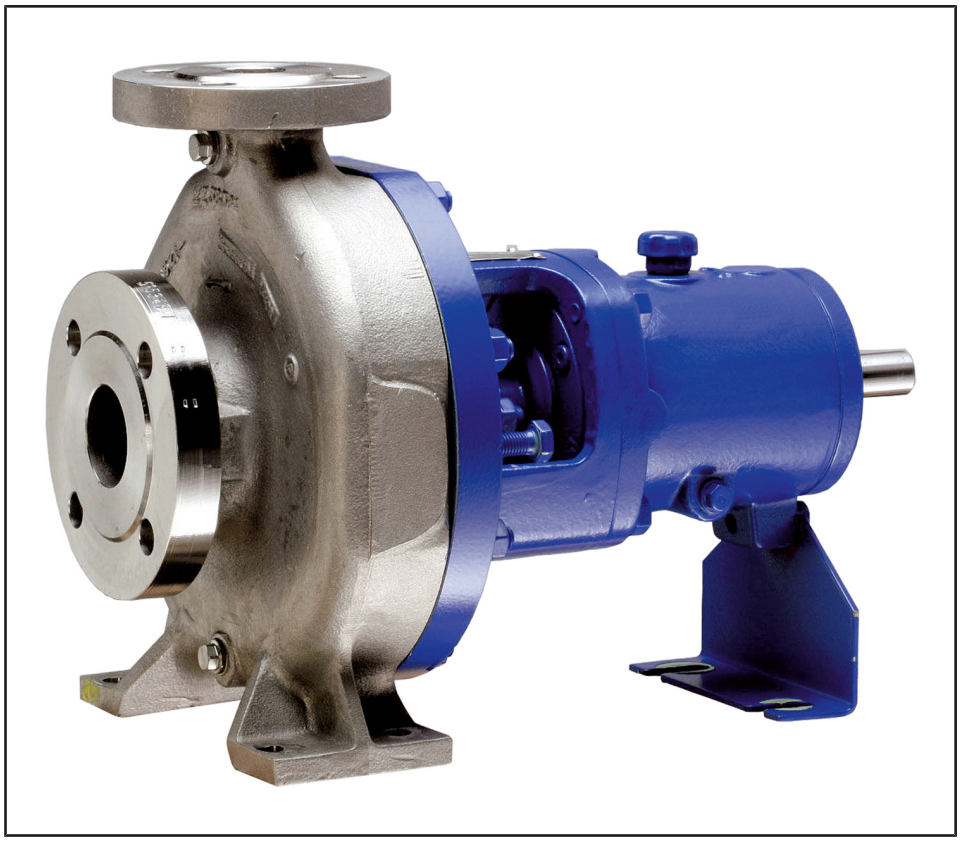
LENNTECH
WATER TREATMENT SOLUTIONS

KSB

Standardised Chemical Pump

CPKNO

Type Series Booklet



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Contents

Centrifugal Pumps with Shaft Seal

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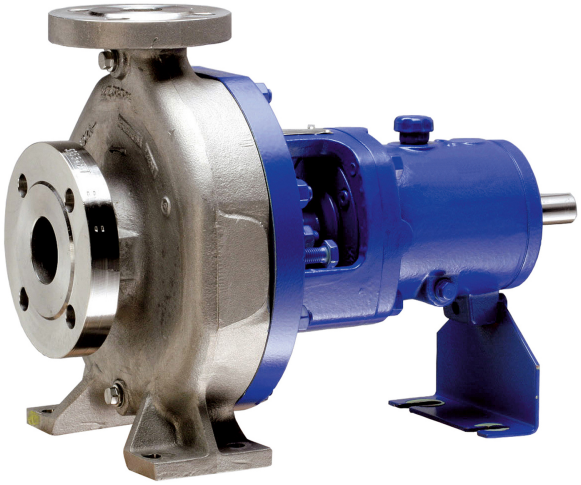


Main applications

- Chemical industry (aggressive / other liquids)
- Petrochemical industry (aggressive / other liquids)
- Alcohol industry
- Fossil-fuelled power stations
- Food industry / beverage industry
- Seawater desalination/reverse osmosis
- Paper industry / pulp industry
- Refinery
- Sugar industry
- Polymerising fluids
- Fluids containing a small amount of gas
- General industry

Operating data

Table 1: Operating properties

Characteristic		Value
Flow rate	Q [m³/h]	900
Head	H [m]	150
Fluid temperature	$T_{min.}$ [°C]	≥ -40
	$T_{max.}$ [°C]	≤ +400
Operating pressure	p [bar]	≤ 25

Design details

Design

- Volute casing pump
- Horizontal installation
- Back pull-out design
- Single-stage
- Technical requirements to ISO 5199
- Dimension and ratings to ISO 2858 complemented by pumps of nominal diameters DN 25 and DN 200

Pump casing

- Single or double volute, depending on the pump size
- Radially split volute casing
- Volute casing with integrally cast pump feet

Impeller type

- Semi-open multi-vane impeller
- Back vanes reduce axial thrust.

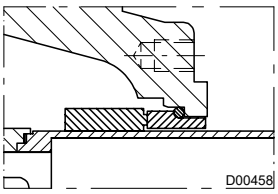
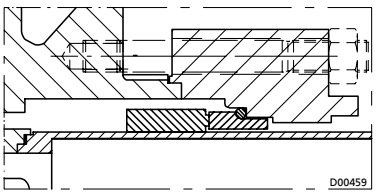
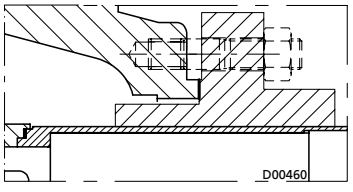
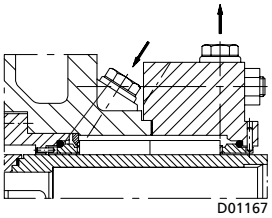
Shaft seal

- Gland packing
- Single mechanical seal / double mechanical seal
- Component seal
- Cartridge seal

Preferred:

- Standardised mechanical seals to EN 12756, K design

Table 2: Seal chamber with different shaft seals (examples)

Type of seal	Drawing
Conical seal chamber (A-type cover) Standardised mechanical seal	 D00458
Cylindrical seal chamber Standardised mechanical seal	 D00459
Cartridge seal	 D00460
Double mechanical seal in back-to-back arrangement, both sides unbalanced	 D01167

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Bearings

Design specifications

Drive-end bearing:

- Fixed bearing
- Paired angular contact ball bearings
- Axial movement of the rotor limited to 0.5 mm maximum
- Oil lubrication

Pump-end bearing:

- Radial bearing
- Cylindrical roller bearing
- Absorbs radial loads only
- Oil lubrication

Bearing bracket designation

Example: UP03

Table 3: Bearing bracket designation

Designation	Description
UP	Bearing bracket
03	Size code (based on dimensions of seal chamber and shaft end)

Bearings used

Table 4: Bearing design

KSB designation	FAG designation	SKF designation
B.G	B-TVP-UA	BECBP
B.G 8	B-TVP-UA 80	BEC86P

Table 5: Standard bearing assembly

Bearing bracket	Rolling element bearing	
	Pump end	Motor end
UP02	NU307	2 x 7307 B.G
UP03	NU311	2 x 7311 B.G.8
UP04	NU311	2 x 7311 B.G.8
UP05	NU313	2 x 7313 B.G.8

Designation

Table 6: Designation example

Position																																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
C	P	K	N	O	-	-	-	0	3	2	-	1	2	5	-	E	C	-	-	-	N	C	E	P	1	3	2	0	6	A	P	D	2	E	M
See name plate and data sheet																						See data sheet													

