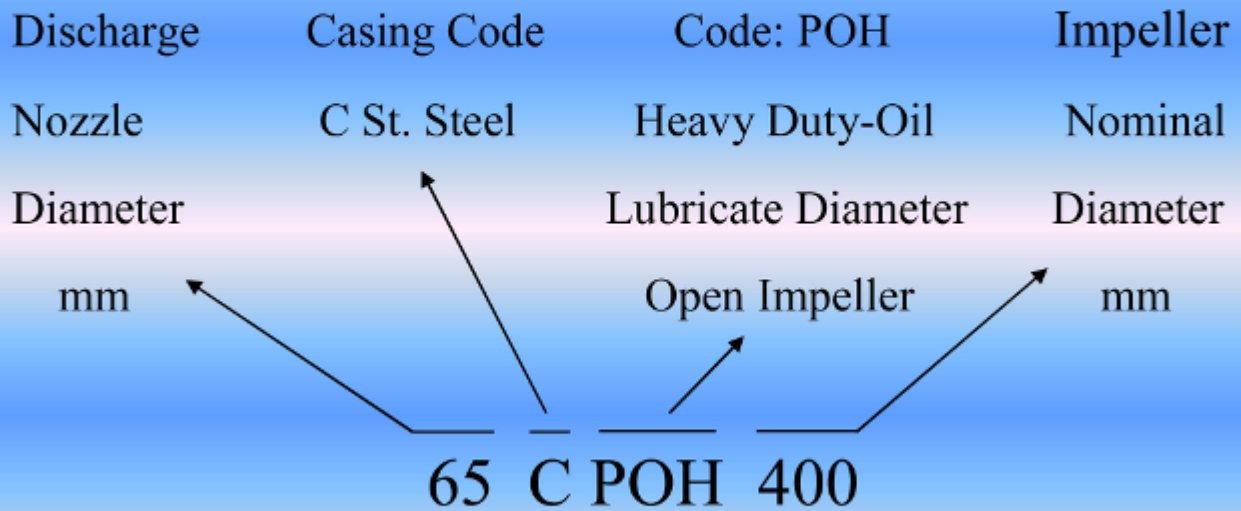


Worthington Simpson D-Line Chemical Pumps



Nomenclature



PRESSURE LIMITATIONS

Casing Working Pressure	-----	16 bar
Casing Test Pressure	-----	24 bar
Seal of Stuffing Box Jacket working Pressure	-----	6 bar

MAXIMUM PUMPING TEMPERATURES

Pump Type: CPOH

Without Bearing Cooling: 175 C Degrees

With Bearing Cooling: 300 C Degrees

The story begins in the early 1970s when Worthington Simpson, the UK's largest manufacturer of standard pumps, first introduced a range of chemical pumps to meet the demands of ISO2858, BS5257 and DIN24256.

These D-Line chemical pumps have given hundreds of thousands of hours reliable and cost-effective service to every sector of the chemical and process industry throughout the world.

Today's arduous demands from the end-user, in terms of application, process design and operating environment, have resulted in the introduction of ISO5199, a technical specification to supplement ISO2858. As the experts in the field, our engineers were called upon to help in the preparation of this new standard and, because of its proven performance in the industry, many of the features of the D-Line chemical pump formed the basis for the new criteria.

In addition, the heavy duty construction of the oil-lubricated bearing frame means D-Line meets the more stringent requirements of API610 7th Edition, and grease lubricated bearings are available to match users' preferences.

Working with major chemical manufacturers and mechanical seal producers, we have increased the radial clearance to the optimum around the mechanical seal to improve seal life and reliability.

D-Line chemical pumps are available with either closed or fully-open impellers and in a range of materials that covers capacities up to 1000m³/hr and heads up to 160m.

Today, D-Line chemical pumps are manufactured in a complete range of solid or lined metallic or lined non-metallic constructions with a support frame.

The standard metallic list uses cast iron, 316 grade stainless steel, 316L grade stainless steel, Ferralium 255®, Inconel 625®, Incoloy 825®, Hastelloy B-2®, Hastelloy C-276® and Grade 2 titanium. The non-metallic list features polypropylene, PVDF, 20% glass filled PTFE and 15% carbon filled PTFE.

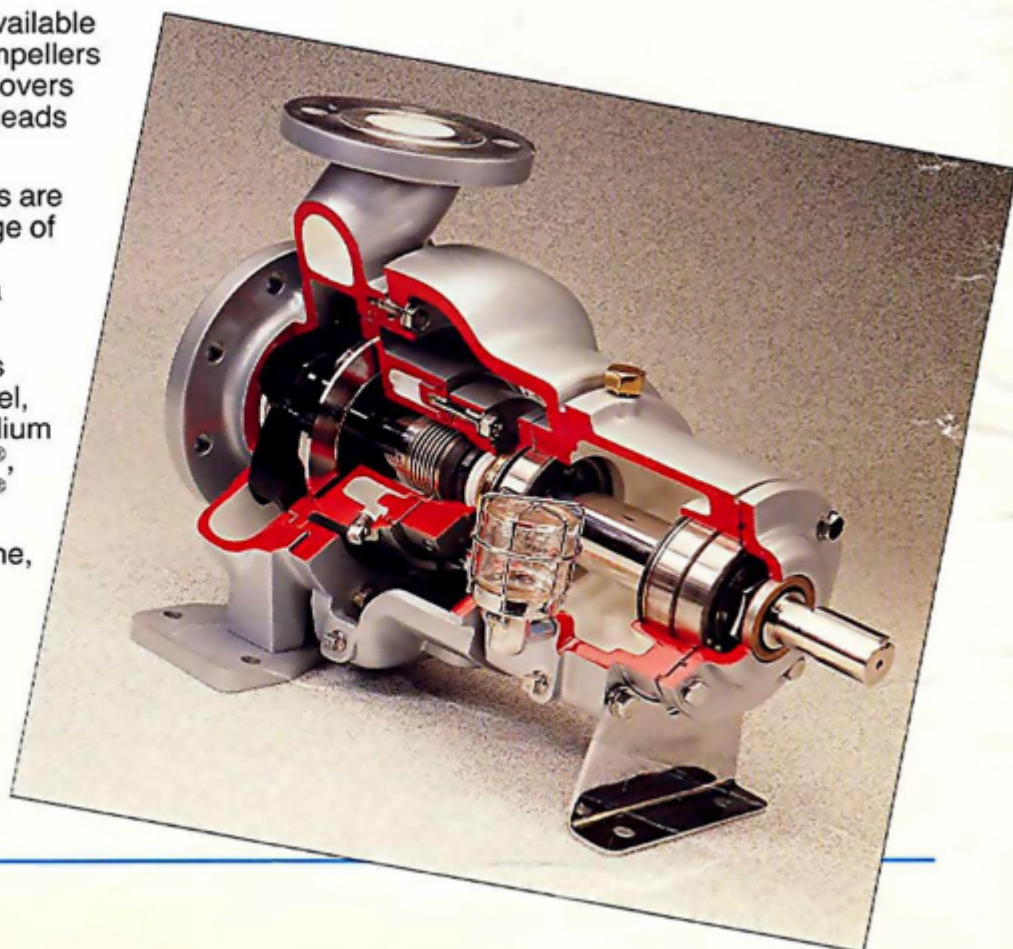
Exhaustive analysis of materials looks ahead to the technology of the 1990s and takes place in our modern laboratory supported by a

