³/h)	130	160
9	Head (mH ₂ O)	60	60
10	Motor rating (kW/V/Phase)	55/400/3	55/400/3
11	Efficiency at design point (%)	54	60
12	Impeller tip speed (m/s)	37.9	37.9
13	Pump RPM	2900	2900
14	Suction flow velocity	2.94	3.62
15	Discharge flow velocity	7.18	8.84
16	Casing and Impeller Materials	304 (ASTM A351 Gr.CF8)	304 (ASTM A351 Gr.CF8)
17	Shaft Material	45# (<u>GB/T699-1999</u>)	45# (<u>GB/T699-1999</u>)
18	P&ID Number	<u>TB2-SDC.VP101-00HTQ-M</u> <u>-M10-PID-0001</u>	<u>TB2-SDC.VP101-00HTQ-M-M10-</u> <u>PID-0001</u>
19	Pump Manufacturer	XiangYang Wu Er Wu Pump Industry Co.,Ltd	
20	Design Code	EN ISO 5199	EN ISO 5199



21	Coupling Type	Direct	Direct
22	Shaft Orientation - Horizontal	Horizontal	Horizontal
23	Range of Solids (%).	0	0
24	Design Temperature(°C) & Pressure(MPa)	120&2.5	120&2.5
25	Operating Temperature(°C) & Pressure((MPa)	55&0.43	55&0.4
26	Corrosion Allowance (mm)	0	0

3.Sump pumps DATA SHEET;

No.	Specification			
1	Pump Description	Gypsum Dewatering Area Sump	Absorber Area Sump Pump A/B	Limestone Slurry Preparation area Sump Pump A/B
2	Location/Service	Indoor	Outdoor	Indoor
3	Mean Environment Temperature(°C) & mean humidity(%)	23.3&86	23.3&86	23.3&86
4	Efficiency at design point (%)	30	40	30
5	Impeller tip speed (m/s)	21.98	23.0	21.98
6	Pump RPM	1400	1480	1400
7	Suction flow velocity	2.76	2.76	2.76
8	Discharge flow velocity	4.66	4.18	4.66
9	Pump Tag Numbers	04HTT40AP001 04HTT40AP002	14HTT10AP001 14HTT10AP002 24HTT10AP001 24HTT10AP002	04HTT60AP001 04HTT60AP002
10	Number of pumps,	1/1	2/2	1/1



	Operating/ Stand- by			
11	Type	Centrifugal		
12	Model No.	PLC50/350N1	PLC65/310	PLC50/350N1
13	Capacity (m³/h)	33	50	33
14	Head (mL)	20	30	20
15	Motor rating (kW/V/Phase)	11/400/3	18.5/400/3	11/400/3
16	Casing and Impeller Materials	Cr30 (F30%CrMo)	Cr30 (F30%CrMo)	Cr30 (F30%CrMo)
17	Shaft Material	<u>2205 (ASTM A276)</u>	<u>2205 (ASTM A276)</u>	<u>2205 (ASTM A276)</u>
18	P&ID Number	<u>TB2-SDC.VP101-00HT</u> <u>T-M-M10-PID-0002</u>	<u>TB2-SDC.VP101-00HT</u> <u>T-M-M10-PID-0001</u>	<u>TB2-SDC.VP101-00HT</u> <u>T-M-M10-PID-0002</u>
19	Pump Manufacturer	XiangYang Wu Er Wu Pump Industry Co.,Ltd		
20	Design Code	EN ISO 5199	EN ISO 5199	EN ISO 5199
21	Coupling Type	Belt	Belt	Belt
22	Shaft Orientation - Horizontal / Vertical	Vertical	Vertical	Vertical
23	Range of Solids (%).	30	20	30
24	Design Temperature(°C) & Pressure(MPa)	90&1.0	90&1.0	90&1.0
25	Operating Temperature(°C) & Pressure((MPa)	55&0.4	55&0.45	55&0.4
26	Corrosion Allowance (mm)	2	2	2

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