Table 7: Designation key

Position	Code	Description	
1-5	Pump type		
	CPKNO	CPKNO	
9-16	Size		
	032	Nominal discharge nozzle diameter [mm]	
	125	Nominal impeller diameter [mm]	
17	Pump casing material		
	V	Stainless steel	1.4408 / A743CF8M
	D	Noridur	1.4593 / 1.4517 / A995 Gr. 1B
	E	Unalloyed steel	GP240GH + N / A216 Gr. WCB
	O	Super duplex stainless steel	Noriclor / 1.4573 / 1.4469.09 / ASTM 995 Gr. 5A
18	Impeller material		
	C	Stainless steel	1.4408 / A743CF8M
	D	Noridur	1.4593 / 1.4517 / A995 Gr. 1B
	O	Super duplex stainless steel	Noriclor / 1.4573 / 1.4469.09 / ASTM 995 Gr. 5A
19	Heatable version and/or orifice plate		
	-[1)]	Standard	
	D	Orifice plate	
	H	Heatable casing and heatable casing cover	
	Z	Orifice plate and heatable casing and heatable casing cover	
20	Hydraulic system		
	-[1)]	Standard	
21	Design		
	-[1)]	Standard	
	X	Non-standard (BT3D, BT3)	
22	Bearing bracket		
	N	Normal	

1 Blank

Position	Code	Description
23-25	Seal options	
	A	A-type casing cover (conical casing cover)
	AD	A-type casing cover with throttling bush as quench seal
	AQ	A-type casing cover with lip seal as quench seal
	B	Dead-end
	BD	Dead-end, with throttling bush as quench seal
	BQ	Dead-end, with lip seal as quench seal
	CA	Cartridge seal (A-type casing cover)
	CB	Double cartridge seal, supplied with barrier fluid pressure
	CBA	Double cartridge seal, supplied with barrier fluid pressure (A-type casing cover)
	CDA	Cartridge seal with throttling bush as quench seal (A-type casing cover)
	CE	Cartridge seal with external circulation
	CED	Cartridge seal with external circulation and throttling bush as quench seal
	CEQ	Cartridge seal with external circulation and lip seal as quench seal
	CF	Cartridge seal with external flushing
	CFD	Cartridge seal with external flushing and throttling bush as quench seal
	CFQ	Cartridge seal with external flushing and lip seal as quench seal
	CI	Cartridge seal with internal circulation
	CID	Cartridge seal with internal circulation and throttling bush as quench seal
	CIQ	Cartridge seal with internal circulation and lip seal as quench seal
	CQA	Cartridge seal with lip seal as quench seal (A-type casing cover)
	CT	Double cartridge seal with unpressurised quench fluid
	CTA	Double cartridge seal with unpressurised quench fluid (A-type casing cover)
	DB	Double mechanical seal in back-to-back arrangement
	DR	Double mechanical seal in back-to-back arrangement with pumping screw
	E	External circulation
	EB	Internal circulation with heatable seal cover and throttling bush as quench seal
	ED	External circulation with throttling bush as quench seal
	EQ	External circulation with lip seal as quench seal
	ES	Internal circulation with heatable seal cover
	F	External flushing
	FD	External flushing with throttling bush as quench seal
	FQ	External flushing with lip seal as quench seal
	I	Internal circulation
	ID	Internal circulation with throttling bush as quench seal
	IDH	Internal circulation with heatable casing cover and throttling bush as quench seal
	IH	Internal circulation with heatable casing cover
	IQ	Internal circulation with lip seal as quench seal
	IQH	Internal circulation with heatable casing cover and lip seal as quench seal
	P2	Gland packing variant without barrier fluid (Nb)
	P3	Gland packing variant with external barrier fluid (Nc)
26-29	Motor rating P_N [kW]	
	0007	0,75
	...	...
	1320	132
30	Number of motor poles	
31	Product generation	
	A	CPKNO
32-35	PumpDrive	
	PD2	With PumpDrive 2nd generation
	PD2E	With PumpDrive 2nd generation, Eco
36	PumpMeter	
	M	Mit PumpMeter

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Bearing life

The minimum calculated bearing life equals:

- 25000 h
- For operation at 0.7 - 1.1 Q/Q_{BEP}: 40000 h

Materials

Table 8: Overview of available materials

Description	EC	ED	VC	VD	DD	OO
Volute casing	CS		1.4408[2)]		D	SD
Casing cover	CS		1.4408[2)]		D	SD
Impeller	SS	D	SS	D	D	SD
Shaft	C45+N[3)]					
Bearing bracket	Cl					
Support foot	Steel					
Seal cover	CrNiMoSt				DS	SD
Shaft protecting sleeve (mechanical seal)	CrNiMoSt				DS	SD
Shaft protecting sleeve (gland packing)	1.4122		CrNiMoSt		DS	SD
Impeller nut	CrNiMoSt				D	SD
Bearing bracket lantern	Cl[4)]					
Wear plate	CS		CrNiMoSt		D	SD

Table 9: Codes used

Code	Material
CrNiMoSt	1.4408 / 1.4571
Cl	EN-GJL-250
CS	GP240GH+N / P250GH
D	1.4593/ 1.4462
DS	1.4462
SD	Noriclor / 1.4573 / 1.4469.09
SS	1.4408

Coating and preservation

- Coating and preservation to KSB standard
- Special coatings on request

Product benefits

- Hydraulic characteristics optimised for excellent efficiency and NPSH, ensuring energy-efficient and environmentally friendly use of resources
- Lower investment costs as duty points required can be achieved with smaller pump sizes
- Lower operating costs due to reduced energy consumption, optimised spare parts concept and hard-wearing, service-friendly design
- Flexible use due to modular design regarding hydraulic system materials, sealing elements, bearing brackets, coupling, baseplate and drive
- Gentle handling of the fluid makes this pump set perfect for polymerising fluids as well as for fluids sensitive to shear forces.
- Semi-open impeller allows use of fluids containing a small amount of gas.

Acceptance tests and warranty

- Materials testing
  - Test report 2.2 on request
- Final inspection
  - Inspection certificate 3.1 to EN 10204 on request
- Hydraulic test

  The operating point of each pump is guaranteed to ISO 9906/3B.

  The following acceptance tests can be performed and certified at extra charge:
  - Performance test to ISO 9906
  - NPSH test
- Other inspections/tests on request
- Warranty

  Warranties are given within the scope of the valid terms and conditions of sale and delivery.

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2 To VDMA 24276
3 T≤10 °C: 1.4462; T>250 °C 1.7709.QT+SR
4 Optional: DI / EN-GJS-400-18-LT

Pressure limits and temperature limits

Pressure limits and temperature limits of the pump

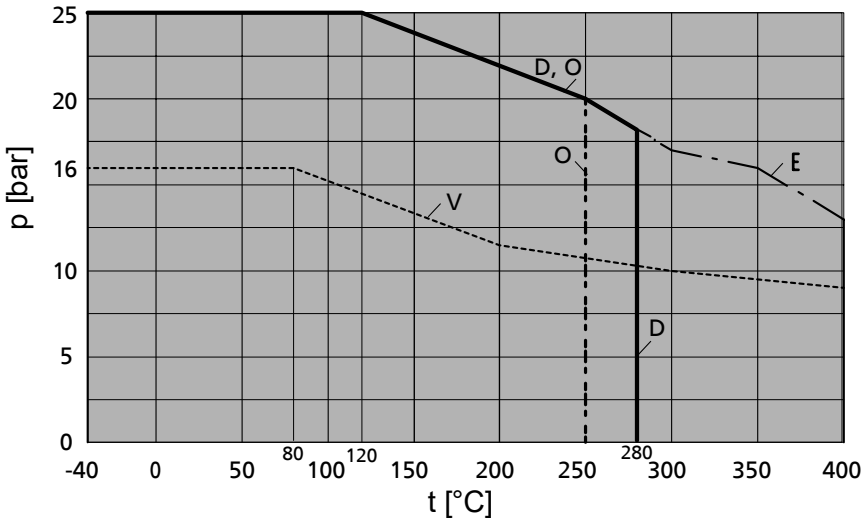

Fig. 1: Pressure limits and temperature limits of the pump

Pressure limits and temperature limits of shaft seals

The application limits of shaft seals depend on the circumferential speed, the material and the fluid handled. Verify the application limits in each individual case on the basis of manufacturers' catalogues, taking into account the actual operating conditions.