quality system to BS5750 Part 1 and approved by LRQA Limited.

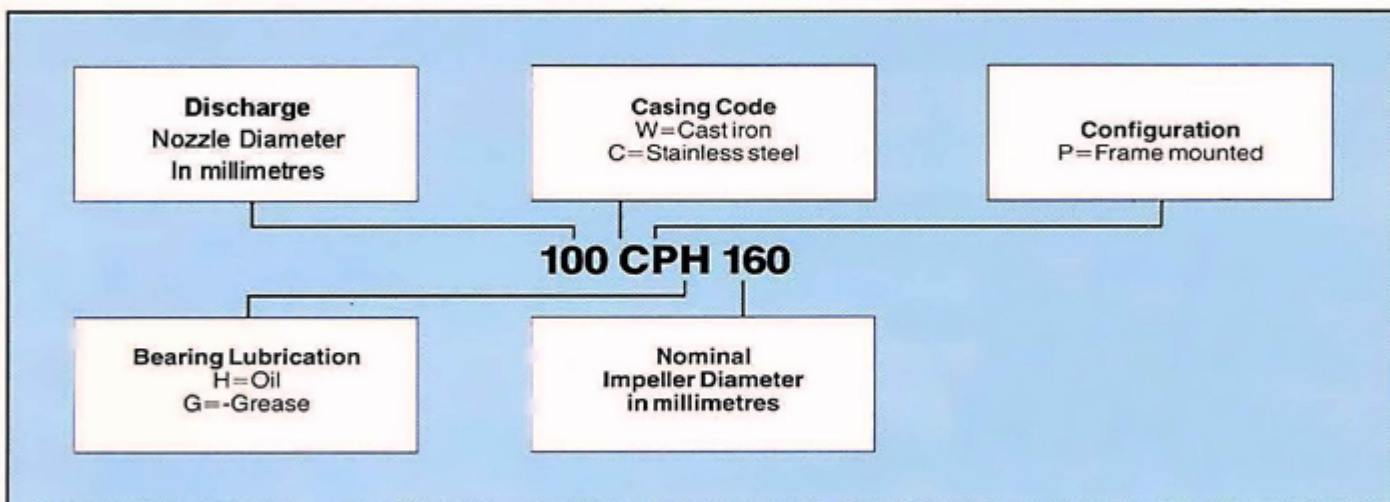
Vital back-up comes from nine strategically sited sales offices, providing the most comprehensive after-sales service from factory-trained service engineers and offering applications advice from qualified engineers in the industry.

The Worthington Simpson D-Line is the chemical pump for the future, available today, for all sectors of the chemical and process industries:

- plastics, synthetic rubbers and adhesives
- organic and inorganic chemicals
- pharmaceuticals
- fertilisers and dyestuffs
- paints, varnishes, dyestuffs, pigments and inks
- soaps, detergents, perfumes, cosmetics and toilet preparations.
- biotechnology
- natural gas exploration and production
- coal, coke and tar processing
- petroleum refining and distribution
- pulp and paper
- gas processing and distribution
- electricity generation and transmission
- nuclear fuel production and atomic energy establishments
- refuse disposal plants and incinerators
- FGD plant manufacturers



Nomenclature



Operating limits

FEATURE	UNITS	CPH	
		AISI 316 S/Steel	
Casing working pressure	bar G	16	
Casing test pressure	bar G	24	
Casing jacket working pressure	bar G	6@ 170°C	
Stuffing box cover jacket working pressure	bar G	6@ 170°C	
Maximum Suction pressure	bar G	13.8	
Maximum pumping temp.	With bearing cooling	°C	300
	Without bearing cooling	°C	175
Corrosion allowance	mm	3	

