

Process Pump

RPH-RO

Type Series Booklet



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Type Series Booklet RPH-RO

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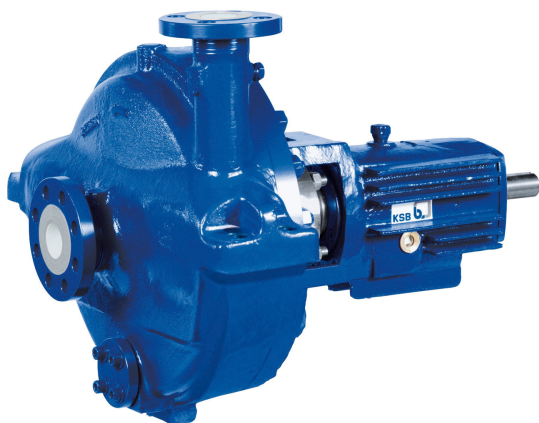
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Centrifugal Pumps with Shaft Seal

Process Pumps

RPH-RO



Main applications

Pump for water desalination systems (reverse osmosis applications)

Operating data

Operating properties

Characteristic		Value
Flow rate	Q	Up to 2500 m³/h / 11008 gpm
Head	H	Up to 150 m / 492 ft
Operating temperature	T	0 °C to 40 °C / 32 °F to 104 °F
Operating pressure ¹⁾	p	Up to 80 bar / 1160 psi (ASME B 16.5 Class 600)

Designation

Example: RPH-RO 150-230

Key to the designation

Code	Description
RPH	Type series
150	Nominal discharge nozzle diameter [mm]
230	Nominal impeller diameter [mm]
RO	Reverse osmosis

Design details

Design

- Volute casing pump
- Horizontal installation

- Back pull-out design
- Single-stage

Pump casing

- Volute casing with integrally cast pump feet
- Centreline pump feet
- Single or double volute, depending on the pump size
- Radially split volute casing
- Axial inlet nozzle, tangential discharge nozzle pointing vertically upwards.
(From DN 250 / from impeller diameter 500 / pump size 200-401: radial discharge nozzle pointing vertically upwards)
- Volute casing with casing wear ring
- Casing cover (with casing wear ring, as required)

Impeller type

- Closed radial impeller
- Impeller with impeller wear ring on the suction side

Shaft seal

- KSB mechanical seal

Bearings

- Uncooled

Optional:

- Cooled bearing bracket

Drive-end bearing:

- Fixed bearing
- Paired angular contact ball bearing (triple bearing assembly)
- Axial movement of the rotor limited to 0.5 mm maximum
- Oil bath lubrication
- **Optional:** oil mist lubrication

Pump-end bearing:

- Radial bearing
- Cylindrical roller bearing
- Absorbs radial loads only
- Oil bath lubrication
- **Optional:** oil mist lubrication

Bearing bracket designation

Example: B03

Bearing bracket designation

Designation	Description
B	Back pull-out bearing bracket
03	Size code (based on dimensions of seal chamber, shaft end and bearings)

¹⁾ Higher pressures and flange pressure ratings on request

Bearings used

Bearing design

KSB designation	FAG designation	SKF designation
B.MUA	B-MP-UA	BECBM

Reinforced bearing assembly (triple bearing assembly)

Bearing bracket	Rolling element bearings	
	Pump end	Motor end
B03	NU213C3	3 x 7311B-MUA
B05	NU316C3	3 x 7315B-MUA

Bearing bracket	Rolling element bearings	
	Pump end	Motor end
B06	NU324C3	3 x 7224B-MUA
B07	NU324C3	3 x 7324B-MUA

Materials

Materials

Part No.	Description	Material variant
102	Volute casing	A890 Gr 5A
161	Casing cover	A890 Gr 5A
210	Shaft	1.4462
230	Impeller	A890 Gr 5A
330	Bearing bracket	A216 Gr WCB
412.50	O-ring	Viton
433	Mechanical seal	4RPS (KSB) Q1Q11VMG4
502.01	Casing wear ring	1.4501
503.01	Impeller wear ring	1.4501
523	Shaft sleeve	1.4501
542.02	Throttling bush	1.4501
902.01/ 920.01	Casing studs/hexagon nuts	1.6772 A2D

Table of comparison of materials

Material type	ASTM designation	DIN standard	BS standard
Carbon steel	A 216 Gr WCB	GP 240 GH+N	EN 10213-2
Super duplex stainless steel	A890 Gr 5A	1.4469.09 ²⁾	EN 10213-4
(PREN > 40)	A276-S32760	1.4501	EN 10088-3

Coating and preservation

- Coating and preservation to KSB standard

Product benefits

- Double volute from DN 80 (3 in.): low radial thrust and reduced shaft deflection extend the service life of bearings and mechanical seal.
- Easy to service thanks to back pull-out design
- Dimensioned for longer service life than specified by API 610, reducing maintenance expenditure and work
- Tandem bearing arrangement absorbs high axial forces
- Cast steel bearing brackets with integrated cooling fins enable higher fluid temperatures and reduce bearing temperatures.
- Optional fan impeller: no cooling water supply required for high temperatures
- Wetted components made of super duplex stainless steel for optimum corrosion resistance
- Optimised KSB mechanical seal for maximum operating reliability

Acceptance tests / Warranties

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

The duty point of each pump is guaranteed according to ISO 9906/2B.

The following acceptance tests can be performed and certified at extra charge:

 - Performance test to ISO 9906
 - NPSH test
- Other tests (e.g. vibrations, strength, noise characteristics) on request.
- Warranty

Warranties are given within the scope of the valid delivery conditions.

