

50 Hz



Z6 Series

6" Submersible Pumps and Electric Pumps
Z612, Z616, Z622, Z631, Z646 and Z660

ErP 2009/125/EC

Directive 2009/125/EC of the European Union

The **Directive 2005/32/EC** on energy-using products (**EuP**) and the subsequent **Directive 2009/125/EC** on energy-related products (**ErP**) established the ecodesign requirements for products to reduce their energy consumption and consequently their environmental impact.

These requirements apply to products placed and used in the European Economic Area (European Union plus Iceland, Liechtenstein and Norway) as a stand-alone unit or as integrated parts in other products.

The following tables show the Regulations that define the requirements applicable to Lowara products.

- Some types of **pump**, used for pumping clean water:

Regulations	From	Target
(EU) N. 547/2012 and subsequent updates	1 January 2015	MEI $\geq 0,4$

- Circulators** with a rated hydraulic output power of between 1 and 2500 W, designed for use in heating systems or in secondary circuits of cooling distribution systems:

Regulations	From	Target
(EC) N. 641/2009 and subsequent updates	1 August 2015	EEI $< 0,23$

- Three-phase motors** with frequency 50 or 60 or 50/60 Hz and voltages between 50 and 1000 V (S1 and D.O.L.):

Regulations	From	Target
(EU) 2019/1781 and subsequent updates	1 July 2023	IE2 : motors with a rated output $\geq 0,12$ and $< 0,749$ kW IE3 : motors with a rated output $\geq 0,75$ and $< 74,9$ kW IE4 : motors with a rated output ≥ 75 and < 200 kW IE3 : motors with a rated output ≥ 201 and < 1000 kW

- Single-phase motors** with frequency 50 or 60 or 50/60 Hz and voltages between 50 and 1000 V (S1 and D.O.L.):

Regulations	From	Target
(EU) 2019/1781 and 2021/341	1 July 2023	IE2 : motors with a rated output $\geq 0,12$ kW

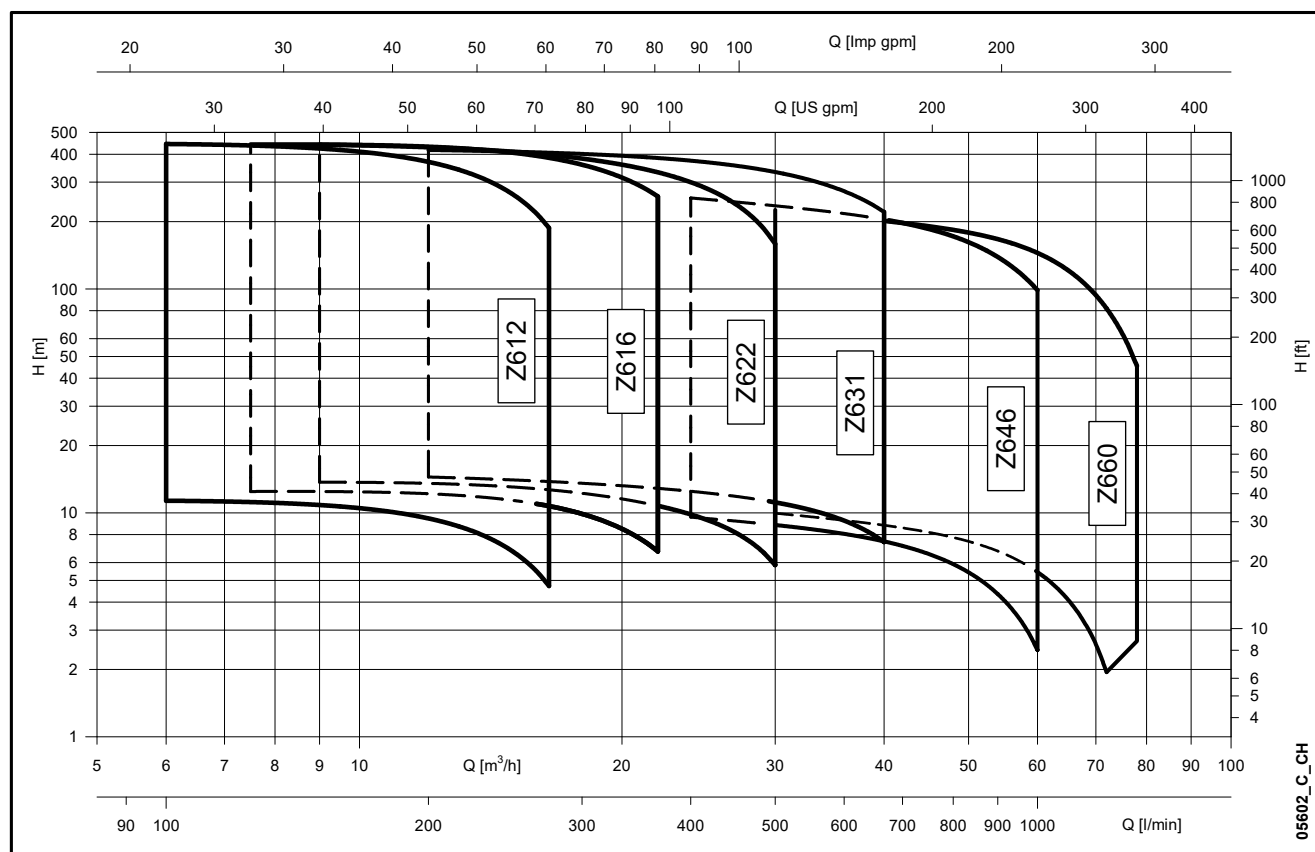
- Variable speed drives** with three-phase input and rated output power from 0,12 kW up to 1000 kW, rated for operating with motor included in the same regulations:

Regulations	From	Target
(EU) 2019/1781 and 2021/341	1 July 2021	IE2

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Z6 SERIES HYDRAULIC PERFORMANCE RANGE



6" Submersible Electric Pumps

Z6 Series



MARKET SECTORS

RESIDENTIAL, AGRICULTURE, INDUSTRY.

APPLICATIONS

- Groundwater supply
- Irrigation
- Groundwater lowering
- Fountains waterworks
- Pressure boosting
- Industrial applications
- Mine dewatering.

SPECIFICATIONS

- **Delivery:** up to 78 m³/h.
- **Head:** up to 460 m.
- **Maximum overall diameter of pump:** 142 mm (one cable guard included).
- **Maximum pump immersion depth:** 300 m with C4S motors.
350 m with L6W motors.
- **Maximum permissible quantity of suspended sand:** 100 g/m³.
- **Delivery port:** Rp 2 1/2" for Z612-Z616-Z622 versions.
Rp 3" for Z631-Z646-Z660 versions.
- **Construction materials available:** AISI304 stainless steel (Z6),
AISI316 stainless steel (ZN6).
- **All pumps can operate in the horizontal position.**
Ensure that the motor's operating conditions are compatible with this configuration.

CONSTRUCTION CHARACTERISTICS

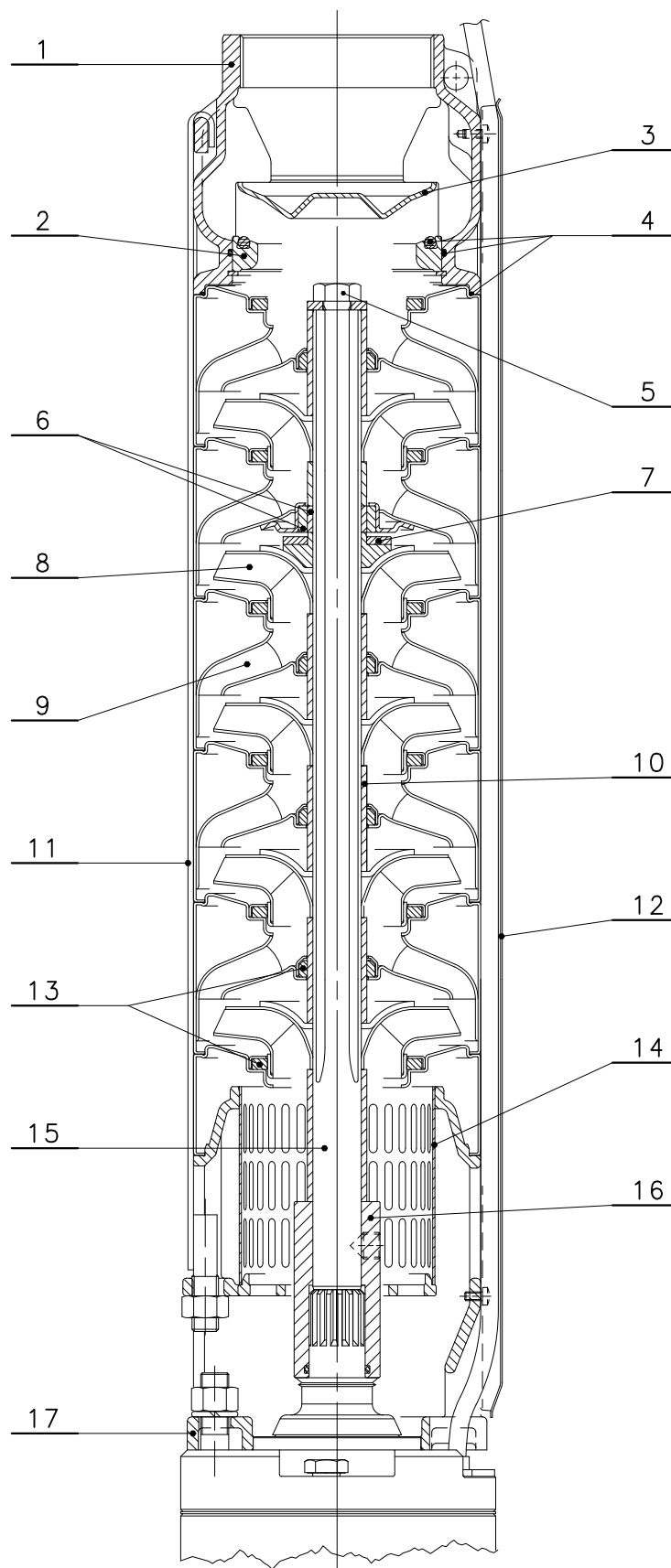
- **Head and motor support** made of microcast stainless steel.
- **Delivery port** equipped with holes for safety hooks.
- Stainless steel **integrated non-return valve**.
- Stainless steel **impeller** with removable wear ring.
- Stainless steel **shaft** protected by shaft sleeves.
- **Replaceable coupling.**

ACCESSORIES

- Coupling flanges.
- Control panels.
- Drop cables.
- Cable joints
- Cooling shrouds.



**Z6 SERIES
PUMP SECTION AND LIST OF MAIN COMPONENTS**



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Z6 SERIES

TABLE OF MATERIALS

REF. N°	NAME	MATERIAL	REFERENCE STANDARDS	
			EUROPE	USA
1	Discharge head	Stainless steel	EN 10213-4 - GX5CrNi19-10 (1.4308)	ASTM CF-8 (AISI 304 cast)
2	Valve support	Stainless steel	EN 10213-4 - GX5CrNi19-10 (1.4308)	ASTM CF-8 (AISI 304 cast)
3	Valve	Stainless steel	EN 10088-1 - X5CrNi18-10 (1.4301)	AISI 304
4	Elastomers	EPDM		
5	Bolts and screws	Stainless steel	EN 10088-1 - X5CrNi18-10 (1.4301)	AISI 304
6	Shaft sleeve and bushing	Tungsten carbide		
7	Thrust bearing	PTFE+Graphite		
8	Impeller	Stainless steel	EN 10088-1 - X5CrNi18-10 (1.4301)	AISI 304
9	Diffuser	Stainless steel	EN 10088-1 - X5CrNi18-10 (1.4301)	AISI 304
10	Spacer	Stainless steel	EN 10088-1 - X17CrNi16-2 (1.4057)	AISI 431
11	Tie rod	Stainless steel	EN 10088-1 - X5CrNi18-10 (1.4301)	AISI 304
12	Cable guard	Stainless steel	EN 10088-1 - X5CrNi18-10 (1.4301)	AISI 304
13	Wear rings	Technopolymer PPO		
14	Strainer	Stainless steel	EN 10088-1 - X5CrNi18-10 (1.4301)	AISI 304
15	Shaft	Stainless steel	EN 10088-1 - X17CrNi16-2 (1.4057)	AISI 431
16	Coupling	Stainless steel	EN 10088-1 - X17CrNi16-2 (1.4057)	AISI 431
17	Lower support	Stainless steel	EN 10213-4 - GX5CrNi19-10 (1.4308)	ASTM CF-8 (AISI 304 cast)

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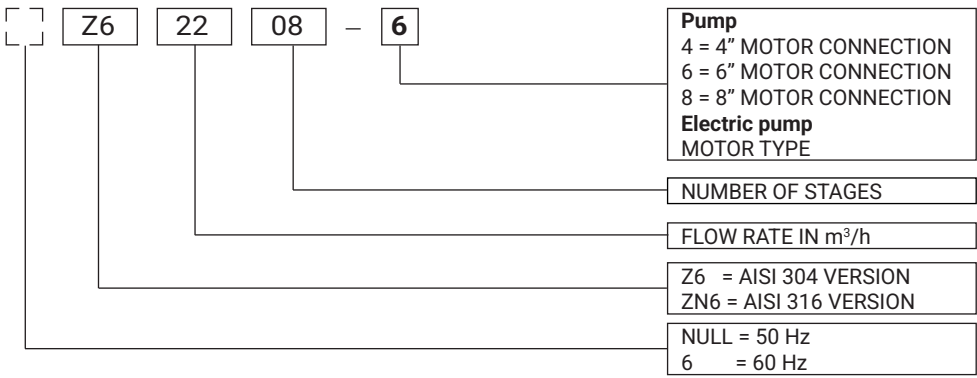
ZN6 SERIES

TABLE OF MATERIALS

REF. N°	NAME	MATERIAL	REFERENCE STANDARDS	
			EUROPE	USA
1	Discharge head	Stainless steel	EN 10213-4 - GX5CrNiMo19-11-2 (1.4408)	ASTM CF-8M (AISI 316 cast)
2	Valve support	Stainless steel	EN 10213-4 - GX5CrNiMo19-11-2 (1.4408)	ASTM CF-8M (AISI 316 cast)
3	Valve	Stainless steel	EN 10088-1 - X2CrNiMo17-12-2 (1.4404)	AISI 316L
4	Elastomers	EPDM		
5	Bolts and screws	Stainless steel	EN 10088-1 - X5CrNiMo17-12-2 (1.4401)	AISI 316
6	Shaft sleeve and bushing	Tungsten carbide		
7	Thrust bearing	PTFE+Graphite		
8	Impeller	Stainless steel	EN 10088-1 - X2CrNiMo17-12-2 (1.4404)	AISI 316L
9	Diffuser	Stainless steel	EN 10088-1 - X2CrNiMo17-12-2 (1.4404)	AISI 316L
10	Spacer	Duplex stainless steel	EN 10088-1 - X2CrNiN23-4 (1.4362)	UNS S 32304
11	Tie rod	Stainless steel	EN 10088-1 - X2CrNiMo17-12-2 (1.4404)	AISI 316L
12	Cable guard	Stainless steel	EN 10088-1 - X2CrNiMo17-12-2 (1.4404)	AISI 316L
13	Wear rings	Technopolymer PPO		
14	Strainer	Stainless steel	EN 10088-1 - X2CrNiMo17-12-2 (1.4404)	AISI 316L
15	Shaft	Duplex stainless steel	EN 10088-1 - X2CrNiMoN22-5-3 (1.4462)	UNS S 31803
16	Coupling	Duplex stainless steel	EN 10088-1 - X2CrNiN23-4 (1.4362)	UNS S 32304
17	Lower support	Stainless steel	EN 10213-4 - GX5CrNiMo19-11-2 (1.4408)	ASTM CF-8M (AISI 316 cast)

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**Z6 SERIES
IDENTIFICATION CODE**

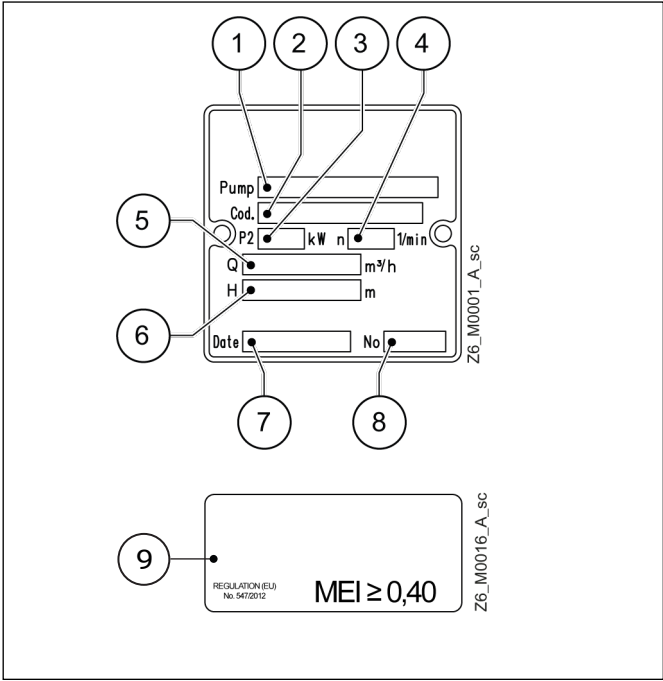


EXAMPLE :

Z622 08 - 6
6" Pump at 50 Hz, AISI 304, flow rate 22 m³/h, 8 stages, with 6" motor connection.

Z622 08 - L6W
6" Electric pump at 50 Hz, AISI 304, flow rate 22 m³/h, 8 stages, coupled to a 6" motor L6W.

RATING PLATE



LEGEND

- 1. Type
- 2. Identification code
- 3. Rated output
- 4. Speed
- 5. Flow rate range
- 6. Head range
- 7. Production date
- 8. Serial number
- 9. MEI label (Regulation EU n. 547/2012)

Z6 SERIES PUMPS (ErP 2009/125/EC)

With the **Regulation (EU) N. 547/2012**, the European Commission has established the requirements of ecodesign for some typologies of pumps used for pumping clean water, placed on the market and operated as stand-alone units or as parts of other products.

For vertical multi-stage pumps (MS-V for the Regulations), the requirements refers to:

- just the pump and not the pump and motor assembly (electric or combustion);
- pumps with:
 - a nominal pressure PN not higher than 25 bar (2500 kPa);
 - a speed of 2900 min⁻¹ (for electric pumps this means 50 Hz 2-pole electric motors);
 - a maximum flow of 100 m³/h;
- use with clean water at a temperature ranging from -10°C to 120°C (the test is performed with cold water at a temperature not higher than 40°C).

This regulation states that water pumps shall have index MEI coming from a dedicated formula which considers hydraulic efficiency values at 'best efficiency point' (BEP), 75 % of the flow at BEP (Part load – PL) and 110 % of the flow at BEP (Over load – OL).

The Regulation also establishes the following deadline:

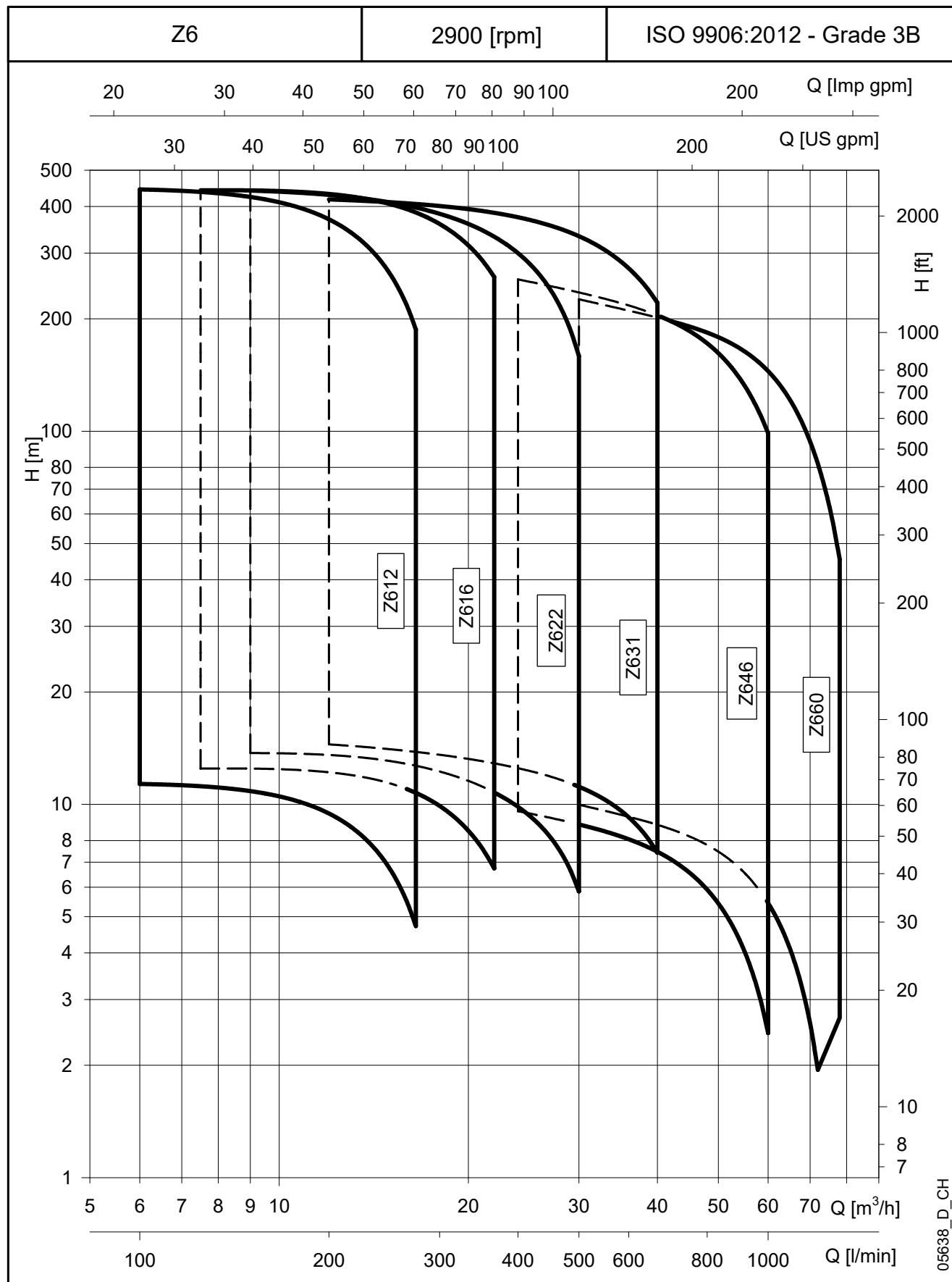
from	minimum efficiency index (MEI)
1 st January 2015	MEI ≥ 0,4

Regulation (EU) n. 547/2012 – Annex II – point 2 (Product information requirements)

- 1) Minimum efficiency index: see the MEI column in the tables in the Hydraulic performance section.
- 2) The benchmark for most efficient water pumps is MEI ≥ 0,70.
- 3) Year of manufacture: see date on rating plate (≥ 2013).
- 4) Manufacturer: Lowara srl Unipersonale - Reg. No. 03471820260 - Montecchio Maggiore, Vicenza, Italy.
- 5) Product type: see the PUMP TYPE column in the tables in the Hydraulic performance section.
- 6) Hydraulic pump efficiency with trimmed impeller: not applicable to these products.
- 7) Pump performance curves, including the performance curve: see the Operating Characteristics graphs in the following pages.
- 8) The efficiency of a pump with a trimmed impeller is usually lower than that of a pump with the full impeller diameter. The trimming of the impeller will adapt the pump to a fixed duty point, leading to reduced energy consumption. The minimum efficiency index (MEI) is based on the full impeller diameter.
- 9) The operation of this water pump with variable duty points may be more efficient and economic when controlled, for example, by the use of a variable speed drive that matches the pump duty to the system.
- 10) Information relevant for disassembly, recycling or disposal at end-of-life: observe the current laws and by-laws governing sorted waste disposal. Consult the product operating manual.
- 11) "Designed for use below – 10 °C only": note not applicable to these products.
- 12) "Designed for use above 120 °C only": note not applicable to these products.
- 13) Specific instructions for pumps as per points 11 and 12: not applicable to these products.
- 14) "Information on benchmark efficiency is available at": www.europump.org (Ecodesign section).
- 15) The benchmark efficiency graphs with MEI = 0.7 and MEI = 0.4 are available at www.europump.org, (Ecodesign, Efficiency charts). Refer to "Multistage Vertical 2900 rpm"

Z6 SERIES

HYDRAULIC PERFORMANCE RANGE AT 50 Hz, 2 POLES



Z612: FROM 1 TO 19 STAGES

HYDRAULIC PERFORMANCE TABLE AT 50 Hz, 2 POLES

PUMP TYPE	RATED POWER		Q = DELIVERY						
			l/min	0	100	150	200	250	275
			m³/h	0	6	9	12	15	16,5
	kW	MEI* ≥	H = TOTAL HEAD METRES COLUMN OF WATER						
Z612 01	0,55	0,40	11,3	11,3	10,9	9,5	6,7	4,7	
Z612 02	1,1	0,40	22,6	22,7	21,7	19,1	14,4	11,1	
Z612 03	1,5	0,40	33,9	34,0	32,6	28,7	21,6	16,6	
Z612 04	2,2	0,40	45,2	45,4	43,4	38,3	28,8	22,2	
Z612 05	3	0,40	56,5	56,7	54,3	47,6	34,9	25,8	
Z612 06	3	0,40	67,8	68,0	65,1	57,2	42,1	31,4	
Z612 07	4	0,40	79,1	79,4	76,0	66,6	48,8	36,1	
Z612 08	4	0,40	90,4	90,7	86,9	76,4	56,7	42,9	
Z612 09	5,5	0,40	101,7	102,1	97,7	85,6	62,4	45,8	
Z612 10	5,5	0,40	113,0	113,4	108,6	95,1	69,7	51,5	
Z612 11	5,5	0,40	124,3	124,7	119,4	104,8	77,1	57,4	
Z612 12	7,5	0,40	135,6	136,1	130,3	114,1	83,5	61,6	
Z612 13	7,5	0,40	146,8	147,4	141,1	123,7	90,6	66,9	
Z612 14	7,5	0,40	158,1	158,8	152,0	133,4	98,6	73,8	
Z612 15	7,5	0,40	169,4	170,1	162,9	143,2	106,5	80,8	
Z612 16	9,3	0,40	180,7	181,5	173,7	152,4	112,1	83,4	
Z612 17	9,3	0,40	192,0	192,8	184,6	162,0	119,6	89,5	
Z612 18	9,3	0,40	203,3	204,1	195,5	171,8	127,7	96,6	
Z612 19	9,3	0,40	214,6	215,5	206,3	181,5	135,3	102,9	

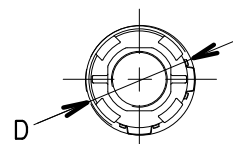
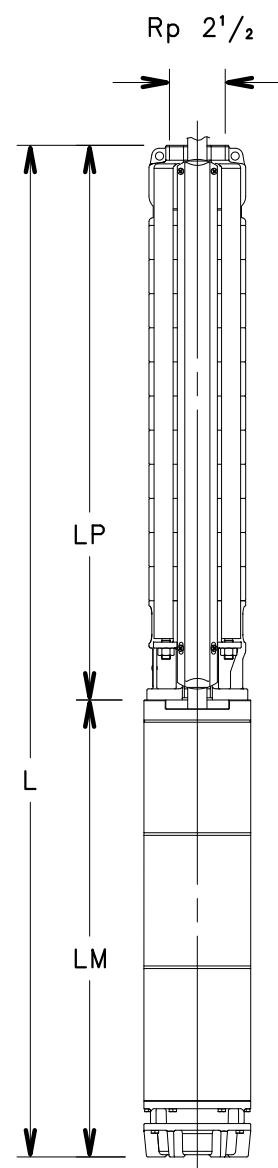
* Efficiency index MEI