*2 mm on lined 25-125 and 25-162

Range specification

PUMPTYPE	WPH	CPH	CPH-SM	WPG	CPG
Operating speeds of up to	4500 rpm	4700 rpm	3600 rpm	4500 rpm	4700 rpm
Design features	DIN 24256, BS5257 BS6836, ISO2858 ISO5199, API610	DIN 24256, BS5257 BS6836, ISO2858 ISO5199, API610	DIN 24256, BS5257 BS6836, ISO2858 ISO5199, API610	DIN 24256, BS5257 BS6836, ISO2858 ISO5199	DIN 24256, BS5257 BS6836, ISO2858 ISO5199
Back pullout	●	●	●	●	●
Self venting casing	●	●	●	●	●
Suction & discharge flange drillings	ANSI 125FF or DIN 2533 ND16	ANSI 150RF or DIN 2501 ND16	ANSI 150RF or DIN 2501 ND16	ANSI 125FF or DIN 2533 ND16	ANSI 150RF or DIN 2501 ND16
Front casing ring	●	Optional on certain sizes	■	●	Optional on certain sizes
Casing jacket	■	○	Optional on Metallic Construction	■	○
Impeller	Closed with Balance Holes	Closed with Balance Holes	Fully open with Balance Holes	Closed with Balance Holes	Closed with Balance Holes
Inducer	○	○	○	○	○
Shaft sleeve	●	●	●	●	○
Stuffing box cover wear ring	Standard on certain sizes	Standard on certain sizes	■	Standard on certain sizes	Standard on certain sizes
Stuffing box cover jacket	●	●	Optional on Metallic Construction	■	■
Shaft sealing	Packed Gland or Mechanical Seal	Packed Gland or Mechanical Seal	Mechanical Seal	Packed Gland or Mechanical Seal	Mechanical Seal
Bearing frames across range	4	4	3	5	5
Pump end bearing	Cylindrical Roller	Cylindrical Roller	Cylindrical Roller	Ball	Ball
Pump end bearing protection	Oil Seal & Labyrinth Cover	Oil Seal & Labyrinth Cover	Oil Seal & Labyrinth Cover	Labyrinth Cover	Labyrinth Cover
Drive end bearing	Pair of Angular Contact	Pair of Angular Contact	Pair of Angular Contact	Ball	Ball
Bearing lubrication	Flooded Oil	Flooded Oil	Flooded Oil	Grease	Grease
Bearing cooling	○	○	○	■	■
Spacer coupling	●	●	●	●	●
BS5304 coupling guard	●	●	●	●	●
Steel baseplate	●	●	●	●	●