²⁾ On request

Sizes

Nominal impeller diameters available

Nominal diameter of the discharge nozzle	Bearing bracket	Nominal impeller diameter				
		180	230	280	400	401
100	B03	X	-	-	-	-
150	B03	-	X ³⁾	-	-	-
200	B05S	-	-	X ³⁾	-	-
	B05L	-	-	-	-	X ³⁾⁴⁾
250	B05L	-	-	-	-	X ³⁾⁴⁾
300	B05L	-	-	-	X ³⁾⁴⁾	-
350	B07	-	-	-	X ³⁾⁴⁾	-

Technical data

Technical data

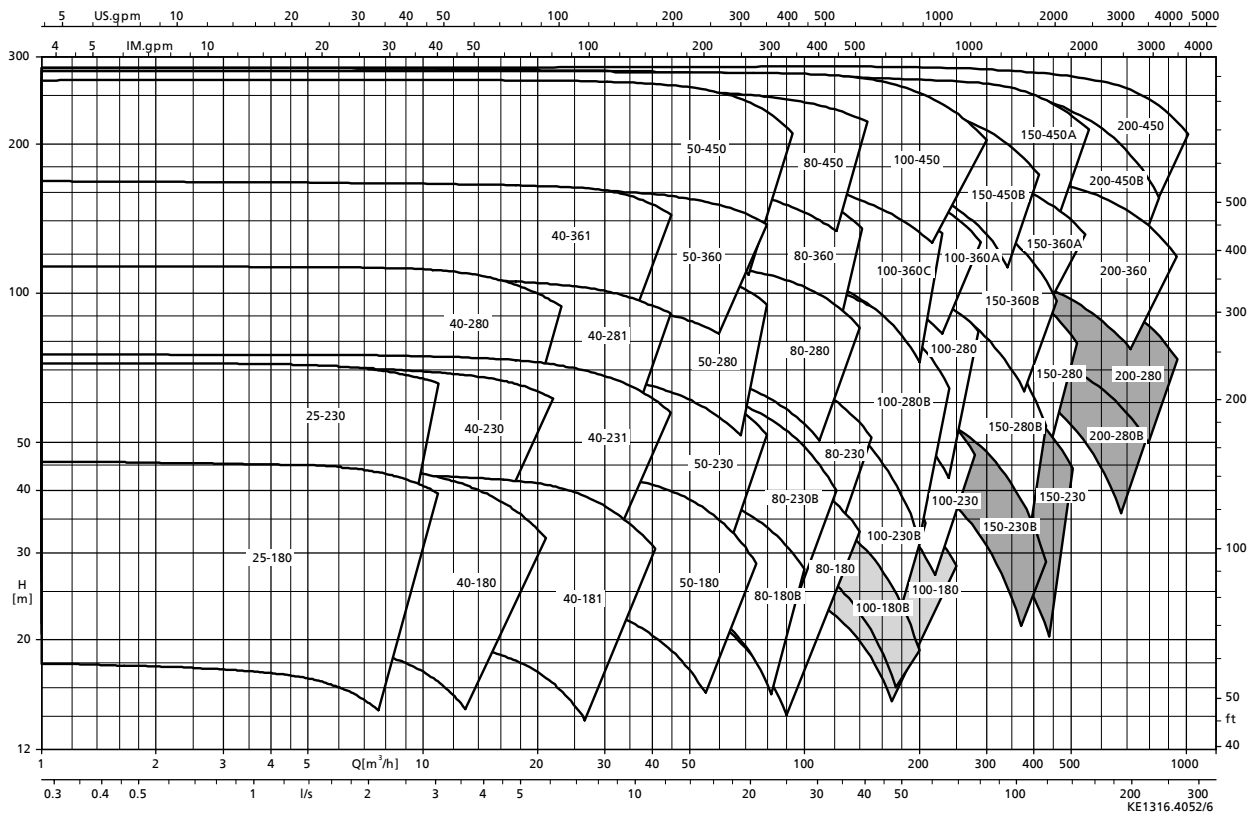
Size	Bearing bracket	Impeller				Shaft diameter				Drive						
						In seal chamber	At bearings		At coupling	P/n value	Max. drive power at					
		Impeller outlet width	Impeller inlet diameter	Impeller diameter			Pump end	Drive end			n = 1450 rpm	n = 1750 rpm	n = 2900 rpm	n = 3500 rpm		
															Max.	Min.
															[mm]	[mm]
100-180	B03	28	133	190	150	47	65	55	42	0,0875	126,9	153,1	251,8	306,3		
100-180B	B03	19,8	133	190	150	47	65	55	42	0,0875	126,9	153,1	251,8	306,3		
150-230	B03	35	161	240	190	47	65	55	42	0,0875	126,9	153,1	251,8	306,3		
150-230B	B03	25	161	240	190	47	65	55	42	0,0875	126,9	153,1	251,8	306,3		
200-280	B05S	43,1	198	295	235	56	80	75	60	0,2481	359,8	434,2	719,6	868,4		
200-280B	B05S	30,7	198	295	235	56	80	75	60	0,2481	359,8	434,2	719,6	868,4		
200-401	B05L	40	222	408	320	73	80	75	60	0,3860	559,7	675,5	-	-		
250-401	B05L	63	294	404	320	73	80	75	60	0,3860	559,7	675,5	-	-		
300-400	B05L	68	294	404	353	73	80	75	60	0,3860	559,7	675,5	-	-		
350-400	B07	115,4	337	408	380	-	120	120	95	1,9210	2785,4	3361,7	-	-		