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DIMENSIONS AND WEIGHTS

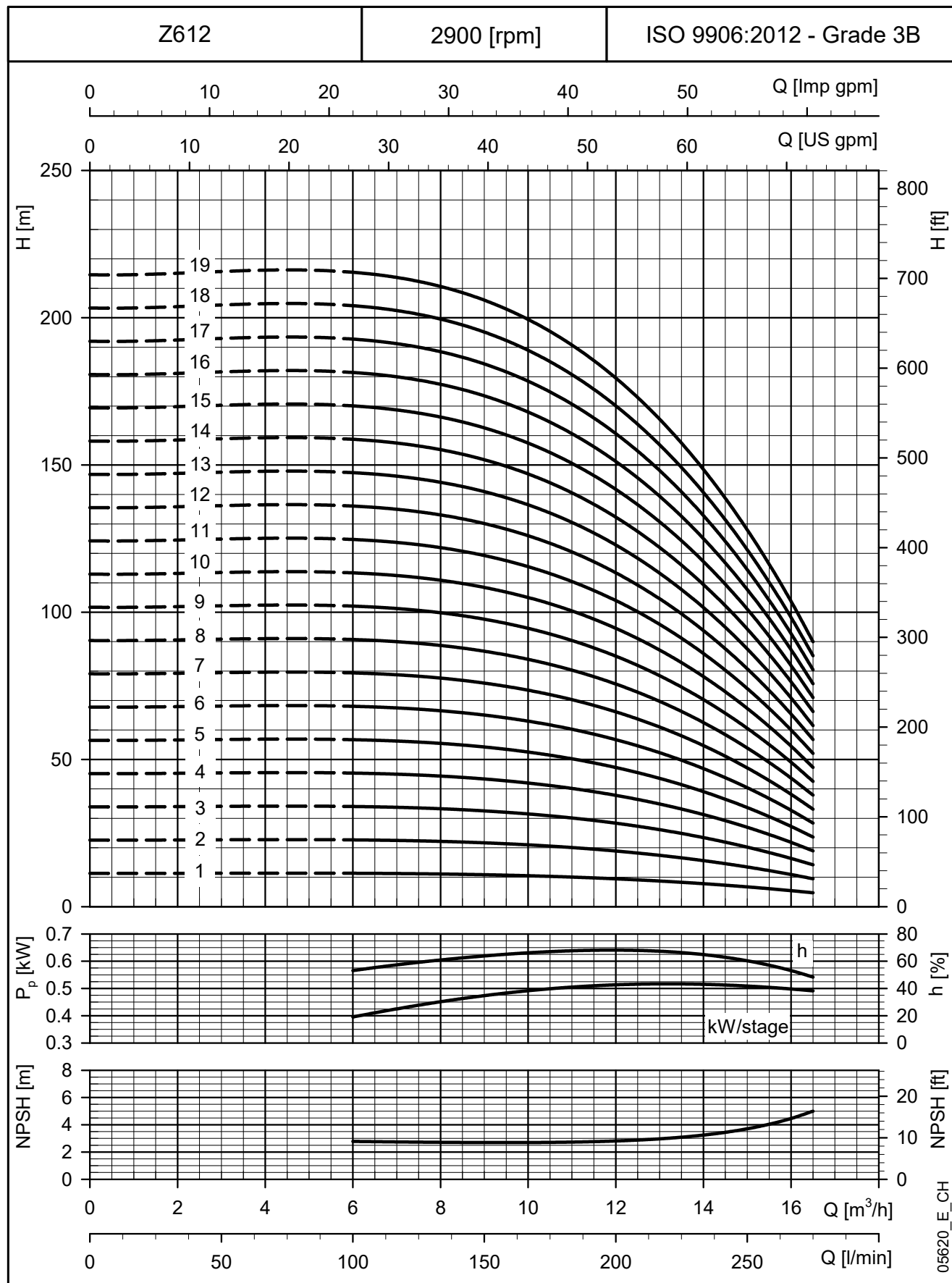
ELECTRO PUMP TYPE	RATED POWER kW	DIMENSIONS (mm)					WEIGHT
		L	LM	LP	ø D		
					1 Cable	2 Cables	Kg
Z612 01-C4S	0,55	630	250	380	142	144	18
Z612 02-C4S	1,1	731	305	426	142	144	21
Z612 03-C4S	1,5	812	340	472	142	144	24
Z612 04-C4S	2,2	898	380	518	142	144	27
Z612 05-C4S	3	1044	480	564	142	144	33
Z612 06-C4S	3	1090	480	610	142	144	34
Z612 07-C4S	4	1206	550	656	142	144	39
Z612 08-C4S	4	1252	550	702	142	144	40
Z612 09-C4S	5,5	1423	675	748	142	144	47
Z612 10-C4S	5,5	1469	675	794	142	144	48
Z612 11-C4S	5,5	1515	675	840	142	144	50
Z612 12-C4S	7,5	1651	765	886	142	144	55
Z612 13-C4S	7,5	1697	765	932	142	144	56
Z612 14-C4S	7,5	1743	765	978	142	144	57
Z612 15-C4S	7,5	1789	765	1024	142	144	58
Z612 07-L6W	4	1239	583	656	144	146	56
Z612 08-L6W	4	1285	583	702	144	146	57
Z612 09-L6W	5,5	1361	613	748	144	146	61
Z612 10-L6W	5,5	1407	613	794	144	146	62
Z612 11-L6W	5,5	1453	613	840	144	146	63
Z612 12-L6W	7,5	1539	653	886	144	146	68
Z612 13-L6W	7,5	1585	653	932	144	146	69
Z612 14-L6W	7,5	1631	653	978	144	146	70
Z612 15-L6W	7,5	1677	653	1024	144	146	72
Z612 16-L6W	9,3	1753	683	1070	144	146	75
Z612 17-L6W	9,3	1799	683	1116	144	146	76
Z612 18-L6W	9,3	1845	683	1162	144	146	77
Z612 19-L6W	9,3	1891	683	1208	144	146	78

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Z612: FROM 1 TO 19 STAGES **HYDRAULIC PERFORMANCE RANGE AT 50 Hz, 2 POLES**



These performances are valid for liquids with density $\rho = 1.0 \text{ kg/dm}^3$ and kinematic viscosity $\nu = 1 \text{ mm}^2/\text{sec}$.

Z612: FROM 20 TO 39 STAGES

HYDRAULIC PERFORMANCE TABLE AT 50 Hz, 2 POLES

PUMP TYPE	RATED POWER		Q = DELIVERY						
			l/min	0	100	150	200	250	275
	m³/h	0	6	9	12	15	16,5		
	kW	MEI* ≥	H = TOTAL HEAD METRES COLUMN OF WATER						
Z612 20	11	0,40	228,2	227,4	217,8	190,9	137,9	98,6	
Z612 21	11	0,40	239,6	238,7	228,7	200,5	144,8	103,5	
Z612 22	11	0,40	251,0	250,1	239,6	210,0	151,7	108,5	
Z612 23	11	0,40	262,4	261,5	250,4	219,6	158,7	113,4	
Z612 24	13	0,40	273,3	273,1	261,2	227,4	160,8	111,4	
Z612 25	13	0,40	284,6	284,5	272,0	236,9	167,5	116,1	
Z612 26	13	0,40	296,0	295,9	282,9	246,3	174,2	120,7	
Z612 27	13	0,40	307,4	307,3	293,8	255,8	181,0	125,4	
Z612 28	13	0,40	318,8	318,6	304,6	265,3	187,7	130,1	
Z612 29	15	0,40	332,0	332,8	318,6	279,0	202,1	145,3	
Z612 30	15	0,40	343,4	344,3	329,5	288,6	209,0	150,4	
Z612 31	15	0,40	354,9	355,8	340,5	298,2	216,0	155,4	
Z612 32	15	0,40	366,3	367,2	351,5	307,9	223,0	160,5	
Z612 33	18,5	0,40	374,8	376,0	359,0	312,8	223,7	158,5	
Z612 34	18,5	0,40	386,2	387,4	369,9	322,2	230,5	163,3	
Z612 35	18,5	0,40	397,5	398,8	380,7	331,7	237,3	168,1	
Z612 36	18,5	0,40	408,9	410,2	391,6	341,2	244,1	173,0	
Z612 37	18,5	0,40	420,2	421,6	402,4	350,6	250,9	177,8	
Z612 38	18,5	0,40	431,6	433,0	413,3	360,1	257,7	182,6	
Z612 39	18,5	0,40	442,9	444,4	424,2	369,6	264,5	187,4	

* Efficiency index MEI

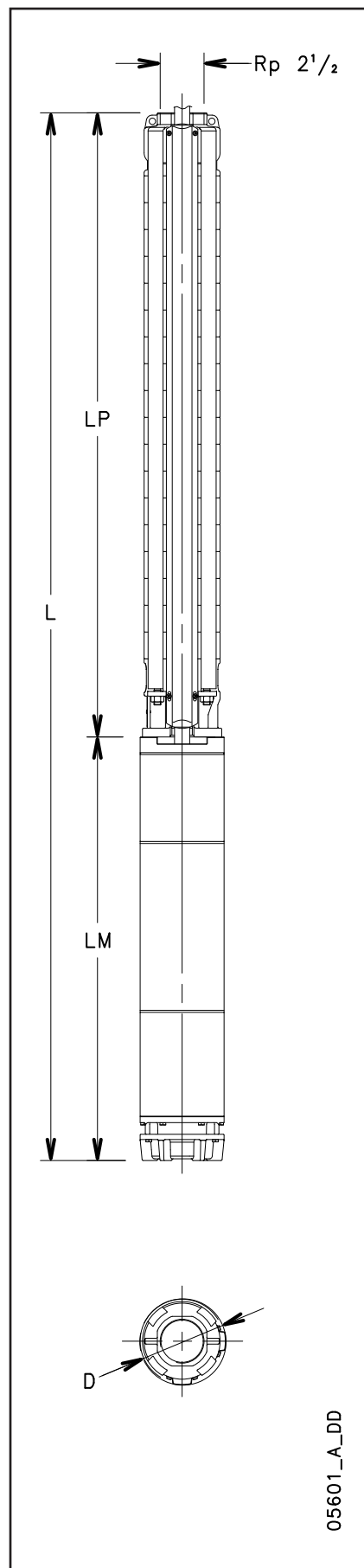
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DIMENSIONS AND WEIGHTS

ELECTRO PUMP TYPE	RATED POWER kW	DIMENSIONS (mm)					WEIGHT
		L	LM	LP	ø D		kg
					1 Cable	2 Cables	
Z612 20-L6W	11	1977	723	1254	144	146	84
Z612 21-L6W	11	2023	723	1300	144	146	85
Z612 22-L6W	11	2069	723	1346	144	146	86
Z612 23-L6W	11	2161	723	1438	144	146	88
Z612 24-L6W	13	2247	763	1484	144	146	94
Z612 25-L6W	13	2293	763	1530	144	146	95
Z612 26-L6W	13	2339	763	1576	144	146	97
Z612 27-L6W	13	2385	763	1622	144	146	98
Z612 28-L6W	13	2431	763	1668	144	146	99
Z612 29-L6W	15	2547	833	1714	144	146	103
Z612 30-L6W	15	2593	833	1760	144	146	104
Z612 31-L6W	15	2639	833	1806	144	146	106
Z612 32-L6W	15	2685	833	1852	144	146	107
Z612 33-L6W	18.5	2801	903	1898	144	146	120
Z612 34-L6W	18.5	2847	903	1944	144	146	121
Z612 35-L6W	18.5	2893	903	1990	144	146	122
Z612 36-L6W	18.5	2985	903	2082	144	146	124
Z612 37-L6W	18.5	3031	903	2128	144	146	126
Z612 38-L6W	18.5	3077	903	2174	144	146	127
Z612 39-L6W	18.5	3123	903	2220	144	146	128

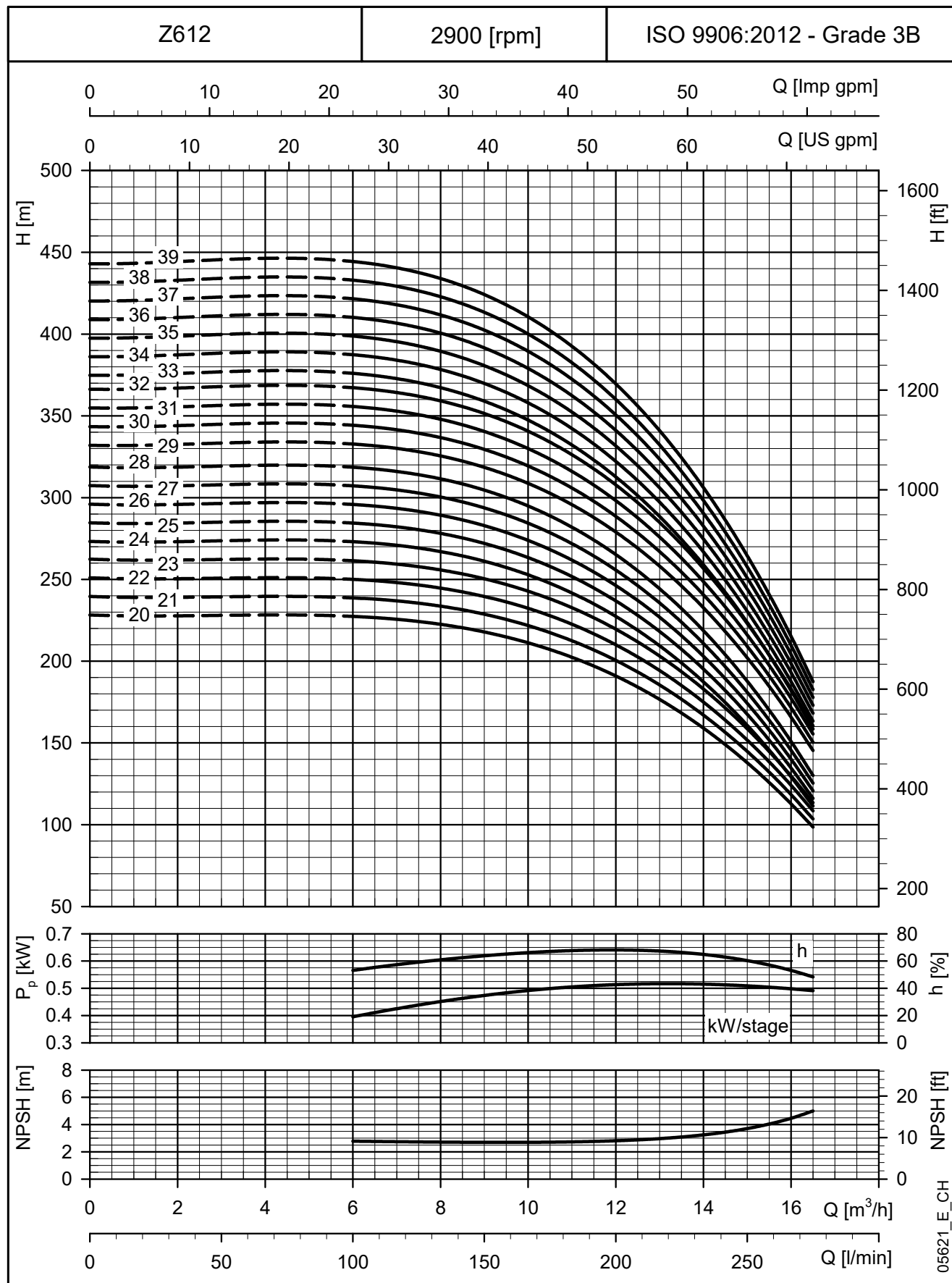
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Pump and motor are supplied uncoupled in two separated packages if the total length is > 3000 mm



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Z612: FROM 20 TO 39 STAGES **HYDRAULIC PERFORMANCE RANGE AT 50 Hz, 2 POLES**



These performances are valid for liquids with density $\rho = 1.0 \text{ kg/dm}^3$ and kinematic viscosity $\nu = 1 \text{ mm}^2/\text{sec}$.

Z616: FROM 1 TO 18 STAGES

HYDRAULIC PERFORMANCE RANGE AT 50 Hz, 2 POLES

PUMP TYPE	RATED POWER		Q = DELIVERY						
			l/min	0	125	200	250	300	367
	m³/h	0	7,5	12	15	18	22		
	kW	MEI* ≥	H = TOTAL HEAD METRES COLUMN OF WATER						
Z616 01	0,75	0,40	12,1		12,5	12,2	11,4	9,9	6,7
Z616 02	1,5	0,40	24,1		24,4	24,0	22,7	20,2	14,8
Z616 03	2,2	0,40	36,1		36,6	36,0	34,0	30,3	22,1
Z616 04	3	0,40	48,0		48,9	48,0	45,3	40,3	29,6
Z616 05	4	0,40	60,0		61,1	60,0	56,6	50,4	37,0
Z616 06	5,5	0,40	72,3		73,6	72,2	68,0	60,3	44,1
Z616 07	5,5	0,40	84,3		86,1	84,4	79,5	70,5	51,7
Z616 08	7,5	0,40	96,3		98,4	96,5	90,8	80,6	59,1
Z616 09	7,5	0,40	108,6		110,8	108,6	102,2	90,7	66,8
Z616 10	7,5	0,40	121,1		123,3	120,6	113,4	100,3	72,4
Z616 11	9,3	0,40	133,2		135,6	132,7	124,8	110,4	79,6
Z616 12	9,3	0,40	145,6		148,0	145,1	136,7	121,4	88,1
Z616 13	11	0,40	157,7		160,3	157,2	148,1	131,5	95,5
Z616 14	11	0,40	169,5		172,8	169,4	159,7	142,1	104,2
Z616 15	11	0,40	181,6		185,2	181,5	171,1	152,2	111,6
Z616 16	11	0,40	193,7		197,5	193,6	182,5	162,4	119,0
Z616 17	13	0,40	206,3		209,7	205,0	192,3	169,8	124,1
Z616 18	13	0,40	218,5		222,1	217,1	203,6	179,8	131,4

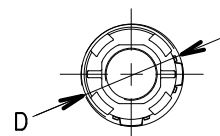
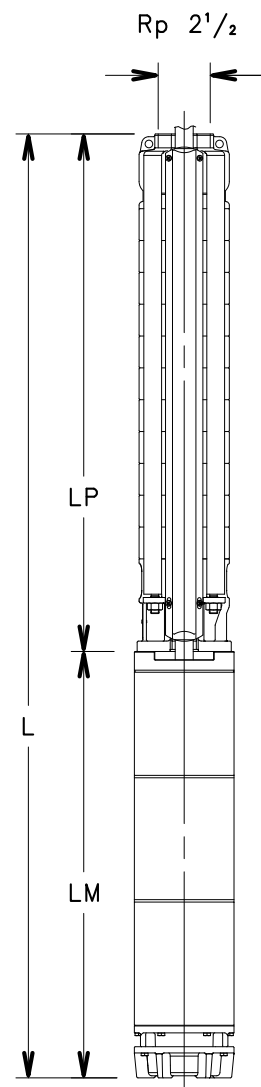
* Efficiency index MEI

z616-1-50-en_c_th

DIMENSIONS AND WEIGHTS

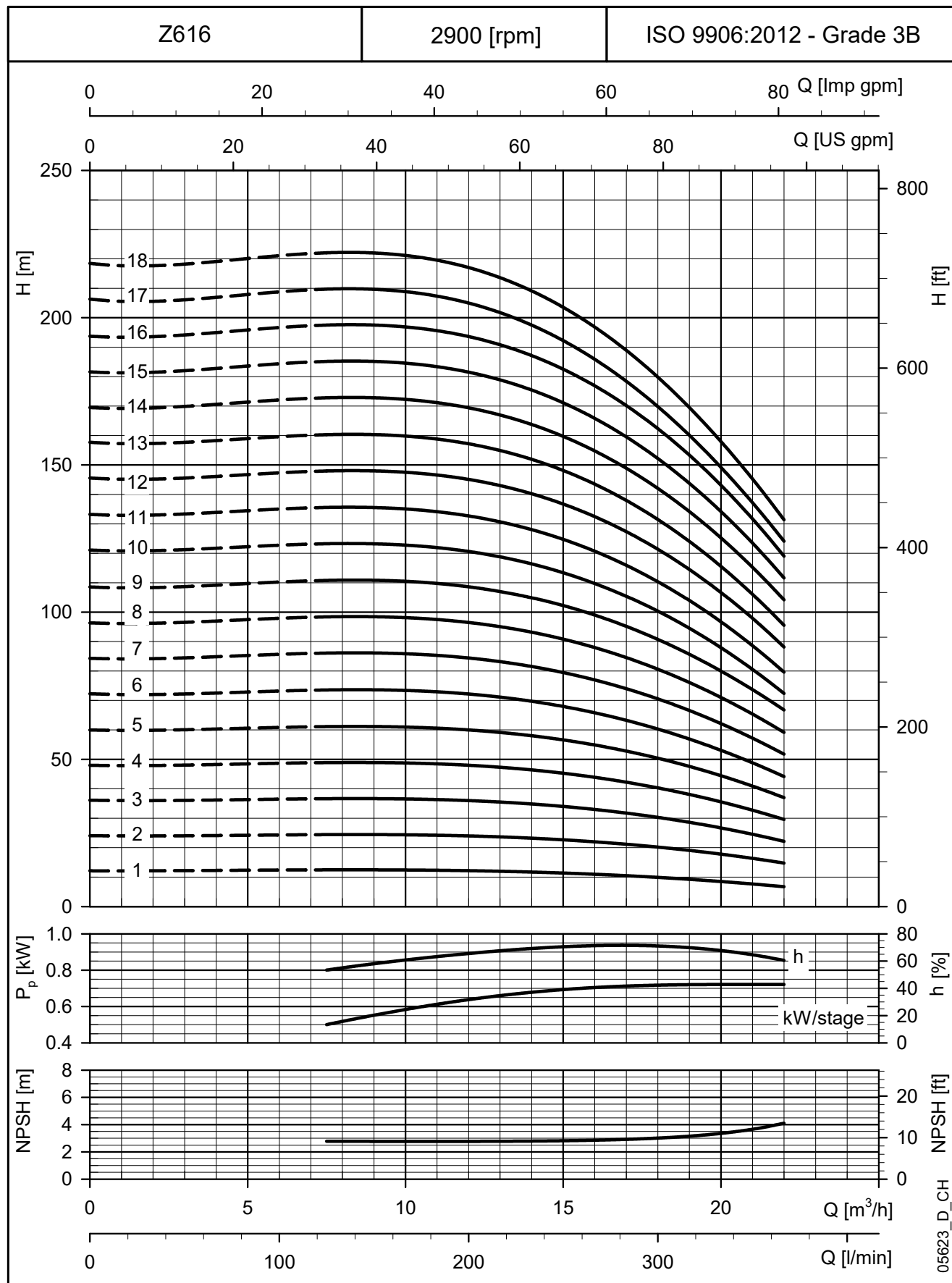
ELECTRO PUMP TYPE	RATED POWER kW	DIMENSIONS (mm)					WEIGHT
		L	LM	LP	ø D		
					1 Cable	2 Cables	Kg
Z616 01-C4S	0,75	645	265	380	142	144	18
Z616 02-C4S	1,5	766	340	426	142	144	23
Z616 03-C4S	2,2	852	380	472	142	144	26
Z616 04-C4S	3	998	480	518	142	144	32
Z616 05-C4S	4	1114	550	564	142	144	37
Z616 06-C4S	5,5	1285	675	610	142	144	44
Z616 07-C4S	5,5	1331	675	656	142	144	45
Z616 08-C4S	7,5	1467	765	702	142	144	50
Z616 09-C4S	7,5	1513	765	748	142	144	51
Z616 10-C4S	7,5	1559	765	794	142	144	53
Z616 05-L6W	4	1147	583	564	144	146	54
Z616 06-L6W	5,5	1223	613	610	144	146	57
Z616 07-L6W	5,5	1269	613	656	144	146	58
Z616 08-L6W	7,5	1355	653	702	144	146	63
Z616 09-L6W	7,5	1401	653	748	144	146	65
Z616 10-L6W	7,5	1447	653	794	144	146	66
Z616 11-L6W	9,3	1523	683	840	144	146	69
Z616 12-L6W	9,3	1569	683	886	144	146	70
Z616 13-L6W	11	1655	723	932	144	146	75
Z616 14-L6W	11	1701	723	978	144	146	76
Z616 15-L6W	11	1747	723	1024	144	146	78
Z616 16-L6W	11	1793	723	1070	144	146	79
Z616 17-L6W	13	1879	763	1116	144	146	85
Z616 18-L6W	13	1925	763	1162	144	146	86

z616-1-50-en_c_td



05600_A_DD

Z616: FROM 1 TO 18 STAGES **HYDRAULIC PERFORMANCE RANGE AT 50 Hz, 2 POLES**



These performances are valid for liquids with density $\rho = 1.0 \text{ kg/dm}^3$ and kinematic viscosity $\nu = 1 \text{ mm}^2/\text{sec}$.