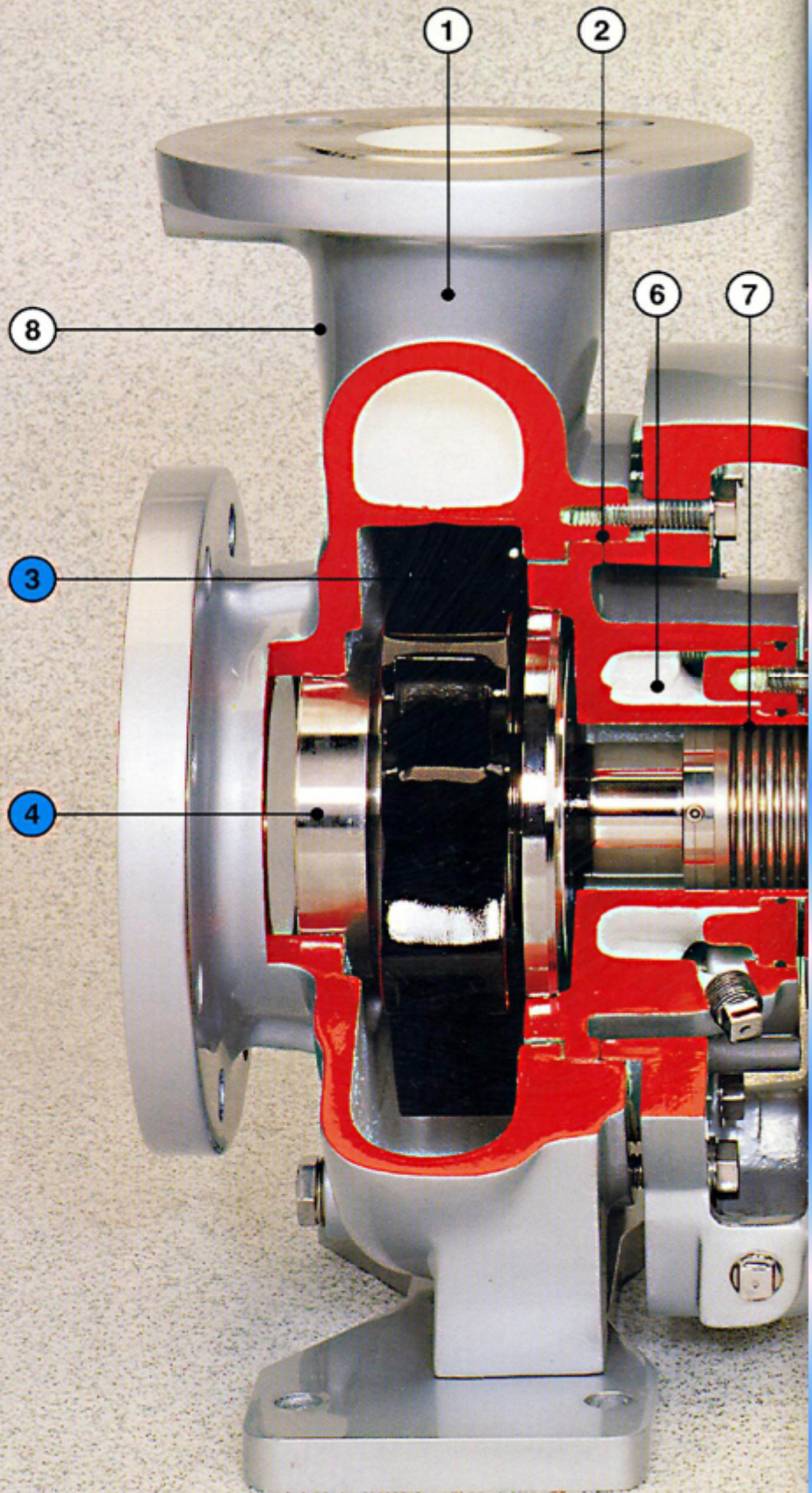
● Standard ○ Optional ■ Not available