³⁾ Casing with double volute

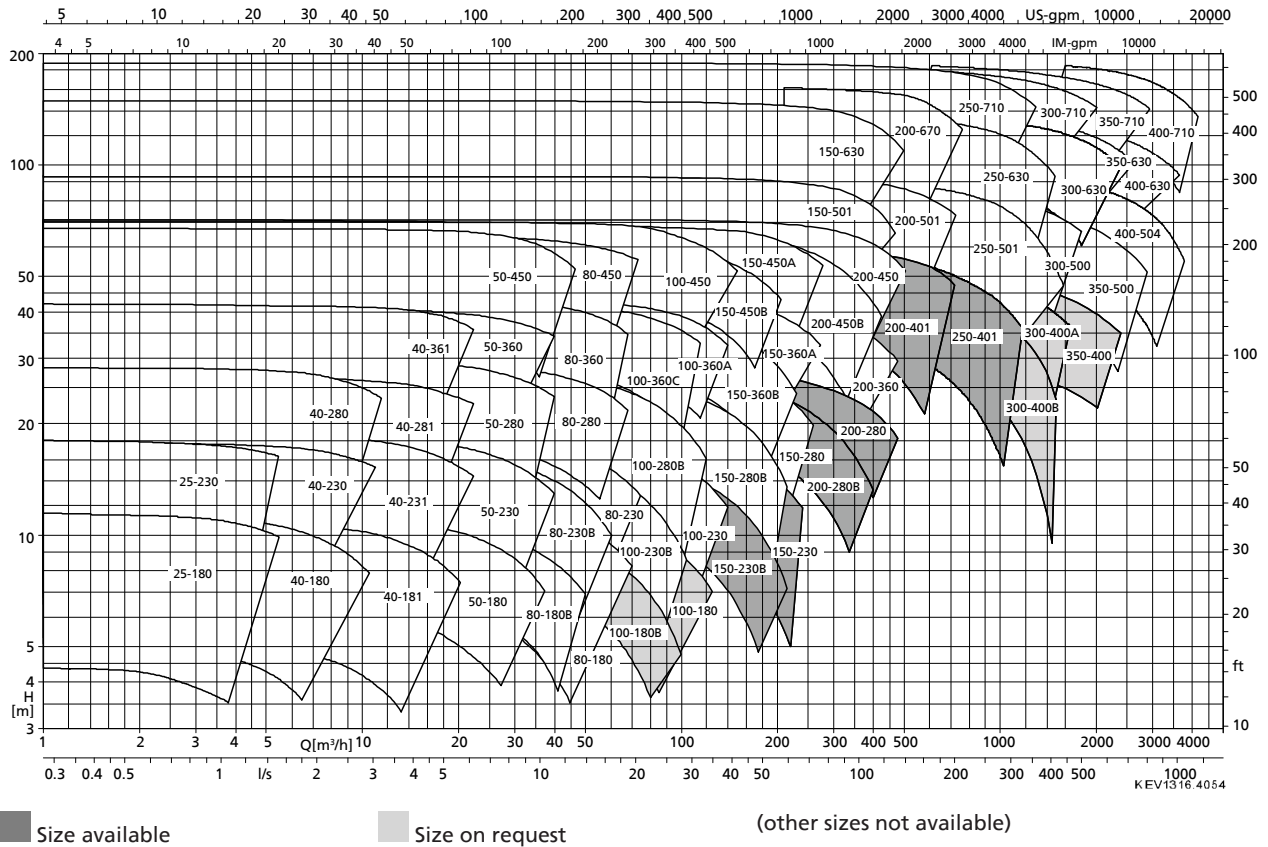
⁴⁾ Complementary sizes: only in combination with 4-pole drive

