

Process Pump

RPH-V

Type Series Booklet



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Type Series Booklet RPH-V

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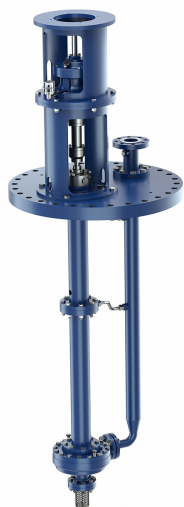
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Centrifugal Pumps with Shaft Seal

Process Pumps

RPH-V



Main applications

Pump for handling the large variety of petroleum products in refineries as well as in the chemical and petrochemical industry.

- Refinery
- Chemical industry
- Petrochemical industry
- Onshore processes and offshore processes

Operating data

Operating properties

Characteristic		Value	
		50 Hz	60 Hz
Sizes	DN	40 to 150	40 to 150
Flow rate	Q [m³/h]	≤ 150	≤ 180
Head	H [m]	≤ 240	≤ 240
Fluid temperature	T [°C]	-30 to +274	-30 to +274
Operating pressure	p [bar]	≤ 35 ¹⁾	≤ 35 ¹⁾
Installation depths ²⁾	ET [mm]	590 to 5000	590 to 5000

Other operating data on request.

Designation

Example: RPH-V 50-180

Designation key

Code	Description
RPH	Type series
V	Vertical installation
50	Nominal discharge nozzle diameter [mm] of volute casing
180	Nominal impeller diameter [mm]

Design details

Design

- Volute casing pump
- Vertical installation
- Single-stage
- Meets the technical requirements to API 610, 11th edition / ISO 13709
- Shaft deflection to API 610, 11th edition
- Pump shaft, intermediate shaft and top shaft are connected by a conical coupling.

Direction of rotation

- Clockwise, viewed from the drive end.

Drive

- Electric motor
- Internal combustion engine
- Turbine

Shaft seal

Standard design:

- Mechanical seal
- Mechanical seal chamber to API 610, 11th edition
- KSB cartridge seal

Pump casing

- Single volute
- Radially split volute casing
- Volute casing with casing wear ring
- Casing cover

Impeller type

- Closed radial impeller
- Impeller with impeller wear ring on the suction side only for hydraulically balanced impellers

Balancing device

- Sealing clearance and balancing holes balance axial thrust (if required).

¹ For piping in material ASTM A 106

² Standard; larger installation depths on request

Soleplate seal

- Discharge line sealed at the soleplate with O-rings

Bearings

- Uncooled
- Oil-lubricated radial ball bearing
- Sealing with labyrinth ring

Optional:

- Grease-packed radial ball bearing

Shaft guide bearings:

- Radial plain bearings made of GTC-AR-HT (or 3P/Xytrex 451)
- With shaft protecting sleeve
- Product-lubricated³⁾

Optional:

- Lubricated with water from an external source⁴⁾


Coating and preservation


Type A1 - Standard coating for material variants S-5 and S-6 up to 90 °C (standard design)

- Preparatory treatment:
 - Grease-free
 - Steel shot blasting to ISO 8501-1 SA 2 1/2
- Primer:
 - Zinc phosphate epoxy resin, 1 × 100 µm (dry)
- Top coat:
 - Internal surfaces: none
 - External surfaces: aliphatic acrylic polyurethane, RAL 5002 blue, 1 × 70 µm (dry)

Type A2 – standard coating for material variants S-5 and S-6 from 90 °C to 230 °C (standard design)

- Preparatory treatment:
 - Grease-free
 - Steel shot blasting to ISO 8501-1 SA 2 1/2
- Primer:
 - Inorganic zinc silicate, 1 × 50 µm (dry)
- Top coat:
 - Internal surfaces: none
 - External surfaces: modified single-component silicate, aluminium 800, 1 × 35 µm (dry)

 No coating is applied to material variants A8, C6 and D1.

 Special coatings or special surface treatments on request.

Product benefits

- Dimensioned for longer service life than specified by API 610, to reduce maintenance.
- Rigid spacer-type coupling for ease of mechanical seal maintenance
- Seal chamber to API 610 accommodates all mechanical seals to API 682.

Selection information

Pumps of the RPH-V type series have the same documented characteristic curves as the horizontally installed model of the RPH type series; however, the following requirements must be met.

Flow rate

Unless specified otherwise in the individual characteristic curves, the following applies:

Short-time operation:

- $Q_{min} = 0.1 \times Q_{BEP}$

Continuous operation:

- $Q_{min} = 0.3 \times Q_{BEP}$

Head

The reference datum for defining the head and the flow rate is the pump discharge nozzle DN2. The characteristic curve does not take into account pressure losses caused by the suction strainer, riser elbow, shaft guide bearings, riser and internal circulation for bearing lubrication.

The total pump head is composed as follows:

- Installation head
- Losses in the straight vertical riser section
- Losses in the riser elbow
- Losses in the suction strainer

Pressure losses

Piping losses: head losses in straight pipes per 100 m of pipe [m]

Nominal flow rate [m³/h]	DN				
	40	50	60	100	150
1	0,22	0,08	-	-	-
1,5	0,50	0,17	-	-	-
2	0,80	0,28	-	-	-
3	1,80	0,60	0,05	-	-
4	3,00	1,05	0,10	-	-
5	4,70	1,60	0,15	0,05	-
6	6,60	2,20	0,20	0,07	-
8	11,50	3,90	0,35	0,13	-
10	17,00	5,70	0,50	0,20	-
12,5	26,00	8,50	0,80	0,28	-
15	37,00	12,50	1,10	0,40	0,05
17,5	47,00	16,00	1,40	0,50	0,06
20	63,00	21,50	2,00	0,70	0,09
25	95,00	33,00	3,00	1,10	0,13
30	-	45,00	4,20	1,50	0,20
35	-	61,00	5,70	2,00	0,24
40	-	78,00	7,00	2,50	0,30
45	-	100,00	9,00	3,10	0,40
50	-	-	11,00	3,80	0,50
60	-	-	16,00	5,50	0,70
70	-	-	21,00	7,20	0,90
80	-	-	26,50	9,20	1,20
90	-	-	34,00	12,00	1,40

³ If pumping fluids with lubricating properties, a maximum contamination of 20 ppm and a maximum particle size of 10 µm; the lubricant is supplied through pipes fitted between each shaft guide bearing and the riser.

⁴ Water is supplied to all shaft guide bearings through an external connection located above the soleplate.

Nominal flow rate [m³/h]	DN				
	40	50	60	100	150
100	-	-	40,00	14,00	1,80
120	-	-	58,00	20,00	2,50
140	-	-	80,00	27,00	3,30
160	-	-	-	35,00	4,25
180	-	-	-	43,00	5,30
200	-	-	-	50,00	6,50

Piping losses: head losses in 90° elbow [m]

Nominal flow rate [m³/h]	Discharge nozzle DN			
	25	40	50	80
3	0,02	-	-	-
4	0,04	-	-	-
5	0,07	0,01	-	-
6	0,10	0,02	-	-
8	0,18	0,03	0,01	-
10	0,28	0,04	0,02	-
12,5	0,43	0,07	0,03	-
15	0,62	0,10	0,04	-
17,5	0,85	0,13	0,05	-
20	1,11	0,17	0,07	0,01
25	1,73	0,26	0,11	0,02
30	2,50	0,38	0,16	0,02
35	-	0,52	0,21	0,03
40	-	0,68	0,28	0,04
45	-	0,86	0,35	0,05
50	-	1,06	0,43	0,07
60	-	1,52	0,62	0,10
70	-	2,08	0,85	0,13
80	-	-	1,11	0,17
90	-	-	1,41	0,21
100	-	-	1,73	0,26
120	-	-	2,50	0,38
140	-	-	-	0,52
160	-	-	-	0,68
180	-	-	-	0,86
200	-	-	-	1,06
250	-	-	-	1,65
300	-	-	-	2,38

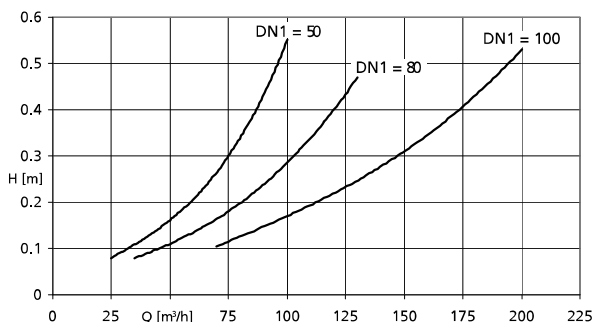


Fig. 1: Suction strainer losses [m], characteristic curves based on nominal suction nozzle diameter DN1

NPSH

The NPSH data indicated in the individual characteristic curves were measured on impellers without hydraulic balancing. They correspond to a head drop of 3 %.