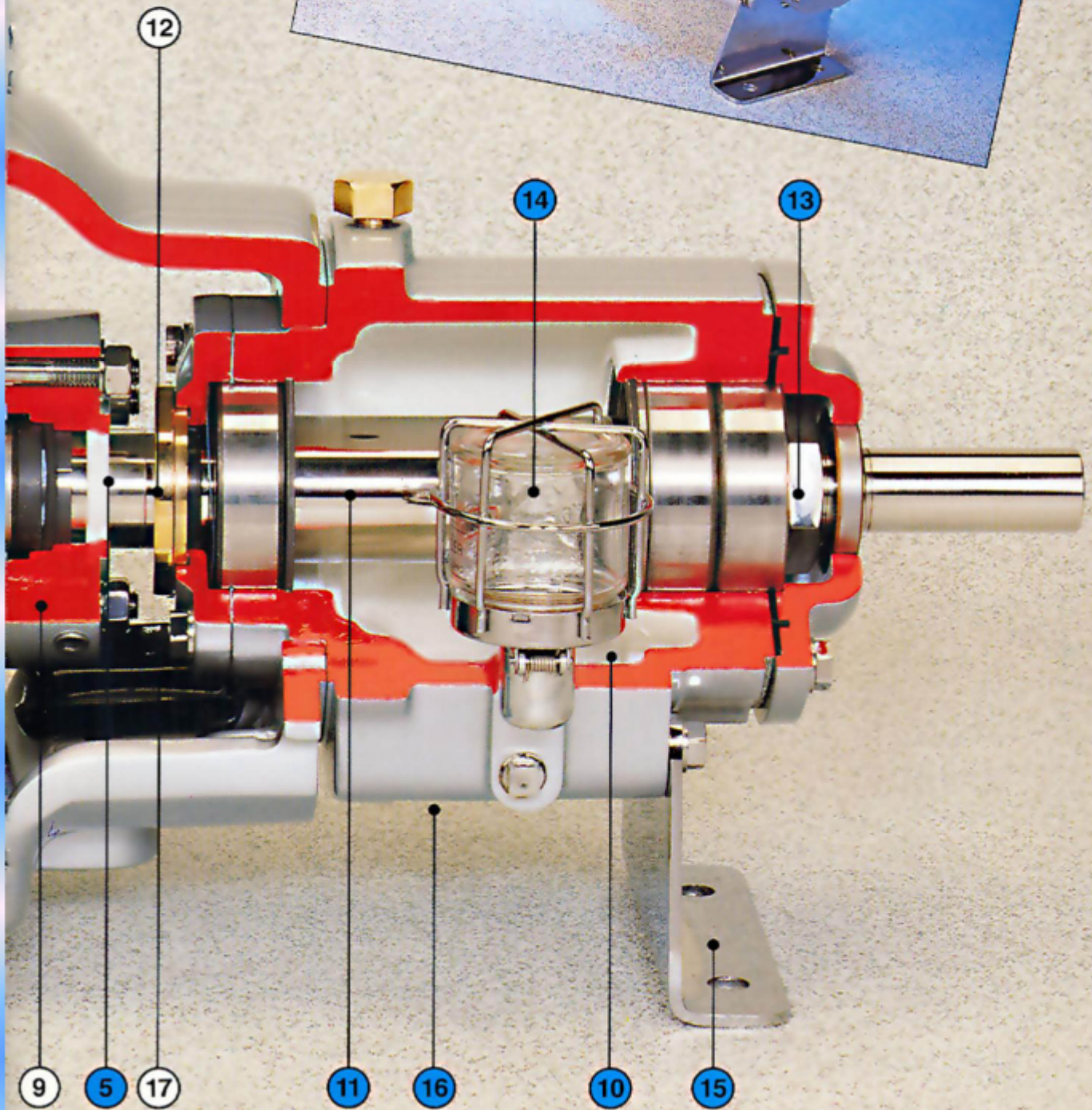
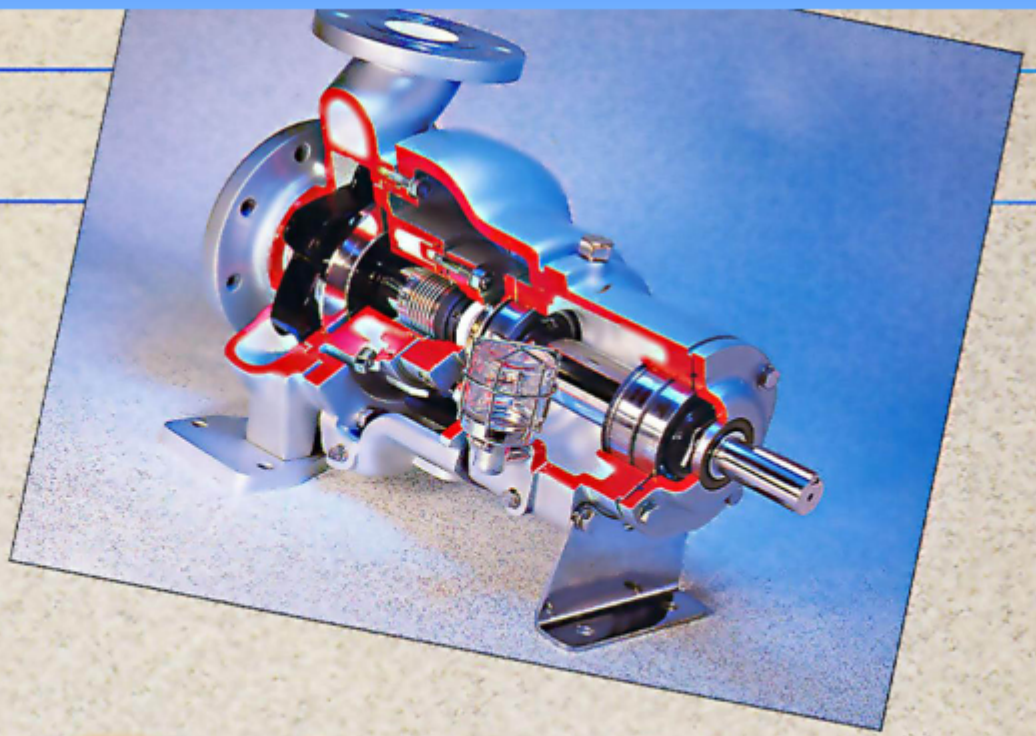
Pump design features