Z616: FROM 19 TO 36 STAGES

HYDRAULIC PERFORMANCE RANGE AT 50 Hz, 2 POLES

PUMP TYPE	RATED POWER		Q = DELIVERY						
			l/min	0	125	200	250	300	367
			m³/h	0	7,5	12	15	18	22
	kW	MEI* ≥	H = TOTAL HEAD METRES COLUMN OF WATER						
Z616 19	15	0,40	230,6	234,4	229,1	214,9	189,8	138,	
Z616 20	15	0,40	241,0	245,5	240,1	225,6	199,6	143,9	
Z616 21	15	0,40	253,0	257,8	252,1	236,9	209,5	151,1	
Z616 22	18,5	0,40	265,1	270,0	264,1	248,2	219,5	158,3	
Z616 23	18,5	0,40	277,1	282,3	276,1	259,5	229,5	165,5	
Z616 24	18,5	0,40	289,2	294,6	288,1	270,7	239,5	172,7	
Z616 25	18,5	0,40	301,2	306,9	300,1	282,0	249,4	179,8	
Z616 26	18,5	0,40	313,3	319,1	312,1	293,3	259,4	187,1	
Z616 27	22	0,40	325,3	331,4	324,1	304,6	269,4	194,3	
Z616 28	22	0,40	337,4	343,7	336,1	315,9	279,4	201,5	
Z616 29	22	0,40	349,4	356,0	348,1	327,2	289,4	208,7	
Z616 30	22	0,40	361,5	368,2	360,1	338,4	299,3	215,9	
Z616 31	26	0,40	373,5	380,5	372,1	349,7	309,3	223,1	
Z616 32	26	0,40	385,6	392,8	384,1	361,0	319,3	230,3	
Z616 33	26	0,40	397,6	405,1	396,1	372,3	329,3	237,5	
Z616 34	26	0,40	409,7	417,3	408,1	383,6	339,3	244,5	
Z616 35	26	0,40	421,7	429,6	420,1	394,8	349,2	251,8	
Z616 36	26	0,40	433,8	441,9	432,1	406,1	359,2	259,0	

* Efficiency index MEI

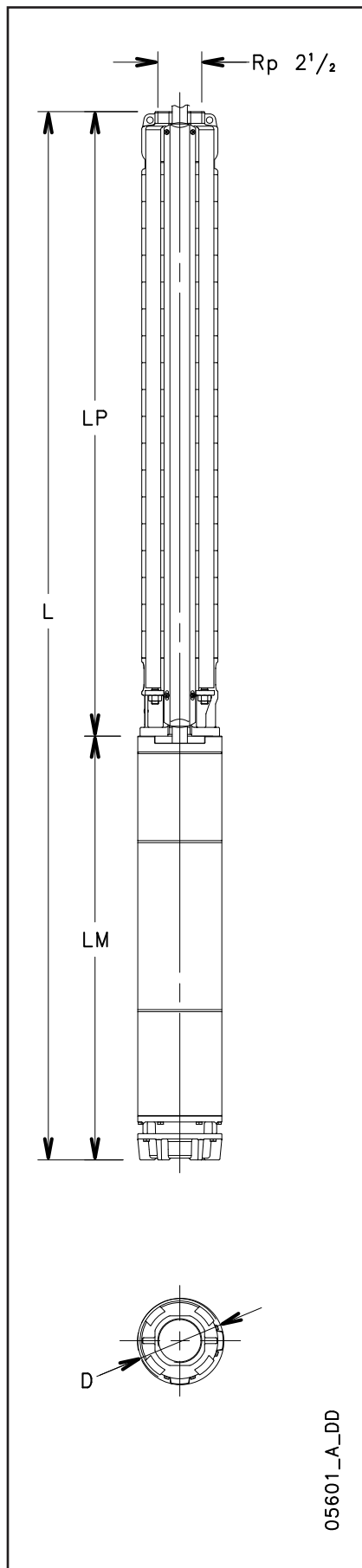
z616-2-50-en_c_th

DIMENSIONS AND WEIGHTS

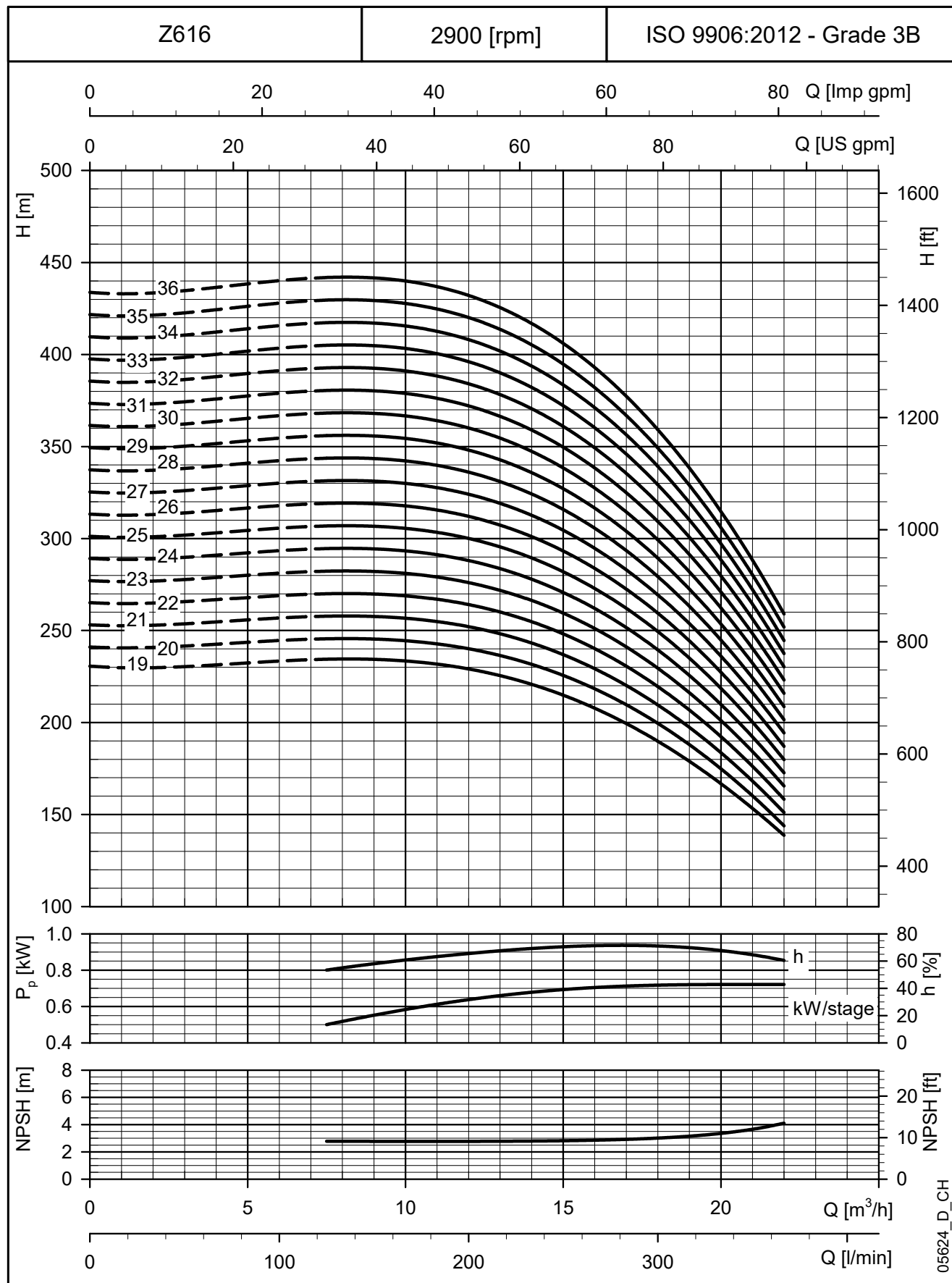
ELECTRO PUMP TYPE	RATED POWER kW	DIMENSIONS (mm)					WEIGHT
		L	LM	LP	ø D		
					1 Cable	2 Cables	kg
Z616 19-L6W	15	2041	833	1208	144	146	90
Z616 20-L6W	15	2087	833	1254	144	146	92
Z616 21-L6W	15	2133	833	1300	144	146	93
Z616 22-L6W	18.5	2249	903	1346	144	146	106
Z616 23-L6W	18.5	2341	903	1438	144	146	108
Z616 24-L6W	18.5	2387	903	1484	144	146	109
Z616 25-L6W	18.5	2433	903	1530	144	146	110
Z616 26-L6W	18.5	2479	903	1576	144	146	112
Z616 27-L6W	22	2545	923	1622	144	146	117
Z616 28-L6W	22	2591	923	1668	144	146	118
Z616 29-L6W	22	2637	923	1714	144	146	119
Z616 30-L6W	22	2683	923	1760	144	146	120
Z616 31-L6W	26	2819	1013	1806	144	146	136
Z616 32-L6W	26	2865	1013	1852	144	146	137
Z616 33-L6W	26	2911	1013	1898	144	146	138
Z616 34-L6W	26	2957	1013	1944	144	146	139
Z616 35-L6W	26	3003	1013	1990	144	146	140
Z616 36-L6W	26	3095	1013	2082	144	146	142

z616-2-50-en_b_td

Pump and motor are supplied uncoupled in two separated packages if the total length is > 3000 mm



Z616: FROM 19 TO 36 STAGES **HYDRAULIC PERFORMANCE RANGE AT 50 Hz, 2 POLES**



These performances are valid for liquids with density $\rho = 1.0 \text{ kg/dm}^3$ and kinematic viscosity $\nu = 1 \text{ mm}^2/\text{sec}$.

Z622: FROM 1 TO 17 STAGES

HYDRAULIC PERFORMANCE RANGE AT 50 Hz, 2 POLES

PUMP TYPE	RATED POWER		Q = DELIVERY						
			l/min	0	150	200	300	400	500
			m³/h	0	9	12	18	24	30
	kW	MEI* ≥	H = TOTAL HEAD METRES COLUMN OF WATER						
Z622 01	1,1	0,40	14,5	13,7	13,6	12,2	9,9	5,8	
Z622 02	2,2	0,40	33,6	27,2	26,8	23,7	19,0	10,3	
Z622 03	3	0,40	42,8	40,8	39,8	35,7	28,5	17,2	
Z622 04	4	0,40	56,9	54,2	52,9	47,0	37,1	20,2	
Z622 05	5,5	0,40	73,2	68,0	66,2	58,6	46,1	25,2	
Z622 06	5,5	0,40	88,0	81,6	79,5	70,3	55,3	30,2	
Z622 07	7,5	0,40	101,3	95,1	92,4	81,7	64,3	35,3	
Z622 08	7,5	0,40	116,0	108,7	105,6	93,4	73,5	40,4	
Z622 09	9,3	0,40	129,9	122,7	119,3	105,5	83,3	46,5	
Z622 10	9,3	0,40	143,4	136,0	132,2	117,4	92,0	50,5	
Z622 11	11	0,40	156,3	148,1	143,9	127,2	99,0	53,3	
Z622 12	11	0,40	170,8	161,6	157,0	138,7	108,0	58,2	
Z622 13	13	0,40	185,1	175,5	170,5	151,0	117,8	63,1	
Z622 14	13	0,40	199,6	189,0	183,6	162,6	126,8	68,0	
Z622 15	15	0,40	213,5	202,0	196,3	173,6	135,1	72,0	
Z622 16	15	0,40	228,0	215,5	209,4	185,2	144,1	76,8	
Z622 17	15	0,40	242,5	229,0	222,5	196,8	153,0	81,6	

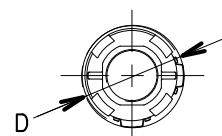
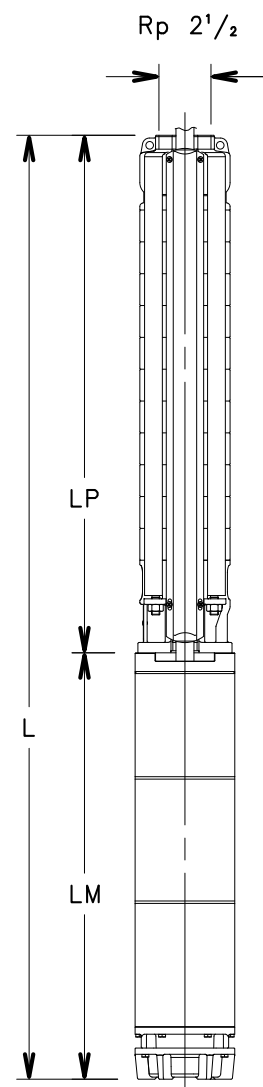
* Efficiency index MEI

z622-1-50-en_c_th

DIMENSIONS AND WEIGHTS

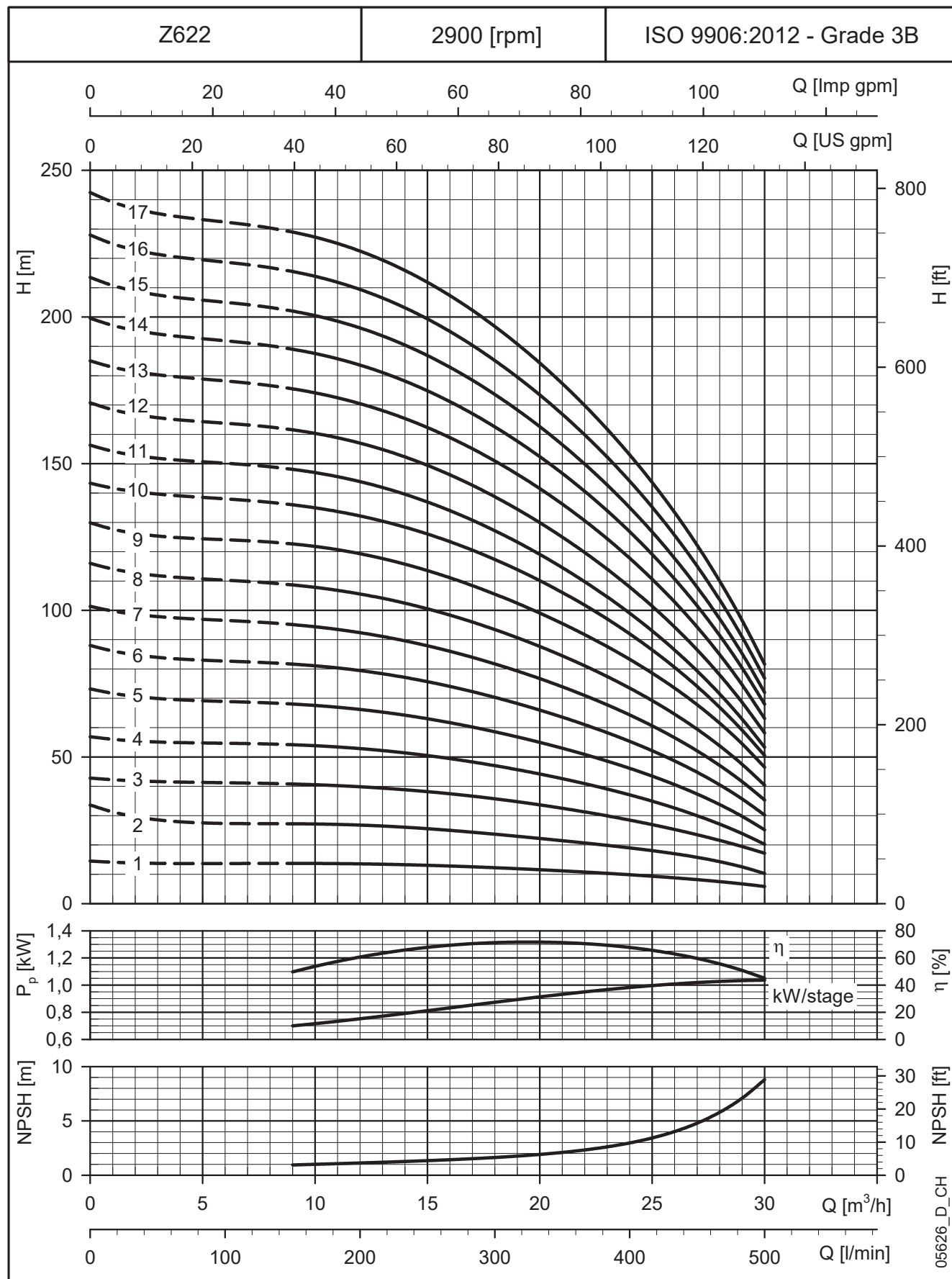
ELECTRO PUMP TYPE	RATED POWER kW	DIMENSIONS (mm)					WEIGHT
		L	LM	LP	ø D		
					1 Cable	2 Cables	kg
Z622 01-C4S	1,1	662	305	357	142	144	20
Z622 02-C4S	2,2	806	380	426	142	144	24
Z622 03-C4S	3	975	480	495	142	144	31
Z622 04-C4S	4	1114	550	564	142	144	37
Z622 05-C4S	5,5	1308	675	633	142	144	44
Z622 06-C4S	5,5	1377	675	702	142	144	46
Z622 07-C4S	7,5	1536	765	771	142	144	51
Z622 08-C4S	7,5	1605	765	840	142	144	53
Z622 04-L6W	4	1147	583	564	144	146	54
Z622 05-L6W	5,5	1246	613	633	144	146	57
Z622 06-L6W	5,5	1315	613	702	144	146	59
Z622 07-L6W	7,5	1424	653	771	144	146	64
Z622 08-L6W	7,5	1493	653	840	144	146	66
Z622 09-L6W	9,3	1592	683	909	144	146	69
Z622 10-L6W	9,3	1661	683	978	144	146	71
Z622 11-L6W	11	1770	723	1047	144	146	76
Z622 12-L6W	11	1839	723	1116	144	146	78
Z622 13-L6W	13	1948	763	1185	144	146	84
Z622 14-L6W	13	2017	763	1254	144	146	86
Z622 15-L6W	15	2156	833	1323	144	146	91
Z622 16-L6W	15	2225	833	1392	144	146	92
Z622 17-L6W	15	2294	833	1461	144	146	94

z622-1-50-en_c_td



05600_A_DD

Z622: FROM 1 TO 17 STAGES **HYDRAULIC PERFORMANCE RANGE AT 50 Hz, 2 POLES**



These performances are valid for liquids with density $\rho = 1.0 \text{ kg/dm}^3$ and kinematic viscosity $\nu = 1 \text{ mm}^2/\text{sec}$.

Z622: FROM 18 TO 33 STAGES

HYDRAULIC PERFORMANCE RANGE AT 50 Hz, 2 POLES

PUMP TYPE	RATED POWER		Q = DELIVERY						
			l/min	0	150	200	300	400	500
			m³/h	0	9	12	18	24	30
	kW	MEI* ≥	H = TOTAL HEAD METRES COLUMN OF WATER						
Z622 18	18,5	0,40	253,2	241,9	235,4	207,7	160,1	87,1	
Z622 19	18,5	0,40	267,3	255,3	248,5	219,3	169,0	92,0	
Z622 20	18,5	0,40	281,7	268,7	261,6	230,8	177,9	96,8	
Z622 21	18,5	0,40	295,8	282,2	274,7	242,4	186,8	101,7	
Z622 22	22	0,40	308,2	294,3	286,2	253,4	196,0	102,2	
Z622 23	22	0,40	322,3	307,7	299,3	264,9	204,8	106,9	
Z622 24	22	0,40	336,5	321,0	312,2	276,5	213,7	111,5	
Z622 25	22	0,40	350,8	334,5	325,3	287,9	222,6	116,2	
Z622 26	26	0,40	363,9	347,8	338,7	301,3	236,4	125,4	
Z622 27	26	0,40	378,0	361,1	351,7	312,9	245,5	130,2	
Z622 28	26	0,40	392,0	374,4	364,6	324,6	254,5	135,0	
Z622 29	26	0,40	406,3	387,8	377,6	336,1	263,6	139,9	
Z622 30	30	0,40	419,5	401,3	390,6	347,6	272,8	144,6	
Z622 31	30	0,40	433,4	414,6	403,6	359,2	281,9	149,4	
Z622 32	30	0,40	447,5	428,0	416,8	370,8	290,9	154,3	
Z622 33	30	0,40	461,8	441,3	429,7	382,4	300,0	159,1	

* Efficiency index MEI

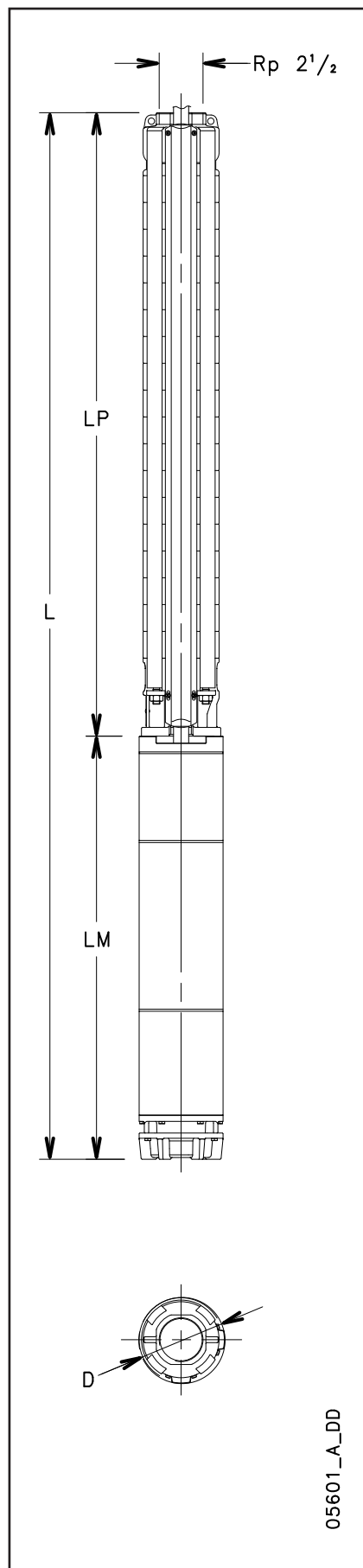
z622-2-50-en_c_th

DIMENSIONS AND WEIGHTS

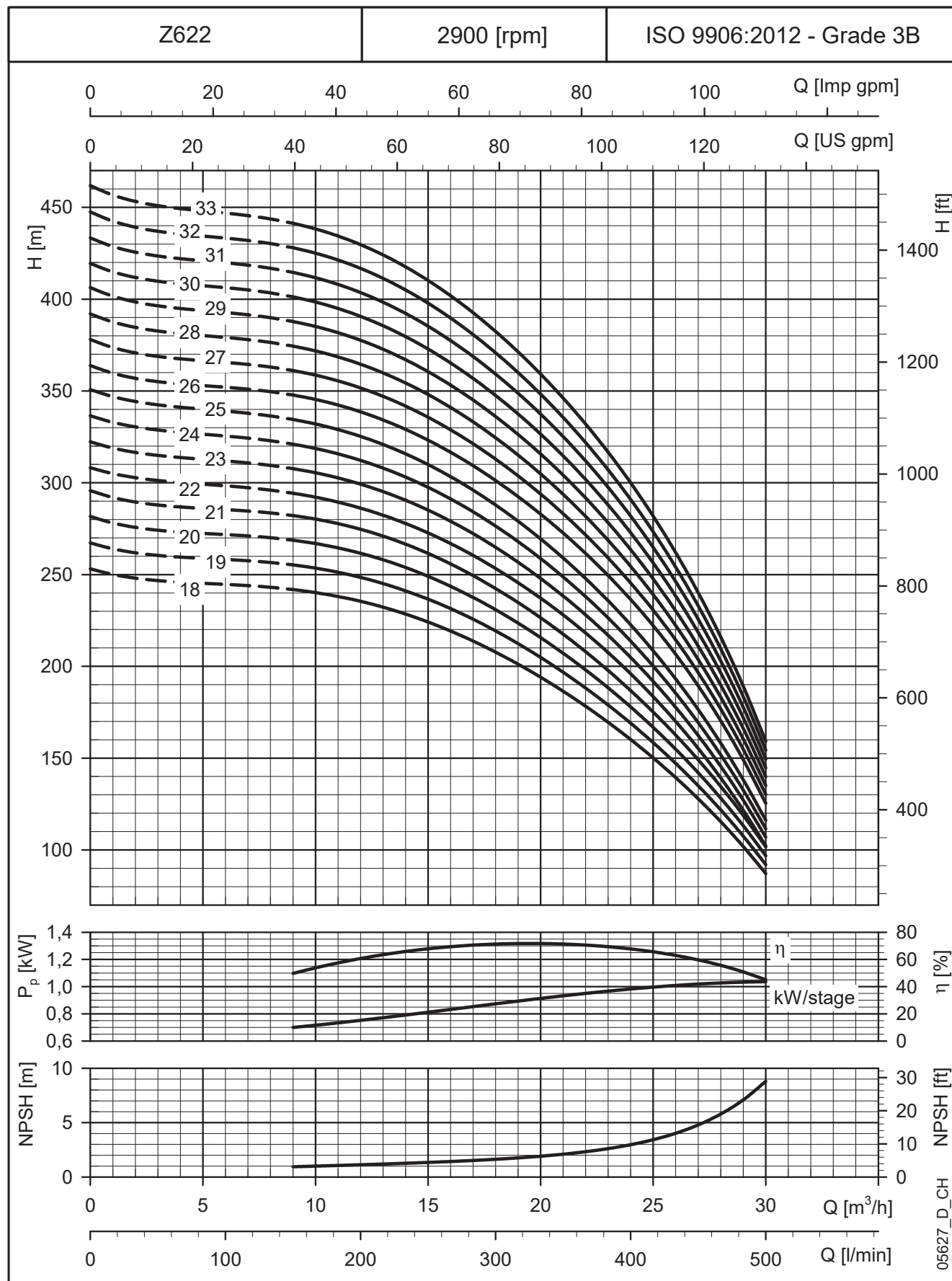
ELECTRO PUMP TYPE	RATED POWER kW	DIMENSIONS (mm)					WEIGHT
		L	LM	LP	ø D		
					1 Cable	2 Cables	Kg
Z622 18-L6W	18,5	2433	903	1530	144	146	107
Z622 19-L6W	18,5	2502	903	1599	144	146	109
Z622 20-L6W	18,5	2571	903	1668	144	146	111
Z622 21-L6W	18,5	2640	903	1737	144	146	112
Z622 22-L6W	22	2729	923	1806	144	146	118
Z622 23-L6W	22	2798	923	1875	144	146	119
Z622 24-L6W	22	2867	923	1944	144	146	121
Z622 25-L6W	22	2936	923	2013	144	146	123
Z622 26-L6W	26	3095	1013	2082	144	146	138
Z622 27-L6W	26	3164	1013	2151	144	146	140
Z622 28-L6W	26	3233	1013	2220	144	146	141
Z622 29-L6W	26	3302	1013	2289	144	146	143
Z622 30-L6W	30	3499	1141	2358	144	146	156
Z622 31-L6W	30	3568	1141	2427	144	146	158
Z622 32-L6W	30	3637	1141	2496	144	146	159
Z622 33-L6W	30	3706	1141	2565	144	146	161

z622-2-50-en_c_td

Pump and motor are supplied uncoupled in two separated packages if the total length is > 3000 mm