In principle, the following rule applies:

$$\text{NPSH}_{\text{available}} - \text{NPSH}_{\text{required}} \geq 0.5 \text{ m}$$

Contact KSB for hot water applications.

Efficiency

The efficiencies specified in the characteristic curves refer only to the hydraulic pump efficiency without losses. Axial thrust balancing of the impeller, fluid viscosity, larger impeller clearance gaps, shaft seal type, top shaft and thrust bearing losses reduce a pump's overall efficiency. Efficiency was measured using a clearance gap to AN 1501, Group 2, and an inlet pressure of 2 to 3 bar. The efficiency is stated in the individual characteristic curves of the horizontally installed RPH model.

Power consumption per shaft guide bearing

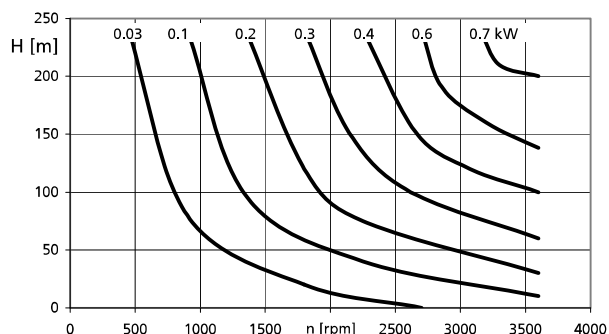


Fig. 2: Power consumption per shaft guide bearing

The power consumption of the mechanical seal must also be considered.

Drive

Direct or indirect by electric motor, internal combustion engine or turbine; if an internal combustion engine has been specified, special care must be taken in selecting the coupling.

Motor selection

When determining the motor size required, consideration shall be given to the efficiency determined and the power reserves as per API 610.

Motor rating and power reserve

Motor rating [kW]	Power reserve [%]
< 22	25
22 to 55	15
> 55	10

Materials

Material variants

Part No.	Description	Material variant				
		S-5	S-6	C-6	A-8	D1
102	Volute casing	A216 Gr. WCB		A743 Gr. CA6NM	A351 Gr. CF8M	A995 Gr 1B
161	Casing cover	A216 Gr. WCB		A743 Gr. CA6NM	A351 Gr. CF8M	A995 Gr 1B
210	Shaft	A276 Type 420			A276 Type 316	1.4462
230	Impeller	A216 Gr. WCB	A743 Gr. CA6NM		A743 Gr. CF8M	A890 Gr 1B
341	Drive lantern	A36				
344	Bearing bracket lantern	A36				
350	Bearing housing	A216 Gr. WCB				
411.10	Joint ring	SS316 / graphite				1.4462 / graphite
502	Casing wear ring	AISI 420, hardened			AISI 316, hard-faced	1.4462
503	Impeller wear ring	AISI 420, hardened			AISI 316, hard-faced	1.4462
711	Riser	A106 Grade B			AISI 316	1.4462
713	Suspension pipe	A106 Grade B			AISI 316	1.4462
893	Soleplate	A516 Grade 65/70			AISI 316	1.4462

Technical data

Technical data

Size	Impeller				Seal chamber size ⁵⁾	Bearings	Shaft diameter				Pressure limits		Flanges	Drive: max. P/n values ⁶⁾
	Impeller outlet width	Impeller inlet diameter	Max. diameter	Min. diameter			in the seal chamber (D)	in the bearing	in the coupling	in the impeller	Maximum operating pressure ⁷⁾	Max. test pressure ⁸⁾		
25-180	6	48	179	120	4	6313C3	50	35	32	24	35	1.5 × operating pressure	ASME B16.5 Class 300# RF	0,019
25-230	6	48	224	180	4	6313C3	50	35	32	24	35	1.5 × operating pressure	ASME B16.5 Class 300# RF	0,019
40-180	6	58	180	130	4	6313C3	50	35	32	24	35	1.5 × operating pressure	ASME B16.5 Class 300# RF	0,019
40-230	6,2	57	224	180	4	6313C3	50	35	32	24	35	1.5 × operating pressure	ASME B16.5 Class 300# RF	0,019
40-181	7,8	75	180	130	4	6313C3	50	35	32	27	35	1.5 × operating pressure	ASME B16.5 Class 300# RF	0,032
40-231	7,7	75	230	180	4	6313C3	50	35	32	27	35	1.5 × operating pressure	ASME B16.5 Class 300# RF	0,032
40-280	7,5	61	278	220	4	6313C3	50	35	32	27	35	1.5 × operating pressure	ASME B16.5 Class 300# RF	0,032
40-281	7,7	71	278	230	4	6313C3	50	35	32	27	35	1.5 × operating pressure	ASME B16.5 Class 300# RF	0,032
40-361	7,9	69	343	280	4	6313C3	50	35	32	27	35	1.5 × operating pressure	ASME B16.5 Class 300# RF	0,032
50-180	10,9	88	180	140	4	6313C3	50	35	32	27	35	1.5 × operating pressure	ASME B16.5 Class 300# RF	0,032
50-230	10	95	230	180	4	6313C3	50	35	32	35	35	1.5 × operating pressure	ASME B16.5 Class 300# RF	0,032
50-280	9,6	93	286	230	4	6313C3	50	35	32	35	35	1.5 × operating pressure	ASME B16.5 Class 300# RF	0,032
80-180	17	110	190	110	4	6313C3	50	35	32	35	35	1.5 × operating pressure	ASME B16.5 Class 300# RF	0,032
80-230	14	113	235	190	4	6313C3	50	35	32	35	35	1.5 × operating pressure	ASME B16.5 Class 300# RF	0,032
80-280	12,5	110	286	230	4	6313C3	50	35	32	35	35	1.5 × operating pressure	ASME B16.5 Class 300# RF	0,032

⁵ To API 610, 11th edition, Table 7

⁶ The max. P/n values refer to shafts made of A276 Type 420 and impellers made of A216WCB at < 100 °C

⁷ The pressure limits refer to piping made of A106.

⁸ As indicated, or as specified in API 610, 11th edition

Permissible forces and moments at the discharge nozzle

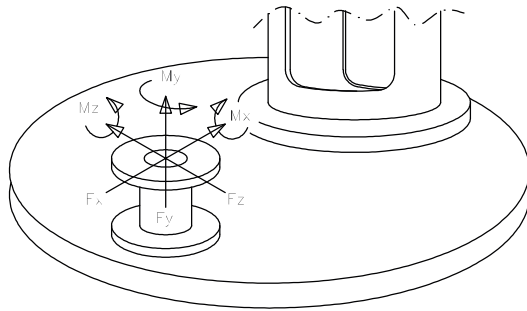


Fig. 3: Forces and moments at the discharge nozzle

Forces and moments at the discharge nozzle⁹⁾

Size	Forces				Moments			
	F _x	F _y	F _z	F _{res}	M _x	M _y	M _z	M _{res}
	[N]				[Nm]			
25-180	710	580	890	1280	460	230	350	620
25-230	710	580	890	1280	460	230	350	620
40-180	1070	890	1330	1930	950	470	720	1280
40-181	1070	890	1330	1930	950	470	720	1280
40-230	1070	890	1330	1930	950	470	720	1280
40-231	1070	890	1330	1930	950	470	720	1280
40-280	1070	890	1330	1930	950	470	720	1280
40-281	1070	890	1330	1930	950	470	720	1280
40-361	1070	890	1330	1930	950	470	720	1280
50-180	1070	890	1330	1930	950	470	720	1280
50-230	1070	890	1330	1930	950	470	720	1280
50-280	1070	890	1330	1930	950	470	720	1280
80-180	2490	2050	3110	4480	2300	1180	1760	3130
80-230	2490	2050	3110	4480	2300	1180	1760	3130
80-280	2490	2050	3110	4480	2300	1180	1760	3130