- ① End suction, top centre line discharge, self venting, thick section casing with ample corrosion allowance. Withstands high branch loads.
- ② Casing spigots directly onto adaptor for optimum concentricity of casing and impeller.
- ③ Fully shrouded impeller with balance holes minimises seal chamber pressure and ensures hydraulic balance at all operating points.
- ④ Impeller keyed to shaft and secured by a domed nut (not shown) and positive locking washer to protect shaft threads and eliminate corrosion.
- ⑤ Hook type shaft sleeve extended through seal cover is positively driven by impeller key.
- ⑥ Stuffing box cover with integral jacket for heating or cooling the seal cavity. Cooling cap design of stuffing box cover shown.
- ⑦ 5mm radial clearance around seal ensures optimum operating environment.
- ⑧ Product recirculation from casing volute ensures cooling at the seal faces at all operating points.
- ⑨ Thick section seal cover with built in P.T.F.E. throttle bush and connection for safer leakage control.
- ⑩ Large capacity, heavy duty construction bearing housing with flooded oil lubrication directed to bearings by internal channels.
- ⑪ Large diameter stiff shaft supported by cylindrical roller bearing at pump end and a pair of angular contact ball bearings at drive end ensures less than 0.05mm deflection at the seal face.
- ⑫ Pump end bearing protected by a lip seal and labyrinth cover against ingress of pumped liquid.
- ⑬ Drive end bearings positively secured by a bearing locknut and tab washer.
- ⑭ Constant level sight feed oiler with positive level positioner, heat resistant glass container and protective wire cage.
- ⑮ Steel back foot anchors bearing housing to maintain alignment thus increasing bearing and coupling life.
- ⑯ Cooling plate (not shown) fixed to underside of bearing housing for high temperature operation.
- ⑰ Stainless steel drip tray for collecting leakage.

The D-Line chemical pump pictured is type 65CPH200 manufactured in AISI 316 stainless steel and fitted with a John Crane (UK) Limited 515E mechanical seal. Pump is designed in accordance with ISO 2858 and ISO5199.

Those features highlighted in blue also meet the more stringent requirements of API 610 7th Edition.





Materials – Standards

GROUP NO.	MATERIAL TYPE		PRODUCT FROM CAST=C WROUGHT=W*	NEAR EQUIVALENT NATIONAL STANDARDS										
				U.S. ASTM		U.K. BS		WEST GERMANY DIN			FRANCE AFNOR		ITALY UNI	
				NO.	GRADE	NO.	GRADE	NO.	GRADE	WERK-STOFF NO.	NO.	GRADE	NO.	GRADE
1	Grey Cast Iron	Class 25	C	A48*	Class 25	1452*	180	1691	GG20	0.6018	A32-101	FGL 200	5007	G20
3		Class 40	C	A48*	Class 40B	1452	260	1691	GG25	0.6025	A32-101	FGL 250	5007	G25
2	Austenitic Cast Iron	Type 1	C	A436*	Type 1	3468	F1	1694	GGL-Ni Cu Cr 15 6 2	0.6655	A32-301	L-NUC 15 6 2	—	—
3		Type 2	C	A436*	Type 2	3468	F2	1694	GGL-Ni Cr 20 2	0.6660	A32-301	L-NC 20 2	—	—
3	Ferritic S.G. Iron	60-40-18	C	A536*	60-40-18	2789	400-18	1693	GGG40	0.6040	A32-201	FGS 400-18	4544	GS400-12
3		60-40-18 Pressure	C	A396*	N.A.	2789	400-18	1693	GGG40	0.6040	A32-201	FGS 400-18	4544	GS400-12
2	Carbon Steel	WCB	C	A216*	WCB	1504	161-480	1681	GS-52.3	1.0552	A32-051	280-480-M	3158	Fe G 520
3						3100	A2						7316	Fe G 49-1
3		LCA	C	A352*	LCA	1504	161-430ALT40	—	—	—	A32-053	FA-M	7317	G22 Mn 3
3	WCA	C	A216*	WCA	1504	161-430A	1681	GS-45.3	1.0446	A32-051	A420 CP-M	3158	Fe G 450	
3					3100	A1					7316	Fe G 42		
1	Austenitic Stainless Steel	316	C	A744*	CF-8M	1504	316C16	17445	G-X6 Cr Ni Mo 18 10	1.4408	A32-055	Z6 CND 18.12-M	3161	GX6 Cr Ni Mo 20 11
2		316L	C	A744*	CF-3M	1504	316C12	—	G-X2 Cr Ni Mo 18 10	1.4404	A32-055	Z2 CND 18.12-M	3161	GX2 Cr Ni Mo 19 11
1		316L	W	A240*	S31603	1449	316S11	17440	X2 Cr Ni Mo 17 13 2	1.4404	A36-209	Z2 CND 18.13 Z2 CND 17.12	6900	X2 Cr Ni Mo 17 12
3	Duplex Stainless Steel	255	C	A744	CD-4M Cu	—	—	—	—	—	—	—	—	—
1		255	W	A240	S32550	—	—	—	—	—	—	—	—	—
3	Martensitic/Ferritic Stainless Steel	CA-15	C	A743*	CA-15	1504	420C29	17445	G-X8 Cr Ni 13	1.4008	A32-055	Z6 CN 12.1-M	3161	GX12 Cr 13
3		CA6NM	C	A743*	CA6NM	1504	425C11A	17445	G-X5 Cr Ni 13 4	1.4313	—	—	3161	GX6 Cr Ni 1304
3		CB7Cu-1	C	A743*	CB7Cu-1	—	—	—	—	—	—	—	—	—
2	High Alloy Austenitic Stainless Steel	Worhtite M	C	—	—	1504	364C11	—	—	—	—	—	—	—
3		CN7M	C	A744*	CN7M	1504	332C11	SEW 410	G-X2 Ni Cr Mo Cu 25.20	1.4536	A31-055 A32-056	Z6 NCDU 25 20.4-M Z6 NCDU 25 20.4-M	3161	GX5 Ni Cr Cu Mo 29 21
3	Nickel-Chromium Molybdenum	Worhtalloy 55	C	—	—	—	—	—	—	—	—	—	—	—
1		825	W	B443	N06625	—	—	17744	Ni Cr 22 Mo 9Nb	2.4856	—	—	—	—
3		825	C	—	—	—	—	—	—	—	—	—	—	—
1		825	W	B424	N08825	3072	NA16	17744	Ni Cr 21 Mo	2.4858	—	—	—	—
1	Nickel-Molybdenum	C276	W	B575	N10276	—	—	17744	Ni Mo 16Cr 15 W	2.4819	—	—	—	—
1		B2	W	B333	N10665	—	—	17744	Ni Mo 26	2.4617	—	—	—	—
1	Titanium	Grade 2	W	B265*	2	3531	A2	17860	Fi 2	3.7035	—	—	—	—
1	Polypropylene	—	—	—	—	—	—	—	—	—	—	—	—	—
1	P.V.D.F.	—	—	—	—	—	—	—	—	—	—	—	—	—
1	P.T.F.E.	20% Glass	—	—	—	—	—	—	—	—	—	—	—	—
		15% Carbon	—	—	—	—	—	—	—	—	—	—	—	—