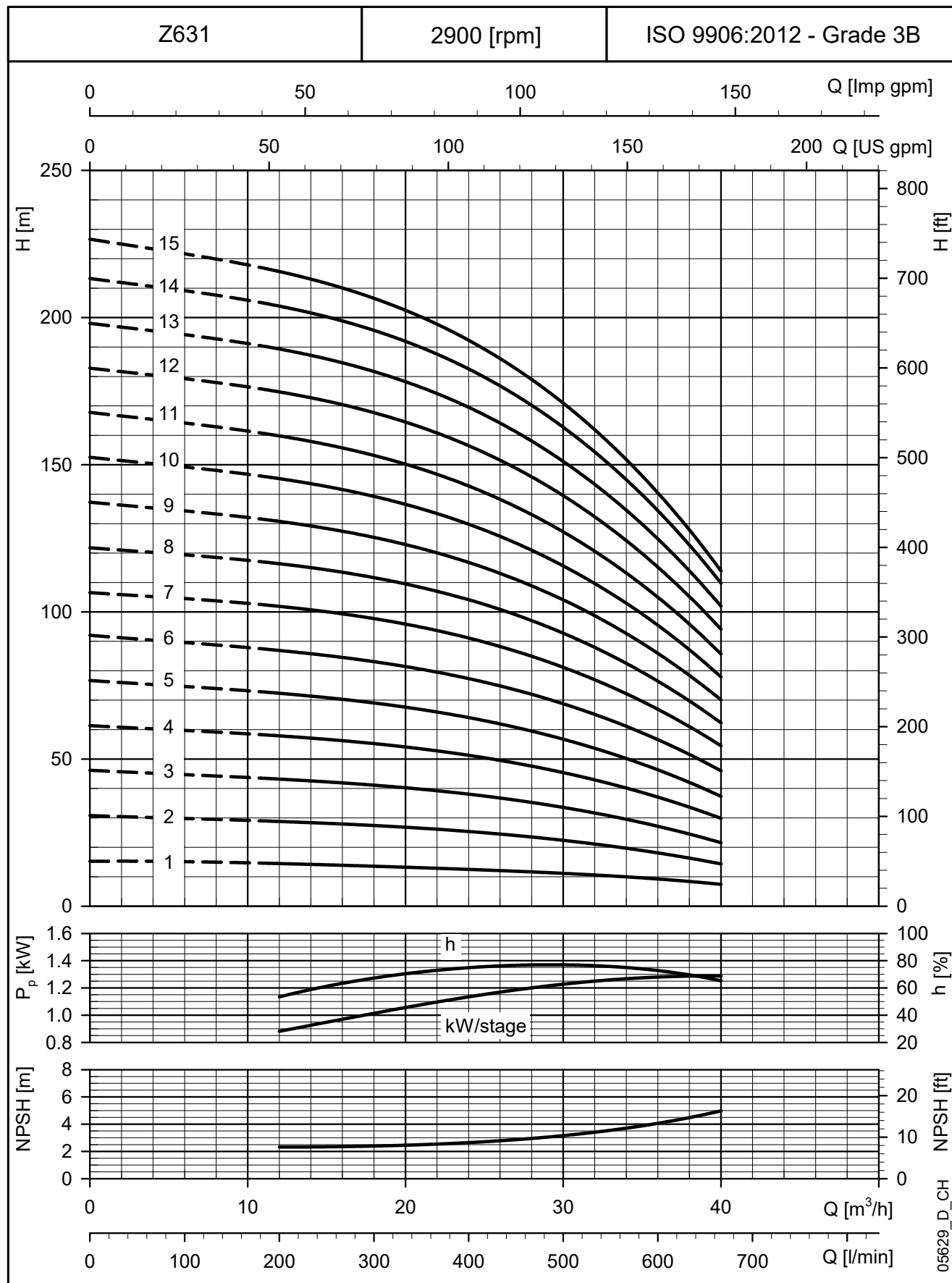


Z622: FROM 18 TO 33 STAGES **HYDRAULIC PERFORMANCE RANGE AT 50 Hz, 2 POLES**



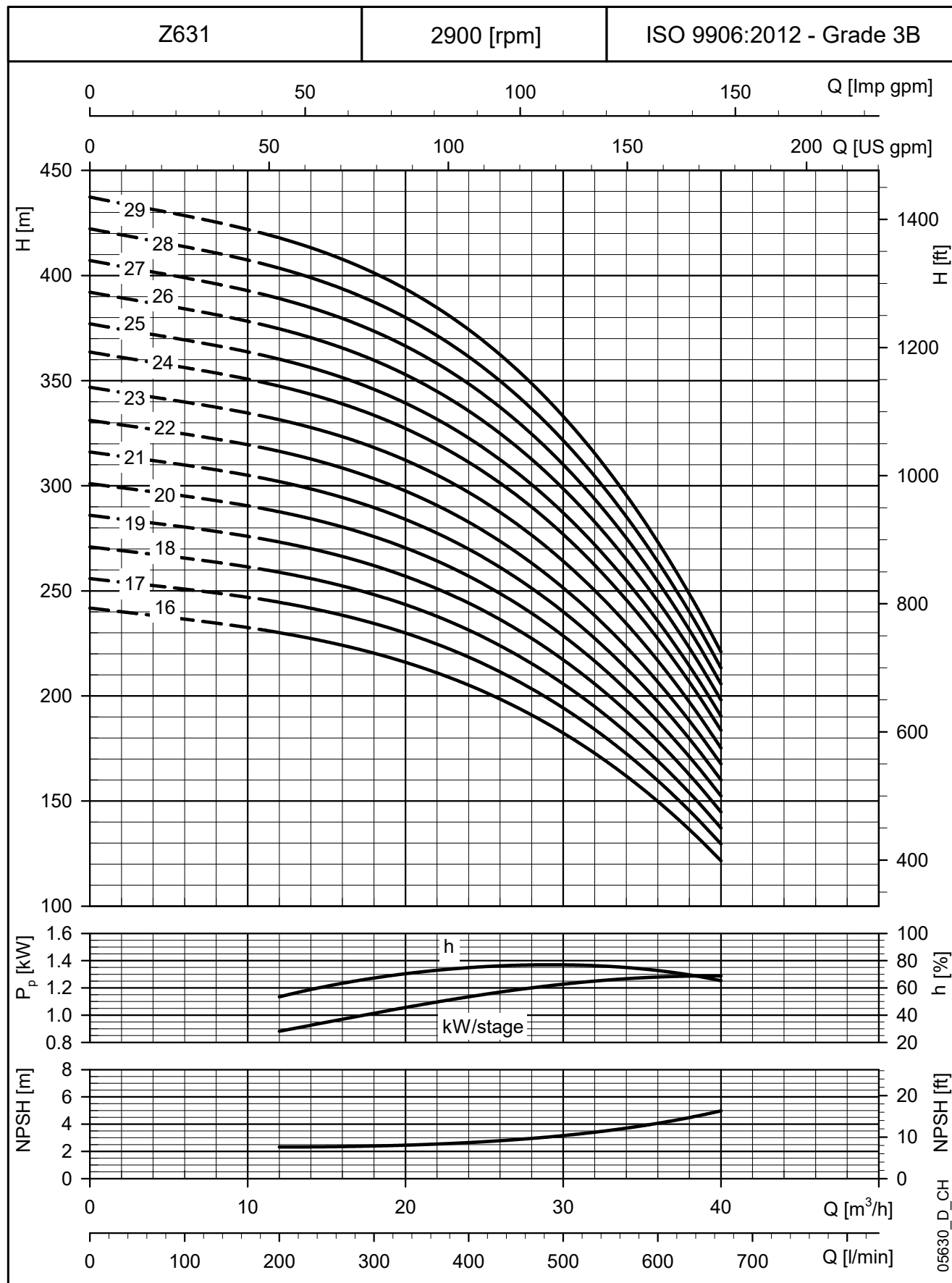
These performances are valid for liquids with density $\rho = 1.0 \text{ kg/dm}^3$ and kinematic viscosity $\nu = 1 \text{ mm}^2/\text{sec}$.

Z631: FROM 1 TO 15 STAGES **HYDRAULIC PERFORMANCE RANGE AT 50 Hz, 2 POLES**



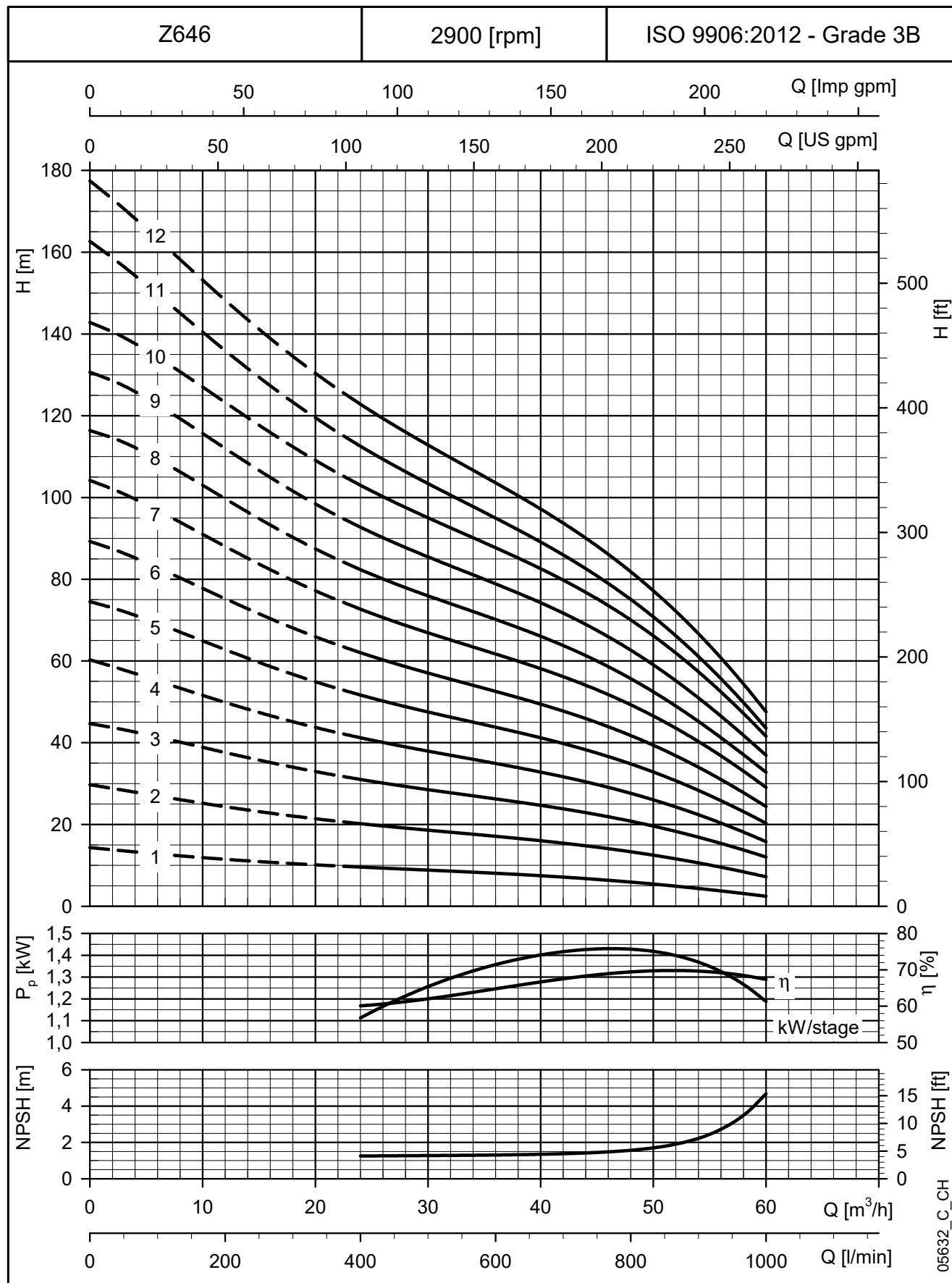
These performances are valid for liquids with density $\rho = 1.0 \text{ kg/dm}^3$ and kinematic viscosity $\nu = 1 \text{ mm}^2/\text{sec}$.

Z631: FROM 16 TO 29 STAGES **HYDRAULIC PERFORMANCE RANGE AT 50 Hz, 2 POLES**



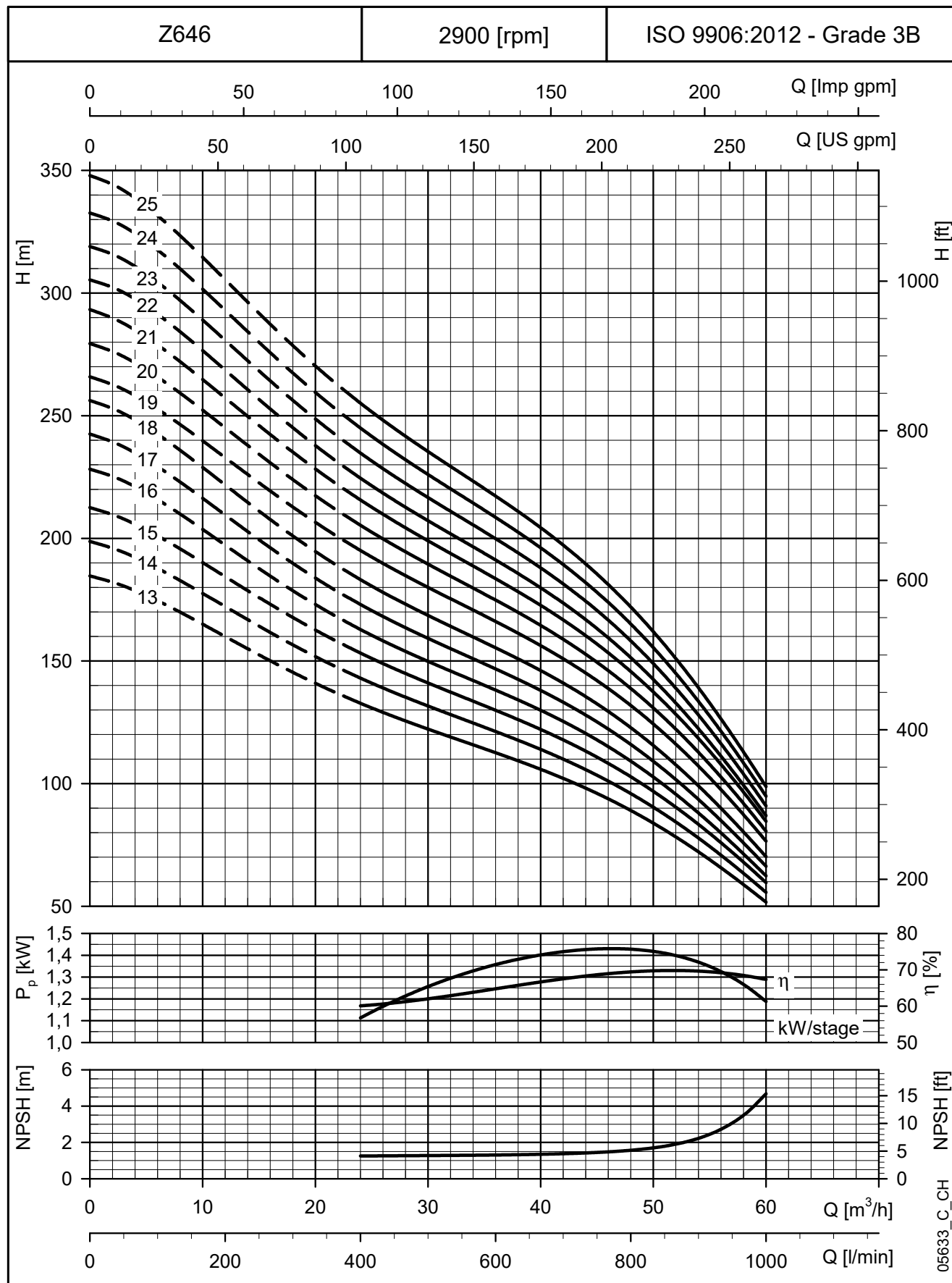
These performances are valid for liquids with density $\rho = 1.0 \text{ kg/dm}^3$ and kinematic viscosity $\nu = 1 \text{ mm}^2/\text{sec}$.

Z646: FROM 1 TO 12 STAGES **HYDRAULIC PERFORMANCE RANGE AT 50 Hz, 2 POLES**



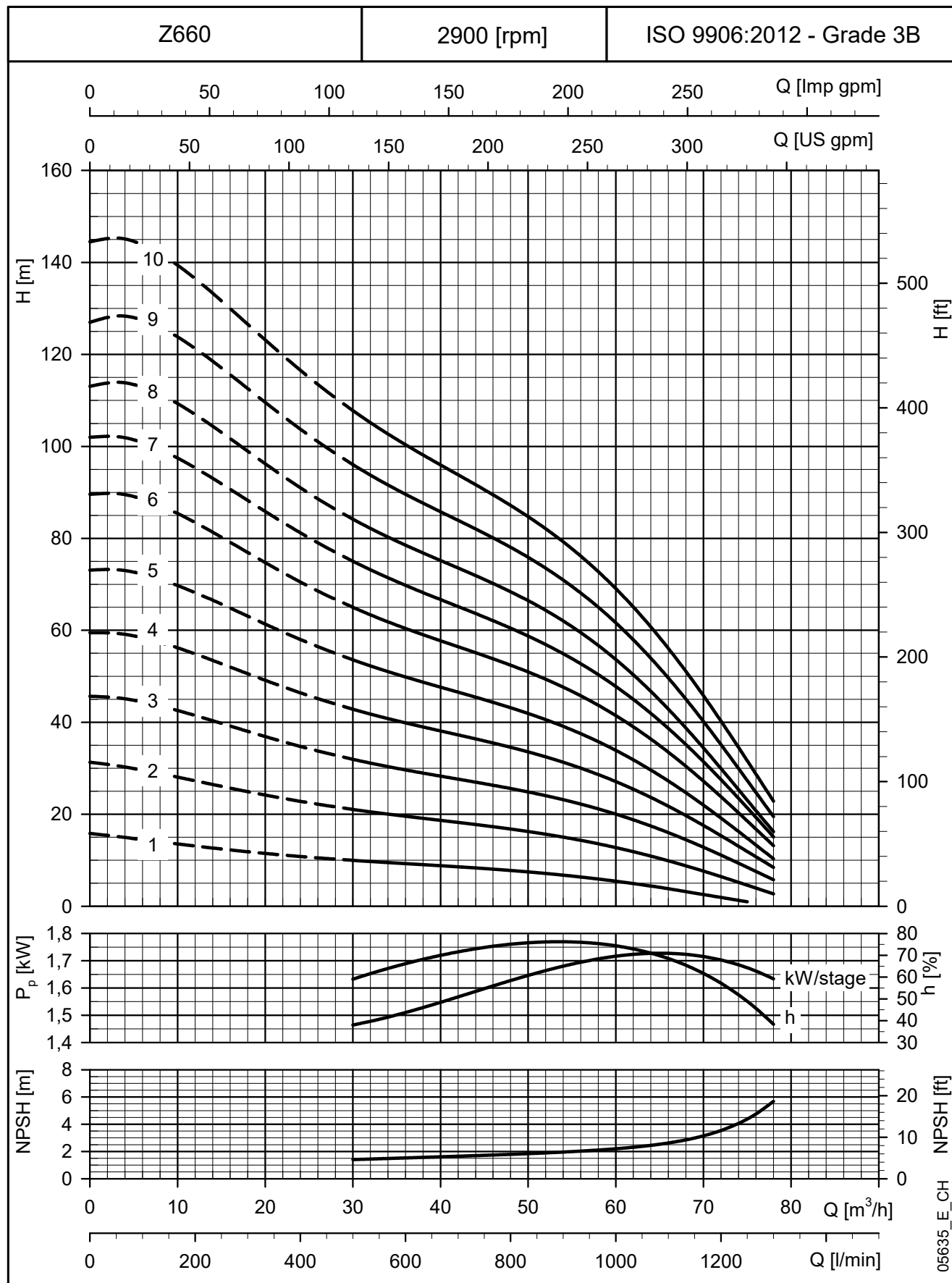
These performances are valid for liquids with density $\rho = 1.0 \text{ kg/dm}^3$ and kinematic viscosity $\nu = 1 \text{ mm}^2/\text{sec}$.

Z646: FROM 13 TO 25 STAGES **HYDRAULIC PERFORMANCE RANGE AT 50 Hz, 2 POLES**



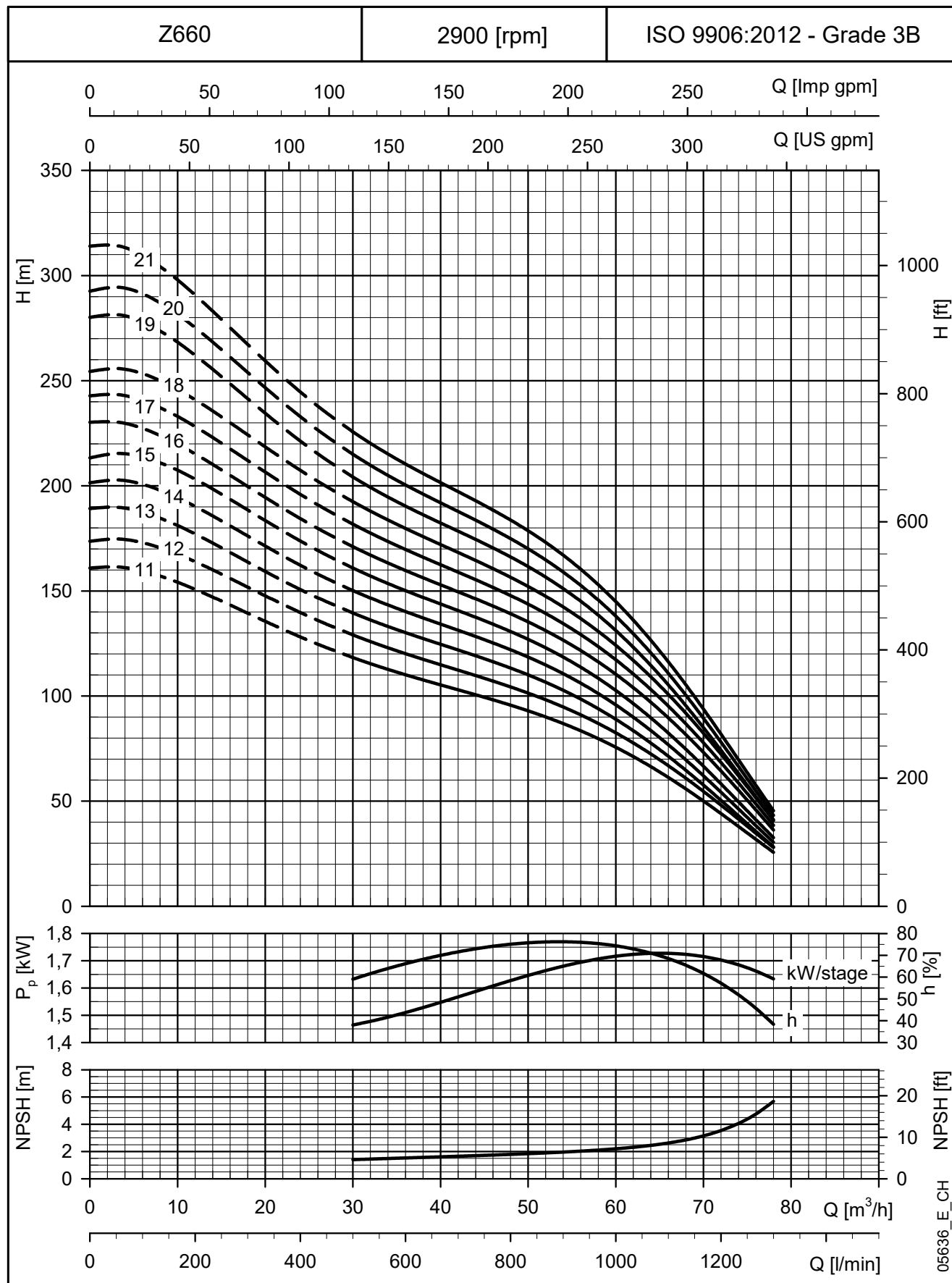
These performances are valid for liquids with density $\rho = 1.0 \text{ kg/dm}^3$ and kinematic viscosity $\nu = 1 \text{ mm}^2/\text{sec}$.

Z660: FROM 1 TO 10 STAGES **HYDRAULIC PERFORMANCE RANGE AT 50 Hz, 2 POLES**



These performances are valid for liquids with density $\rho = 1.0 \text{ kg/dm}^3$ and kinematic viscosity $\nu = 1 \text{ mm}^2/\text{sec}$.

Z660: FROM 11 TO 21 STAGES **HYDRAULIC PERFORMANCE RANGE AT 50 Hz, 2 POLES**



These performances are valid for liquids with density $\rho = 1.0 \text{ kg/dm}^3$ and kinematic viscosity $\nu = 1 \text{ mm}^2/\text{sec}$.

Z612 SERIES PUMPS DIMENSIONS AND WEIGHTS

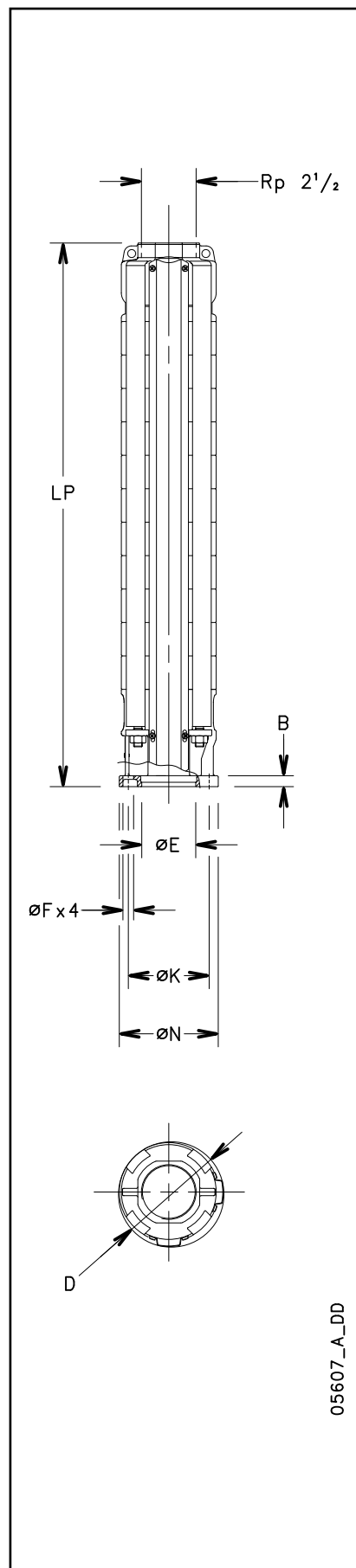
PUMP TYPE	MAX PUMP POWER at 2900 min ⁻¹	DIMENSIONS (mm)			WEIGHT
			ø D		
	kW	LP	1 Cable	2 Cables	kg
Z612 01-4	0.5	380	142	144	9
Z612 02-4	1.0	426	142	144	10
Z612 03-4	1.5	472	142	144	12
Z612 04-4	1.9	518	142	144	13
Z612 05-4	2.4	564	142	144	14
Z612 06-4	2.8	610	142	144	15
Z612 07-4	3.3	656	142	144	16
Z612 08-4	3.7	702	142	144	17
Z612 09-4	4.2	748	142	144	19
Z612 10-4	4.6	794	142	144	20
Z612 11-4	5.1	840	142	144	21
Z612 12-4	5.5	886	142	144	22
Z612 13-4	6.0	932	142	144	23
Z612 14-4	6.4	978	142	144	24
Z612 15-4	6.9	1024	142	144	26
Z612 07-6	3.3	656	142	144	16
Z612 08-6	3.7	702	142	144	17
Z612 09-6	4.2	748	142	144	19
Z612 10-6	4.6	794	142	144	20
Z612 11-6	5.1	840	142	144	21
Z612 12-6	5.5	886	142	144	22
Z612 13-6	6.0	932	142	144	23
Z612 14-6	6.4	978	142	144	24
Z612 15-6	6.9	1024	142	144	26
Z612 16-6	7.4	1070	142	144	27
Z612 17-6	7.8	1116	142	144	28
Z612 18-6	8.3	1162	142	144	29
Z612 19-6	9.1	1208	142	144	30
Z612 20-6	9.3	1254	142	144	32
Z612 21-6	9.7	1300	142	144	33
Z612 22-6	10.2	1346	142	144	34
Z612 23-6	10.7	1438	142	144	36
Z612 24-6	11.0	1484	142	144	37
Z612 25-6	11.5	1530	142	144	38
Z612 26-6	11.9	1576	142	144	40
Z612 27-6	12.4	1622	142	144	41
Z612 28-6	12.8	1668	142	144	42
Z612 29-6	13.5	1714	142	144	43
Z612 30-6	14.0	1760	142	144	44
Z612 31-6	14.5	1806	142	144	46
Z612 32-6	14.9	1852	142	144	47
Z612 33-6	15.1	1898	142	144	48
Z612 34-6	15.6	1944	142	144	49
Z612 35-6	16.1	1990	142	144	50
Z612 36-6	16.5	2082	142	144	52
Z612 37-6	17.0	2128	142	144	54
Z612 38-6	17.4	2174	142	144	55
Z612 39-6	17.9	2220	142	144	56

z612p-2p50-en_c_td

PUMPS MOTOR CONNECTION

MOTOR	DIMENSIONS (mm)				
	N	K	F	B	E ^{H7}
4" (NEMA)	130	76,2	9,5	10,5	87,3
6" (NEMA)	136	111,1	14,5	15	76,2
Coupling 4" and 6" according to NEMA standards					