Selection charts

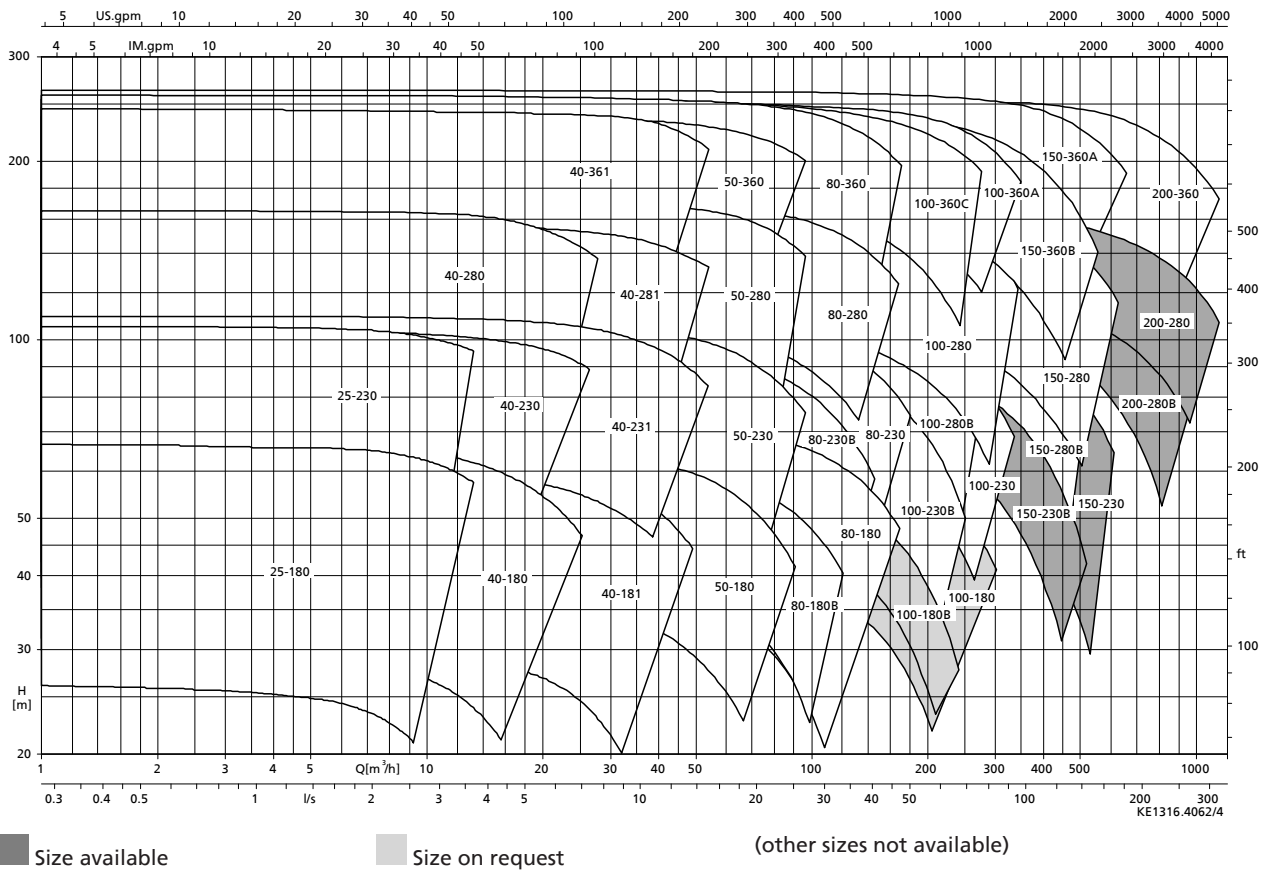
RPH-RO, n = 2900 rpm



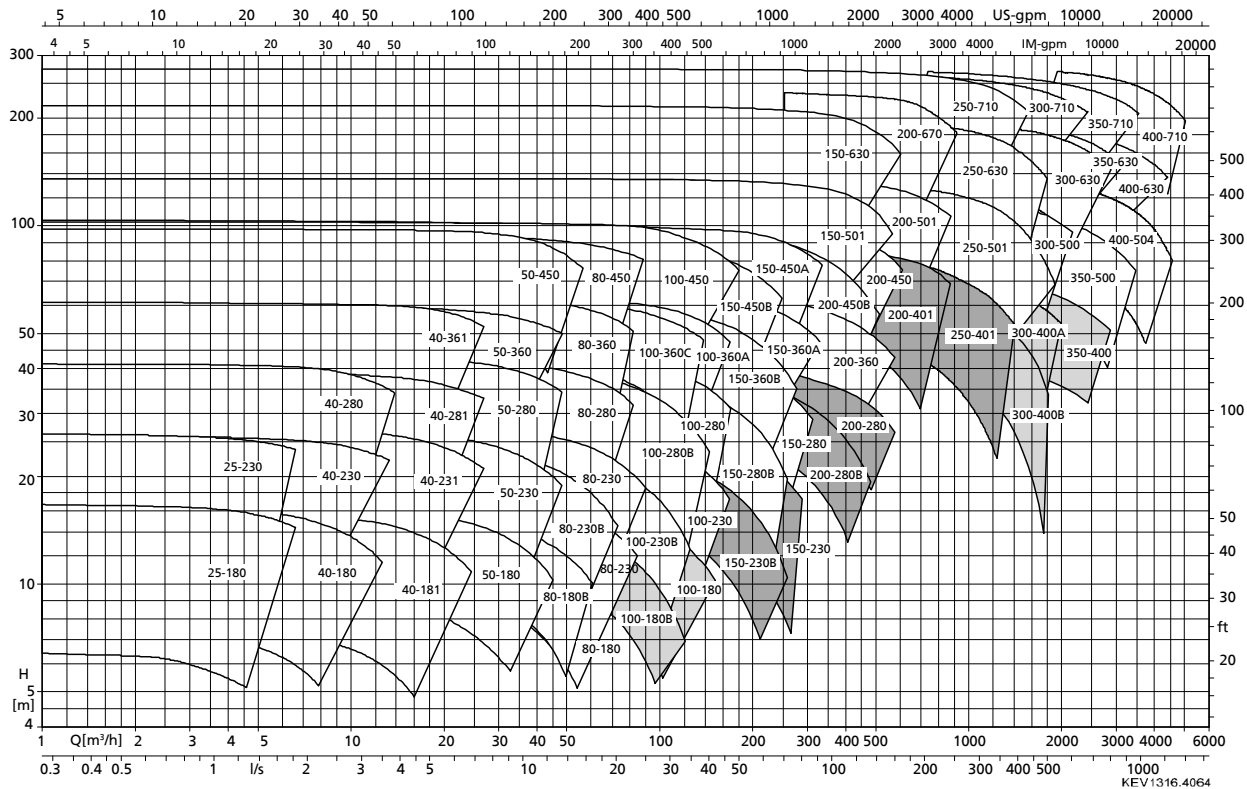
RPH-RO, n = 1450 rpm



RPH-RO, n = 3500 rpm

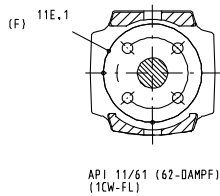


RPH-RO, n = 1750 rpm



Size available Size on request (other sizes not available)