Group 1 Standard material
 Group 2 Standard option
 Group 3 Investigate against enquiry

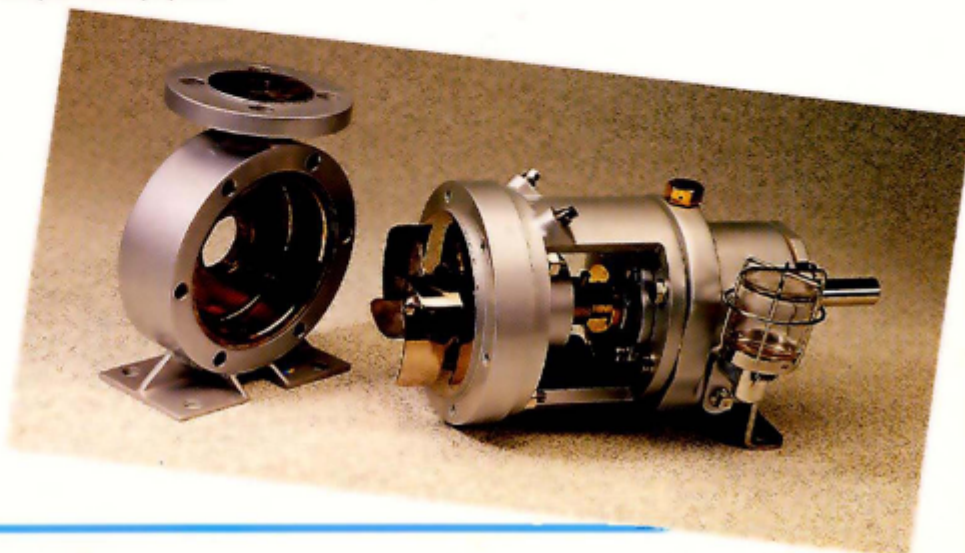
* Denotes standard on which the Worthington Simpson material is based.
 ** The National Standard quoted for wrought products relates to plate material.
 Further information can be obtained from Worthington Simpson for bar and tube standards.

Materials – composition

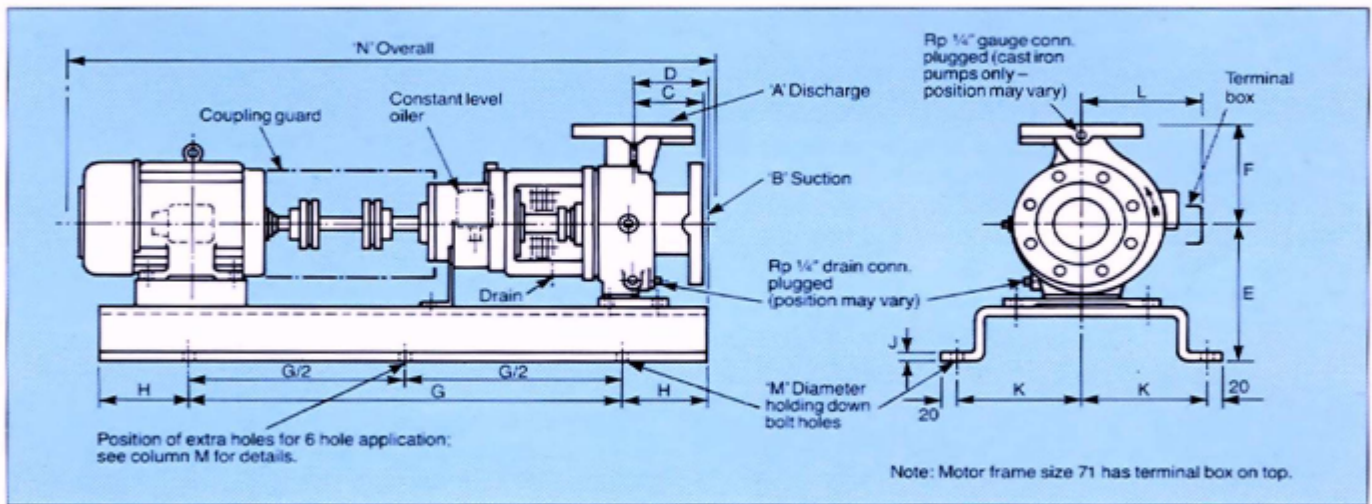
MATERIAL TYPE		PRODUCT FORM CAST = C WROUGHT = W	STANDARD		CHEMICAL COMPOSITION – W1%									
			NO.	GRADE	C	Ni	Cr	Mo	Cu	Fe	OTHERS			
Grey Cast Iron	Class 25	C	ASTM A48	Class 25	At the discretion of the foundry									
	Class 40	C	ASTM A48	Class 40										
Austenitic Cast Iron	Type 1	C	ASTM A436	Type 1	max. 3.0	13.5-17.5	1.5-2.5	—	5.5-7.5	Bal.	—	—	—	—
	Type 2	C	ASTM A436	Type 2	max. 3.0	18.0-22.0	1.5-2.5	—	max. 0.5	Bal.	—	—	—	—
Ferritic S.G. Iron	60-40-18	C	ASTM A536	60-40-18	At the discretion of the foundry									
	60-40-18 Pressure	C	ASTM A395	(not applicable)										
Carbon Steel	WCB	C	ASTM A216	WCB	max. 0.30	max. 0.50	max. 0.50	max. 0.20	max. 0.30	Bal.	V 0.03 max.	—	—	—
	LCA	C	ASTM A352	LCA	max. 0.25	max. 0.50	max. 0.50	max. 0.20	max. 0.30	Bal.	V 0.03 max.	—	—	—
	WCA	C	ASTM A216	WCA	max. 0.25	max. 0.50	max. 0.40	max. 0.20	max. 0.30	Bal.	V 0.03 max.	—	—	—
Austenitic Stainless Steel	316	C	ASTM A744	CF-8M	max. 0.08	9.0-12.0	18.0-21.0	2.0-3.0	—	Bal.	—	—	—	—
	316L	C	ASTM A744	CF-3M	max. 0.03	9.0-13.0	17.0-21.0	2.0-3.0	—	Bal.	—	—	—	—
	316L	W	ASTM A240	316L	max. 0.03	10.0-14.0	16.0-18.0	2.0-3.0	—	Bal.	N 0.10 max.	—	—	—
	347	C	—	—	max. 0.08	9.0-12.0	18.0-21.0	—	—	Bal.	Nb 8xC-1.0	—	—	—
Duplex Stainless Steel	255	C	Ferrallium 255-SC* (†)		0.05	6	25	3	2.5	Bal.	N 0.18	—	—	—
	255	W	Ferrallium 255-SF* (†)		0.04 max.	6	25	3	1.8	Bal.	N 0.18	—	—	—
Martensitic / Ferritic Stainless Steel	CA-15	C	ASTM A743	CA-15	max. 0.15	max. 1.0	11.5-14.0	—	—	Bal.	—	—	—	—
	CA6NM	C	ASTM A743	CA6NM	max. 0.06	3.5-4.5	11.5-14.0	0.4-1.0	—	Bal.	—	—	—	—
	CB7Cu-1	C	ASTM A747	CB7Cu-1	max. 0.07	3.6-4.6	15.5-17.5	—	2.5-3.2	Bal.	Nb 0.15-0.35	N 0.05 max.	—	—
High Alloy Austenitic S/Steel	Worthite M	C	Worthite M (†)		max. 0.04	24.0-26.0	20.0-22.0	4.0-5.0	—	Bal.	Nb 0.2-0.4	—	—	—
	CN7M	C	ASTM A744	CN7M	max. 0.07	27.5-30.5	19.0-22.0	2.0-3.0	3.0-4.0	Bal.	—	—	—	—
Nickel Chromium Molybdenum	Worthalloy 55	C	Worthalloy 55 (†)		max. 0.12	Bal.	22.0-24.0	3.0-5.0	3.0-5.0	Max. 10.0	W 1.0-3.0	Si 3.0-5.0	—	—
	625	W	Inconel 625 (†)		Max. 0.12	min. 58.0	20.0-23.0	8.0-10.0	—	max. 5.0	Nb+Ta 3.15-4.15	Al 0.40 max.	Ti 0.40 max.	Co 1.0 max.
	825	C	Incoloy 825CP (†)		max. 0.05	38.0-46.0	19.5-23.5	2.5-3.5	1.5-3.0	Bal.	Nb 0.7-1.1	—	—	—
	825	W	Incoloy 825		max. 0.05	38.0-46.0	19.5-23.5	2.5-3.5	1.5-3.0	min. 22.0	Ti 0.6-1.2	Al 0.2 max.	—	—
	C276	W	Hastelloy C276 (†)		max. 0.01	Bal.	14.5-16.5	15.0-17.0	—	4.0-7.0	Co 2.5 max.	W 3.0-4.5	Si 0.08 max.	V 0.35 max.
Nickel Molybdenum	B2	W	Hastelloy B2 (†)		max. 0.01	Bal.	max. 1.0	26.0-30.0	—	max. 2.0	Co 1.0 max.	Si 0.10 max.	—	—
Titanium	Grade 2	W	ASTM 265	2	max. 0.10	—	—	—	—	max. 0.30	N 0.03 max.	H 0.015 max.	O 0.25 max.	Ti Bal.