z6-mtcn-2p50-en_a_td



05607_A_DD

Z616 SERIES PUMPS DIMENSIONS AND WEIGHTS

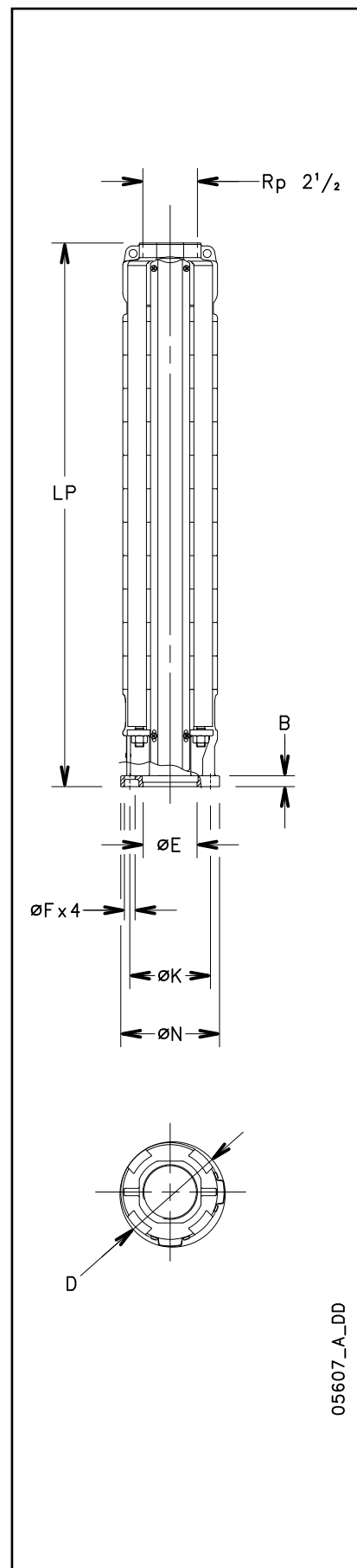
PUMP TYPE	MAX PUMP POWER at 2900 min ⁻¹	DIMENSIONS (mm)			WEIGHT
			ø D		
	kW	LP	1 Cable	2 Cables	kg
Z616 01-4	0.7	380	142	144	9
Z616 02-4	1.6	426	142	144	10
Z616 03-4	2.4	472	142	144	12
Z616 04-4	3.1	518	142	144	13
Z616 05-4	3.8	564	142	144	14
Z616 06-4	4.5	610	142	144	15
Z616 07-4	5.2	656	142	144	16
Z616 08-4	5.9	702	142	144	17
Z616 09-4	6.7	748	142	144	19
Z616 10-4	7.3	794	142	144	20
Z616 05-6	3.8	564	142	144	14
Z616 06-6	4.5	610	142	144	15
Z616 07-6	5.2	656	142	144	16
Z616 08-6	5.9	702	142	144	17
Z616 09-6	6.7	748	142	144	19
Z616 10-6	7.3	794	142	144	20
Z616 11-6	8.0	840	142	144	21
Z616 12-6	8.7	886	142	144	22
Z616 13-6	9.4	932	142	144	23
Z616 14-6	10.2	978	142	144	24
Z616 15-6	10.9	1024	142	144	26
Z616 16-6	11.7	1070	142	144	27
Z616 17-6	12.2	1116	142	144	28
Z616 18-6	12.9	1162	142	144	29
Z616 19-6	13.6	1208	142	144	30
Z616 20-6	14.3	1254	142	144	32
Z616 21-6	15.0	1300	142	144	33
Z616 22-6	15.7	1346	142	144	34
Z616 23-6	16.4	1438	142	144	36
Z616 24-6	17.1	1484	142	144	37
Z616 25-6	17.9	1530	142	144	38
Z616 26-6	18.6	1576	142	144	40
Z616 27-6	19.3	1622	142	144	41
Z616 28-6	20.0	1668	142	144	42
Z616 29-6	20.7	1714	142	144	43
Z616 30-6	21.4	1760	142	144	44
Z616 31-6	22.1	1806	142	144	46
Z616 32-6	22.8	1852	142	144	47
Z616 33-6	23.5	1898	142	144	48
Z616 34-6	24.3	1944	142	144	49
Z616 35-6	25.0	1990	142	144	50
Z616 36-6	25.7	2082	142	144	52

z616p-2p50-en_b_td

PUMPS MOTOR CONNECTION

MOTOR	DIMENSIONS (mm)				
	N	K	F	B	E ^{H7}
4" (NEMA)	130	76,2	9,5	10,5	87,3
6" (NEMA)	136	111,1	14,5	15	76,2
Coupling 4" and 6" according to NEMA standards					

z6-mtcn-2p50-en_a_td

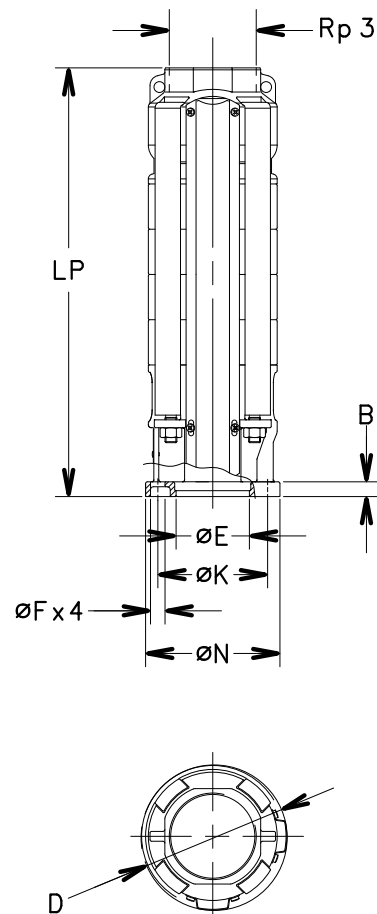


05607_A_DD

Z631 SERIES PUMPS DIMENSIONS AND WEIGHTS

PUMP TYPE	MAX PUMP POWER at 2900 min ⁻¹ kW	DIMENSIONS (mm)			WEIGHT kg
		LP	ø D 1 Cable 2 Cables		
Z631 01-4	1,3	367	142	144	9
Z631 02-4	2,6	436	142	144	10
Z631 03-4	3,9	505	142	144	12
Z631 04-4	5,2	574	142	144	14
Z631 05-4	6,6	643	142	144	15
Z631 06-4	7,8	712	142	144	17
Z631 03-6	3,9	505	142	144	12
Z631 04-6	5,2	574	142	144	14
Z631 05-6	6,6	643	142	144	15
Z631 06-6	7,8	712	142	144	17
Z631 07-6	9,2	781	142	144	18
Z631 08-6	10,5	850	142	144	20
Z631 09-6	11,7	919	142	144	21
Z631 10-6	13,0	988	142	144	23
Z631 11-6	14,3	1057	142	144	24
Z631 12-6	15,7	1126	142	144	26
Z631 13-6	17,0	1195	142	144	27
Z631 14-6	18,3	1264	142	144	29
Z631 15-6	19,6	1333	142	144	31
Z631 16-6	20,9	1402	142	144	32
Z631 17-6	22,0	1471	142	144	34
Z631 18-6	23,2	1540	142	144	35
Z631 19-6	24,5	1609	142	144	37
Z631 20-6	25,8	1678	142	144	38
Z631 21-6	27,1	1747	142	144	40
Z631 22-6	28,4	1816	142	144	42
Z631 23-6	30,1	1885	142	144	43
Z631 24-6	31,6	1954	142	144	45
Z631 25-6	32,7	2023	142	144	46
Z631 26-6	34,0	2092	142	144	48
Z631 27-6	35,3	2161	142	144	50
Z631 28-6	36,7	2230	142	144	51
Z631 29-6	38,0	2299	142	144	53

z631p-2p50-en_b_td



05608_B_DD

PUMPS MOTOR CONNECTION

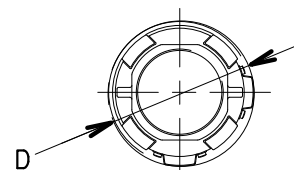
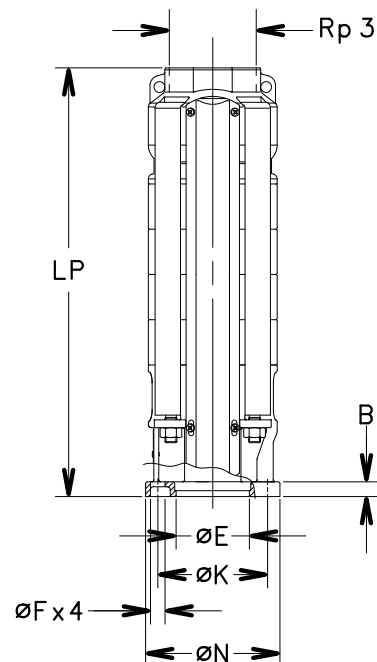
MOTOR	DIMENSIONS (mm)				
	N	K	F	B	E ^{H7}
4" (NEMA)	130	76,2	9,5	10,5	87,3
6" (NEMA)	136	111,1	14,5	15	76,2
Coupling 4" and 6" according to NEMA standards					

z6-mtcn-2p50-en_a_td

Z646 SERIES PUMPS DIMENSIONS AND WEIGHTS

PUMP TYPE	MAX PUMP POWER at 2900 min ⁻¹	DIMENSIONS (mm)			WEIGHT
			ø D		
	kW	LP	1 Cable	2 Cables	kg
Z646 01-4	1,3	413	142	144	10
Z646 02-4	2,4	528	142	144	12
Z646 03-4	3,7	643	142	144	15
Z646 04-4	4,7	758	142	144	17
Z646 05-4	6,1	873	142	144	20
Z646 06-4	7,3	988	142	144	22
Z646 03-6	3,7	643	142	144	15
Z646 04-6	4,7	758	142	144	17
Z646 05-6	6,1	873	142	144	20
Z646 06-6	7,3	988	142	144	22
Z646 07-6	8,4	1103	142	144	25
Z646 08-6	9,6	1218	142	144	27
Z646 09-6	10,8	1333	142	144	30
Z646 10-6	12,0	1448	142	144	32
Z646 11-6	13,3	1563	142	144	35
Z646 12-6	14,5	1678	142	144	37
Z646 13-6	15,6	1793	142	144	40
Z646 14-6	16,8	1908	142	144	42
Z646 15-6	18,0	2023	142	144	45
Z646 16-6	19,3	2138	142	144	47
Z646 17-6	20,5	2253	142	144	50
Z646 18-6	21,7	2368	142	144	52
Z646 19-6	22,7	2483	142	144	55
Z646 20-6	23,9	2598	142	144	57
Z646 21-6	25,1	2713	142	144	60
Z646 22-6	26,4	2828	142	144	62
Z646 23-6	27,5	2943	142	144	65
Z646 24-6	28,7	3058	142	144	67
Z646 25-6	29,9	3173	142	144	70

z646p-2p50-en_b_td



05608_B_DD

PUMPS MOTOR CONNECTION

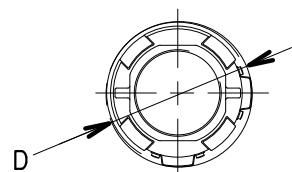
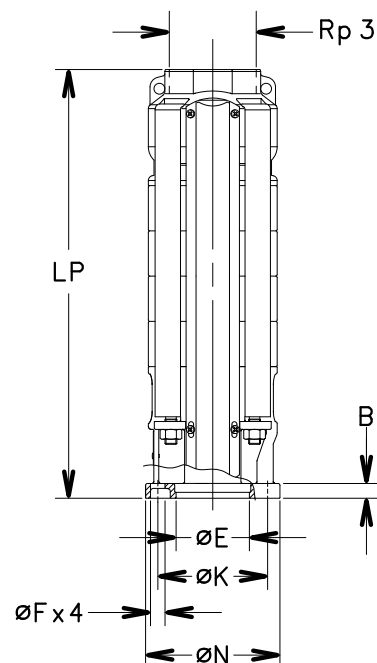
MOTOR	DIMENSIONS (mm)				
	N	K	F	B	E ^{H7}
4" (NEMA)	130	76,2	9,5	10,5	87,3
6" (NEMA)	136	111,1	14,5	15	76,2
Coupling 4" and 6" according to NEMA standards					

z6-mtcn-2p50-en_a_td

Z660 SERIES PUMPS DIMENSIONS AND WEIGHTS

PUMP TYPE	MAX PUMP POWER at 2900 min ⁻¹ kW	DIMENSIONS (mm)			WEIGHT kg
		LP	ø D 1 Cable 2 Cables		
Z660 01-4	1,7	413	142	144	10
Z660 02-4	3,2	528	142	144	12
Z660 03-4	4,5	643	142	144	15
Z660 04-4	6,2	758	142	144	17
Z660 05-4	7,7	873	142	144	20
Z660 02-6	3,2	528	142	144	12
Z660 03-6	4,5	643	142	144	15
Z660 04-6	6,2	758	142	144	17
Z660 05-6	7,7	873	142	144	20
Z660 06-6	9,0	988	142	144	22
Z660 07-6	10,4	1103	142	144	25
Z660 08-6	12,0	1218	142	144	27
Z660 09-6	13,7	1333	142	144	30
Z660 10-6	14,9	1448	142	144	32
Z660 11-6	16,5	1563	142	144	35
Z660 12-6	18,0	1678	142	144	37
Z660 13-6	19,6	1793	142	144	40
Z660 14-6	21,1	1908	142	144	42
Z660 15-6	22,6	2023	142	144	45
Z660 16-6	24,4	2138	142	144	47
Z660 17-6	25,9	2253	142	144	50
Z660 18-6	27,4	2368	142	144	52
Z660 19-6	28,9	2483	142	144	55
Z660 20-6	30,4	2598	142	144	57
Z660 21-6	31,9	2713	142	144	60

z660p-2p50-en_b_td



05608_B_DD

PUMPS MOTOR CONNECTION

MOTOR	DIMENSIONS (mm)				
	N	K	F	B	E ^{H7}
4" (NEMA)	130	76,2	9,5	10,5	87,3
6" (NEMA)	136	111,1	14,5	15	76,2
Coupling 4" and 6" according to NEMA standards					

z6-mtcn-2p50-en_a_td

ACCESSORIES

40S - C4S SERIES MOTORS

MOTOR - CONTROL PANEL COMBINATION TABLE

MOTOR TYPE 40S - 4" SINGLE-PHASE	RATED POWER		RATED CURRENT 220-240 V A	CAPACITOR μ F / 450 V	PANEL TYPE		
	kW	HP			QPC...	QPCS...	QSC...
	0,37	0,5	3,2	16	...03	...03	...03
	0,55	0,75	4,3	20	...05	...05	...05
	0,75	1	5,6	30	...07	...07	...07
	1,1	1,5	7,6	40	...11	...11	...11
	1,5	2	10,5	50	...15	...15	...15
	2,2	3	14,4	70	...22	...22	...22

MOTOR TYPE 40S - 4" THREE-PHASE	RATED POWER		RATED CURRENT 380-415 V A		PANEL TYPE				
	kW	HP			Q1D/...	Q3D/...	Q3I/...	Q3A/...	Q3SF/...
	0,37	0,5	1,2		...03-05	...03-05	-	-	-
	0,55	0,75	1,7		...07	...05-07	-	-	-
	0,75	1	2,4		...07	...05-07	-	-	-
	1,1	1,5	3,1		...11-15	...07-15	-	-	-
	1,5	2	4,4		...22	...15-22	-	-	-
	2,2	3	6,1		...22	...15-22	-	-	-
	3	4	7,1		...30-40	...22-40	-	-	-
	4	5,5	9,8		...55	...22-40	-	-	-
	5,5	7,5	13,7		...75	...40-75	...40-75	...40-75	-
	7,5	10	18,7		...92	...75-92	...75-92	...75-92	...150

For different voltages, please contact our sales network.

40S-2p50-en_g_tc

MOTOR TYPE C4S M SINGLE-PHASE	RATED POWER		RATED CURRENT 220-240 V A	CAPACITOR μ F / 450 V	PANEL TYPE		
	kW	HP			QPC...	QPCS...	QSC...
	0,37	0,5	3,7	16	...03	...03	...03
	0,55	0,75	4,5	20	...05	...05	...05
	0,75	1	6,1	30	...07	...07	...07
	1,1	1,5	8,0	40	...11	...11	...11
	1,5	2	10,4	50	...15	...15	...15
	2,2	3	14,5	70	...22	...22	...22

MOTOR TYPE C4S T THREE-PHASE	RATED POWER		RATED CURRENT 380-415 V A		PANEL TYPE				
	kW	HP			Q1D/...	Q3D/...	Q3I/...	Q3A/...	Q3SF/...
	0,37	0,5	1,31		...03-05	...03-05	-	-	-
	0,55	0,75	1,73		...07	...05-07	-	-	-
	0,75	1	2,13		...07	...05-07	-	-	-
	1,1	1,5	3,3		...11-15	...07-15	-	-	-
	1,5	2	4,03		...22	...15-22	-	-	-
	2,2	3	5,60		...22	...15-22	-	-	-
	3	4	7,64		...30-40	...22-40	-	-	-
	4	5,5	10,2		...55	...40-75	-	-	-
	5,5	7,5	13,2		...75	...40-75	...40-75	...40-75	-
	7,5	10	18,1		...92	...75-92	...75-92	...75-92	...150

For different voltages please contact our sales network

C4S-2p50-en_a_tc

C6S - L6W SERIES MOTORS MOTOR - CONTROL PANEL COMBINATION TABLE

MOTOR TYPE C6S T - 6" THREE--PHASE	RATED POWER		RATED CURRENT 380-415 V A	CONTROL PANEL TYPE					
	kW	HP		Q1D/...	Q3D/...	Q3I/...	Q3A/...	Q3Y/...	Q3SF/...
	4	5,5		...40	-	-	-	-	-
	5,5	7,5		...75	...40-75	...40-75	...40-75	...40-75	-
	7,5	10		...92	...75-92	...75-92	...75-92	...75-92	...150
	9,3	12,5		...110	...92-110	...92-110	...92-110	...92-110	...150
	11	15		...150	...110-150	...110-150	...110-150	...110-150	...150
	15	20		-	...150-185	...150-185	...150-185	...150-185	...185
	18,5	25		-	...185-220	...185-220	...185-220	...185-220	...220
	22	30		-	...185-220	...185-220	...185-220	...185-220	...300
	30	40		-	...300-370	...300-370	...300-370	...300-370	...370
	37	50		-	-	...370-450	...370-450	...370-450	...450

For different voltages, please contact our sales network.

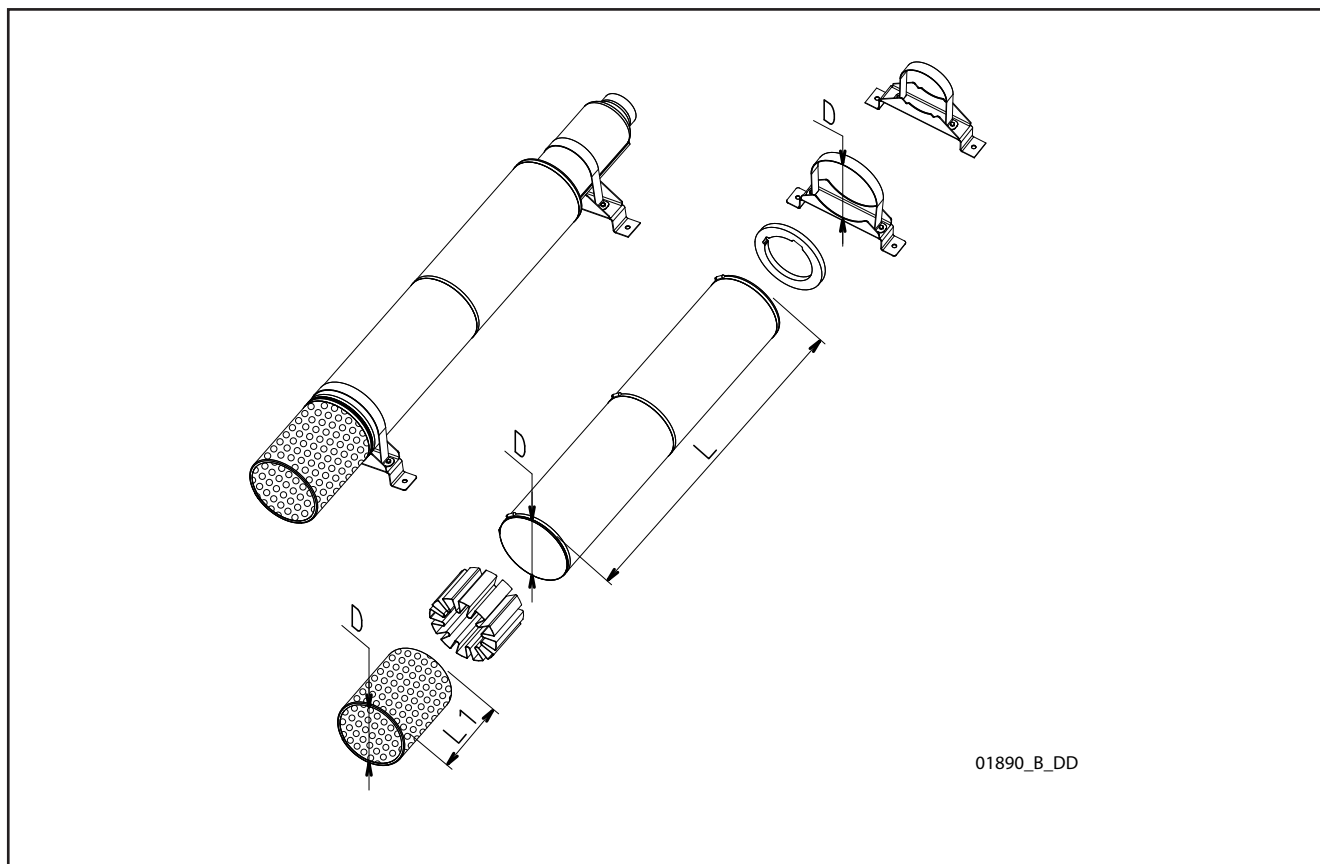
C6S-2p50-en_a_tc

MOTORE TIPO L6W - 6" TRIFASE	POTENZA NOMINALE		CORRENTE NOMINALE 380-415 V A	TIPO DI QUADRO					
	kW	HP		Q1D/...	Q3D/...	Q3I/...	Q3A/...	Q3Y/...	Q3SF/...
	4	5,5		...40	-	-	-	-	-
	5,5	7,5		...75	...40-75	...40-75	...40-75	...40-75	-
	7,5	10		...92	...75-92	...75-92	...75-92	...75-92	...150
	9,3	12,5		...110	...92-110	...92-110	...92-110	...92-110	...150
	11	15		...150	...110-150	...110-150	...110-150	...110-150	...150
	13	17,5		...150	...110-150	...110-150	...110-150	...110-150	...150
	15	20		-	...150-185	...150-185	...150-185	...150-185	...185
	18,5	25		-	...185-220	...185-220	...185-220	...185-220	...220
MOTORE TIPO L6W HT - 6" TRIFASE	22	30	A	-	...220-300	...220-300	...220-300	...220-300	...300
	26	35		-	...220-300	...220-300	...220-300	...220-300	...300
	30	40		-	...300-370	...300-370	...300-370	...300-370	...370
	37	50		-	-	...370-450	...370-450	...370-450	...450
	4	5,5		...55	...40-75	...40-75	...40-75	...40-75	-
	5,5	7,5		...75	...40-75	...40-75	...40-75	...40-75	-
	7,5	10		...92	...75-92	...75-92	...75-92	...75-92	...150
	9,3	12,5		...110	...92-110	...92-110	...92-110	...92-110	...150
	11	15		...150	...110-150	...110-150	...110-150	...110-150	...150
	13	17,5		...150	...110-150	...110-150	...110-150	...110-150	...150
	15	20	A	-	...150-185	...150-185	...150-185	...150-185	...185
	18,5	25		-	...185-220	...185-220	...185-220	...185-220	...220
	22	30		-	...220-300	...220-300	...220-300	...220-300	...300
	26	35		-	...220-300	...220-300	...220-300	...220-300	...300
	30	40		-	...300-370	...300-370	...300-370	...300-370	...370
	37	50		-	-	...370-450	...370-450	...370-450	...450
	45	60		-	-	...450-550	...450-550	...450-550	...550

Per tensioni diverse contattare la nostra rete di vendita.