Weight

Speed 2900 rpm and 3500 rpm

Estimated weight [kg] for pump set without drive

Length of suspension pipe	Size															
	25-180	25-230	40-180	40-230	40-181B	40-181	40-231	40-280	40-281	40-361	50-180	50-230(B)	50-280	80-180(B)	80-230(B)	80-280(B)
400	508	534	520	550	528	526	550	604	588	690	556	545	594	684	687	784
500	512	539	525	555	533	531	555	609	593	695	562	550	599	691	694	791
600	515	541	528	558	537	535	558	612	596	699	565	553	603	696	698	796
700	519	545	533	563	542	540	563	617	601	704	570	559	608	703	705	803
800	524	550	538	568	547	545	568	622	607	709	575	564	613	709	712	810
900	526	552	541	571	550	548	571	625	610	712	578	567	616	714	717	815
1.000	531	557	547	576	555	553	577	630	615	717	583	572	621	721	724	821
1.100	535	561	552	581	560	558	582	636	620	722	588	577	626	728	731	828
1.200	553	579	571	601	579	577	601	655	639	741	607	596	645	749	751	849
1.300	558	584	576	606	584	582	606	660	644	746	613	601	651	755	758	856
1.400	560	586	579	609	588	586	609	663	647	750	616	605	654	760	763	861
1.500	565	591	584	614	593	591	614	668	652	755	621	610	659	767	770	867
1.600	569	595	589	619	598	596	619	673	658	760	626	615	664	774	777	874
1.700	571	597	592	622	601	599	622	676	661	763	629	618	667	779	781	879
1.800	576	602	598	627	606	604	628	681	666	768	634	623	672	786	788	886
1.900	579	605	602	631	610	608	632	686	670	772	638	627	676	791	794	892
2.000	583	609	606	636	614	612	636	690	674	776	642	631	680	797	800	898
2.100	587	613	611	641	619	617	641	695	679	781	648	636	686	804	807	904
2.200	594	620	619	649	628	626	649	703	687	790	656	645	694	814	817	914
2.300	610	636	635	665	644	642	665	719	704	806	672	661	710	832	834	932
2.400	612	638	638	668	647	645	668	722	707	809	675	664	713	837	839	937
2.500	617	643	643	673	652	650	673	727	712	814	680	669	718	843	846	944
2.600	621	647	649	678	657	655	679	732	717	819	685	674	723	850	853	951
2.700	624	650	653	682	661	659	683	737	721	823	689	678	727	856	859	956
2.800	628	654	657	687	665	663	687	741	725	827	694	682	731	862	865	962
2.900	631	657	661	691	670	667	691	745	729	831	698	686	736	868	870	968
3.000	635	661	665	695	674	672	695	749	733	836	702	691	740	873	876	974
3.100	640	666	671	701	680	678	701	755	740	842	708	697	746	881	884	982

⁹⁾ Specific values for a riser made of carbon steel

Length of suspension pipe	Size															
	25-180	25-230	40-180	40-230	40-181B	40-181	40-231	40-280	40-281	40-361	50-180	50-230(B)	50-280	80-180(B)	80-230(B)	80-280(B)
3.200	642	668	674	704	683	681	704	758	743	845	711	700	749	886	889	986
3.300	647	673	680	709	688	686	709	763	748	850	716	705	754	893	896	993
3.400	661	687	695	724	703	701	725	779	763	865	731	720	769	910	912	1.010
3.500	669	695	703	732	711	709	733	787	771	873	739	728	777	920	922	1.020
3.600	673	699	708	738	716	714	738	792	776	878	745	733	782	926	929	1.027
3.700	677	704	713	743	722	719	743	797	781	883	750	738	788	933	936	1.034
3.800	681	707	717	747	726	724	747	801	785	888	754	743	792	939	942	1.039
3.900	684	710	721	751	730	728	751	805	790	892	758	747	796	945	948	1.045
4.000	688	714	725	755	734	732	755	809	794	896	762	751	800	951	953	1.051
4.100	691	717	730	759	738	736	760	813	798	900	766	755	804	957	959	1.057
4.200	696	723	736	765	744	742	766	820	804	906	772	761	810	964	967	1.065
4.300	699	725	739	769	747	745	769	823	807	909	775	764	813	969	972	1.070
4.400	703	729	744	774	752	750	774	828	812	914	781	769	818	976	979	1.076
4.500	718	744	759	789	768	766	789	843	827	930	796	784	834	993	995	1.093
4.600	723	749	765	795	774	772	795	849	833	936	802	791	840	1.001	1.003	1.101
4.700	734	761	777	807	786	784	807	861	846	948	814	803	852	1.014	1.017	1.115
4.800	739	765	782	812	791	789	812	866	851	953	819	808	857	1.021	1.024	1.122
4.900	742	768	787	816	795	793	817	870	855	957	823	812	861	1.027	1.030	1.127
5.000	747	773	792	821	800	798	822	876	860	962	828	817	866	1.034	1.037	1.134

Speed 1450 rpm and 1750 rpm

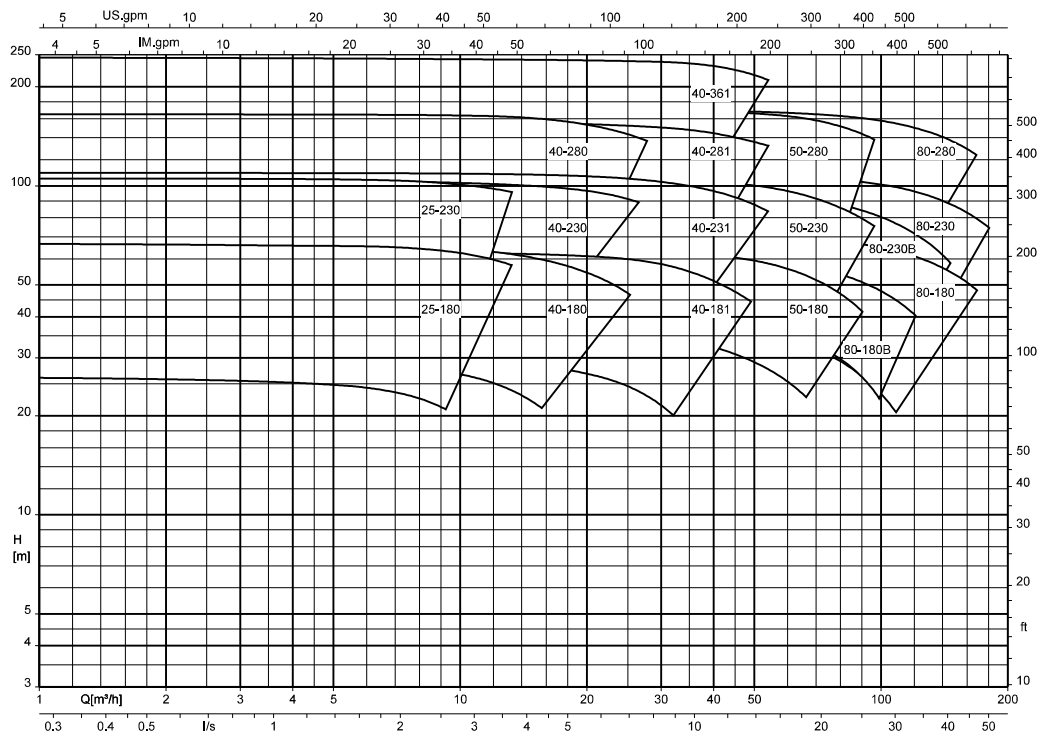
Estimated weight [kg] for pump set without drive