† Proprietary Alloy.
* Nominal Analysis.

The tables are for information only and must not be used for specification purposes.

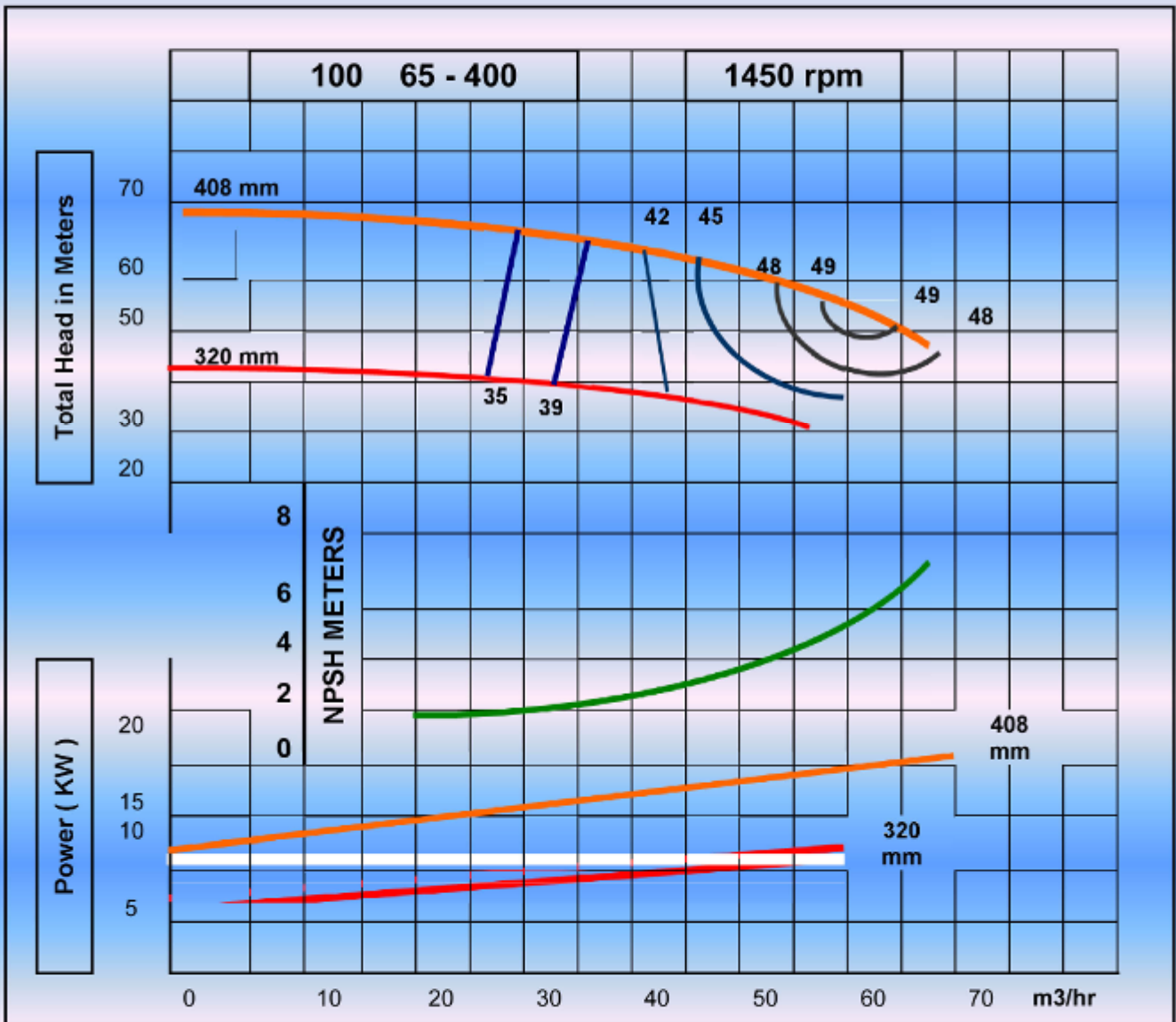


Dimensions



PUMP SIZE	MOTOR FRAME	A	B	C	D	E	F	G	H	J	K	L MAX	M	N MAX
65-100	71, 80, 90S, 90L, 100L	65	80	100	150	232	160	750	110	8	200	191	4-15	1022
25-125	71, 80, 90S, 90L	25	50	75	148	212	150	750	110	8	200	230	4-15	970
32-125	71, 80, 90S, 90L, 100L	32	50	80	130	212	140	750	110	8	200	191	4-15	1002
50-125	71, 80, 90S, 90L, 100L, 112M	50	65	80	130	212	140	750	110	8	200	216	4-15	1021
65-125	71, 80, 90L, 100L	65	80	100	150	232	160	750	110	8	200	191	4-15	1022
65-125	112M	65	80	100	120	232	160	750	110	8	200	216	4-15	1011
65-125	132S	65	80	100	80	232	160	750	110	8	200	235	4-15	1103
80-125	80, 90S, 100L, 112M	80	100	100	150	260	180	750	110	8	200	216	4-15	1041
80-125	132S	80	100	100	80	260	180	750	110	8	200	235	4-15	1103
25-162	71, 80, 90S, 90L, 100L	25	50	75	148	232	170	750	110	8	200	247	4-15	1014
32-160	71, 80, 90S, 90L, 100L, 112M	32	50	80	130	232	160	750	110	8	200	216	4-15	1021
32-160	132S	32	50	80	70	232	160	750	110	8	200	235	4-15	1083
50-160	71, 80, 90L, 100L, 112M	50	65	80	130	232	160	750	110	8	200	216	4-15	1021
50-160	132S	50	65	80	70	232	160	750	110	8	200	235	4-15	1083
65-160	80, 90S, 112M	65	80	100	150	260	180	750	110	8	200	216	4-15	1041
65-160	132S	65	80	100	80	260	180	750	110	8	200	235	4-15	1103
65-160	160M	65	80	100	150	260	180	1050	150	8	235	273	4-15	1350
80-160	80	80	100	100	120	260	200	750	110	8	200	165	4-15	1015
80-160	90S	80	100	100	110	260	200	750	110	8	200	178	4-15	1033
80-160	90L	80	100	100	90	260	200	750	110	8	200	178	4-15	1048
80-160	100L	80	100	100	180	260	200	750	110	8	200	191	4-15	1350
80-160	132S, 160M, 160L	80	100	100	150	260	200	1050	150	8	235	273	4-15	1403
80-160	180M	80	100	100	150	280	200	1050	150	8	235	305	4-15	1462
100-160	90L, 100L, 112M	100	125	150	200	260	280	1050	150	8	235	216	4-15	1350
100-160	160M, 160L, 180M	100	125	150	140	260	280	1050	150	8	235	305	4-15	1502
100-160	200L	100	125	150	140	300	280	1050	200	8	260	357	4-19	1574
32-200	71, 80, 100L, 112M	32	50	80	130	260	180	750	110	8	200	216	4-15	1021
32-200	132S	32	50	80	70	260	180	750	110	8	200	235	4-15	1083
40-200	80, 90S, 90L	40	65	100	150	260	180	750	110	8	200	178	4-15	978
40-200	132S	40	65	100	80	260	180	750	110	8	200	235	4-15	1103
40-200	160M	40	65	100	150	260	180	1050	150	8	235	273	4-15	1288
50-200	90S, 90L, 100L	50	80	100	150	260	200	750	110	8	200	191	4-15	1022
50-200	132S	50	80	100	80	260	200	750	110	8	200	235	4-15	1103
50-200	160M, 160L	50	80	100	150	260	200	1050	150	8	235	273	4-15	1350
65-200	100L, 112M	65	100	100	180	280	225	1050	150	8	235	216	4-15	1350
65-200	160M	65	100	100	150	280	225	1050	150	8	235	273	4-15	1443
65-200	160L, 180M	65	100	100	90	280	225	1050	150	8	235	305	4-15	1452
65-200	200L	65	100	100	90	300	225	1050	200	8	260	357	4-19	1524
100-200	100L, 112M	100	125	125	205	300	280	1050	150	8	235	216	4-15	1350
100-200	132S	100	125	125	175	300	280	1050	150	8	235	235	4-15	1350
100-200	160L, 180M	100	125	125	115	300	280	1050	150	8	235	335	4-15	1477
100-200	200L	100	125	125	115	300	280	1050	200	8	260	343	4-19	1549
100-200	225M	100	125	125	115	325	280	1300	100	10	300	394	6-15	1625

All dimensions in millimetres
 Flange drillings are to DIN 2533 ND16 or ANSI 125FF for cast iron pumps and DIN 2501 ND16 or ANSI 150RF for stainless steel and non-metallic pumps.



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