Pressure limits and temperature limits of ASME flanges

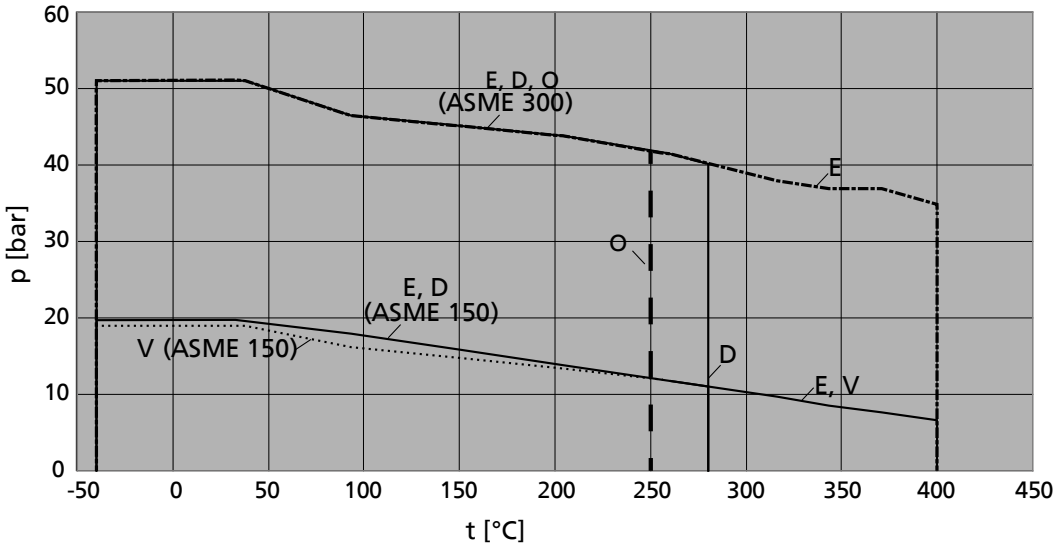

Fig. 2: Pressure limits and temperature limits of ASME flanges

On models with ASME flanges, the pressure limits and temperature limits are determined by the lowest value given in the "Pressure limits and temperature limits of the pump" diagram and the "Pressure and temperature limits of ASME flanges" diagram.

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Technical data

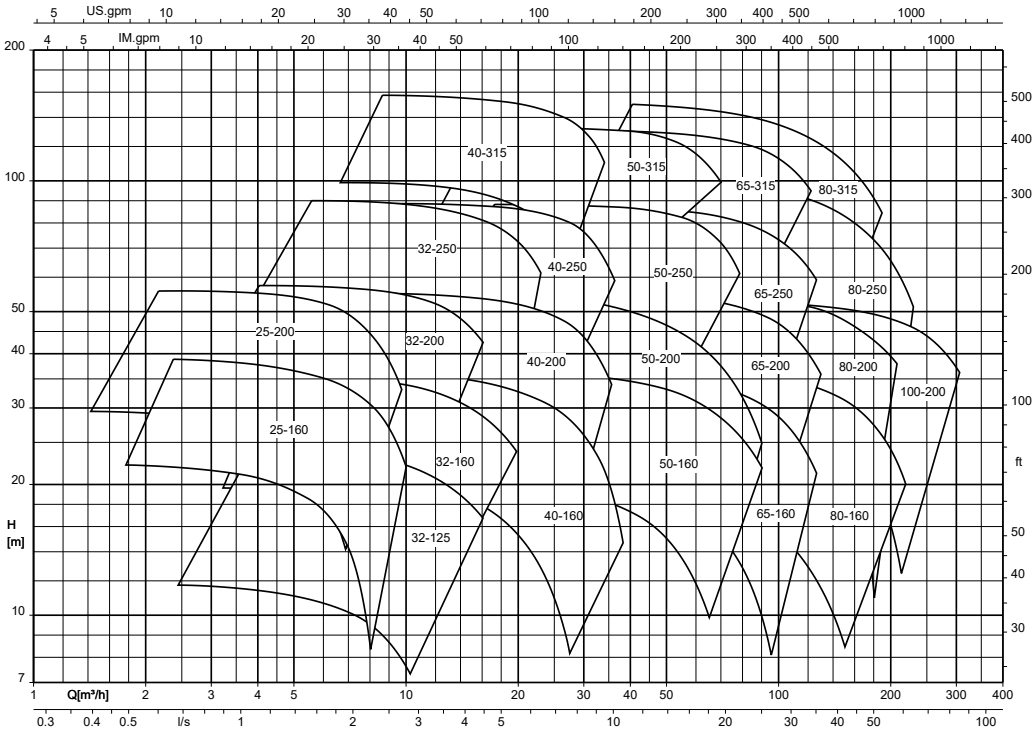
Table 10: Technical data

Size	Bearing bracket	Impeller					Shaft diameter in seal chamber	Bearing	Coupling	Diameter of shaft protecting sleeve		Volute casing design[5]
		Impeller outlet width	Impeller inlet diameter	Impeller diameter		Number of vanes				Gland packing	Mechanical seal	
				Max.	Min.							
		[mm]	[mm]	[mm]	[mm]		[mm]	[mm]	[mm]	[mm]	[mm]	
025-160	UP02	6	45	169	130	4	28	35	24	35	33	E
025-200	UP02	6	45	209	160	4	28	35	24	35	33	E
032-125	UP02	8	52	139	100	4	28	35	24	35	33	E
032-160	UP02	7	52	169	130	4	28	35	24	35	33	E
032-200	UP02	7	52	209	160	4	28	35	24	35	33	E
032-250	UP03	6	52	260	200	6	38	55	32	45	43	E
040-160	UP02	9	65	169	130	4	28	35	24	35	33	E
040-200	UP02	7	65	209	160	5	28	35	24	35	33	E
040-250	UP03	7	65	260	200	6	38	55	32	45	43	E
040-315	UP03	8	65	320	260	6	38	55	32	45	43	E
050-160	UP02	15	82	169	130	6	28	35	24	35	33	E
050-200	UP02	12	82	209	160	5	28	35	24	35	33	E
050-250	UP03	10	84	260	200	6	38	55	32	45	43	E
050-315	UP03	8	84	320	260	6	38	55	32	45	43	E
065-160	UP03	20	89	169	130	7	38	55	32	45	43	E
065-200	UP03	16	96	209	160	6	38	55	32	45	43	E
065-250	UP03	13	96	260	200	6	38	55	32	45	43	E
065-315	UP04	10	96	320	260	6	48	55	42	55	53	E
080-160	UP03	27	100	169	130	8	38	55	32	45	43	E
080-200	UP03	22	114	209	160	7	38	55	32	45	43	D
080-250	UP03	17	114	260	200	7	38	55	32	45	43	D
080-315	UP04	14	129	320	260	7	48	55	42	55	53	D
080-400	UP04	11	118	404	320	7	48	55	42	55	53	D
100-200	UP03	29	122	320	260	8	38	55	32	45	43	D
200-315	UP05	50	222	320	260	7	65	65	48	70	65	E