L6w-2p50_f_tc

COOLING SHROUDS

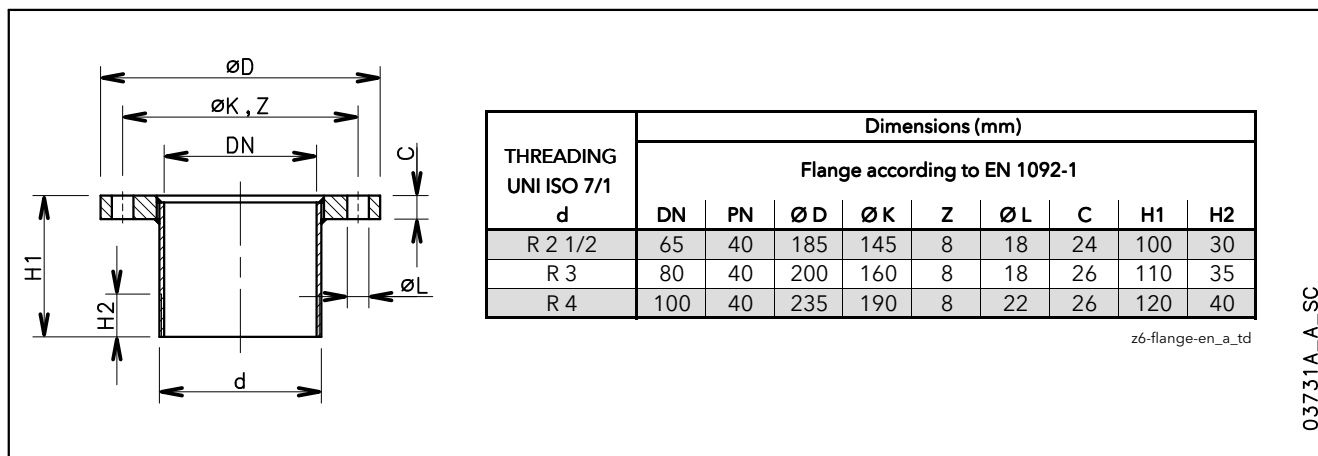


PUMP TYPE	MOTOR TYPE				COOLING SET SHROUD (D x L)	COOLING SET FILTER (D x L1)	COOLING SET BRACKETS (D)
	40S/B	C4S	C6S	L6W			
Z612 Z616 Z622 Z631 Z646	0,55	0,55			D160X800	D160X158	D160 - 2pcs
	0,75	0,75					
	1,1	1,1					
	1,5	1,5					
	2,2	2,2					
	3	3					
	4	4					
Z660	5,5	5,5			D160X1000	D160X158	D160 - 2pcs
	7,5	7,5					
	4	4					
	5,5	5,5			D180X1000	D180X192	D180 - 2pcs
Z612 Z616 Z622 Z631 Z646			3	3	D180X1000	D180X192	D180 - 2pcs
			4	4			
			5,5	5,5			
			7,5	7,5			
			9,3	9,3			
			11	11			
			-	13			
			15	15	D180X1500	D180X192	D180 - 3pcs
			18,5	18,5			
			22	22			
			-	26			
			30	30			
Z660			37	37	D200X1000	D200X192	D200 - 2pcs
			4	4			
			5,5	5,5			
			7,5	7,5			
			9,3	9,3			
			11	11			
			-	13			
			15	15	D200X1500	D200X192	D200 - 3pcs
			18,5	18,5			
			22	22			
			-	26			
			30	30			
			37	37			

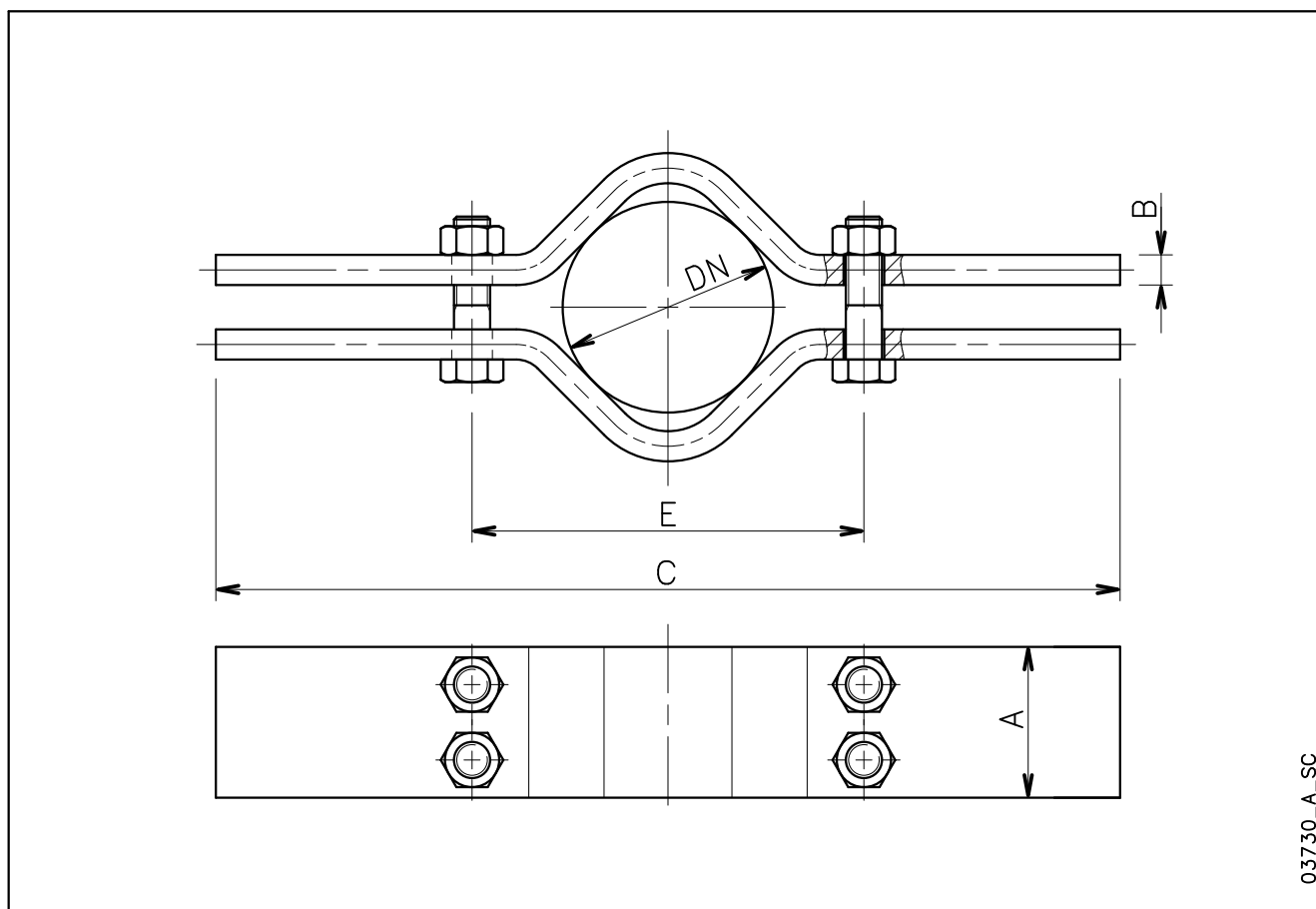
Note: Not available for high pressure version.

z6_kit-raf50-en_c_ta

THREADED FLANGES ISO



CARRYING CLAMPS



Ø PIPE NOMINAL DN		CARRYNG CLAMPS						PIPE WEIGHT		
		Dimensions (mm)					Pmax ⁽¹⁾ kg	Flanged	Threaded	Water
		A	B	C	E	SCREW		kg/m	kg/m	kg/m
65	R 2 1/2	50	15	600	130	M16x90	1300	6,7	8,0	3,3
80	R 3	80	15	600	180	M20x70	3400	8,4	10,5	5,0
100	R 4	80	15	600	180	M20x110	3400	20,5	15,0	7,9

1) Max weight allowable.

z6-clamp-en_a_td

TECHNICAL APPENDIX

40S - C4S - C6S - L6W - L8W - L10W - L12W MOTOR SERIES

TABLE OF POWER REDUCTION COEFFICIENTS WITH INCREASED WATER TEMPERATURE

MOTOR TYPE	RATED POWER kW	TEMPERATURE							
		°C							
		25	30	35	40	45	50	55	60
40S	all models	1,00	1,00	1,00	0,90	0,80	0,70	0,60	0,50
C4S		1,00	1,00	1,00	0,95	0,90	0,85	0,80	0,50
C6S		1,00	1,00	1,00	0,95	0,80	0,75	0,70	0,50
L6W		1,00	1,00	0,75	-	-	-	-	-
L8W		1,00	1,00	0,75	-	-	-	-	-
L10W		1,00	1,00	0,75	-	-	-	-	-
L12W		1,00	1,00	0,75	-	-	-	-	-
L6W..HT		1,00	1,00	1,00	1,00	1,00	0,85	0,75	0,65
L8W..HT		1,00	1,00	1,00	1,00	1,00	0,85	0,75	0,65
L10W..HT		1,00	1,00	1,00	1,00	z	0,85	0,75	0,65
L12W..HT		1,00	1,00	1,00	1,00	1,00	0,85	0,75	0,65

40S-LC-LW-derating-en_c_te

EXAMPLE 1

A 2,2 kW 40S motor is to be used in 50°C water.

Motor power at 50 °C = $2,2 \times 0,7 = 1,54$ kW

EXAMPLE 2

A 2,2 kW C4S motor is to be used in 50°C water.

Motor power at 50 °C = $2,2 \times 0,85 = 1,87$ kW

EXAMPLE 3

A 7,5 kW C6S motor is to be used in 45°C water.

Motor power at 50 °C = $7,5 \times 0,8 = 6$ kW

EXAMPLE 4

A 15 kW L6W motor is to be used in 35°C water.

Motor power at 35 °C = $15 \times 0,75 = 11,25$ kW

SELECTING CABLE CROSS-SECTIONS FOR SUBMERSIBLE MOTORS

To select the cross-section of power cables for submersible pumps, consult the tables shown below. In these tables, the maximum lengths of the power cable for each cross-section are shown for each motor and next to the various input voltage ratings.

Therefore, to find the required cable cross-section, simply read off the maximum permitted lengths for each cross-section next to the selected motor and required input voltage.

E.g.:

A 120 m long power cable must be matched with a 230V L4C07M235 motor.

To determine the cross-section of the cable, simply move along the row of the 230V motor until you find the maximum length of 120 m or immediately above it and then read off the corresponding cross-section in that column.

In this case, the 4 mm² cable is selected.

N.B.: the tables include specific data (current and power factor) for each motor and voltage rating based on a maximum voltage drop of 4% (HD 384.5), a maximum cable temperature of 90°C, water installation similar to air installation at a temperature of 30°C.

CABLE TYPES

SECTION mm ²	THREE CORE FLAT					FOUR CORE FLAT					SINGLE CORE ROUND			FOUR CORE ROUND		
	Hmin mm	Lmin mm	Hmax mm	Lmax mm	Weight kg/km	Hmin mm	Lmin mm	Hmax mm	Lmax mm	Weight kg/km	Dmin mm	Dmax mm	Weight kg/km	Dmin mm	Dmax mm	Weight kg/km
4	8	19,2	9	20,8	250	8	25,2	9	26,8	395	6,5	7,5	92	14	16,1	360
6	8	19,2	9	20,8	325	8	25,2	9	26,8	470	7,4	8	118	15,7	18	475
10	8	19,2	9	20,8	535	8	25,2	9	26,8	710	8,6	10	183	20,9	23,9	836
16	-	-	-	-	-	-	-	-	-	-	9,6	11	251	23,8	27,1	1145
25	-	-	-	-	-	-	-	-	-	-	11	13	362	28,9	32,9	1716
35	-	-	-	-	-	-	-	-	-	-	12,5	14,5	497	-	-	-
50	-	-	-	-	-	-	-	-	-	-	15	17	669	-	-	-
70	-	-	-	-	-	-	-	-	-	-	17,5	19,5	901	-	-	-
95	-	-	-	-	-	-	-	-	-	-	20,5	22,5	1141	-	-	-
120	-	-	-	-	-	-	-	-	-	-	22	24,4	1435	-	-	-
150	-	-	-	-	-	-	-	-	-	-	25,2	28,3	1795	-	-	-
185	-	-	-	-	-	-	-	-	-	-	27,6	31	2156	-	-	-
240	-	-	-	-	-	-	-	-	-	-	30,6	34,5	2760	-	-	-

L-cavi-en_a_td

4OS SINGLE-PHASE, 50 Hz: SIZING OF ETHYLENE-PROPILENE (EPR) CABLES, DOL (DIRECT ON LINE) STARTING

MOTOR TYPE SINGLE-PHASE	RATED POWER Kw HP		RATED VOLTAGE V	Cos φ	RATED CURRENT A	VOLTAGE DROP %	Cable cross section: 4G x ...mm ²								
							mm ²	1,5	2,5	4	6	10	16	25	35
							A max	23	32	42	54	75	100	127	158
							Maximum lenght in metres								
4OS03M235	0,37	0,5	220	0,98	3,01	4		107	179	288	432				
			230	0,96	3,06										
			240	0,93	3,16										
4OS05M235	0,55	0,75	220	0,98	4,07			79	132	213	319				
			230	0,96	4,13										
			240	0,92	4,25										
4OS07M235	0,75	1	220	0,99	5,44			58	98	158	237	409			
			230	0,97	5,45										
			240	0,94	5,58										
4OS11M235	1,1	1,5	220	0,99	7,45			42	71	115	172	298	469		
			230	0,98	7,37										
			240	0,95	7,55										
4OS15M235	1,5	2	220	0,98	10,0			31	53	86	129	223	351	542	
			230	0,96	10,1										
			240	0,92	10,5										
4OS22M235	2,2	3	220	0,99	14,3			20	36	58	89	154	244	377	528
			230	0,97	14,1										
			240	0,94	14,4										
4OS40M235	4	5,5	220	0,96	25,7			-	18	31	49	86	137	212	296
			230	0,94	24,9										
			240	0,92	24,8										

Exposed cable laid at a temperature of 30°C, maximum conductor temperature of 90°C

4osm-b-cavi-50-en_e_te

4OS THREE-PHASE, 50 Hz: SIZING OF ETHYLENE-PROPILENE (EPR) CABLES, DOL (DIRECT ON LINE) STARTING

MOTOR TYPE THREE-PHASE	RATED POWER		RATED VOLTAGE V	Cos φ	RATED CURRENT A	VOLTAGE DROP %	Cable cross section: 4G x ...mm²								
	Kw	HP					mm²	1,5	2,5	4	6	10	16	25	35
							A max	23	32	42	54	75	100	127	158
Maximum lenght in metres															
4OS03T235	0,37	0,5	220	0,78	2,04	4		229	381						
			230	0,72	2,08										
			240	0,68	2,15										
			220	0,80	2,79										
4OS05T235	0,55	0,75	230	0,75	2,86			163	271						
			240	0,71	2,96										
			220	0,78	3,76										
4OS07T235	0,75	1	230	0,71	3,95			124	206	331					
			240	0,67	4,16										
			220	0,80	5,06										
4OS11T235	1,1	1,5	230	0,74	5,18			89	149	240	358				
			240	0,70	5,42										
			220	0,78	6,95										
4OS15T235	1,5	2	230	0,72	7,24			66	110	178	266	455			
			240	0,68	7,64										
			220	0,80	9,72										
4OS22T235	2,2	3	230	0,74	10,0			45	76	123	185	317			
			240	0,69	10,5										
			220	0,85	12,1										
4OS30T235	3	4	230	0,81	12,0			33	57	93	140	241	376		
			240	0,77	12,3										
			220	0,85	16,4										
4OS40T235	4	5,5	230	0,80	16,5			23	41	67	102	177	277		
			240	0,76	17,0										
			220	0,83	22,9										
4OS55T235	5,5	7,5	230	0,78	23,0			-	28	48	73	128	201	306	
			240	0,73	23,7										
			220	0,82	31,0										
4OS75T235	7,5	10	230	0,76	31,4			-	19	34	53	94	148	227	314
			240	0,71	32,4										
			220	0,80	39,7										
4OS03T405	0,37	0,5	380	0,78	1,18			685							
			400	0,72	1,20										
			415	0,68	1,24										
4OS05T405	0,55	0,75	380	0,80	1,61			489							
			400	0,75	1,65										
			415	0,71	1,71										
4OS07T405	0,75	1	380	0,78	2,20			367							
			400	0,71	2,30										
			415	0,67	2,40										
4OS11T405	1,1	1,5	380	0,80	2,90			271	451						
			400	0,74	3,00										
			415	0,70	3,10										
4OS15T405	1,5	2	380	0,78	4,00			201	334						
			400	0,72	4,20										
			415	0,68	4,40										
4OS22T405	2,2	3	380	0,80	5,60			139	232	374					
			400	0,74	5,80										
			415	0,69	6,10										
4OS30T405	3	4	380	0,85	7,00			104	174	281	421				
			400	0,81	7,00										
			415	0,77	7,10										
4OS40T405	4	5,5	380	0,85	9,50			75	127	206	309				
			400	0,80	9,50										
			415	0,76	9,80										
4OS55T405	5,5	7,5	380	0,83	13,2			53	92	150	226	389			
			400	0,78	13,3										
			415	0,73	13,7										
4OS75T405	7,5	10	380	0,82	17,9			37	66	109	166	288	451		
			400	0,76	18,1										
			415	0,71	18,7										

Exposed cable laid at a temperature of 30°C, maximum conductor temperature of 90°C

4os-b-cavi-50-en_b_te

C4S SINGLE-PHASE, 50 Hz: SIZING OF ETHYLENE-PROPILENE (EPR) CABLES, DOL (DIRECT ON LINE) STARTING

MOTOR TYPE SINGLE-PHASE	RATED POWER		RATED VOLTAGE V	Cos φ	RATED CURRENT A	VOLTAGE DROP %	Cable cross section: 4G x ...mm ² (2W: 3G x ...mm ²)								
	Kw	HP					mm ²	1,5	2,5	4	6	10	16	25	35
							A max	23	32	42	54	75	100	127	158
							Maximum lenght in metres								
C4S03M235 2W	0,37	0,5	220	0,75	4,20	4		99	166	266	397				
			230	0,71	4,30										
			240	0,68	4,30										
C4S05M235 2W	0,55	0,75	220	0,75	6,10			68	114	183	273				
			230	0,71	6,10										
			240	0,69	6,20										
C4S07M235 2W	0,75	1	220	0,73	8,70			48	81	131	196	334			
			230	0,69	9,00										
			240	0,66	9,40										
C4S11M235 2W	1,1	1,5	220	0,77	11,4			34	58	94	141	242	377		
			230	0,73	11,4										
			240	0,69	11,7										
C4S03M235	0,37	0,5	220	0,9	3,20			114	191	306	457				
			230	0,86	3,40										
			240	0,81	3,70										
C4S05M235	0,55	0,75	220	0,94	4,20			80	133	215	321				
			230	0,91	4,30										
			240	0,87	4,50										
C4S07M235	0,75	1	220	0,93	5,60			60	101	162	243	418			
			230	0,91	5,70										
			240	0,86	6,10										
C4S11M235	1,1	1,5	220	0,98	7,70			41	69	112	168	290	457		
			230	0,95	7,70										
			240	0,92	8,00										
C4S15M235	1,5	2	220	0,97	10,2			31	52	85	128	221	347	534	
			230	0,96	10,2										
			240	0,93	10,4										
C4S22M235	2,2	3	220	0,98	14,5			20	35	58	88	153	242	373	522
			230	0,96	14,3										
			240	0,94	14,5										

Exposed cable laid at a temperature of 30°C, maximum conductor temperature of 90°C

C4Sm_Cavi-50-en_a_te

C4S THREE-PHASE, 50 Hz: SIZING OF ETHYLENE-PROPILENE (EPR) CABLES, DOL (DIRECT ON LINE) STARTING

MOTOR TYPE THREE-PHASE	RATED POWER Kw HP		RATED VOLTAGE V	Cos φ	RATED CURRENT A	VOLTAGE DROP %	Cable cross section: 4G x ...mm ²									
							mm ²	1,5	2,5	4	6	10	16	25	35	
							A max	23	32	42	54	75	100	127	158	
							Maximum lenght in metres									
C4S03T235	0,37	0,50	220	0,70	2,09	4		249	413							
			230	0,65	2,17											
			240	0,61	2,26											
C4S05T235	0,55	0,75	220	0,74	2,87			171	284	456						
			230	0,69	2,92											
			240	0,65	3,02											
C4S07T235	0,75	1	220	0,79	3,61			127	212	340						
			230	0,75	3,61											
			240	0,71	3,68											
C4S11T235	1,1	1,5	220	0,77	5,70			82	137	220	329					
			230	0,71	5,35											
			240	0,69	5,20											
C4S15T235	1,5	2	220	0,79	6,81			66	111	180	268	459				
			230	0,75	6,85											
			240	0,72	6,97											
C4S22T235	2,2	3	220	0,82	9,70			44	75	121	181	311				
			230	0,79	9,50											
			240	0,75	9,70											
C4S30T235	3	4	220	0,80	13,0			32	56	91	137	236	368			
			230	0,76	13,0											
			240	0,74	13,2											
C4S40T235	4	5,5	220	0,79	17,3			23	41	68	103	179	279	424		
			230	0,76	17,3											
			240	0,72	17,7											
C4S55T235	5,5	7,5	220	0,83	22,9			-	28	48	73	128	201	307		
			230	0,81	22,2											
			240	0,78	21,8											
C4S03T405	0,37	0,50	380	0,70	1,21			743								
			400	0,65	1,26											
			415	0,61	1,31											
C4S05T405	0,55	0,75	380	0,74	1,66			512								
			400	0,69	1,69											
			415	0,65	1,75											
C4S07T405	0,75	1	380	0,79	2,09			381								
			400	0,75	2,09											
			415	0,71	2,13											
C4S11T405	1,1	1,5	380	0,77	3,30			247	411							
			400	0,71	3,10											
			415	0,69	3,00											
C4S15T405	1,5	2	380	0,79	3,94			201	335							
			400	0,75	3,96											
			415	0,72	4,03											
C4S22T405	2,2	3	380	0,82	5,60			135	227	365						
			400	0,79	5,50											
			415	0,75	5,60											
C4S30T405	3	4	380	0,79	7,53			103	174	280	419					
			400	0,76	7,53											
			415	0,72	7,64											
C4S40T405	4	5,5	380	0,79	10,0			76	129	210	314					
			400	0,76	10,0											
			415	0,72	10,2											
C4S55T405	5,5	7,5	380	0,83	13,2			53	92	150	226	389				
			400	0,81	12,8											
			415	0,78	12,6											
C4S75T405	7,5	10	380	0,83	18,1			-	64	107	162	282	441			
			400	0,79	17,9											
			415	0,77	17,9											

Exposed cable laid at a temperature of 30°C, maximum conductor temperature of 90°C

c4s-cavi-50-en_a_te

C6S, 50 Hz: SIZING OF ETHYLENE-PROPILENE (EPR) CABLES DOL (DIRECT ON LINE) STARTING

MOTOR TYPE THREE-PHASE	RATED POWER		RATED VOLTAGE V	Cos φ	RATED CURRENT A	VOLTAGE DROP %	Cable cross section: 4G x ...mm ²								
							mm ²	4	6	10	16	25	35	50	70
	A max	42					54	75	100	127	158	192	246		
	Maximum lenght in metres														
C6S40T405	4	5.5	380	0.85	9.40	4		208	312	537					
			400	0.83	9.20										
			415	0.80	9.10										
C6S55T405	5.5	7.5	380	0.85	12.7			152	230	396					
			400	0.82	12.4										
			415	0.80	12.3										
C6S75T405	7.5	10	380	0.86	16.9			111	169	293	459				
			400	0.84	16.5										
			415	0.81	16.4										
C6S93T405	9.3	12.5	380	0.88	20.3			89	136	237	374	571			
			400	0.86	19.5										
			415	0.84	19.1										
C6S110T405	11	15	380	0.87	24.3			73	113	199	314	480			
			400	0.85	23.6										
			415	0.83	23.4										
C6S150T405	15	20	380	0.88	32.8			50	80	143	227	350	487		
			400	0.86	31.5										
			415	0.84	31.1										
C6S185T405	18.5	25	380	0.89	39.8			39	62	114	183	284	396		
			400	0.87	38.2										
			415	0.85	37.7										
C6S220T405	22	30	380	0.90	46.3			-	51	95	154	240	336	473	
			400	0.90	44.3										
			415	0.89	43.0										
C6S300T405	30	40	380	0.91	63.7			-	-	63	106	168	238	338	470
			400	0.90	60.2										
			415	0.89	59.0										
C6S370T405	37	50	380	0.90	75.3			-	-	-	87	140	200	284	397
			400	0.88	72.6										
			415	0.89	70.9										

Exposed cable laid at a temperature of 30°C, maximum conductor temperature of 90°C

c6s-cavi-50-en_a_te

C6S, 50 Hz: SIZING OF ETHYLENE-PROPILENE (EPR) CABLES

Y/Δ (STAR / DELTA) STARTING

MOTOR TYPE THREE-PHASE	RATED POWER		RATED VOLTAGE V	Cos φ	RATED CURRENT A	VOLTAGE DROP %	Cable cross section: 4G x ...mm ² + 3 x ...mm ²								
							mm ²	4	6	10	16	25	35	50	70
	A max*	73					94	130	173	220	274	333	426		
	Maximum lenght in metres														
C6S40T405-SD	4	5.5	380	0.85	9.4	4		182	272						
			400	0.83	9.2										
			415	0.79	9.1										
C6S55T405-SD	5.5	7.5	380	0.85	12.7			134	201	345					
			400	0.82	12.4										
			415	0.80	12.3										
C6S75T405-SD	7.5	10	380	0.86	16.9			99	149	256					
			400	0.84	16.5										
			415	0.81	16.4										
C6S93T405-SD	9.3	12.5	380	0.88	20.3			80	121	208	326				
			400	0.86	19.5										
			415	0.84	19.1										
C6S110T405-SD	11	15	380	0.87	24.3			67	101	175	274				
			400	0.85	23.6										
			415	0.83	23.4										
C6S150T405-SD	15	20	380	0.88	32.8			48	73	128	200	306			
			400	0.86	31.5										
			415	0.84	31.1										
C6S185T405-SD	18.5	25	380	0.89	39.8			38	59	103	163	250			
			400	0.87	38.2										
			415	0.85	37.7										
C6S220T405-SD	22	30	380	0.90	46.3			32	49	87	138	212	295		
			400	0.90	44.3										
			415	0.89	43.0										
C6S300T405-SD	30	40	380	0.91	63.7			21	34	61	98	151	212	298	
			400	0.90	60.2										
			415	0.89	59.0										
C6S370T405-SD	37	50	380	0.90	75.3			-	28	51	82	128	179	252	349
			400	0.88	72.6										
			415	0.86	70.9										

Exposed cable laid at a temperature of 30°C, maximum conductor temperature of 90°C

c6s-cavi-SD-50-en_a_te

*A max is the maximum rated current of the motor

L6W, 50 Hz: SIZING OF ETHYLENE-PROPILENE (EPR) CABLES DOL (DIRECT ON LINE) STARTING

MOTOR TYPE	RATED POWER		RATED VOLTAGE	Cos φ	RATED CURRENT	VOLTAGE DROP	Cable cross section: 4G x ...mm ²								
							mm ²	4	6	10	16	25	35	50	70
							A max	42	54	75	100	127	158	192	246
THREE-PHASE	Kw	HP	V		A	%	Maximum lenght in metres								
L6W40T405	4	5.5	380	0.89	9.72	4		193	289	498					
			415	0.84	9.17										
L6W55T405	5.5	7.5	380	0.86	12.8			150	225	389					
			415	0.79	12.7										
L6W75T405	7.5	10	380	0.86	17.5			107	163	282	443				
			415	0.78	17.6										
L6W93T405	9.3	12.5	380	0.88	20.9			86	132	230	363	555			
			415	0.82	20.3										
L6W110T405	11	15	380	0.89	24.5			71	110	193	306	469			
			415	0.84	23.1										
L6W130T405	13	17.5	380	0.85	30.0			58	91	162	257	394	546		
			415	0.76	30.2										
L6W150T405	15	20	380	0.87	33.9			49	77	139	222	341	474		
			415	0.81	32.2										
L6W185T405	18.5	25	380	0.87	40.2			-	63	115	185	286	398		
			415	0.80	39.3										
L6W220T405	22	30	380	0.87	47.5			-	50.8	94.8	154	240	335	471	
			415	0.81	46.6										
L6W260T405	26	35	380	0.87	55.6			-	-	78	129	202	284	399	
			415	0.81	54.2										
L6W300T405	30	40	380	0.87	63.0			-	-	67	112	176	249	351	485
			415	0.80	61.7										
L6W370T405	37	50	380	0.86	77.9			-	-	-	87	139	199	282	391
			415	0.79	77.2										

Exposed cable laid at a temperature of 30°C, maximum conductor temperature of 90°C

l6w-cavi-50-en_e_te

L6W HT, 50 Hz: SIZING OF ETHYLENE-PROPILENE (EPR) CABLES DOL (DIRECT ON LINE) STARTING

MOTOR TYPE THREE-PHASE	RATED POWER		RATED VOLTAGE V	Cos φ	RATED CURRENT A	VOLTAGE DROP %	Cable cross section: 4G x ...mm ²								
							mm2	4	6	10	16	25	35	50	70
	A max	42	54	75	100	127	158	192	246						
Maximum lenght in metres															
L6W40T405 HT	4	5.5	380	0.76	11.4	4		190	285	489					
			415	0.66	13										
L6W55T405 HT	5.5	7.5	380	0.85	14.0			138	208	359					
			415	0.77	14.6										
L6W75T405 HT	7.5	10	380	0.89	17.7			102	156	271	425				
			415	0.82	17.3										
L6W93T405 HT	9.3	12.5	380	0.90	22.0			80	122	214	338	518			
			415	0.85	20.3										
L6W110T405 HT	11	15	380	0.89	24.5			71	110	193	305	468			
			415	0.84	23.1										
L6W130T405 HT	13	17.5	380	0.88	30.5			55	87	154	245	377	524		
			415	0.83	28.7										
L6W150T405 HT	15	20	380	0.87	34.2			48	77	138	220	338	470		
			415	0.81	32.5										
L6W185T405 HT	18.5	25	380	0.87	40.4			-	63	114	184	284	396		
			415	0.81	39										
L6W220T405 HT	22	30	380	0.87	48.3			-	49.6	92.8	151	235	329	462	
			415	0.81	46.9										
L6W260T405 HT	26	35	380	0.89	57.1			-	-	74	123	193	272	383	
			415	0.83	54.4										
L6W300T405 HT	30	40	380	0.88	64.1			-	-	64	108	171	242	342	
			415	0.82	61.8										
L6W370T405 HT	37	50	380	0.88	79.8			-	-	-	83	133	190	271	377
			415	0.82	77										