Dimensions and connections



Connections of single KSB mechanical seal

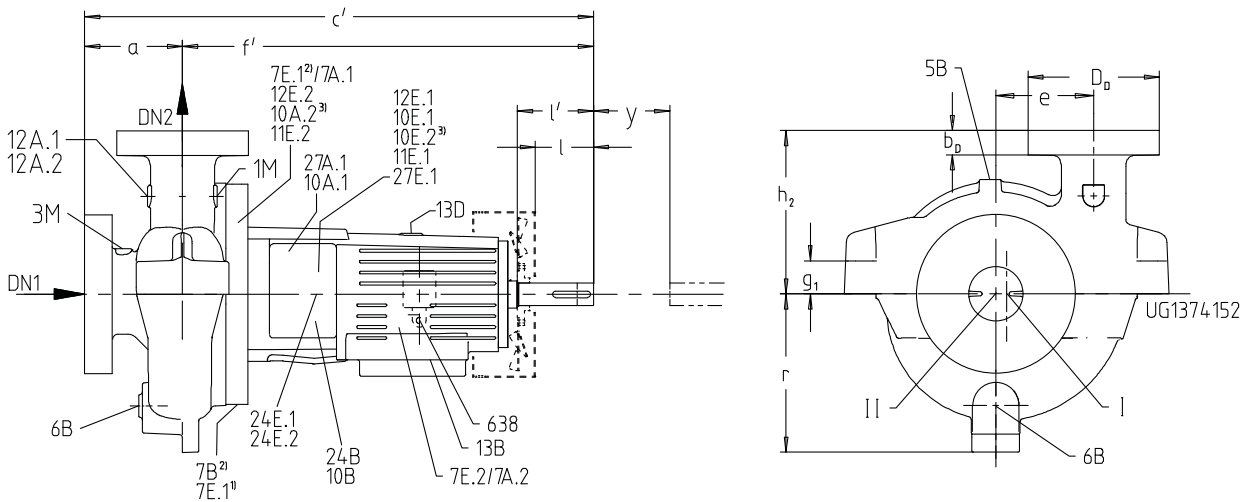
Connection types

Connection	≤ DN 50	≥ DN 80	Description
1M	NPT 1/2-14	NPT 1/2-14	Pressure gauge
3M	NPT 1/2-14	NPT 1/2-14	Pressure gauge
5B	NPT 1/2-14	NPT 1/2-14	Vent
6B	DN15 ASME B16.5		Fluid drain
7B	NPT 1/2-14	NPT 1/2-14	Cooling liquid drain
7E.1/A.1	NPT 1/2-14	NPT 1/2-14	Cooling liquid IN/OUT
7E.2/A.2	NPT 1/2-14	NPT 1/2-14	Cooling liquid IN/OUT
10B	NPT 1/2-14	NPT 1/2-14	Barrier fluid drain
10E.1/A.1	NPT 1/2-14	NPT 1/2-14 ⁵⁾	Barrier fluid IN/OUT

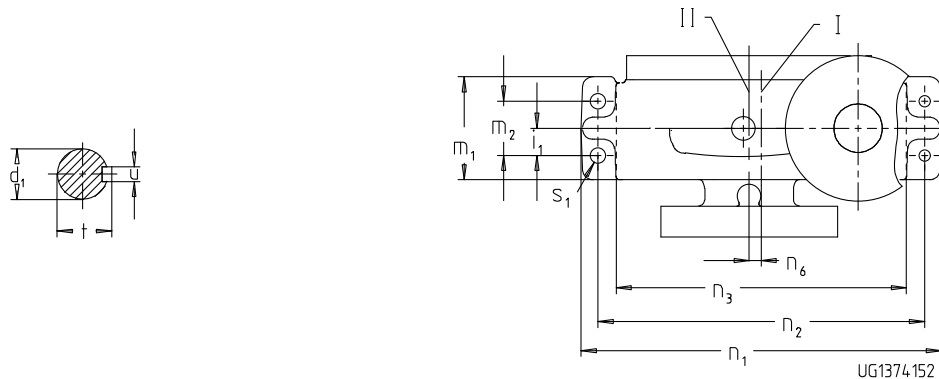
5) NPT3/4-14 on bearing brackets B05 and B06

Connection	≤ DN 50	≥ DN 80	Description
10E.2/A.2	NPT 1/2-14	NPT 1/2-14 ⁵⁾	Barrier fluid IN/OUT
11E.1	NPT 1/2-14	NPT 1/2-14	Flushing liquid IN/OUT
11E.2	NPT 1/2-14	NPT 1/2-14	Flushing liquid IN
12E.1/A.1	NPT 1/2-14	NPT 1/2-14	Circulation liquid IN/OUT
12E.2/A.2	NPT 1/2-14	NPT 1/2-14	Circulation liquid IN/OUT
13B	NPT 1/2-14	NPT 1/2-14	Oil drain
13D	NPT 1/2-14	NPT 1/2-14	Vent plug
24B	NPT 3/8-18	NPT 3/8-18	Quench liquid drain
24 E.1/A.1	NPT 3/8-18	NPT 3/8-18	Quench liquid IN/OUT
24 E.2/A.2	NPT 3/8-18	NPT 3/8-18	Quench liquid IN/OUT
27B	NPT 1/2-14	NPT 1/2-14	Buffer liquid drain
27 E.1/A.1	NPT 1/2-14	NPT 1/2-14 ⁵⁾	Buffer liquid inlet/outlet
638	NPT 3/8-18	NPT 3/8-18	Constant level oiler

Standard sizes



Dimensions of standard pump sizes



Shaft end and foot bolt dimensions of standard pump sizes

1)	Not for material variant S and bearing bracket B06
2)	For pressurised tandem seals
3)	For "back-to-back" seals
I	Middle of pump foot
II	Middle of DN ₁ shaft