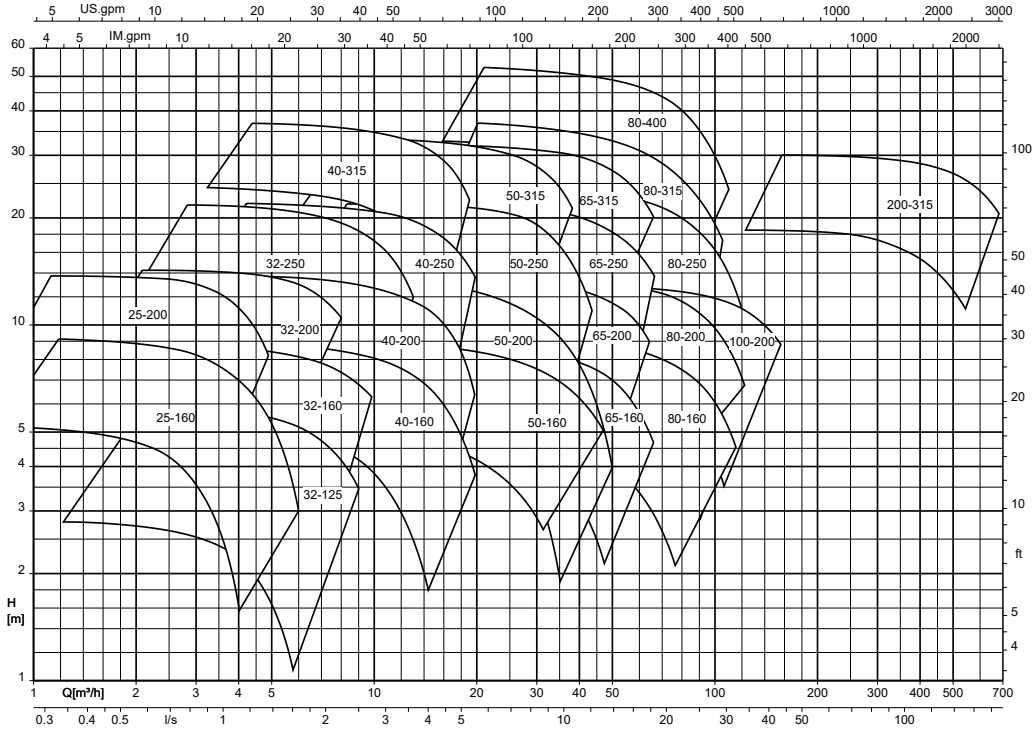
5 D = double volute, E = single volute

Selection charts

CPKNO, n = 2900 rpm



CPKNO, n = 1450 rpm



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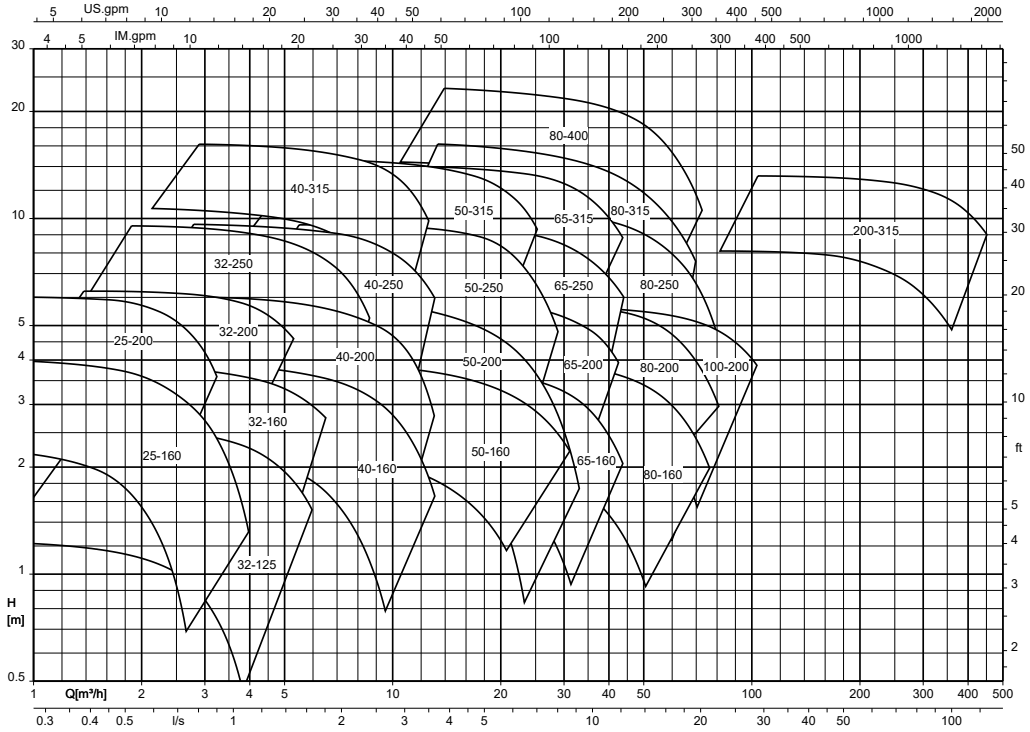
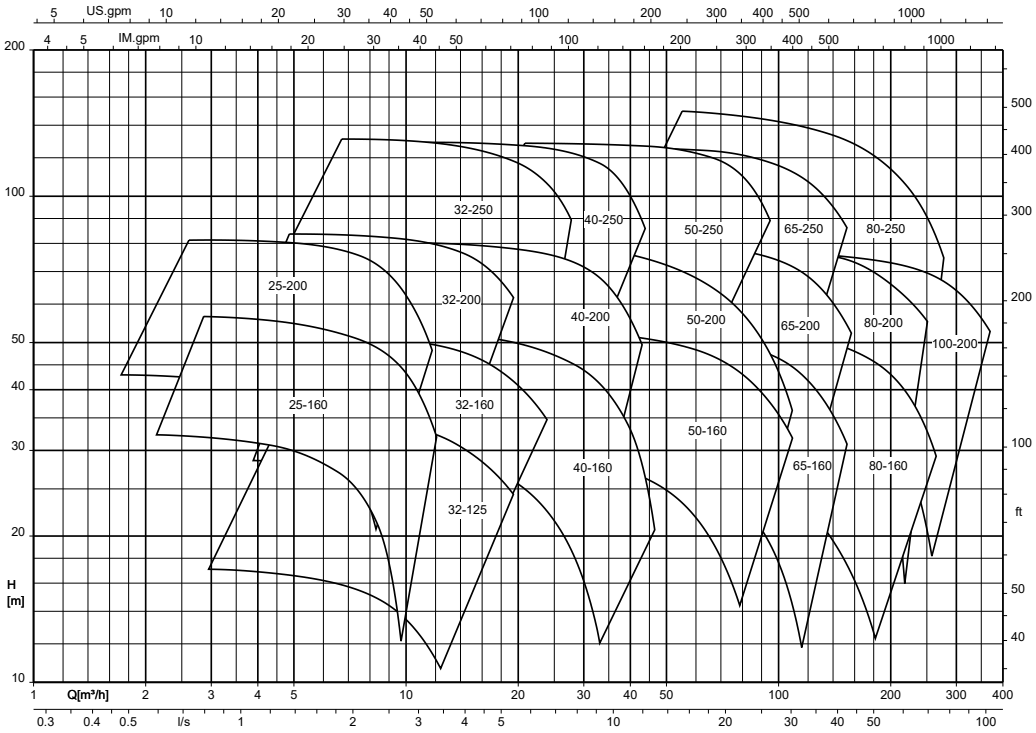
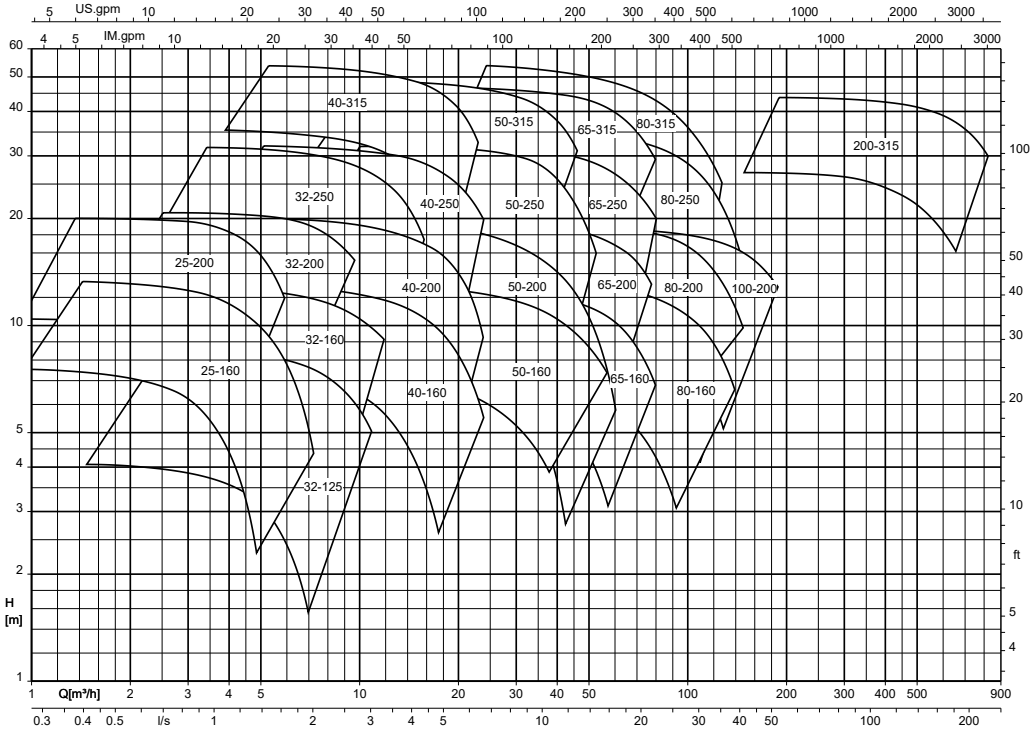
CPKNO, n = 960 rpm