Length of suspension pipe	Size															
	25-180	25-230	40-180	40-230	40-181B	40-181	40-231	40-280	40-281	40-361	50-180	50-230(B)	50-280	80-180(B)	80-230(B)	80-280(B)
400	508	534	520	550	528	526	550	604	588	690	556	545	594	684	687	784
500	512	539	525	555	533	531	555	609	593	695	562	550	599	691	694	791
600	515	541	528	558	537	535	558	612	596	699	565	553	603	696	698	796
700	519	545	533	563	542	540	563	617	601	704	570	559	608	703	705	803
800	524	550	538	568	547	545	568	622	607	709	575	564	613	709	712	810
900	526	552	541	571	550	548	571	625	610	712	578	567	616	714	717	815
1.000	531	557	547	576	555	553	577	630	615	717	583	572	621	721	724	821
1.100	535	561	552	581	560	558	582	636	620	722	588	577	626	728	731	828
1.200	537	563	555	585	563	561	585	639	623	725	591	580	629	733	735	833
1.300	542	568	560	590	568	566	590	644	628	730	597	585	635	739	742	840
1.400	544	570	563	593	572	570	593	647	631	734	600	589	638	744	747	845
1.500	549	575	568	598	577	575	598	652	636	739	605	594	643	751	754	851
1.600	552	578	572	602	581	579	602	656	641	743	609	598	647	757	760	857
1.700	571	597	592	622	601	599	622	676	661	763	629	618	667	779	781	879
1.800	576	602	598	627	606	604	628	681	666	768	634	623	672	786	788	886
1.900	579	605	602	631	610	608	632	686	670	772	638	627	676	791	794	892
2.000	583	609	606	636	614	612	636	690	674	776	642	631	680	797	800	898
2.100	587	613	611	641	619	617	641	695	679	781	648	636	686	804	807	904
2.200	579	605	604	634	613	611	634	688	672	775	641	630	679	799	802	899
2.300	591	617	616	646	625	623	646	700	685	787	653	642	691	813	815	913
2.400	597	623	623	653	632	630	653	707	692	794	660	649	698	822	824	922
2.500	600	626	626	656	635	633	656	710	695	797	663	652	701	826	829	927
2.600	604	630	632	661	640	638	662	715	700	802	668	657	706	833	836	934
2.700	608	634	637	666	645	643	667	721	705	807	673	662	711	840	843	940
2.800	611	637	640	670	648	646	670	724	708	810	677	665	714	845	848	945
2.900	615	641	645	675	654	651	675	729	713	815	682	670	720	852	854	952
3.000	619	645	649	679	658	656	679	733	717	820	686	675	724	857	860	958
3.100	622	648	653	683	662	660	683	737	722	824	690	679	728	863	866	964
3.200	625	651	657	687	666	664	687	741	726	828	694	683	732	869	872	969

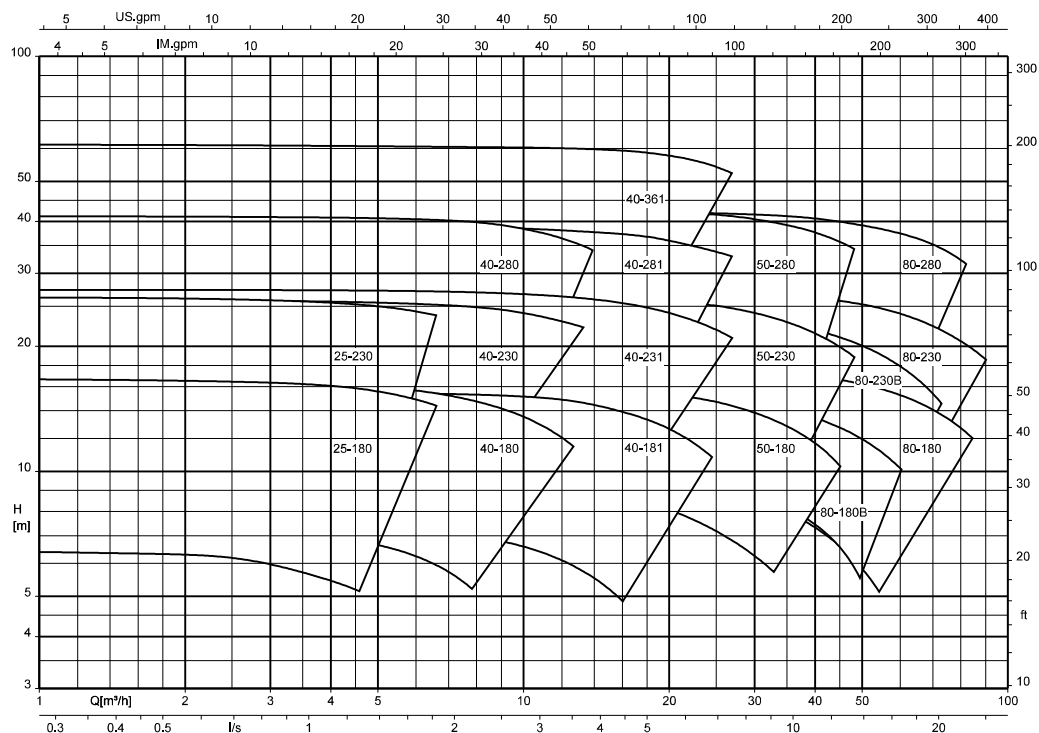
Length of suspension pipe	Size															
	25-180	25-230	40-180	40-230	40-181B	40-181	40-231	40-280	40-281	40-361	50-180	50-230(B)	50-280	80-180(B)	80-230(B)	80-280(B)
3.300	646	672	679	708	687	685	708	762	747	849	715	704	753	892	895	992
3.400	649	675	683	712	691	689	713	767	751	853	719	708	757	898	900	998
3.500	653	679	687	716	695	693	717	771	755	857	723	712	761	904	906	1.004
3.600	658	684	693	723	701	699	723	777	761	863	730	718	767	911	914	1.012
3.700	660	687	696	726	705	702	726	780	764	866	733	721	771	916	919	1.017
3.800	665	691	701	731	710	708	731	785	769	872	738	727	776	923	926	1.023
3.900	666	692	703	733	712	710	733	787	772	874	740	729	778	927	930	1.027
4.000	670	696	707	737	716	714	737	791	776	878	744	733	782	933	935	1.033
4.100	673	699	712	741	720	718	742	795	780	882	748	737	786	939	941	1.039
4.200	677	704	717	746	725	723	747	801	785	887	753	742	791	945	948	1.046
4.300	682	708	722	752	730	728	752	806	790	892	758	747	796	952	955	1.053
4.400	684	710	725	755	733	731	755	809	793	895	762	750	799	957	960	1.057
4.500	690	716	731	761	740	738	761	815	799	902	768	756	806	965	967	1.065
4.600	692	718	734	764	743	741	764	818	802	905	771	760	809	970	972	1.070
4.700	695	722	738	768	747	745	768	822	807	909	775	764	813	975	978	1.076
4.800	699	725	742	772	751	749	772	826	811	913	779	768	817	981	984	1.082
4.900	721	747	766	795	774	772	796	849	834	936	802	791	840	1.006	1.009	1.106
5.000	724	750	769	798	777	775	799	853	837	939	805	794	843	1.011	1.014	1.111