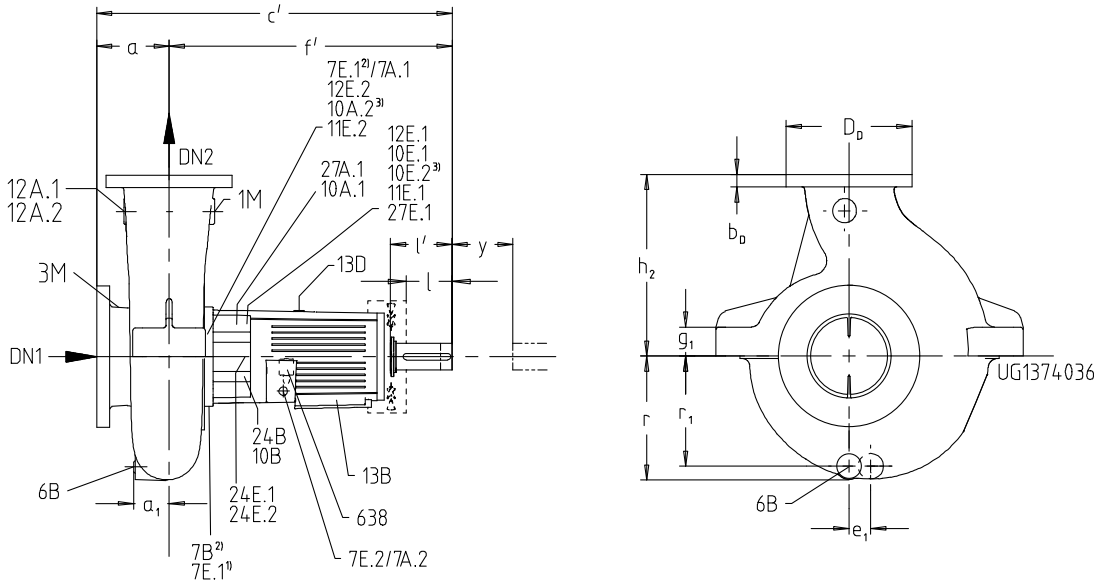
Dimensions of standard pump sizes

Size	Bearing bracket	Weight [kg]	Pump dimensions												
			DN ₁	DN ₂	a	c'	e	f'	g ₁	h ₂	m ₁	n ₁	n ₃	n ₆	r
100-180	B03	289	150	100	185	955	170	770	70	325	190	590	480	25	275
150-230	B03	369	200	150	200	955	210	755	80	335	200	730	590	45	330
200-280	B05S	575	250	200	230	1110	260	880	90	395	230	870	720	50	400

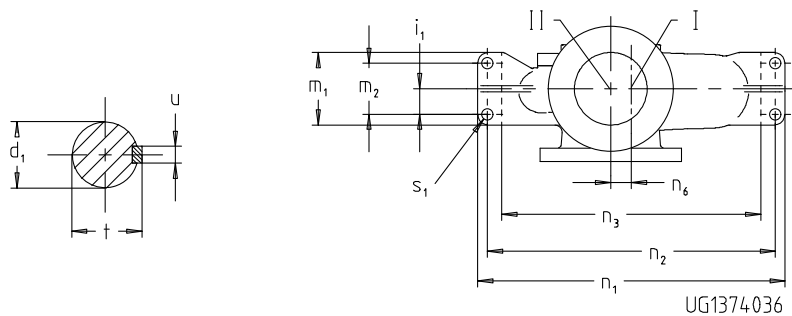
Shaft end and pump feet dimensions of standard pump sizes

Size	Bearing bracket	Shaft end					Pump feet			
		d1 ⁶⁾	l'	t	u	y	i ₁	m ₂	n ₂	s ₁
100-180	B03	42	140	45	12	140	50	100	540	26
150-230	B03	42	140	45	12	140	50	100	670	33
200-280	B05S	60	182	64	18	180	55	110	800	36

Complementary sizes



Dimensions of complementary pump sizes



Foot bolt and shaft end dimensions of complementary pump sizes

1)	Not for material variant S and bearing bracket B06
2)	For pressurised tandem seals
3)	For "back-to-back" seals
I	Middle of pump foot
II	Middle of DN ₁ , shaft

Dimensions of complementary pump sizes

Size	Bearing bracket	Weight [kg]	Pump dimensions											
			DN ₁	DN ₂	a	c'	f'	g ₁	h ₂	m ₁	n ₁	n ₃	n ₆	r
200-401	B05L	528	250	200	215	1120	905	90	530	180	960	820	0	390
250-401	B05L	734	300	250	261	1161	900	90	620	210	1160	1000	0	425
300-400	B05L	1135	350	300	310	1197	887	90	640	310	1200	1020	0	455
350-400	B07	1690	350	350	350	1509	1159	120	750	310	1370	1180	80	558