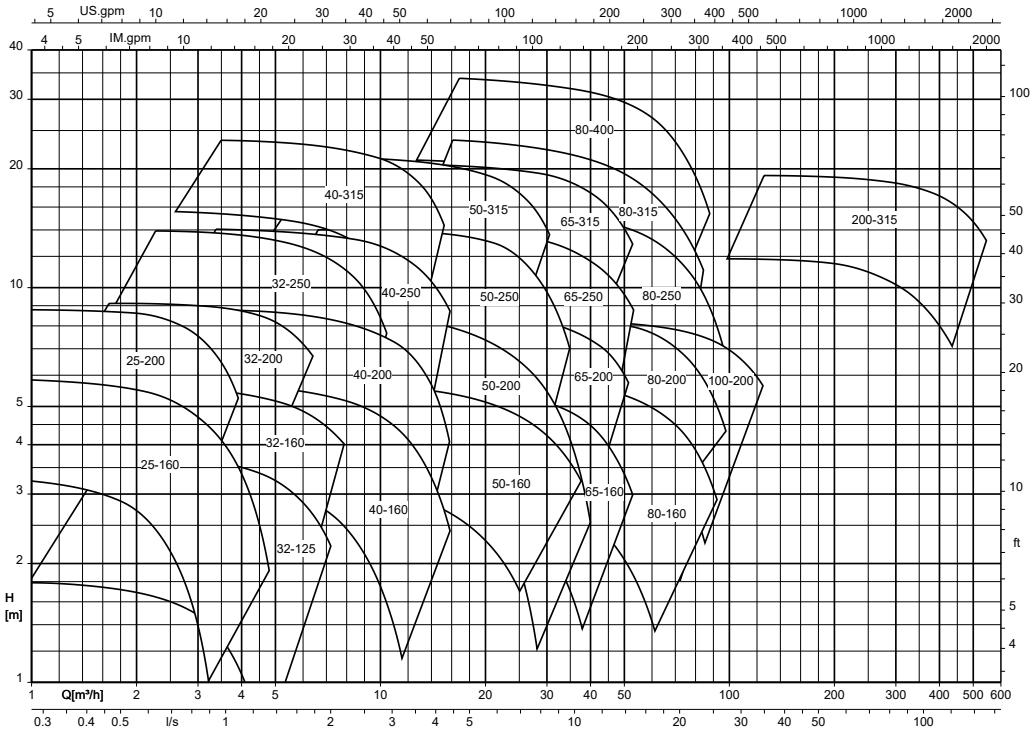
CPKNO, n = 3500 rpm



CPKNO, n =1750 rpm



CPKNO, n = 1160 rpm



Dimensions and connections

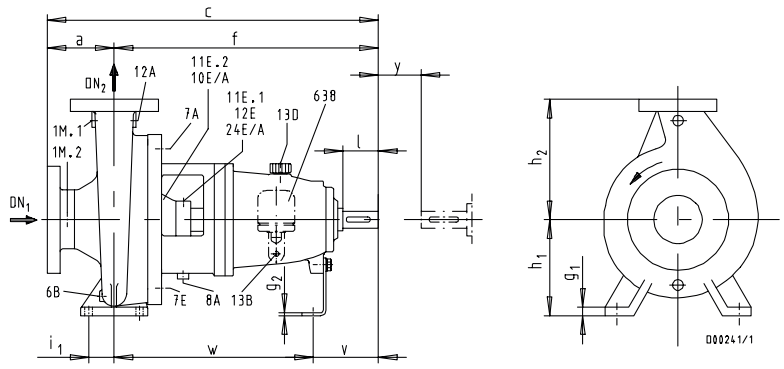


Fig. 3: Dimensions and connections of the pump

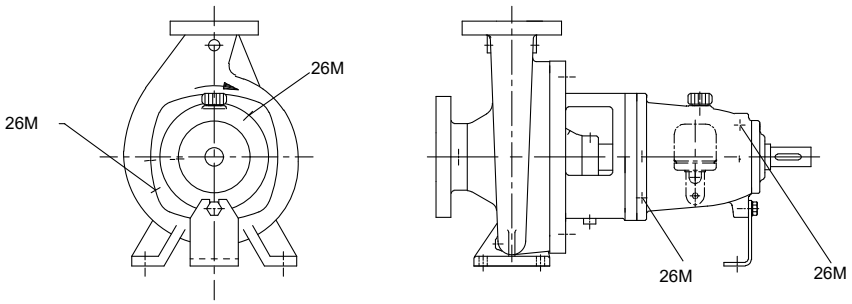


Fig. 4: Connections for shock pulse measurement

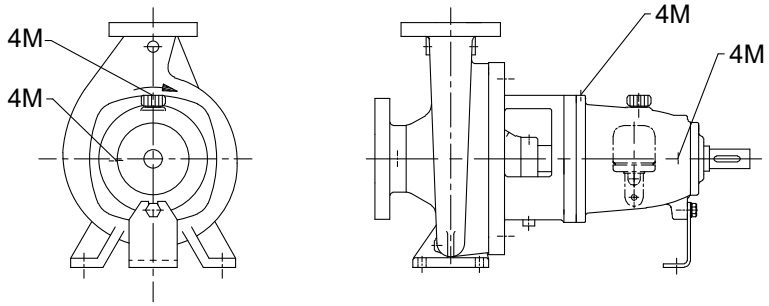


Fig. 5: Connections for Pt100 resistance thermometer

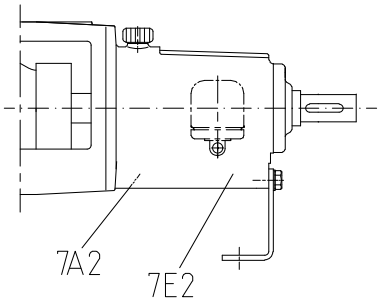


Fig. 6: Connections for version with coolable bearing bracket

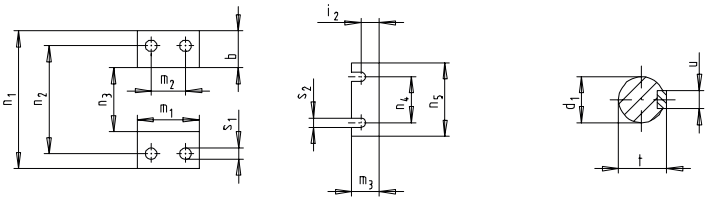
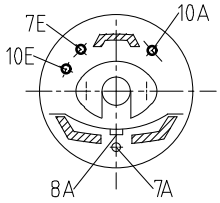
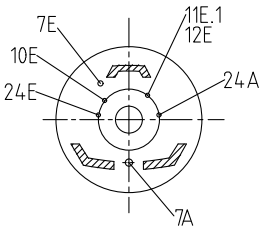


Fig. 7: Dimensions of pump feet and shaft end

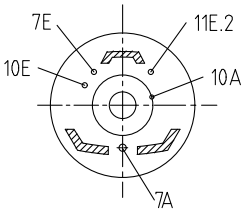
Gland packing



Single mechanical seal



Double mechanical seal



Shaft seal connections

Table 11: Connections

Connection	Bearing bracket				Description
	UP02	UP03	UP04	UP05	
1 M.1	G 1/4	G 1/4	G 1/2	G 1/2	Pressure gauge
1 M.2	G 1/4	G 1/4	G 1/2	G 1/2	Pressure gauge
4 M	G 1/4	G 1/4	G 1/4	G 1/4	Temperature measuring instrument
6 B	G 1/4	G 3/8	G 1/2	G 1/2	Fluid drain
7 E/A[6)]	G 3/8	G 3/8	G 3/8	G 1/2	Cooling liquid IN/OUT
7 E2/A2	G 1/2	G 1/2	G 1/2	G 1/2	Cooling liquid IN/OUT
8 A	Rp 1/2	Rp 1/2	Rp 1/2	Rp 1/2	Leakage drain
10 E / A	G 1/4	G 1/4	G 1/4	G 1/4	Barrier fluid IN/OUT
11 E.1	G 1/4	G 1/4	G 1/4	G 1/4	Flushing liquid IN
11 E.2	G 1/8	G 1/8	G 1/8	G 1/8	Flushing liquid IN
12 E / A	G 1/4	G 1/4	G 1/4	G 1/4	Circulation liquid IN/OUT
13 B	G 1/4	G 1/4	G 1/4	G 1/4	Oil drain
13 D	20 0	20 0	20 0	20 0	Vent plug
16 B.1	G 1/4	G 1/4	G 1/4	G 3/8	Condensate drain
16 B.3	G 1/4	G 1/4	G 1/4	G 1/4	Condensate drain
24 E / A.2	G 1/4	G 1/4	G 1/4	G 1/4	Quench liquid IN/OUT
26 M	M8	M8	M8	M8	Vibration measurement
638	Rp 1/4	Rp 1/4	Rp 1/4	Rp 1/4	Constant level oiler

Table 12: Pump dimensions [mm]

Size	DN 1	DN 2	a	b	c	f	g1	g2	h1	h2	m1	m3	n1	n3	n5
25-160	40	25	80	50	465	385	14	4	132	160	100	48	240	140	160
25-200	40	25	80	50	465	385	14	4	160	180	100	48	240	140	160
32-125	50	32	80	50	465	385	12	4	112	140	100	48	190	90	160
32-160	50	32	80	50	465	385	14	4	132	160	100	48	240	140	160
32-200	50	32	80	50	465	385	14	4	160	180	100	48	240	140	160
32-250	50	32	100	65	600	500	16	4	180	225	125	48	320	190	160
40-160	65	40	80	50	465	385	14	4	132	160	100	48	240	140	160
40-200	65	40	100	50	485	385	14	4	160	180	100	48	265	165	160
40-250	65	40	100	65	600	500	16	4	180	225	125	48	320	190	160
40-315	65	40	125	65	625	500	18	6	200	250	125	48	345	215	160
50-160	80	50	100	50	485	385	14	4	160	180	100	48	265	165	160
50-200	80	50	100	50	485	385	14	4	160	200	100	48	265	165	160
50-250	80	50	125	65	625	500	16	4	180	225	125	48	320	190	160
50-315	80	50	125	65	625	500	18	6	225	280	125	48	345	215	160
65-160	100	65	100	65	600	500	15	4	160	200	125	48	280	150	160
65-200	100	65	100	65	600	500	16	4	180	225	125	48	320	190	160
65-250	100	65	125	80	625	500	18	6	200	250	160	48	360	200	160
65-315	100	65	125	80	655	530	18	6	225	280	160	48	400	240	160
80-160	125	80	125	65	625	500	15	4	180	225	125	48	320	190	160
80-200	125	80	125	65	625	500	16	4	180	250	125	48	345	215	160
80-250	125	80	125	80	625	500	18	6	225	280	160	48	400	240	160

6 Not fitted on pump version with conical seal chamber

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Size	DN 1	DN 2	a	b	c	f	g1	g2	h1	h2	m1	m3	n1	n3	n5
80-315	125	80	125	80	655	530	18	6	250	315	160	48	400	240	160
80-400	125	80	125	80	655	530	20	6	280	355	160	48	435	275	160
100-200	125	100	125	80	625	500	16	6	200	280	160	48	360	200	160
200-315	250	200	200	110	870	670	22	12	355	450	200	60	550	350	200