Exposed cable laid at a temperature of 30°C, maximum conductor temperature of 90°C

l6w-ht-cavi-50-en_d_te

L6W, 50 Hz: SIZING OF ETHYLENE-PROPILENE (EPR) CABLES Y/Δ (STAR / DELTA) STARTING

MOTOR TYPE	RATED POWER		RATED VOLTAGE	Cos φ	RATED CURRENT	VOLTAGE DROP	Cable cross section: 4G x ...mm ² + 3 x ...mm ²								
							mm ²	4	6	10	16	25	35	50	70
							A max*	73	94	130	173	220	274	333	426
THREE-PHASE	Kw	HP	V		A	%	Maximum lenght in metres								
L6W40T405	4	5.5	380	0.89	9.72	4		-	-						
			415	0.84	9.17										
L6W55T405	5.5	7.5	380	0.86	12.8			132	197	338					
			415	0.79	12.7										
L6W75T405	7.5	10	380	0.86	17.5			96	144	247					
			415	0.78	17.6										
L6W93T405	9.3	12.5	380	0.88	20.9			78	117	202	316				
			415	0.82	20.3										
L6W110T405	11	15	380	0.89	24.5			65	99	171	267				
			415	0.84	23.1										
L6W130T405	13	17.5	380	0.85	30.0			55	83	144	226				
			415	0.76	30.2										
L6W150T405	15	20	380	0.87	33.9			47	71	124	196	299			
			415	0.81	32.2										
L6W185T405	18.5	25	380	0.87	40.2			39	60	104	164	252			
			415	0.80	39.3										
L6W220T405	22	30	380	0.87	47.5			32	49.6	87.5	139	212	295		
			415	0.81	46.6										
L6W260T405	26	35	380	0.87	55.6			26	41	74	117	180	251		
			415	0.81	54.2										
L6W300T405	30	40	380	0.87	63.0			22	35.7	64.3	103	159	221	309	
			415	0.80	61.7										
L6W370T405	37	50	380	0.86	77.9			-	28	51	83	128	179	250	344
			415	0.79	77.2										

Exposed cable laid at a temperature of 30°C, maximum conductor temperature of 90°C
*A max is the maximum rated current of the motor

L6W-cavi-SD-50-en_e_te

L6W HT, 50 Hz: SIZING OF ETHYLENE-PROPILENE (EPR) CABLES Y/Δ (STAR / DELTA) STARTING

MOTOR TYPE THREE-PHASE	RATED POWER Kw HP		RATED VOLTAGE V	Cos φ	RATED CURRENT A	VOLTAGE DROP %	Cable cross section: 4G x ...mm ² + 3 x ...mm ²								
							mm ²	4	6	10	16	25	35	50	70
							A max*	73	94	130	173	220	274	333	426
Maximum lenght in metres															
L6W40T405 HT	4	5.5	380	0.76	11.4	4		-							
			415	0.66	13										
L6W55T405 HT	5.5	7.5	380	0.85	14.0			-							
			415	0.77	14.6										
L6W75T405 HT	7.5	10	380	0.89	17.7			-							
			415	0.82	17.3										
L6W93T405 HT	9.3	12.5	380	0.90	22.0			-							
			415	0.85	20.3										
L6W110T405 HT	11	15	380	0.89	24.5			65	98	170	267				
			415	0.84	23.1										
L6W130T405 HT	13	17.5	380	0.88	30.5			52	79	137	216				
			415	0.83	28.7										
L6W150T405 HT	15	20	380	0.87	34.2			46	71	123	194	296			
			415	0.81	32.5										
L6W185T405 HT	18.5	25	380	0.87	40.4			38	59	104	164	250			
			415	0.81	39										
L6W220T405 HT	22	30	380	0.87	48.3			31	48.6	85.9	136	209	289		
			415	0.81	46.9										
L6W260T405 HT	26	35	380	0.89	57.1			32	48	83	129	197	272		
			415	0.83	54.4										
L6W300T405 HT	30	40	380	0.88	64.1			22	35	62	100	154	215	301	
			415	0.82	61.8										
L6W370T405 HT	37	50	380	0.88	79.8			-	-	48.6	78.9	123	172	241	332
			415	0.82	77.0										

Exposed cable laid at a temperature of 30°C, maximum conductor temperature of 90°C
*A max is the maximum rated current of the motor

l6w-ht-cavi-SD-50-en_d_te

SPLICE BETWEEN DROP CABLE AND MOTOR CABLE

MOTOR TYPE	POWER kW	TYPE OF SPLICE	FOUR-CORE DROP CABLE - SECTION (mm ²)												
			1,5	2,5	4	6	10	16	25	35	50	70	95	120	150
4OS C4S	0,37 - 7,5	Resin-filled method	GR11	GR11	GR12	GR12	GR12	GR13	GR13	GR14	GR14	GR15	GR15	GR16	-
		Heat-shrink method	GT11	GT11	GT12	GT12	GT13	GT14	GT15	GT16	-	-	-	-	-
		Tape method	Self-vulcanizing tape + self-vulcanizing sealing putty and PVC tape (1)												
C6S L6W	4 - 37	Resin-filled method	-	-	GR12	GR12	GR12	GR13	GR13	GR14	GR14	GR15	GR15	GR16	-
		Heat-shrink method	-	-	GT12	GT12	GT13	GT14	GT15	GT16	-	-	-	-	-
		Tape method	Self-vulcanizing tape + self-vulcanizing sealing putty and PVC tape (1)												

MOTOR TYPE	POWER kW	TYPE OF SPLICE	THREE-CORE DROP CABLE - SECTION (mm ²)												
			1,5	2,5	4	6	10	16	25	35	50	70	95	120	150
C6S L6W	4 - 37	Resin-filled method	-	-	GR12	GR12	GR12	GR13	GR13	GR14	GR14	GR15	GR15	GR16	-
		Heat-shrink method	-	-	GT12	GT12	GT13	GT14	GT15	GT16	-	-	-	-	-
		Tape method	Self-vulcanizing tape + PVC tape												

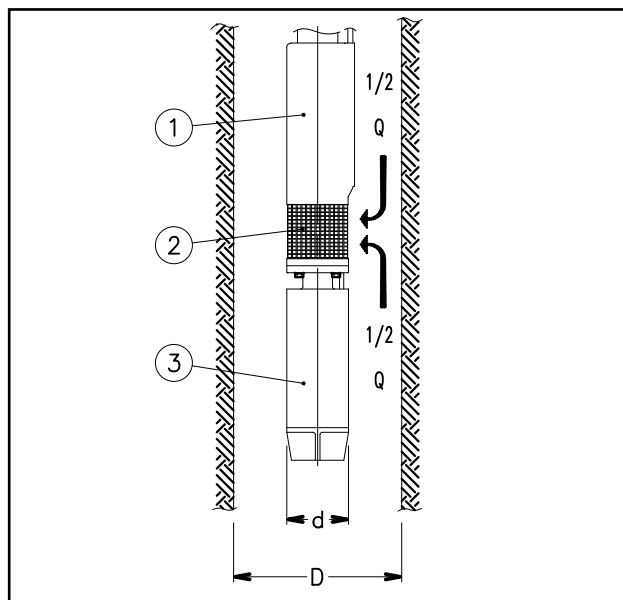
MOTOR TYPE	POWER kW	TYPE OF SPLICE	SINGLE-CORE DROP CABLE - SECTION (mm ²)												
			1,5	2,5	4	6	10	16	25	35	50	70	95	120	150
L8W L10W L12W	30 - 300	Resin-filled method	-	-	-	GR12	GR12	GR17	GR17	GR17	GR18	GR18	GR18	GR19	GR19
		Heat-shrink method	-	-	-	-	-	-	-	-	-	-	-	-	-
		Tape method	Self-vulcanizing tape + PVC tape												

(1) Use self-vulcanizing sealing putty to fill in the gaps between the three-conductor cable and the ground cable in the area covered by the final layer of tape, to restore continuity to the protective sheath.

RESIN-FILLED SPLICES				HEAT-SHRINK SPLICES			
TYPE	L x D [mm]	TYPE	L x D [mm]	TYPE	L x D [mm]	TYPE	L x D [mm]
GR11	190 x 45	GR14	357 x 62	GT11	330	GT14	330
GR12	190 x 51	GR15	325 x 95	GT12	330	GT15	500
GR13	240 x 62	GR16	520 x 100	GT13	330	GT16	500

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CALCULATING THE SPEED OF THE FLUID THAT FLOWS AROUND A SUBMERGED MOTOR AND SIZING OF THE COOLING SLEEVE



The following formula is used to verify whether the speed of the fluid that flows around the motor of a submersible pump is high enough to guarantee the proper cooling of the motor:

$$v = \frac{\frac{Q}{2}}{\pi \cdot \left(\frac{D^2}{4} - \frac{d^2}{4} \right)}$$

Where:

Q in [m³/s] is the operating flow rate of the electric pump; only half of this flow is taken into account, because the fluid which is sucked into the area of the filter (2), comes from the motor side (3) as well as from the pump side (1);

D in [m] is the diameter of the well;

d in [m] is the diameter of the motor (3);

v in [m/s] is the calculated speed of the fluid that flows around the motor.

Now, compare the speed thus calculated (v) with the minimum speed required for correct cooling of the motor (v_m) if:

v ≥ v_m the motor is properly cooled

v < v_m it will be necessary to mount a cooling sleeve (4)

Example:

An electric pump with motor diameter d = 0.144 m operates in an 8" well (well diameter D = 0.203 m) with flow rate:

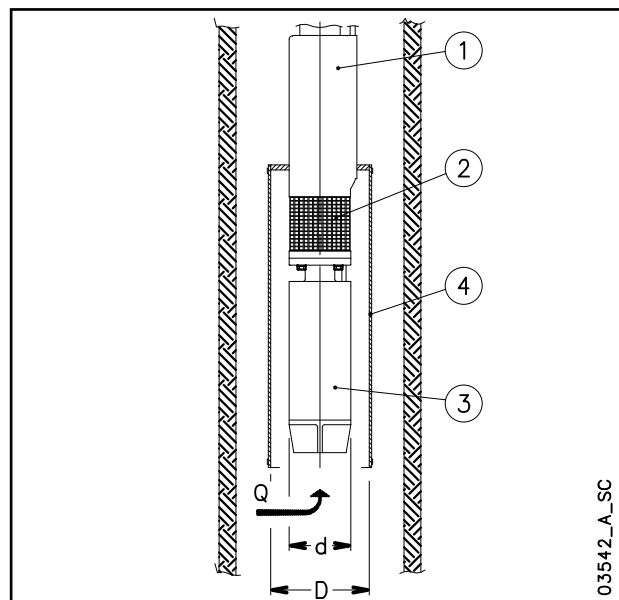
Q = 20 m³/h = 0.0055 m³/s

and speed of the fluid:

v = (0.0055/2) / {π · [(0.203)²/4 - (0.144)²/4]} = 0.17 m/s

The minimum speed required for proper motor cooling is v_m = 0.20 m/s.

As v < v_m it will be necessary to mount a cooling sleeve.



The following formula is used to determine the maximum diameter of a cooling sleeve to be mounted on a submersible motor:

$$D = \sqrt{4 \cdot \left(\frac{Q}{v \cdot \pi} + \frac{d^2}{4} \right)}$$

Where:

Q in [m³/s] is the operating flow rate of the electric pump; the entire flow is taken into account because the fluid comes from the motor side (3) only;

D in [m] corresponds to the diameter of the cooling sleeve (4);

d in [m] corresponds to the diameter of the motors(3);

v_m in [m/s] is the minimum speed of the fluid that flows around the motor.

If the electric pump operates at different flow rate, the minimum flow rate must be taken into account for calculating the diameter of the cooling sleeve.

Example:

A motor coupled to an electric pump with motor diameter d = 0.144 m, which operates with flow rate:

Q = 15 m³/h = 0.0042 m³/s

requires a minimum speed of the fluid:

v_m = 0.20 m/s.

cooling sleeve diameter:

D = {4 · [(0.0042/(0.2 · π) + (0.144)²/4]}^{0.5} = 0.217 m.

ASYNCHRONOUS MOTOR STARTING SYSTEMS

Direct

Suitable for low-power motors.

The starting current (I_s) is much higher than the rated current (I_n).

Starting current $I_s = I_n \times 4 \div 8$

Starting torque $T_s = T_n \times 2 \div 3$

Indirect

• Star/Delta

The starting current (I_s) is three times less than the direct starting current.

Starting current $I_s = I_n \times 1.3 \div 2.7$

Starting torque $T_s = T_n \times 0.7 \div 1$

In the star to delta changeover phase (approx. 70 ms) the motor is not supplied and tends to reduce its rotation speed.

In the case of submersible electric pumps with power above 10 HP, the modest mass of the rotor causes a slowdown at changeover, so that the initial Star supply phase is rendered partially useless.

In such cases we recommend using impedance panels or an autotransformer.

• Impedances

The motor is started with a voltage which is lower than the rated one, and which is obtained by means of impedances.

The Lowara panels use impedances which cut down to 70% the starting voltage.

The switch to the rated voltage takes place without any interruptions of the power supply.

Rated voltage $U_n = 400 \text{ V}$

Starting voltage $U_s = U_n \times 0.7 = 280 \text{ V}$

Starting current

$$I_s = I_n \times 4 \div 8 \times \left(\frac{U_s}{U_n} \right) = I_n \times 3 \div 6$$

Starting torque

$$T_s = T_n \times 2 \div 3 \times \left(\frac{U_s}{U_n} \right)^2 = T_n \times 1 \div 1.5$$

Autotransformer

The pump is started with a voltage which is lower than the rated one.

The Lowara panels use an autotransformer with a voltage that is 70% the value of the line voltage.

The switch to the rated voltage occurs without any interruptions of the power supply.

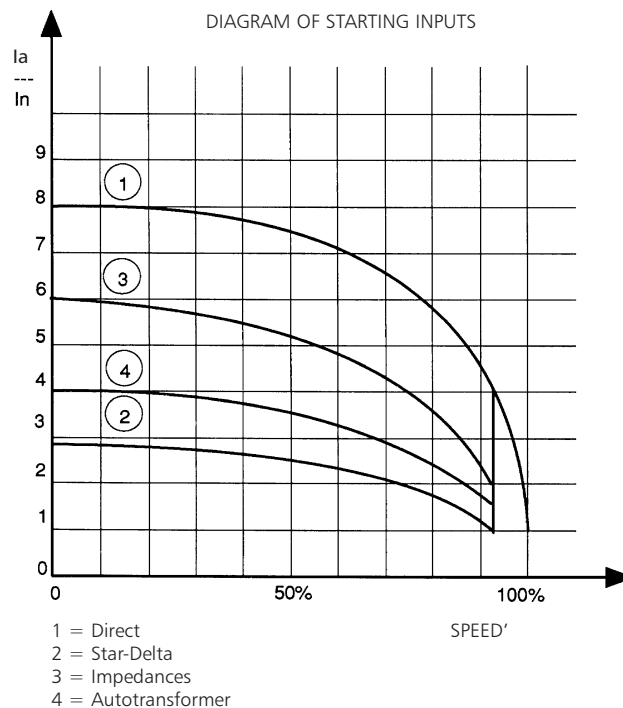
Rated voltage $U_n = 400 \text{ V}$

Starting current

$$I_s = I_n \times 4 \div 8 \times \left(\frac{U_s}{U_n} \right) = I_n \times 3 \div 6$$

Starting torque

$$T_s = T_n \times 2 \div 3 \times \left(\frac{U_s}{U_n} \right)^2 = T_n \times 1 \div 1.5$$



WATER REQUIREMENTS IN CIVIL USERS

Determination of the water requirement depends on the type of users and contemporaneity factor. The calculation may be subject to regulations, standards or customs that may vary from country to country. The calculation method shown below is an example based on practical experience, designed to provide a reference value and not a substitute for detailed analytical calculation.

Water requirements in condominiums.

The **consumption table** shows the maximum values for each delivery point, depending on the plumbing amenities.

MAXIMUM CONSUMPTION FOR EACH DELIVERY POINT

TYPE	CONSUMPTION (l/min)
Sink	9
Dishwasher	10
Washing machine	12
Shower	12
Bathtub	15
Washbasin	6
Bidet	6
Flush tank WC	6
Controlled flushing system WC	90

The **sum of the water consumption values** of each delivery point determines the maximum theoretical requirement, which must be reduced according to the **contemporaneity coefficient**, because in actual fact the delivery points are never used all together.

$f = \frac{1}{\sqrt{(0,857 \times Nr \times Na)}}$	Coefficient for apartments with one bathroom and flush tank WC
$f = \frac{1}{\sqrt{(0,857 \times Nr \times Na)}}$	Coefficient for apartments with one bathroom and controlled flushing system WC
$f = \frac{1,03}{\sqrt{(0,545 \times Nr \times Na)}}$	Coefficient for apartments with two bathrooms and flush tank WC
$f = \frac{0,8}{\sqrt{(0,727 \times Nr \times Na)}}$	Coefficient for apartments with two bathrooms and controlled flushing system WC
f= coefficient; Nr= number of delivery points; Na= number of apartments	

The **table of water requirements in civil users** shows the maximum contemporaneity flow-rate values based on the **number of apartments** and the type of WC for apartments with one bathroom and two bathrooms. As regards apartments with one bathroom, 7 drawing points have been taken into consideration, while 11 points have been considered for apartments with two bathrooms. If the number of drawing points or apartments is different, use the formulas to **calculate** the requirement.

TABLE OF WATER REQUIREMENTS IN CIVIL USERS

NUMBER OF APARTMENTS	WITH FLUSH TANK WC		WITH CONTROLLED FLUSHING SYSTEM WC	
	1	2	1	2
	FLOW RATE (l/min)			
1	32	40	60	79
2	45	56	85	111
3	55	68	105	136
4	63	79	121	157
5	71	88	135	176
6	78	97	148	193
7	84	105	160	208
8	90	112	171	223
9	95	119	181	236
10	100	125	191	249
11	105	131	200	261
12	110	137	209	273
13	114	143	218	284
14	119	148	226	295
15	123	153	234	305
16	127	158	242	315
17	131	163	249	325
18	134	168	256	334
19	138	172	263	343
20	142	177	270	352
21	145	181	277	361
22	149	185	283	369
23	152	190	290	378
24	155	194	296	386
25	158	198	302	394
26	162	202	308	401
27	165	205	314	409
28	168	209	320	417
29	171	213	325	424
30	174	217	331	431
35	187	234	357	466
40	200	250	382	498
45	213	265	405	528
50	224	280	427	557
55	235	293	448	584
60	245	306	468	610
65	255	319	487	635
70	265	331	506	659
75	274	342	523	682
80	283	354	540	704
85	292	364	557	726
90	301	375	573	747
95	309	385	589	767
100	317	395	604	787
120	347	433	662	863
140	375	468	715	932
160	401	500	764	996
180	425	530	811	1056
200	448	559	854	1114

For seaside resorts, a flow rate increased by at least 20% must be considered.

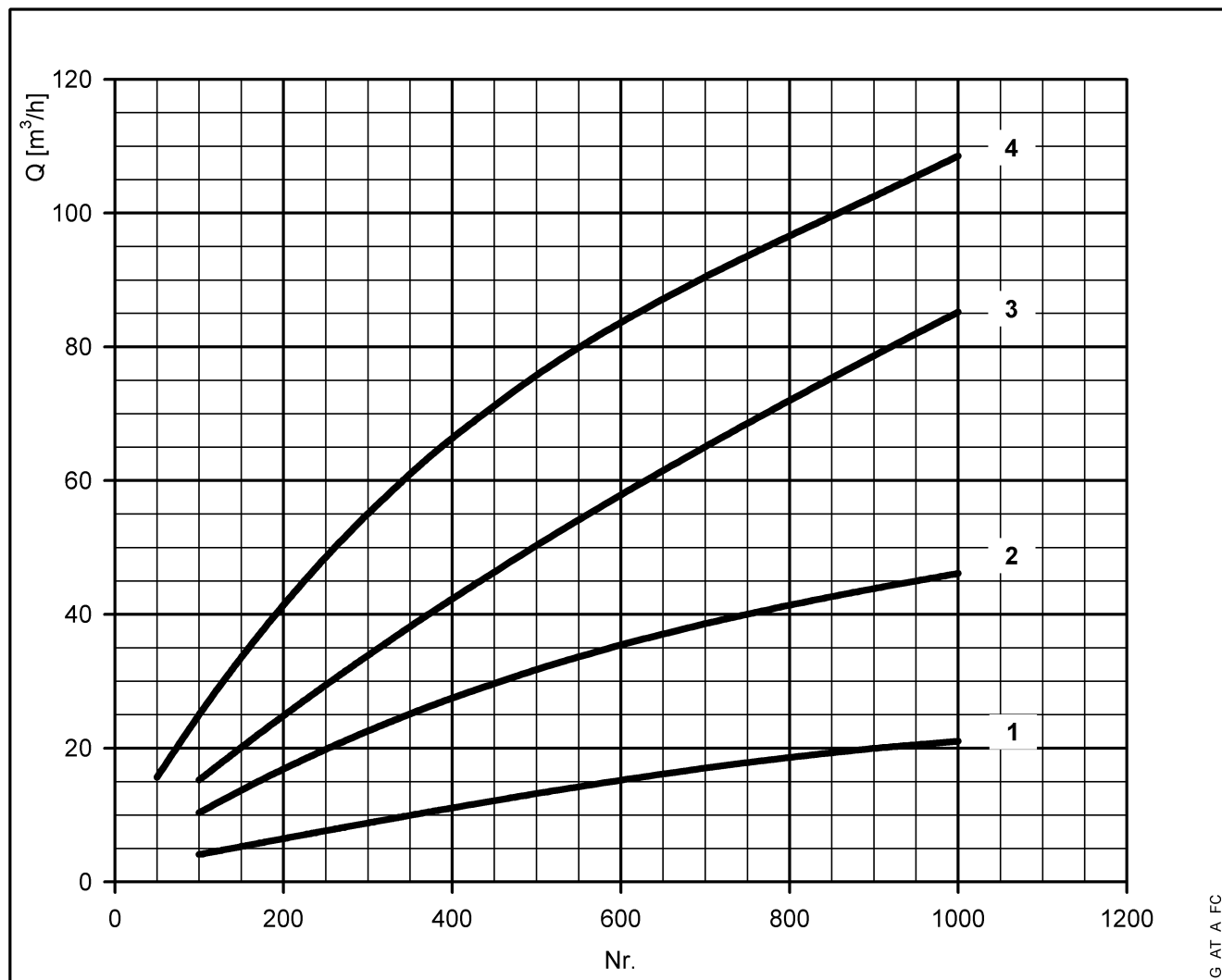
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WATER REQUIREMENTS FOR COMMUNITY BUILDINGS

The requirements of buildings intended for specific uses, such as **offices, residential units, hotels, department stores, nursing homes** and so on, are different from those of condominiums, and both their global daily water consumption and the maximum contemporaneity flow rate are usually greater.

The **diagram of water requirements for community buildings** shows the maximum contemporaneity flow rate of some types of communities, for guidance.

These requirements must be determined case by case with the utmost accuracy, using analytical calculation methods, according to particular needs and local provisions.



For seaside resorts, the flow rate must be increased by at least 20%.

- 1= Offices (N. of people)
- 2= Department stores (N. of people)
- 3= Nursing homes (N. of beds)
- 4= Hotels, residences (N. of beds)

NPSH

The minimum operating values that can be reached at the pump suction end are limited by the onset of cavitation.

Cavitation is the formation of vapour-filled cavities within liquids where the pressure is locally reduced to a critical value, or where the local pressure is equal to, or just below the vapour pressure of the liquid.

The vapour-filled cavities flow with the current and when they reach a higher pressure area the vapour contained in the cavities condenses. The cavities collide, generating pressure waves that are transmitted to the walls. These, being subjected to stress cycles, gradually become deformed and yield due to fatigue. This phenomenon, characterized by a metallic noise produced by the hammering on the pipe walls, is called incipient cavitation.

The damage caused by cavitation may be magnified by electrochemical corrosion and a local rise in temperature due to the plastic deformation of the walls. The materials that offer the highest resistance to heat and corrosion are alloy steels, especially austenitic steel. The conditions that trigger cavitation may be assessed by calculating the total net suction head, referred to in technical literature with the acronym NPSH (Net Positive Suction Head).

The NPSH represents the total energy (expressed in m.) of the liquid measured at suction under conditions of incipient cavitation, excluding the vapour pressure (expressed in m.) that the liquid has at the pump inlet.

To find the static height h_z at which to install the machine under safe conditions, the following formula must be verified:

$$h_p + h_z \geq (NPSH_r + 0.5) + h_f + h_{pv} \quad (1)$$

where:

h_p is the absolute pressure applied to the free liquid surface in the suction tank, expressed in m. of liquid; h_p is the quotient between the barometric pressure and the specific weight of the liquid.

h_z is the suction lift between the pump axis and the free liquid surface in the suction tank, expressed in m.; h_z is negative when the liquid level is lower than the pump axis.

h_f is the flow resistance in the suction line and its accessories, such as: fittings, foot valve, gate valve, elbows, etc.

h_{pv} is the vapour pressure of the liquid at the operating temperature, expressed in m. of liquid. h_{pv} is the quotient between the P_v vapour pressure and the liquid's specific weight.

0,5 is the safety factor.

The maximum possible suction head for installation depends on the value of the atmospheric pressure (i.e. the elevation above sea level at which the pump is installed) and the temperature of the liquid.

To help the user, with reference to water temperature (4° C) and to the elevation above sea level, the following tables show the drop in hydraulic pressure head in relation to the elevation above sea level, and the suction loss in relation to temperature.

Water temperat. (°C)	20	40	60	80	90	110	120
Suction loss (m)	0,2	0,7	2,0	5,0	7,4	15,4	21,5

Elevation above sea level (m)	500	1000	1500	2000	2500	3000
Suction loss (m)	0,55	1,1	1,65	2,2	2,75	3,3

Friction loss is shown in the tables at pages 66-67.

To reduce it to a minimum, especially in cases of high suction head (over 4-5 m.) or within the operating limits with high flow rates, we recommend using a suction line having a larger diameter than that of the pump's suction port.

It is always a good idea to position the pump as close as possible to the liquid to be pumped.

Make the following calculation:

Liquid: water at ~15°C $\gamma = 1 \text{ kg/dm}^3$

Flow rate required: 30 m³/h

Head for required delivery: 43 m.

Suction lift: 3,5 m.

The selection is an FHE 40-200/75 pump whose NPSH required value is, at 30 m³/h, di 2,5 m.

For water at 15 °C

$$h_p = P_a / \gamma = 10,33\text{m}, h_{pv} = P_v / \gamma = 0,174\text{m} (0,01701 \text{ bar})$$

The H_f flow resistance in the suction line with foot valves is ~ 1,2 m.

By substituting the parameters in formula (1) with the numeric values above, we have:

$$10,33 + (-3,5) \geq (2,5 + 0,5) + 1,2 + 0,17$$

from which we have: 6,8 > 4,4

The relation is therefore verified.