⁶⁾ d1 Ø k6 for bearing brackets B02 and B03; d1 Ø n6 for bearing bracket B05

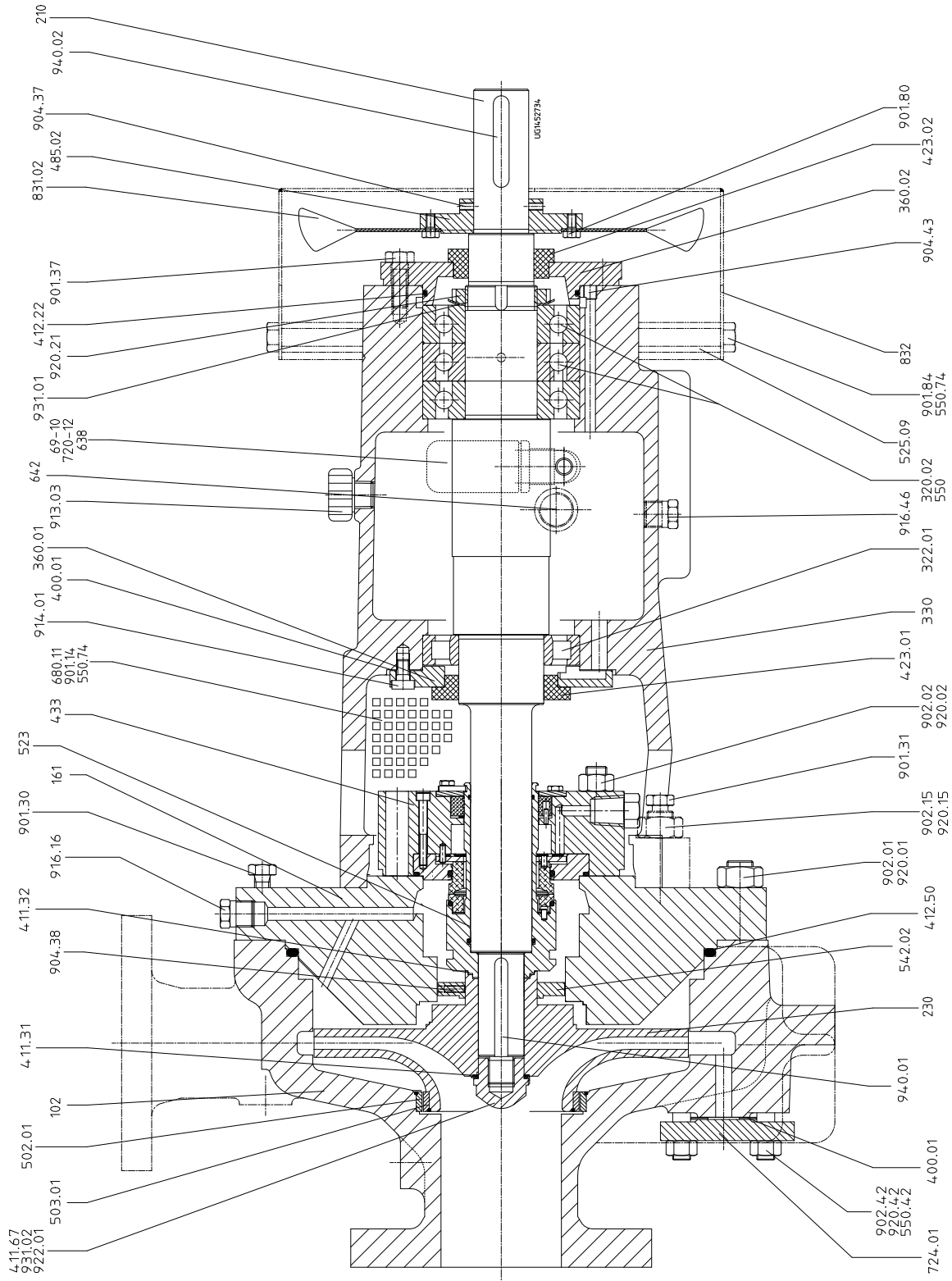
Shaft end and pump feet dimensions of complementary pump sizes

Size	Bearing bracket	Shaft end					Pump feet			
		d ₁ ⁷⁾	l'	t	u	y	i ₁	m ₂	n ₂	s ₁
200-401	B05L	60	182	64	18	180	60	120	900	33
250-401	B05L	60	182	64	18	180	75	150	1080	33
300-400	B05L	60	182	64	18	250	130	210	1120	33
350-400	B07	95	215	100	25	350	105	210	1280	33