Table 13: Dimensions of pump feet and shaft end

Size	Shaft end [mm]					Pump feet [mm]								
	d1 ł k6	l	t	u	y	i1	i2	m2	n2	n4	s1	s2	v	w
25-160	24	50	27	8	100	35	20	70	190	110	14	14	100	285
25-200	24	50	27	8	100	35	20	70	190	110	14	14	100	285
32-125	24	50	27	8	100	35	20	70	140	110	14	14	100	285
32-160	24	50	27	8	100	35	20	70	190	110	14	14	100	285
32-200	24	50	27	8	100	35	20	70	190	110	14	14	100	285
32-250	32	80	35	10	100	47,5	20	95	250	110	14	14	130	370
40-160	24	50	27	8	100	35	20	70	190	110	14	14	100	285
40-200	24	50	27	8	100	35	20	70	212	110	14	14	100	285
40-250	32	80	35	10	100	47,5	20	95	250	110	14	14	130	370
40-315	32	80	35	10	100	47,5	20	95	280	110	14	14	130	370
50-160	24	50	27	8	100	35	20	70	212	110	14	14	100	285
50-200	24	50	27	8	100	35	20	70	212	110	14	14	100	285
50-250	32	80	35	10	100	47,5	20	95	250	110	14	14	130	370
50-315	32	80	35	10	100	47,5	20	95	280	110	14	14	130	370
65-160	32	80	35	10	100	47,5	20	95	212	110	14	14	130	370
65-200	32	80	35	10	140	47,5	20	95	250	110	14	14	130	370
65-250	32	80	35	10	140	60	20	120	280	110	18	14	130	370
65-315	42	110	45	12	140	60	20	120	315	110	18	14	160	370
80-160	32	80	35	10	140	47,5	20	95	250	110	14	14	130	370
80-200	32	80	35	10	140	47,5	20	95	280	110	14	14	130	370
80-250	32	80	35	10	140	60	20	120	315	110	18	14	130	370
80-315	42	110	45	12	140	60	20	120	315	110	18	14	160	370
80-400	42	110	45	12	140	60	20	120	355	110	18	14	160	370
100-200	32	80	35	10	140	60	20	120	280	110	18	14	130	370
200-315	48	110	51	14	180	75	39	150	450	140	23	18	170	500

Flange design

Table 14: Flange design by materials

Material	Pump flanges
V	EN 1092-1 PN 16 Drilled to ASME B16.5 Class 150[7)]
D / E / O	EN 1092-1 PN 25 Drilled to ASME B16.5 Class 150[7)] Drilled to ASME B16.5, Class 300[8)9)]

Scope of supply

Depending on the model, the following items are included in the scope of supply:

- Pump

Drive

- Surface-cooled IEC frame three-phase squirrel-cage motor

Coupling

- Flexible coupling with or without spacer

Contact guard

- Coupling guard
- Baseplate (to ISO 3661), cast or welded, for pump and motor, in torsion-resistant design
- Channel section steel or folded steel plate

7 Flanges DN32 are drilled 1 1/2 in.
8 Size 200-315 requires one-off casting with pattern variant.
9 Possible from 40-250 up to and including 100-400.