Selection charts

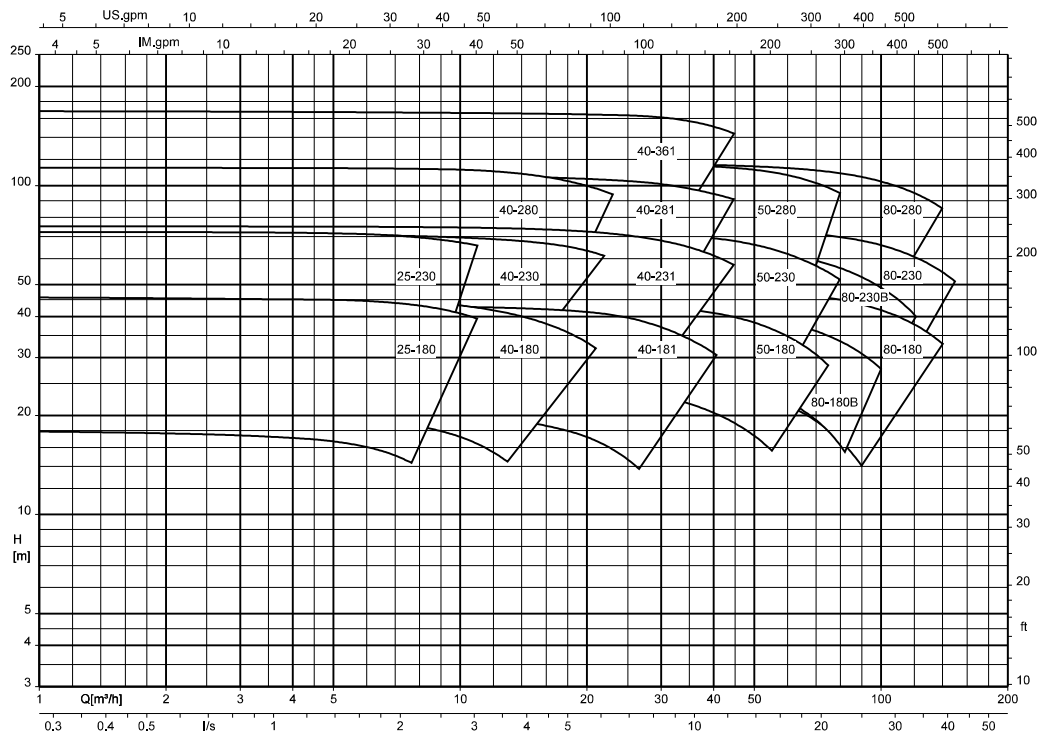
RPH-V, 60 Hz $n = 3500$ rpm



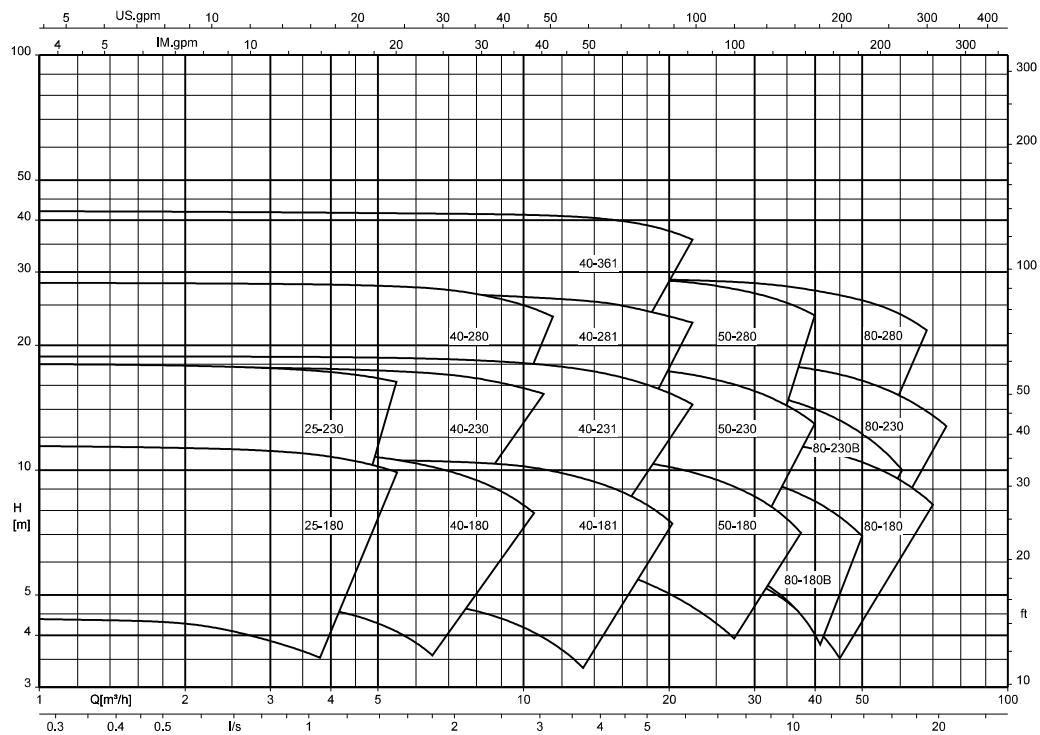
RPH-V, 60 Hz $n = 1750$ rpm



RPH-V, 50 Hz n = 2900 rpm

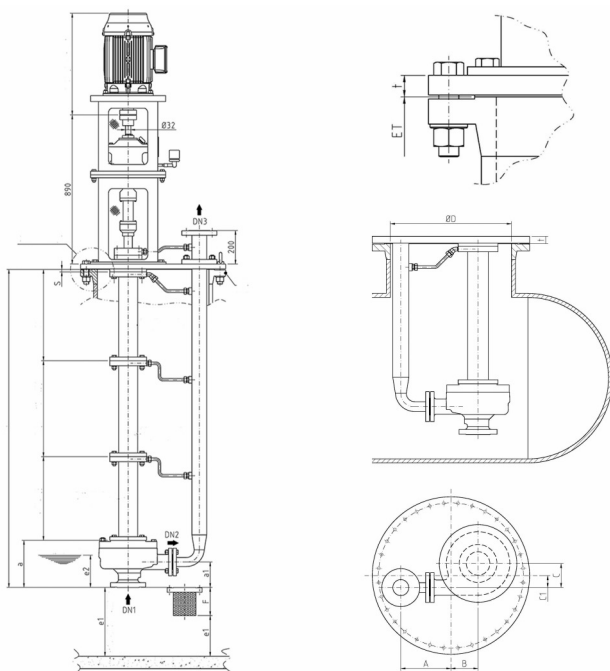


RPH-V, 50 Hz n = 1450 rpm



Dimensions

Design with circular soleplate



Detail "X"

Dimensions, circular soleplate

*	Without suction strainer
①	Upper suspension pipe
②	Middle suspension pipe
③	Lower suspension pipe

④	Fluid level
⑤	Motor length
⑥	Tank flange

Pump dimensions

Size	Nozzle			a	a1	e1 min.	e2 min.	F
	DN1	DN2	DN3	[mm]	[mm]	[mm]	[mm]	[mm]
25-180	40	25	40	232	120	65	240	140
25-230	40	25	40	232	120	65	240	140
40-180	50	40	80	240	130	80	260	160
40-181	50	40	80	242	130	80	260	160
40-230	50	40	80	240	130	80	260	160
40-231	50	40	80	237	140	80	280	160
40-280	50	40	80	237	140	80	280	160
40-281	50	40	80	237	140	80	280	160
40-361	50	40	80	246	150	80	300	160
50-180	80	50	80	248	150	100	300	160
50-230	80	50	80	251	155	100	300	160
50-280	80	50	80	266	167	100	300	160
80-180	100	80	150	287	175	125	370	200
80-230	100	80	150	267	170	125	370	200
80-280	100	80	150	276	180	125	370	200

Dimensions, circular soleplate

Size	Circular soleplate ¹⁰⁾						
	Nominal pipe diameter	A	B	D min. ¹¹⁾	t	C	C1
	["]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
25-180	24	186	105	584	48	105	65
25-230	24	211	105	584	48	125	85
40-180	24	217	105	584	48	105	65
40-181	24	217	105	584	48	110	70
40-230	24	189	105	584	48	166	126
40-231	24	207	105	584	48	135	95
40-280	28	252	110	685	48	160	100
40-281	28	252	110	685	48	160	100
40-361	30	257	100	736	51	195	140
50-180	24	221	105	584	48	120	80
50-230	26	232	110	635	45	140	60
50-280	28	251	110	685	48	160	110
80-180	30	211	160	736	51	140	85
80-230	30	201	140	736	51	160	110
80-280	32	221	153	787	55	180	120

¹⁰⁾ Dimensions to ASME B16.5 Class 150 RF for nominal pipe diameter 24"; to ASME B16.47, Class 150 RF, Series B for nominal pipe diameters 26", 28", 30" and 32". The materials (standard variant) are selected for a maximum operating pressure of 13.5 bar at 200 °C. Cast: A216 WCB (CS) and A351CF8M (SS); forged: A105 (CS) and A182 Gr. F316 (SS); other materials, pressure classes or flange thicknesses on request.

¹¹⁾ D min. designates the minimum inside pipe diameter.