⁷⁾ d1 Ø n6

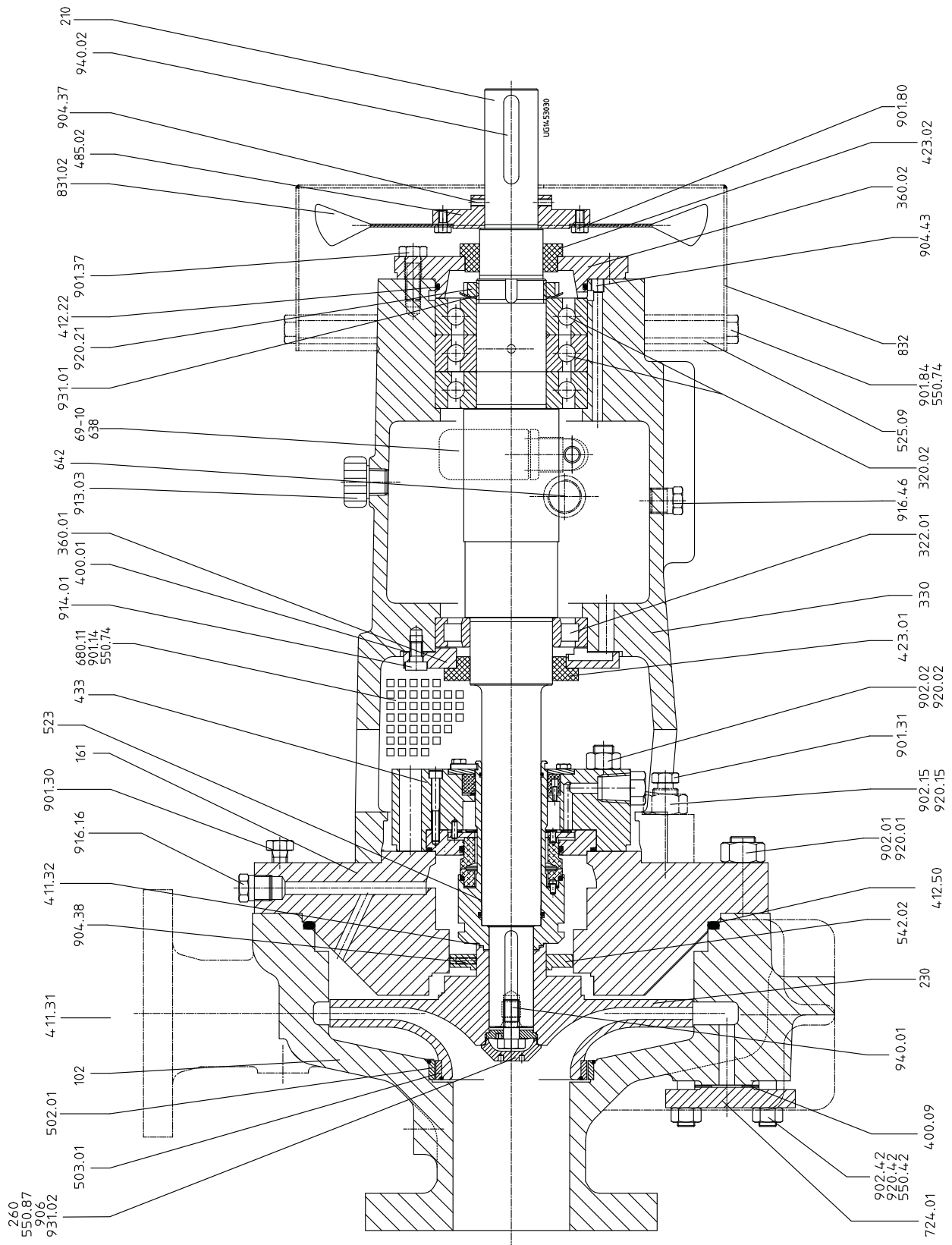
General assembly drawings with list of components

Bearing brackets B03 to B05



Bearing brackets B03 to B05

Bearing brackets B06 and B07



Bearing brackets B06 and B07

List of components

Part No.	Comprising	Description
102	102	Volute casing
	412.50	O-ring
	502.01	Casing wear ring
	902.01	Stud
	916.01	Plug
	920.01	Hexagon nut
161	161	Casing cover
	412.50	O-ring
	901.30	Hexagon head bolt
	902.15	Stud
	916.16	Plug
	920.15	Hexagon nut
210	210	Shaft
	920.21	Slotted round nut
	931.01	Lock washer
	940.01/.02	Key
230	230	Impeller
	411.31/.32/.67	Joint ring
	503.01	Impeller wear ring
	931.02	Lock washer
260 ⁸⁾	260	Impeller hub cap
	550.87	Disc
	906	Impeller screw
320.02	320.02	Angular contact ball bearing
	550	Adjusting washer
322.01	322.01 ⁹⁾	Cylindrical roller bearing
330	330	Bearing bracket
	69.10	Protective cage
	360.01/.02	Bearing cover
	400.01	Gasket
	412.22	O-ring
	638	Constant level oiler
	642	Oil level sight glass
	710.21	Pipe
	901.31/.37	Hexagon head bolt
	913.03	Vent plug
	916.46	Plug
	914.01	Hexagon socket head cap screw
360.01/.02	360.01/.02	Bearing cover
	400.01	Gasket
	412.22	O-ring
	914.01	Hexagon socket head cap screw
400.09	400.09	Gasket
423.01/.02 ¹⁰⁾	423.01/.02	Labyrinth ring
433	433	Mechanical seal
	523	Shaft sleeve
502.01	502.01	Casing wear ring
503.01	503.01	Impeller wear ring
507.01/.02 ¹¹⁾	507.01/.02 ¹¹⁾	Thrower
	904.41/.42 ¹¹⁾	Grub screw
542.02	542.02	Throttling bush
	904.38	Grub screw
550.42	550.42	Disc
638	638	Constant level oiler
680.11	680.11	Guard
	901.14	Hexagon head bolt
	550.74	Disc

8) For bearing brackets B06 and B07 only

9) For bearing brackets B03 to B05 only

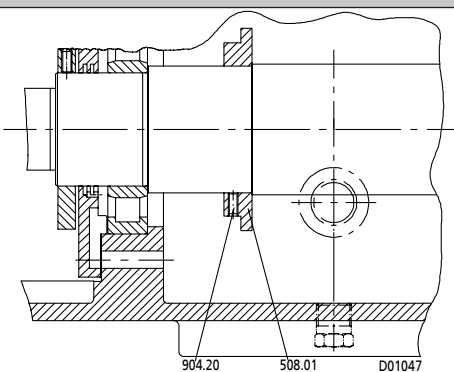
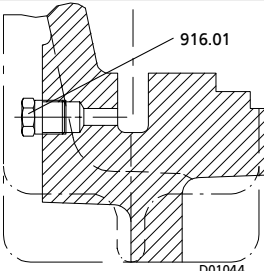
10) On pumps with fan only

11) On pumps without fan only

Part No.	Comprising	Description
724.01	724.01	Blind flange
831.02 ¹²⁾	831.02	Fan impeller
	832	Fan hood
	485.02	Fan hub
	904.37	Grub screw
902.42	902.42	Stud
920.42	920.42	Hexagon nut
922.01 ⁹⁾	922.01	Impeller nut
	931.02	Lock washer
99-9	99-9	Set of sealing elements, complete

Design variants

Design variants

Design	Detailed view
Design with thrower	
Design with plug	

¹²⁾ Optional



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