Special accessories

- As required

General assembly drawing with list of components

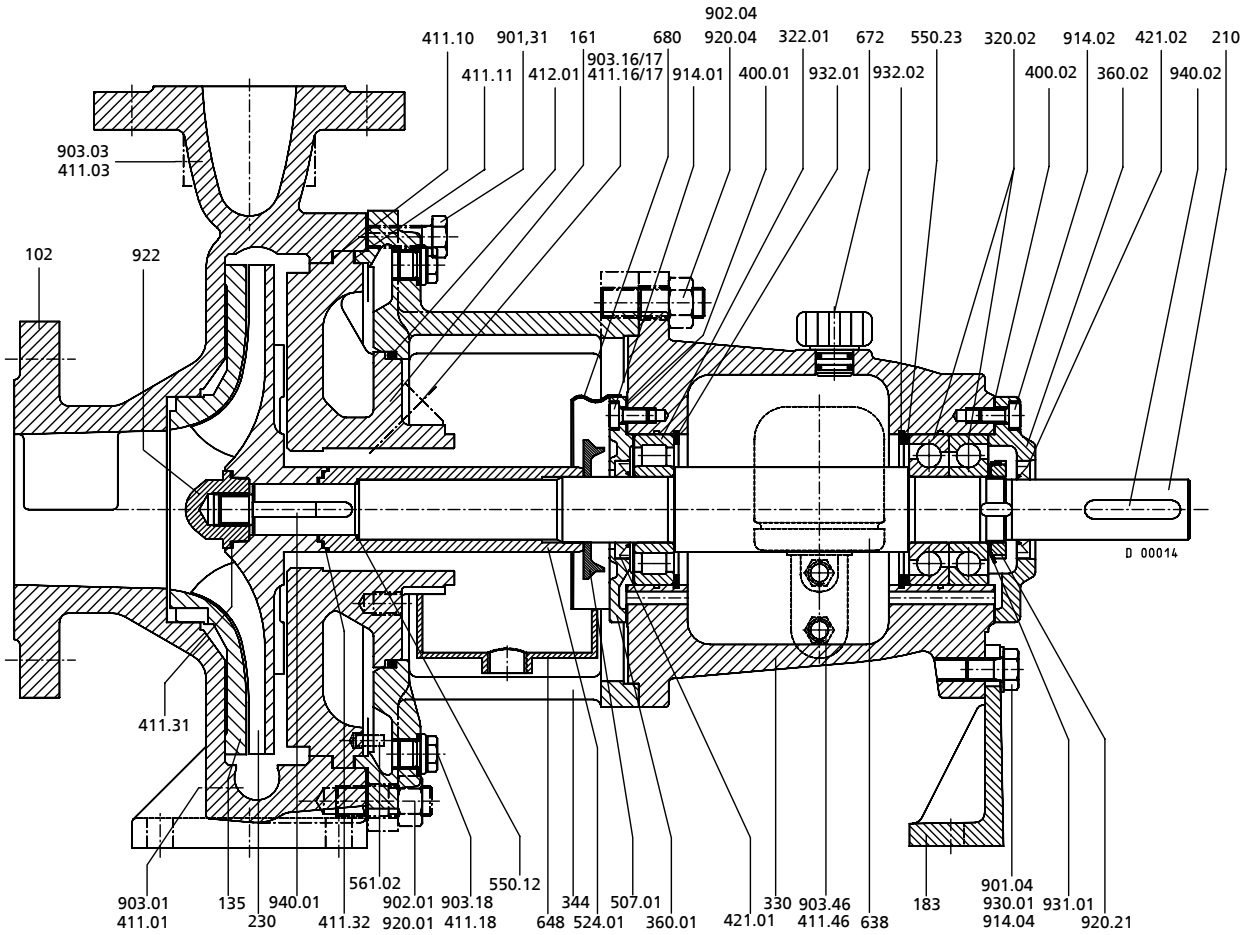

Fig. 8: Version with mechanical seal

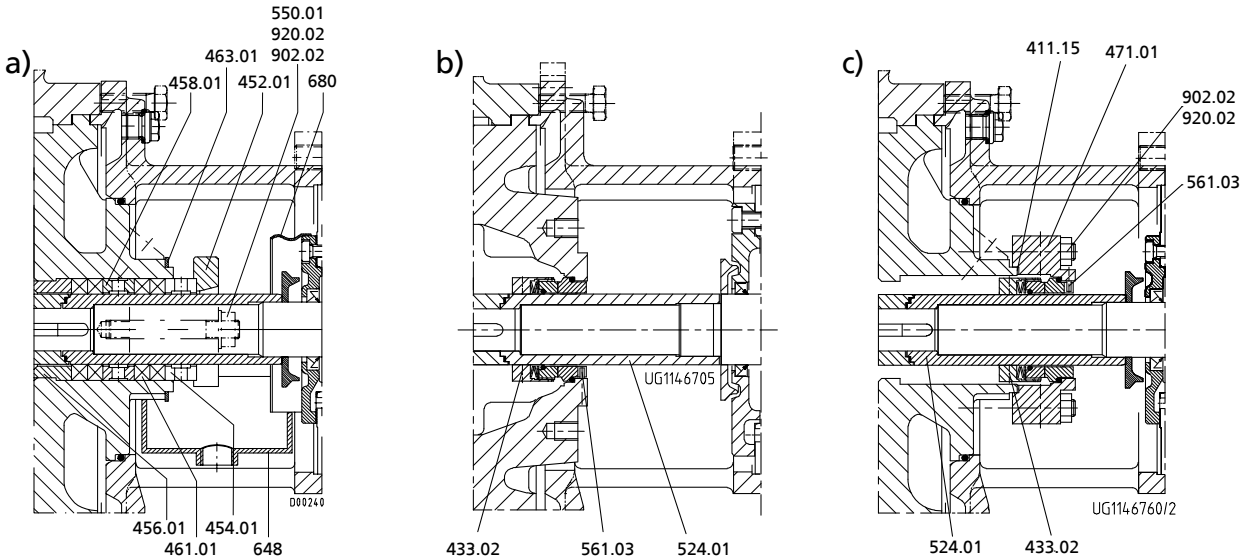

Fig. 9: a) Version with gland packing, b) Mechanical seal with conical casing cover, c) Mechanical seal with cylindrical casing cover

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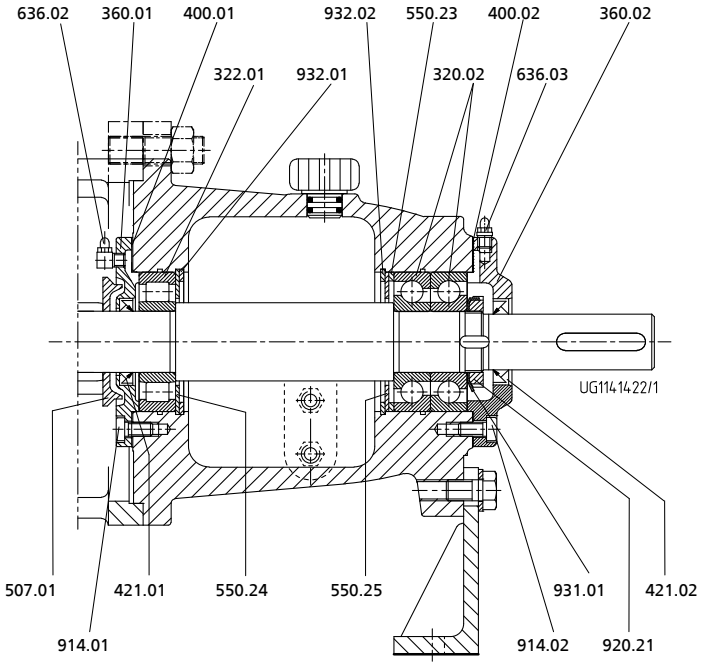

Fig. 10: Grease-lubricated version

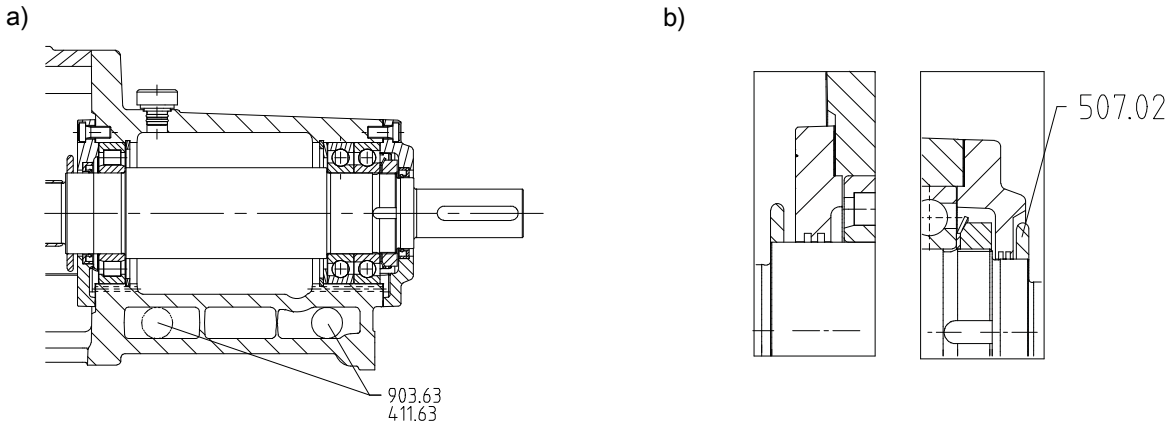

Fig. 11: a) Version with coolable bearing bracket, b) Version with labyrinth seal

Table 15: List of components

Part No.	Comprising	Description
102	102	Volute casing
	411.01/.03	Joint ring
	411.10[10)]	Joint ring
	902.01	Stud
	903.01/.03	Screw plug
	920.01	Hexagon nut
135	135	Wear plate
161	161	Casing cover
	411.11/.16/.17	Joint ring
	412.01[11)]	O-ring
	463.01[12)]	Drip plate
	550.01[12)]	Disc
	902.02	Stud
	903.16/.17	Screw plug

10 Joint ring 411.10 (and 411.15 for version with mechanical seal) depending on the operating temperature. To be ordered separately in spare parts order.

11 Not fitted on version with conical seal chamber

12 Provided for version with gland packing only

Part No.	Comprising	Description
161	920.02	Hexagon nut
183	183	Support foot
	901.04[13)]	Hexagon head bolt
	930.01	Spring washer
210	210	Shaft
	550.12	Set of adjusting washers
	920.21	Slotted round nut
	931.01	Lock washer
	940.01/.02	Key
230	230	Impeller
	411.32	Joint ring
320.02	320.02	Angular contact ball bearing