Installation information

Installation depth

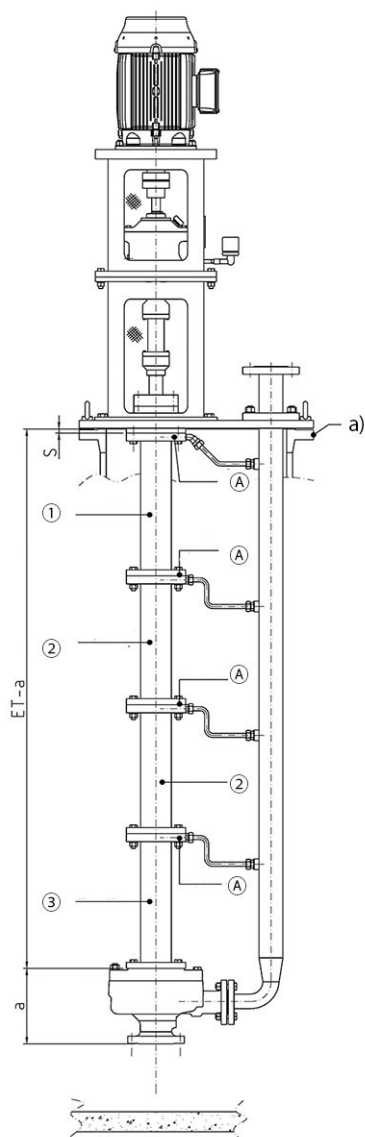


Fig. 4: Installation depths, design with circular soleplate

①	Upper suspension pipe
②	Middle suspension pipe
③	Lower suspension pipe
A	Bearing sleeve
a)	Tank flange
ET-a	Installation depth

Standard length of suspension pipe [mm], speed 2900 rpm and 3500 rpm

Overall pipe length	Length of suspension pipe					Number of bearing sleeves	ET-a													
	①	②	②	②	③		Size													
							25-180	25-230	40-180	40-230	40-231	40-280	40-281	50-180	50-230	50-280	40-361	80-180	80-230	80-280
400	-	-	-	-	400	2	444	444	444	444	444	444	444	444	444	444	440	440	440	437
500	-	-	-	-	500	2	544	544	544	544	544	544	544	544	544	544	540	540	540	537
600	-	-	-	-	600	2	644	644	644	644	644	644	644	644	644	644	640	640	640	637
700	-	-	-	-	700	2	744	744	744	744	744	744	744	744	744	744	740	740	740	737
800	-	-	-	-	800	2	844	844	844	844	844	844	844	844	844	844	840	840	840	837
900	-	-	-	-	900	2	944	944	944	944	944	944	944	944	944	944	940	940	940	937
1000	-	-	-	-	1000	2	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1040	1040	1040	1037
1100	-	-	-	-	1100	2	1144	1144	1144	1144	1144	1144	1144	1144	1144	1144	1140	1140	1140	1137
1200	800	-	-	-	400	3	1244	1244	1244	1244	1244	1244	1244	1244	1244	1244	1240	1240	1240	1237
1300	800	-	-	-	500	3	1344	1344	1344	1344	1344	1344	1344	1344	1344	1344	1340	1340	1340	1337
1400	800	-	-	-	600	3	1444	1444	1444	1444	1444	1444	1444	1444	1444	1444	1440	1440	1440	1437
1500	1100	-	-	-	400	3	1544	1544	1544	1544	1544	1544	1544	1544	1544	1544	1540	1540	1540	1537
1600	1100	-	-	-	500	3	1644	1644	1644	1644	1644	1644	1644	1644	1644	1644	1640	1640	1640	1637
1700	1100	-	-	-	600	3	1744	1744	1744	1744	1744	1744	1744	1744	1744	1744	1740	1740	1740	1737
1800	1100	-	-	-	700	3	1844	1844	1844	1844	1844	1844	1844	1844	1844	1844	1840	1840	1840	1837
1900	1100	-	-	-	800	3	1944	1944	1944	1944	1944	1944	1944	1944	1944	1944	1940	1940	1940	1937
2000	1100	-	-	-	900	3	2044	2044	2044	2044	2044	2044	2044	2044	2044	2044	2040	2040	2040	2037
2100	1100	-	-	-	1000	3	2144	2144	2144	2144	2144	2144	2144	2144	2144	2144	2140	2140	2140	2137
2200	1100	-	-	-	1100	3	2244	2244	2244	2244	2244	2244	2244	2244	2244	2244	2240	2240	2240	2237
2300	1100	700	-	-	500	4	2344	2344	2344	2344	2344	2344	2344	2344	2344	2344	2340	2340	2340	2337
2400	1100	700	-	-	600	4	2444	2444	2444	2444	2444	2444	2444	2444	2444	2444	2440	2440	2440	2437
2500	1100	700	-	-	700	4	2544	2544	2544	2544	2544	2544	2544	2544	2544	2544	2540	2540	2540	2537
2600	1100	800	-	-	700	4	2644	2644	2644	2644	2644	2644	2644	2644	2644	2644	2640	2640	2640	2637
2700	1100	800	-	-	800	4	2744	2744	2744	2744	2744	2744	2744	2744	2744	2744	2740	2740	2740	2737
2800	1100	900	-	-	800	4	2844	2844	2844	2844	2844	2844	2844	2844	2844	2844	2840	2840	2840	2837
2900	1100	900	-	-	900	4	2944	2944	2944	2944	2944	2944	2944	2944	2944	2944	2940	2940	2940	2937
3100	1100	1100	-	-	900	4	3144	3144	3144	3144	3144	3144	3144	3144	3144	3144	3140	3140	3140	3137
3100	1100	1000	-	-	1000	4	3144	3144	3144	3144	3144	3144	3144	3144	3144	3144	3140	3140	3140	3137
3200	1100	1100	-	-	1000	4	3244	3244	3244	3244	3244	3244	3244	3244	3244	3244	3240	3240	3240	3237
3300	1100	1100	-	-	1100	4	3344	3344	3344	3344	3344	3344	3344	3344	3344	3344	3340	3340	3340	3337
3400	1100	1100	600	-	600	5	3444	3444	3444	3444	3444	3444	3444	3444	3444	3444	3440	3440	3440	3437
3500	1100	1100	700	-	600	5	3544	3544	3544	3544	3544	3544	3544	3544	3544	3544	3540	3540	3540	3537
3600	1100	1100	700	-	700	5	3644	3644	3644	3644	3644	3644	3644	3644	3644	3644	3640	3640	3640	3637
3700	1100	1100	800	-	700	5	3744	3744	3744	3744	3744	3744	3744	3744	3744	3744	3740	3740	3740	3737
3800	1100	1100	800	-	800	5	3844	3844	3844	3844	3844	3844	3844	3844	3844	3844	3840	3840	3840	3837
3900	1100	1100	900	-	800	5	3944	3944	3944	3944	3944	3944	3944	3944	3944	3944	3940	3940	3940	3937
4000	1100	1100	900	-	900	5	4044	4044	4044	4044	4044	4044	4044	4044	4044	4044	4040	4040	4040	4037
4100	1100	1100	1000	-	900	5	4144	4144	4144	4144	4144	4144	4144	4144	4144	4144	4140	4140	4140	4137
4200	1100	1100	1000	-	1000	5	4244	4244	4244	4244	4244	4244	4244	4244	4244	4244	4240	4240	4240	4237
4300	1100	1100	1100	-	1000	5	4344	4344	4344	4344	4344	4344	4344	4344	4344	4344	4340	4340	4340	4337
4400	1100	1100	1100	-	1100	5	4444	4444	4444	4444	4444	4444	4444	4444	4444	4444	4440	4440	4440	4437
4500	1100	1100	1100	600	600	6	4544	4544	4544	4544	4544	4544	4544	4544	4544	4544	4540	4540	4540	4537
4600	1100	1100	1100	700	600	6	4644	4644	4644	4644	4644	4644	4644	4644	4644	4644	4640	4640	4640	4637
4700	1100	1100	1100	700	700	6	4744	4744	4744	4744	4744	4744	4744	4744	4744	4744	4740	4740	4740	4737
4800	1100	1100	1100	800	700	6	4844	4844	4844	4844	4844	4844	4844	4844	4844	4844	4840	4840	4840	4837
4900	1100	1100	1100	800	800	6	4944	4944	4944	4944	4944	4944	4944	4944	4944	4944	4940	4940	4940	4937
5000	1100	1100	1100	900	800	6	5044	5044	5044	5044	5044	5044	5044	5044	5044	5044	5040	5040	5040	5037