TECHNICAL APPENDIX VAPOUR PRESSURE p_s VAPOUR PRESSURE AND ρ DENSITY OF WATER TABLE

t °C	T K	p_s bar	ρ kg/dm ³	t °C	T K	p_s bar	ρ kg/dm ³	t °C	T K	p_s bar	ρ kg/dm ³
0	273,15	0,00611	0,9998	55	328,15	0,15741	0,9857	120	393,15	1,9854	0,9429
1	274,15	0,00657	0,9999	56	329,15	0,16511	0,9852	122	395,15	2,1145	0,9412
2	275,15	0,00706	0,9999	57	330,15	0,17313	0,9846	124	397,15	2,2504	0,9396
3	276,15	0,00758	0,9999	58	331,15	0,18147	0,9842	126	399,15	2,3933	0,9379
4	277,15	0,00813	1,0000	59	332,15	0,19016	0,9837	128	401,15	2,5435	0,9362
5	278,15	0,00872	1,0000	60	333,15	0,1992	0,9832	130	403,15	2,7013	0,9346
6	279,15	0,00935	1,0000	61	334,15	0,2086	0,9826	132	405,15	2,867	0,9328
7	280,15	0,01001	0,9999	62	335,15	0,2184	0,9821	134	407,15	3,041	0,9311
8	281,15	0,01072	0,9999	63	336,15	0,2286	0,9816	136	409,15	3,223	0,9294
9	282,15	0,01147	0,9998	64	337,15	0,2391	0,9811	138	411,15	3,414	0,9276
10	283,15	0,01227	0,9997	65	338,15	0,2501	0,9805	140	413,15	3,614	0,9258
11	284,15	0,01312	0,9997	66	339,15	0,2615	0,9799	145	418,15	4,155	0,9214
12	285,15	0,01401	0,9996	67	340,15	0,2733	0,9793	155	428,15	5,433	0,9121
13	286,15	0,01497	0,9994	68	341,15	0,2856	0,9788	160	433,15	6,181	0,9073
14	287,15	0,01597	0,9993	69	342,15	0,2984	0,9782	165	438,15	7,008	0,9024
15	288,15	0,01704	0,9992	70	343,15	0,3116	0,9777	170	443,15	7,920	0,8973
16	289,15	0,01817	0,9990	71	344,15	0,3253	0,9770	175	448,15	8,924	0,8921
17	290,15	0,01936	0,9988	72	345,15	0,3396	0,9765	180	453,15	10,027	0,8869
18	291,15	0,02062	0,9987	73	346,15	0,3543	0,9760	185	458,15	11,233	0,8815
19	292,15	0,02196	0,9985	74	347,15	0,3696	0,9753	190	463,15	12,551	0,8760
20	293,15	0,02337	0,9983	75	348,15	0,3855	0,9748	195	468,15	13,987	0,8704
21	294,15	0,24850	0,9981	76	349,15	0,4019	0,9741	200	473,15	15,550	0,8647
22	295,15	0,02642	0,9978	77	350,15	0,4189	0,9735	205	478,15	17,243	0,8588
23	296,15	0,02808	0,9976	78	351,15	0,4365	0,9729	210	483,15	19,077	0,8528
24	297,15	0,02982	0,9974	79	352,15	0,4547	0,9723	215	488,15	21,060	0,8467
25	298,15	0,03166	0,9971	80	353,15	0,4736	0,9716	220	493,15	23,198	0,8403
26	299,15	0,03360	0,9968	81	354,15	0,4931	0,9710	225	498,15	25,501	0,8339
27	300,15	0,03564	0,9966	82	355,15	0,5133	0,9704	230	503,15	27,976	0,8273
28	301,15	0,03778	0,9963	83	356,15	0,5342	0,9697	235	508,15	30,632	0,8205
29	302,15	0,04004	0,9960	84	357,15	0,5557	0,9691	240	513,15	33,478	0,8136
30	303,15	0,04241	0,9957	85	358,15	0,5780	0,9684	245	518,15	36,523	0,8065
31	304,15	0,04491	0,9954	86	359,15	0,6011	0,9678	250	523,15	39,776	0,7992
32	305,15	0,04753	0,9951	87	360,15	0,6249	0,9671	255	528,15	43,246	0,7916
33	306,15	0,05029	0,9947	88	361,15	0,6495	0,9665	260	533,15	46,943	0,7839
34	307,15	0,05318	0,9944	89	362,15	0,6749	0,9658	265	538,15	50,877	0,7759
35	308,15	0,05622	0,9940	90	363,15	0,7011	0,9652	270	543,15	55,058	0,7678
36	309,15	0,05940	0,9937	91	364,15	0,7281	0,9644	275	548,15	59,496	0,7593
37	310,15	0,06274	0,9933	92	365,15	0,7561	0,9638	280	553,15	64,202	0,7505
38	311,15	0,06624	0,9930	93	366,15	0,7849	0,9630	285	558,15	69,186	0,7415
39	312,15	0,06991	0,9927	94	367,15	0,8146	0,9624	290	563,15	74,461	0,7321
40	313,15	0,07375	0,9923	95	368,15	0,8453	0,9616	295	568,15	80,037	0,7223
41	314,15	0,07777	0,9919	96	369,15	0,8769	0,9610	300	573,15	85,927	0,7122
42	315,15	0,08198	0,9915	97	370,15	0,9094	0,9602	305	578,15	92,144	0,7017
43	316,15	0,09639	0,9911	98	371,15	0,9430	0,9596	310	583,15	98,70	0,6906
44	317,15	0,09100	0,9907	99	372,15	0,9776	0,9586	315	588,15	105,61	0,6791
45	318,15	0,09582	0,9902	100	373,15	1,0133	0,9581	320	593,15	112,89	0,6669
46	319,15	0,10086	0,9898	102	375,15	1,0878	0,9567	325	598,15	120,56	0,6541
47	320,15	0,10612	0,9894	104	377,15	1,1668	0,9552	330	603,15	128,63	0,6404
48	321,15	0,11162	0,9889	106	379,15	1,2504	0,9537	340	613,15	146,05	0,6102
49	322,15	0,11736	0,9884	108	381,15	1,3390	0,9522	350	623,15	165,35	0,5743
50	323,15	0,12335	0,9880	110	383,15	1,4327	0,9507	360	633,15	186,75	0,5275
51	324,15	0,12961	0,9876	112	385,15	1,5316	0,9491	370	643,15	210,54	0,4518
52	325,15	0,13613	0,9871	114	387,15	1,6362	0,9476	374,15	647,30	221,20	0,3154
53	326,15	0,14293	0,9862	116	389,15	1,7465	0,9460				
54	327,15	0,15002	0,9862	118	391,15	1,8628	0,9445				

G-at_npsb_b_sc

TABLE OF FLOW RESISTANCE IN 100 m OF STRAIGHT CAST IRON PIPELINE (HAZEN-WILLIAMS FORMULA C=100)

FLOW RATE		NOMINAL DIAMETER in mm and inches																												
m³/h	l/min			15 1/2"	20 3/4"	25 1"	32 1 1/4"	40 1 1/2"	50 2	65 2 1/2"	80 3"	100 4"	125 5"	150 6"	175 7"	200 8"	250 10"	300 12"	350 14"	400 16"										
0,6	10		v hr	0,94 16	0,53 3,94	0,34 1,33	0,21 0,40	0,13 0,13			The hr values must be multiplied by: 0,71 for galvanized or painted steel pipes 0,54 for stainless steel or copper pipes 0,47 for PVC or PE pipes																			
0,9	15		v hr	1,42 33,9	0,80 8,35	0,51 2,82	0,31 0,85	0,20 0,29																						
1,2	20		v hr	1,89 57,7	1,06 14,21	0,68 4,79	0,41 1,44	0,27 0,49	0,17 0,16																					
1,5	25		v hr	2,36 87,2	1,33 21,5	0,85 7,24	0,52 2,18	0,33 0,73	0,21 0,25																					
1,8	30		v hr	2,83 122	1,59 30,1	1,02 10,1	0,62 3,05	0,40 1,03	0,25 0,35																					
2,1	35		v hr	3,30 162	1,86 40,0	1,19 13,5	0,73 4,06	0,46 1,37	0,30 0,46																					
2,4	40		v hr		2,12 51,2	1,36 17,3	0,83 5,19	0,53 1,75	0,34 0,59	0,20 0,16																				
3	50		v hr		2,65 77,4	1,70 26,1	1,04 7,85	0,66 2,65	0,42 0,89	0,25 0,25																				
3,6	60		v hr		3,18 108	2,04 36,6	1,24 11,0	0,80 3,71	0,51 1,25	0,30 0,35																				
4,2	70		v hr		3,72 144	2,38 48,7	1,45 14,6	0,93 4,93	0,59 1,66	0,35 0,46																				
4,8	80		v hr		4,25 185	2,72 62,3	1,66 18,7	1,06 6,32	0,68 2,13	0,40 0,59																				
5,4	90		v hr			3,06 77,5	1,87 23,3	1,19 7,85	0,76 2,65	0,45 0,74	0,30 0,27																			
6	100		v hr			3,40 94,1	2,07 28,3	1,33 9,54	0,85 3,22	0,50 0,90	0,33 0,33																			
7,5	125		v hr			4,25 142	2,59 42,8	1,66 14,4	1,06 4,86	0,63 1,36	0,41 0,49																			
9	150		v hr				3,11 59,9	1,99 20,2	1,27 6,82	0,75 1,90	0,50 0,69	0,32 0,23																		
10,5	175		v hr				3,63 79,7	2,32 26,9	1,49 9,07	0,88 2,53	0,58 0,92	0,37 0,31																		
12	200		v hr				4,15 102	2,65 34,4	1,70 11,6	1,01 3,23	0,66 1,18	0,42 0,40																		
15	250		v hr				5,18 154	3,32 52,0	2,12 17,5	1,26 4,89	0,83 1,78	0,53 0,60	0,34 0,20																	
18	300		v hr					3,98 72,8	2,55 24,6	1,51 6,85	1,00 2,49	0,64 0,84	0,41 0,28																	
24	400		v hr					5,31 124	3,40 41,8	2,01 11,66	1,33 4,24	0,85 1,43	0,54 0,48	0,38 0,20																
30	500		v hr					6,63 187	4,25 63,2	2,51 17,6	1,66 6,41	1,06 2,16	0,68 0,73	0,47 0,30																
36	600		v hr					5,10 88,6	3,02 24,7	1,99 8,98	1,27 3,03	0,82 1,02	0,57 0,42	0,42 0,20																
42	700		v hr					5,94 118	3,52 32,8	2,32 11,9	1,49 4,03	0,95 1,36	0,66 0,56	0,49 0,26																
48	800		v hr					6,79 151	4,02 42,0	2,65 15,3	1,70 5,16	1,09 1,74	0,75 0,72	0,55 0,34																
54	900		v hr					7,64 188	4,52 52,3	2,99 19,0	1,91 6,41	1,22 2,16	0,85 0,89	0,62 0,42																
60	1000		v hr					5,03 63,5	3,32 23,1	2,12 7,79	1,36 2,63	0,94 1,08	0,69 0,51	0,53 0,27																
75	1250		v hr					6,28 96,0	4,15 34,9	2,65 11,8	1,70 3,97	1,18 1,63	0,87 0,77	0,66 0,40																
90	1500		v hr					7,54 134	4,98 48,9	3,18 16,5	2,04 5,57	1,42 2,29	1,04 1,08	0,80 0,56																
105	1750		v hr					8,79 179	5,81 65,1	3,72 21,9	2,38 7,40	1,65 3,05	1,21 1,44	0,93 0,75																
120	2000		v hr					6,63 83,3	4,25 28,1	2,72 9,48	1,89 3,90	1,39 1,84	1,06 0,96	0,68 0,32																
150	2500		v hr					8,29 126	5,31 42,5	3,40 14,3	2,36 5,89	1,73 2,78	1,33 1,45	0,85 0,49																
180	3000		v hr						6,37 59,5	4,08 20,1	2,83 8,26	2,08 3,90	1,59 2,03	1,02 0,69	0,71 0,28															
210	3500		v hr						7,43 79,1	4,76 26,7	3,30 11,0	2,43 5,18	1,86 2,71	1,19 0,91	0,83 0,38															
240	4000		v hr						8,49 101	5,44 34,2	3,77 14,1	2,77 6,64	2,12 3,46	1,36 1,17	0,94 0,48															
300	5000		v hr							6,79 51,6	4,72 21,2	3,47 10,0	2,65 5,23	1,70 1,77	1,18 0,73															
360	6000		v hr								8,15 72,3	5,66 29,8	4,16 14,1	3,18 7,33	2,04 2,47	1,42 1,02														
420	7000		v hr									6,61 39,6	4,85 18,7	3,72 9,75	2,38 3,29	1,65 1,35	1,21 0,64													
480	8000		v hr									7,55 50,7	5,55 23,9	4,25 12,49	2,72 4,21	1,89 1,73	1,39 0,82													
540	9000		v hr									8,49 63,0	6,24 29,8	4,78 15,5	3,06 5,24	2,12 2,16	1,56 1,02	1,19 0,53												
600	10000		v hr										6,93 36,2	5,31 18,9	3,40 6,36	2,36 2,62	1,73 1,24	1,33 0,65												

hr = flow resistance for 100 m of straight pipeline (m)

V = water speed (m/s)

G-at-pct-en_b_th

TABLE OF FLOW RESISTANCE IN BENDS, VALVES AND GATES

The flow resistance is calculated using the equivalent pipeline length method according to the table below:

ACCESSORY TYPE	DN											
	25	32	40	50	65	80	100	125	150	200	250	300
	Equivalent pipeline length (m)											
45° bend	0,2	0,2	0,4	0,4	0,6	0,6	0,9	1,1	1,5	1,9	2,4	2,8
90° bend	0,4	0,6	0,9	1,1	1,3	1,5	2,1	2,6	3,0	3,9	4,7	5,8
90° smooth bend	0,4	0,4	0,4	0,6	0,9	1,1	1,3	1,7	1,9	2,8	3,4	3,9
Union tee or cross	1,1	1,3	1,7	2,1	2,6	3,2	4,3	5,3	6,4	7,5	10,7	12,8
Gate valve	-	-	-	0,2	0,2	0,2	0,4	0,4	0,6	0,9	1,1	1,3
Foot check valve	1,1	1,5	1,9	2,4	3,0	3,4	4,7	5,9	7,4	9,6	11,8	13,9
Non return valve	1,1	1,5	1,9	2,4	3,0	3,4	4,7	5,9	7,4	9,6	11,8	13,9

G-a-pcv-en_b_th

The table is valid for the Hazen Williams coefficient $C = 100$ (cast iron pipework). For steel pipework, multiply the values by 1.41. For stainless steel, copper and coated cast iron pipework, multiply the values by 1.85.

When the **equivalent pipeline length** has been determined, the flow resistance is obtained from the table of flow resistance.

The values given are guideline values which are bound to vary slightly according to the model, especially for gate valves and non-return valves, for which it is a good idea to check the values supplied by the manufacturers.

VOLUMETRIC CAPACITY

Litres per minute l/min	Cubic metres per hour m ³ /h	Cubic feet per hour ft ³ /h	Cubic feet per minute ft ³ /min	Imperial gallon per minute Imp. gal/min	U.S. gallon per minute US gal/min
1,0000	0,0600	2,1189	0,0353	0,2200	0,2642
16,6667	1,0000	35,3147	0,5886	3,6662	4,4029
0,4719	0,0283	1,0000	0,0167	0,1038	0,1247
28,3168	1,6990	60,0000	1,0000	6,2288	7,4805
4,5461	0,2728	9,6326	0,1605	1,0000	1,2009
3,7854	0,2271	8,0208	0,1337	0,8327	1,0000

PRESSURE AND HEAD

Newton per square metre N/m ²	kilo Pascal kPa	bar bar	Pound force per square inch psi	Metre of water m H ₂ O	Millimetre of mercury mm Hg
1,0000	0,0010	1×10^{-5}	$1,45 \times 10^{-4}$	$1,02 \times 10^{-4}$	0,0075
1 000,0000	1,0000	0,0100	0,1450	0,1020	7,5006
1×10^5	100,0000	1,0000	14,5038	10,1972	750,0638
6 894,7570	6,8948	0,0689	1,0000	0,7031	51,7151
9 806,6500	9,8067	0,0981	1,4223	1,0000	73,5561
133,3220	0,1333	0,0013	0,0193	0,0136	1,0000

LENGTH

Millimetre mm	Centimetre cm	Metre m	Inch in	Foot ft	Yard yd
1,0000	0,1000	0,0010	0,0394	0,0033	0,0011
10,0000	1,0000	0,0100	0,3937	0,0328	0,0109
1 000,0000	100,0000	1,0000	39,3701	3,2808	1,0936
25,4000	2,5400	0,0254	1,0000	0,0833	0,0278
304,8000	30,4800	0,3048	12,0000	1,0000	0,3333
914,4000	91,4400	0,9144	36,0000	3,0000	1,0000

VOLUME

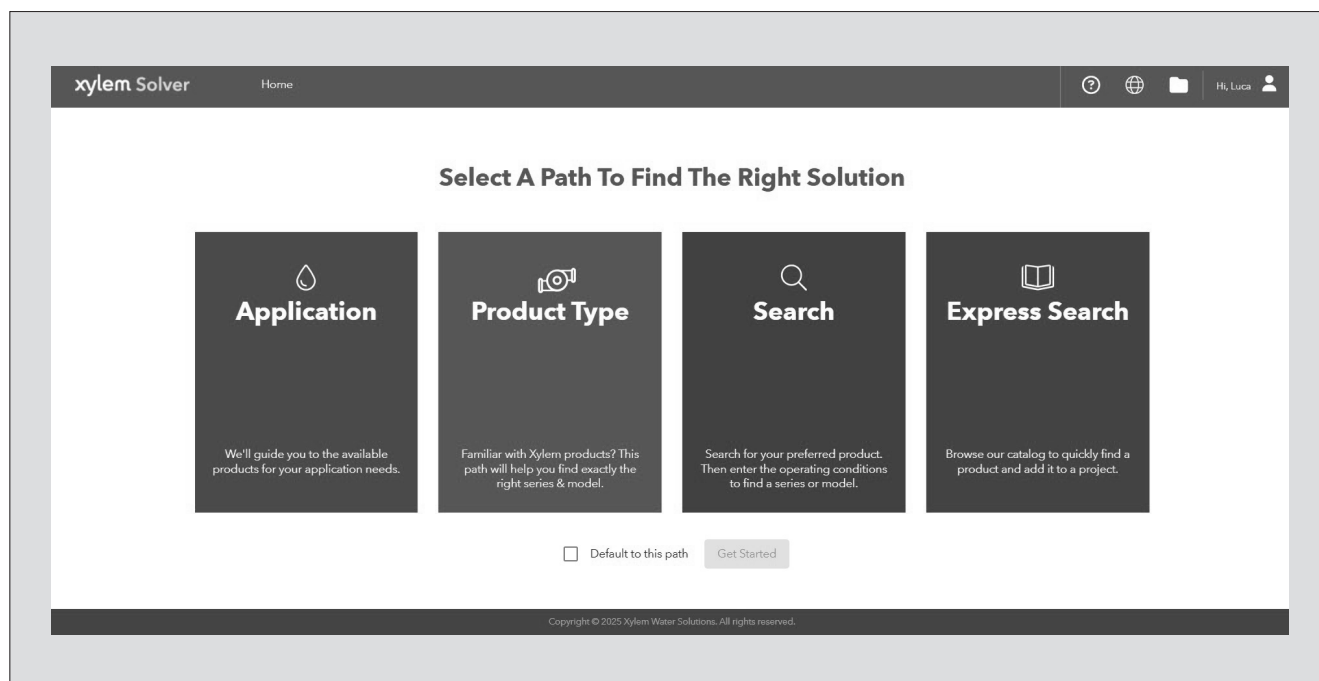
Cubic metre m ³	Litre L	Millilitre ml	Imperial gallon imp. gal.	U.S. gallon US gal.	Cubic foot ft ³
1,0000	1 000,0000	1×10^6	219,9694	264,1720	35,3147
0,0010	1,0000	1 000,0000	0,2200	0,2642	0,0353
1×10^{-6}	0,0010	1,0000	$2,2 \times 10^{-4}$	$2,642 \times 10^{-4}$	$3,53 \times 10^{-5}$
0,0045	4,5461	4 546,0870	1,0000	1,2009	0,1605
0,0038	3,7854	3 785,4120	0,8327	1,0000	0,1337
0,0283	28,3168	28 316,8466	6,2288	7,4805	1,0000

TEMPERATURE

Water	Kelvin K	Celsius °C	Fahrenheit °F	$^{\circ}\text{F} = ^{\circ}\text{C} \times \frac{9}{5} + 32$ $^{\circ}\text{C} = (^{\circ}\text{F} - 32) \times \frac{5}{9}$
icing	273,1500	0,0000	32,0000	
boiling	373,1500	100,0000	212,0000	

G-at_pp-en_b_sc

FURTHER PRODUCT SELECTION AND DOCUMENTATION Xylem Solver



Xylem Solver is pump solution selection software with an extensive online database of product information across the entire Xylem range of pumps and related products, with multiple search options and helpful project management facilities. The system holds up-to-date product information on thousands of products and accessories.

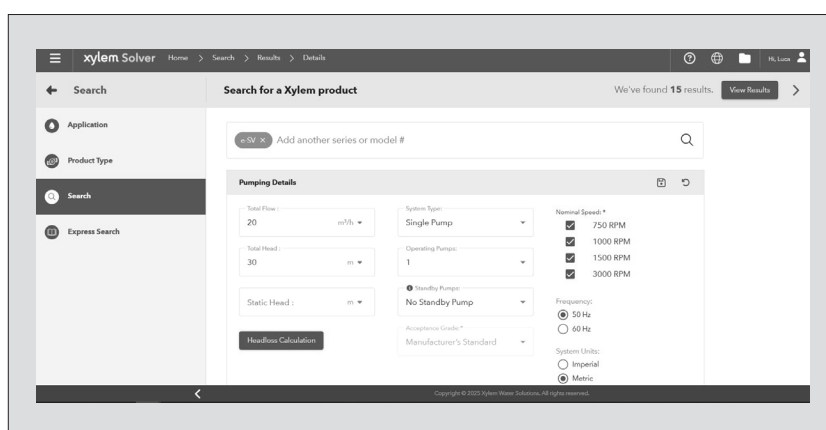
The possibility to search by applications and the detailed information output given makes it easy to make the optimal selection without having detailed knowledge about the Xylem products.

The search can be made by:

- Application
- Product type
- Duty point

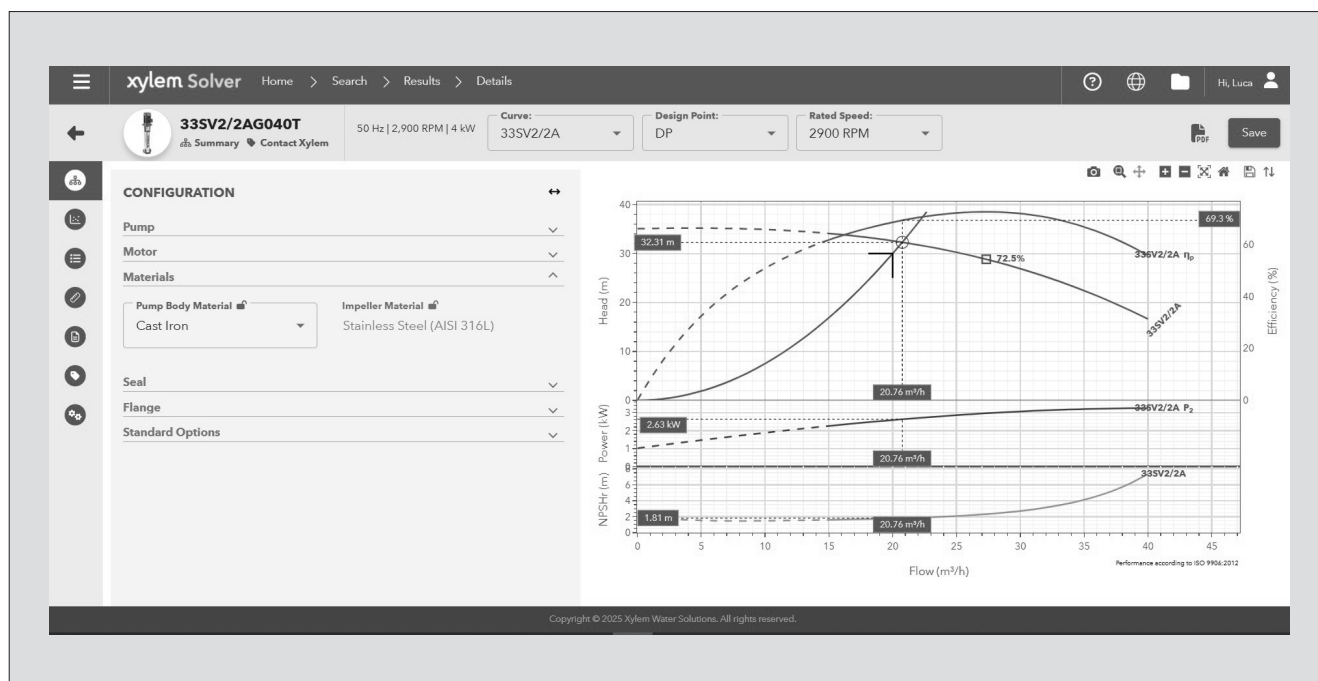
Xylem Solver gives a detailed output:

- List with search results in which you can compare up to four products
- Performance curves (flow, head, power, efficiency, NPSH)
- Motor data
- Dimensional drawings
- Options
- Data sheet printouts
- Document downloads incl dxf, stp and BIM files



Once a product series has been selected, input design criteria to select pumps that meet the design requirements.

FURTHER PRODUCT SELECTION AND DOCUMENTATION Xylem Solver



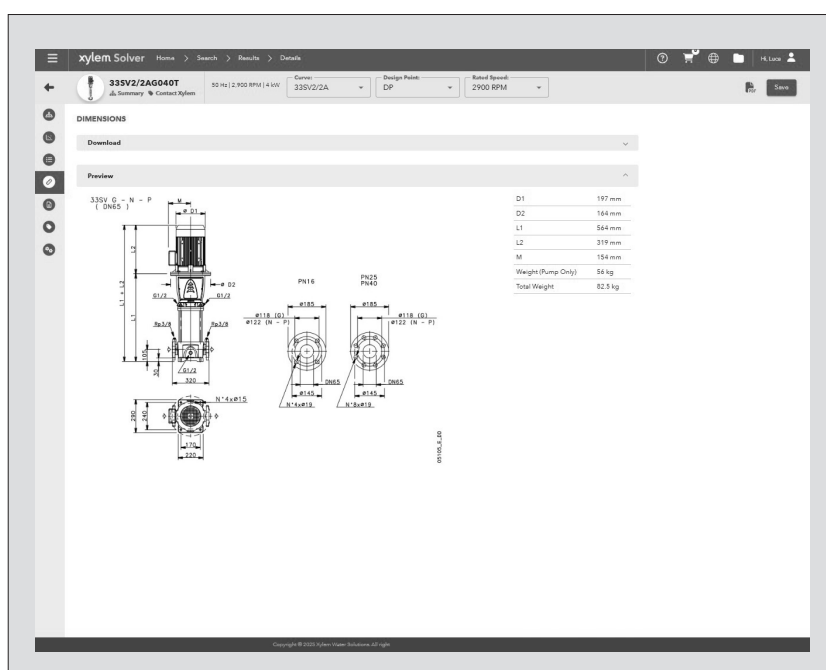
The detailed output makes it easy to select the optimal pump from the given alternatives.

The best way to work with Xylem Solver is to create a personal account. This makes it possible to:

- Set own standard units
- Create and save projects

Every registered user has a proper space, where all projects are saved.

For more information about Xylem Solver please contact our sales network or visit <https://solver.xylem.com>.



The dimensions tab shows technical drawings, dimensions, and CAD files when available.

Xylem l'zīlām

- 1) the tissue in plants that brings water and nutrients upward from the roots.
- 2) a leading global water solutions company.

Xylem is the connective tissue and system in plants which cleanses and transports water from the root to where it is needed most to sustain life.

And this is the essence of Xylem as a company. We are committed to driving sustainable impact by ensuring our connected technologies and solutions support our customers and the communities they serve, to tackle the water challenges that matter most to them.

For more information on how Xylem can help you, visit xylem.com.

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The logo for Xylem, featuring the word "xylem" in a lowercase, blue, sans-serif font.