322.01	322.01	Cylindrical roller bearing
330	330	Bearing bracket
	360.01/.02	Bearing cover
	400.01/.02	Gasket
	411.46	Joint ring
	421.01/.02	Lip seal
	550.23	Support disc
	638[14)]	Constant level oiler
	672	Vent plug
	903.46	Screw plug
	914.01/.02	Hexagon socket head cap screw
	932.01/.02	Circlip
	550.24/.25[15)]	Disc
	636.02/.03[15)]	Lubricating nipple
344	344	Bearing bracket lantern
	411.18	Joint ring
	412.01[11)]	O-ring
	561.02	Parallel pin
	903.18	Screw plug
	902.04	Stud
	901.31	Hexagon head bolt
	920.04	Hexagon nut
360.01/.02	360.01/.02	Bearing cover
	400.01/.02	Gasket
	914.01/.02	Hexagon socket head cap screw
421.01/.02	421.01/.02	Lip seal
433	433	Mechanical seal
452.01[12)]	452.01[12)]	Gland follower
454.01[12)]	454.01[12)]	Stuffing box ring
456.01[12)]	456.01[12)]	Neck bush
458.01[12)]	458.01[12)]	Lantern ring
461.01[12)]	461.01[12)]	Gland packing
463.01[12)]	463.01[12)]	Drip plate
471.01	471.01	Seal cover
	411.15[10)]	Joint ring
507.01	507.01	Thrower
	561.03	Grooved pin
524.01	524.01	Shaft protecting sleeve
	411.32	Joint ring
561.02	561.02	Grooved pin
638[14)]	638[14)]	Constant level oiler
648[12)]	648[12)]	Drip pan

13 For bearing brackets UP02 and UP04: socket head cap screw 914.04
14 Not applicable to grease-lubricated versions
15 Only included for grease-lubricated versions

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Part No.	Comprising	Description
680	680	Guard
922	922	Impeller nut
	411.31	Joint ring

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