Standard length of suspension pipe [mm], speed 1450 rpm and 1750 rpm

Overall pipe length	Length of suspension pipe				Number of bearing sleeves	ET-a													
	①	②	③	④		Size													
						25-180	25-230	40-180	40-230	40-231	40-280	40-281	50-180	50-230	50-280	40-361	80-180	80-230	80-280
400	-	-	-	400	2	444	444	444	444	444	444	444	444	444	444	440	440	440	437
500	-	-	-	500	2	544	544	544	544	544	544	544	544	544	544	540	540	540	537
600	-	-	-	600	2	644	644	644	644	644	644	644	644	644	644	640	640	640	637
700	-	-	-	700	2	744	744	744	744	744	744	744	744	744	744	740	740	740	737
800	-	-	-	800	2	844	844	844	844	844	844	844	844	844	844	840	840	840	837
900	-	-	-	900	2	944	944	944	944	944	944	944	944	944	944	940	940	940	937
1000	-	-	-	1000	2	1044	1044	1044	1044	1044	1044	1044	1044	1044	1044	1040	1040	1040	1037
1100	-	-	-	1100	2	1144	1144	1144	1144	1144	1144	1144	1144	1144	1144	1140	1140	1140	1137
1200	-	-	-	1200	2	1244	1244	1244	1244	1244	1244	1244	1244	1244	1244	1240	1240	1240	1237
1300	-	-	-	1300	2	1344	1344	1344	1344	1344	1344	1344	1344	1344	1344	1340	1340	1340	1337
1400	-	-	-	1400	2	1444	1444	1444	1444	1444	1444	1444	1444	1444	1444	1440	1440	1440	1437
1500	-	-	-	1500	2	1544	1544	1544	1544	1544	1544	1544	1544	1544	1544	1540	1540	1540	1537
1600	-	-	-	1600	2	1644	1644	1644	1644	1644	1644	1644	1644	1644	1644	1640	1640	1640	1637
1700	1100	-	-	600	3	1744	1744	1744	1744	1744	1744	1744	1744	1744	1744	1740	1740	1740	1737
1800	1100	-	-	700	3	1844	1844	1844	1844	1844	1844	1844	1844	1844	1844	1840	1840	1840	1837
1900	1400	-	-	500	3	1944	1944	1944	1944	1944	1944	1944	1944	1944	1944	1940	1940	1940	1937
2000	1400	-	-	600	3	2044	2044	2044	2044	2044	2044	2044	2044	2044	2044	2040	2040	2040	2037
2100	1600	-	-	500	3	2144	2144	2144	2144	2144	2144	2144	2144	2144	2144	2140	2140	2140	2137
2200	1600	-	-	600	3	2244	2244	2244	2244	2244	2244	2244	2244	2244	2244	2240	2240	2240	2237
2300	1600	-	-	700	3	2344	2344	2344	2344	2344	2344	2344	2344	2344	2344	2340	2340	2340	2337
2400	1600	-	-	800	3	2444	2444	2444	2444	2444	2444	2444	2444	2444	2444	2440	2440	2440	2437
2500	1600	-	-	900	3	2544	2544	2544	2544	2544	2544	2544	2544	2544	2544	2540	2540	2540	2537
2600	1600	-	-	1000	3	2644	2644	2644	2644	2644	2644	2644	2644	2644	2644	2640	2640	2640	2637
2700	1600	-	-	1100	3	2744	2744	2744	2744	2744	2744	2744	2744	2744	2744	2740	2740	2740	2737
2800	1600	-	-	1200	3	2844	2844	2844	2844	2844	2844	2844	2844	2844	2844	2840	2840	2840	2837
2900	1600	-	-	1300	3	2944	2944	2944	2944	2944	2944	2944	2944	2944	2944	2940	2940	2940	2937
3000	1600	-	-	1400	3	3044	3044	3044	3044	3044	3044	3044	3044	3044	3044	3040	3040	3040	3137
3100	1600	-	-	1500	3	3144	3144	3144	3144	3144	3144	3144	3144	3144	3144	3140	3140	3140	3137
3200	1600	-	-	1600	3	3244	3244	3244	3244	3244	3244	3244	3244	3244	3244	3240	3240	3240	3237
3300	1600	900	-	800	4	3344	3344	3344	3344	3344	3344	3344	3344	3344	3344	3340	3340	3340	3337
3400	1600	900	-	900	4	3444	3444	3444	3444	3444	3444	3444	3444	3444	3444	3440	3440	3440	3437
3500	1600	1000	-	900	4	3544	3544	3544	3544	3544	3544	3544	3544	3544	3544	3540	3540	3540	3537
3600	1600	1000	-	1000	4	3644	3644	3644	3644	3644	3644	3644	3644	3644	3644	3640	3640	3640	3637
3700	1600	1100	-	1000	4	3744	3744	3744	3744	3744	3744	3744	3744	3744	3744	3740	3740	3740	3737
3800	1600	1100	-	1100	4	3844	3844	3844	3844	3844	3844	3844	3844	3844	3844	3840	3840	3840	3837
3900	1600	1600	-	700	4	3944	3944	3944	3944	3944	3944	3944	3944	3944	3944	3940	3940	3940	3937
4000	1600	1600	-	800	4	4044	4044	4044	4044	4044	4044	4044	4044	4044	4044	4040	4040	4040	4037
4100	1600	1600	-	900	4	4144	4144	4144	4144	4144	4144	4144	4144	4144	4144	4140	4140	4140	4137
4200	1600	1600	-	1000	4	4244	4244	4244	4244	4244	4244	4244	4244	4244	4244	4240	4240	4240	4237
4300	1600	1600	-	1100	4	4344	4344	4344	4344	4344	4344	4344	4344	4344	4344	4340	4340	4340	4337
4400	1600	1600	-	1200	4	4444	4444	4444	4444	4444	4444	4444	4444	4444	4444	4440	4440	4440	4437
4500	1600	1600	-	1300	4	4544	4544	4544	4544	4544	4544	4544	4544	4544	4544	4540	4540	4540	4537
4600	1600	1600	-	1400	4	4644	4644	4644	4644	4644	4644	4644	4644	4644	4644	4640	4640	4640	4637
4700	1600	1600	-	1500	4	4744	4744	4744	4744	4744	4744	4744	4744	4744	4744	4740	4740	4740	4737
4800	1600	1600	-	1600	4	4844	4844	4844	4844	4844	4844	4844	4844	4844	4844	4840	4840	4840	4837
4900	1600	1600	900	800	5	4944	4944	4944	4944	4944	4944	4944	4944	4944	4944	4940	4940	4940	4937
5000	1600	1600	900	900	5	5044	5044	5044	5044	5044	5044	5044	5044	5044	5044	5040	5040	5040	5037

General assembly drawings with list of components

General assembly drawing, discharge side

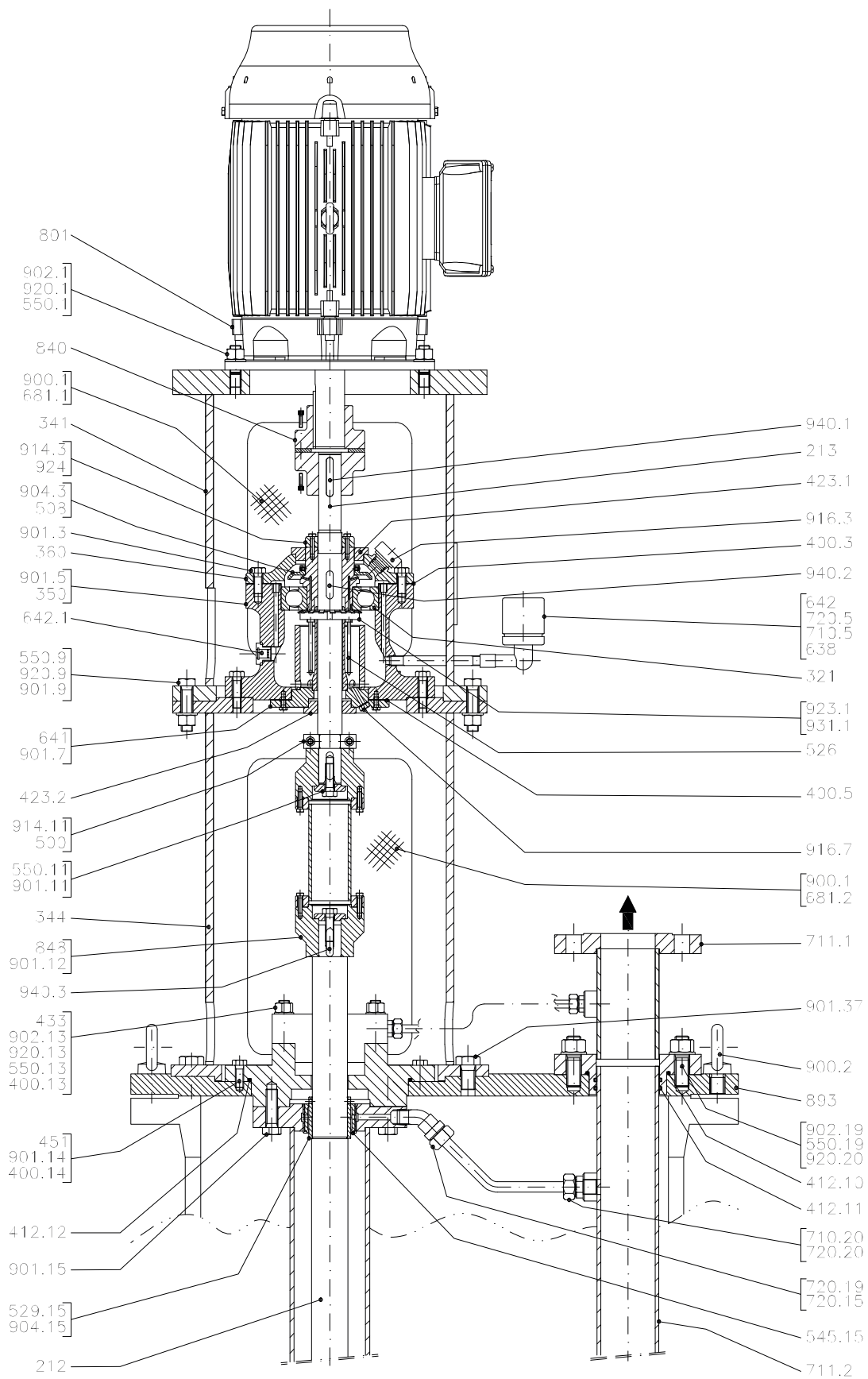


Fig. 5: General assembly drawing, discharge side

General assembly drawing, suction side

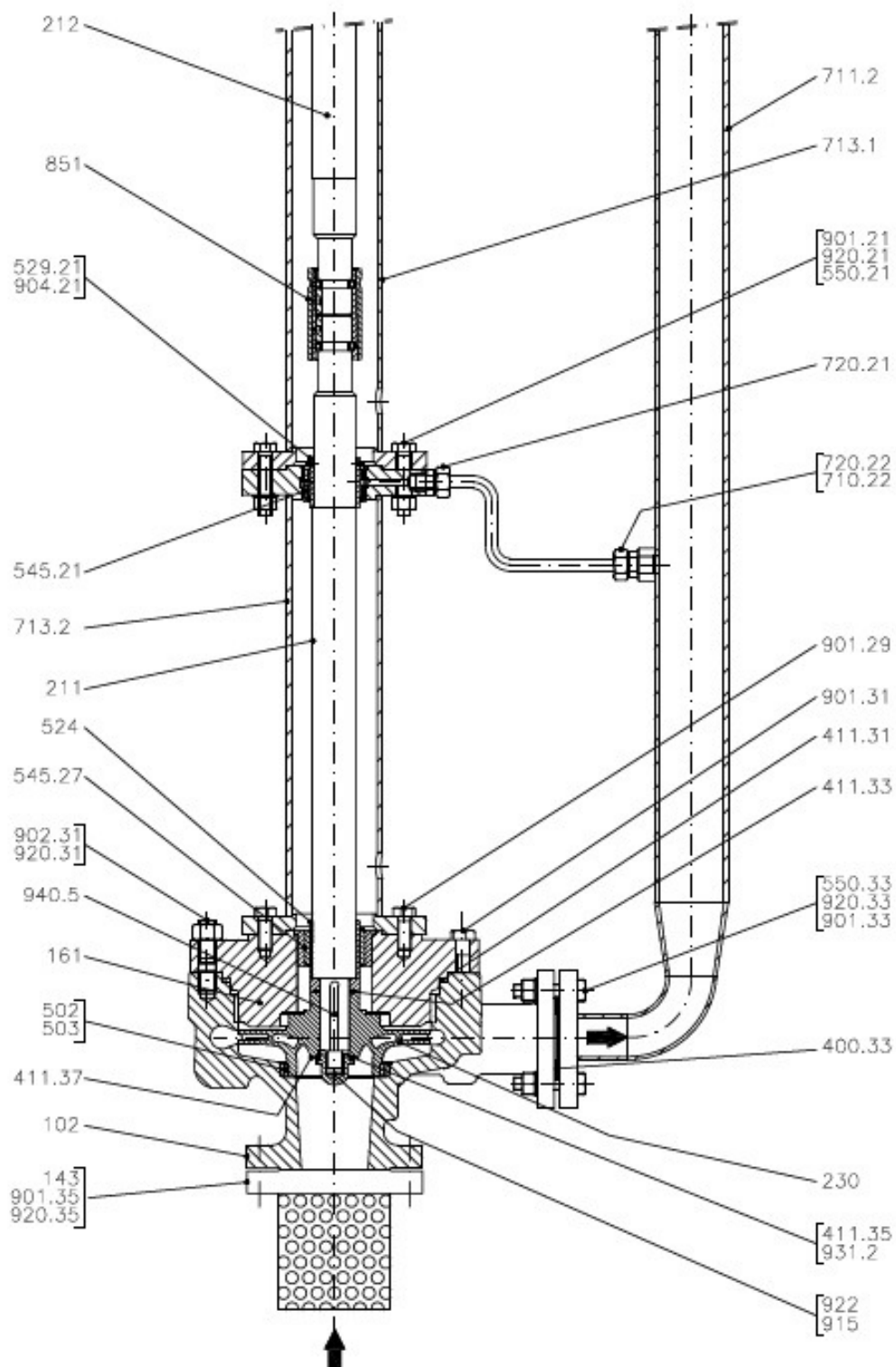


Fig. 6: General assembly drawing, suction side

List of components

Part No.	Description	Part No.	Description
102	Volute casing	638	Constant level oiler
143	Suction strainer	641	Oil level tube
161	Casing cover	642	Oil level sight glass
211	Pump shaft	681.1/2	Coupling guard
212	Intermediate shaft	710.5/.20/.22	Pipe
213	Top shaft	711.1/2	Riser

Part No.	Description	Part No.	Description
230	Impeller	713.1/.2	Suspension pipe
321	Radial ball bearing	720.5/.15/.19/.20/.21/.22	Fitting
341	Drive lantern	801	Flanged motor
344	Bearing bracket lantern	840	Coupling
350	Bearing housing	848	Intermediate coupling
360	Bearing cover	851	Conical coupling
400.3/.5/.13/.14/.17/33	Gasket	893	Soleplate
411.31/.33/.35/.37	Spiral wound gasket	900.1/.2	Bolt/screw
412.10/.11	O-ring	901.3/.5/.7/.9/.11/.12/.14/.15/.21/.29/.31/.33/.35/.37	Hexagon head bolt
423.1/.2	Labyrinth ring	902.1/.13/.19/.31	Stud
433	Mechanical seal	904.3/.15/.21	Grub screw
451	Stuffing box housing	914.3/.11	Hexagon socket head cap screw
500	Ring	915	Threaded insert
502	Casing wear ring	916.3/.7/.15	Plug
503	Impeller wear ring	920.1/.9/.13/.20/.21/.31/.33/.35	Nut
508	Oil thrower	922	Impeller nut
524	Shaft protecting sleeve	923.1	Bearing nut
526	Centring sleeve	924	Adjusting nut
529.15/.21	Bearing sleeve	931.1/.2	Lock washer
545.15/.21/.27	Bearing bush	940.1/.2/.3/.4/.5	Key
550.1/.9/.11/.13/.19/.21/.33	Disc		



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