

60 Hz



e-GS Series

4" SUBMERSIBLE
ELECTRIC PUMPS

Cod. 191015711 Rev. A Ed.06/2017

 **LOWARA**
a xylem brand

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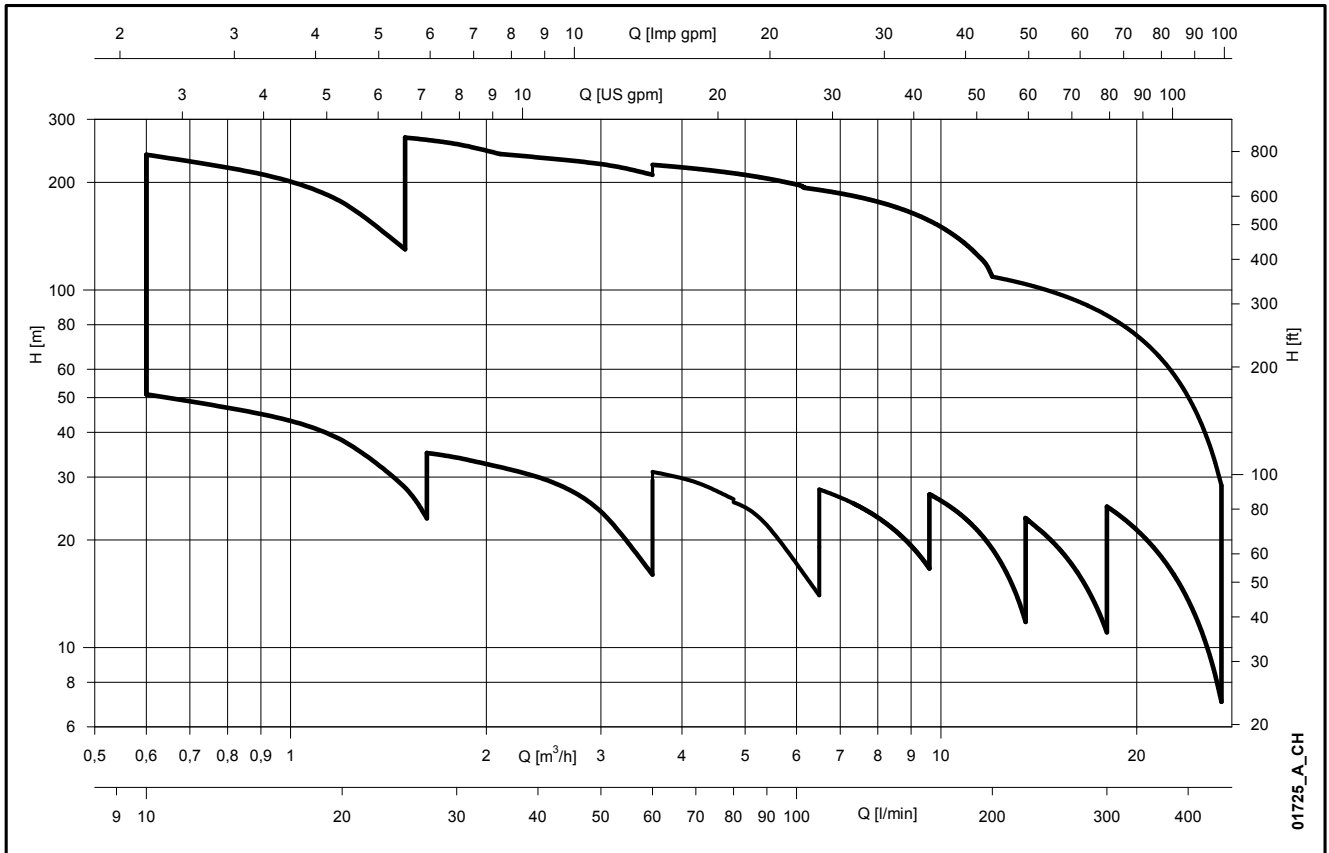
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**e-GS SERIES
HYDRAULIC PERFORMANCE RANGE AT 60 Hz**



4" e-GS Series Submersible Pumps



- Abrasion resistant
- Floating impellers
- Compact
- Ecodesign compliant MEI $\geq 0,4$
- Approvals
 - ACS
 - D.M.174/2004

MARKET SECTORS

RESIDENTIAL, AGRICULTURE, INDUSTRY.

APPLICATIONS

- Water supply from drilled wells, cisterns.
- Sprinkler irrigation.
- Pressure boosting.
- Fire-fighting.

SPECIFICATIONS

PUMP

- **Delivery:**
up to 27 m³/h at 3500 rpm.
- **Head:**
up to 300 m at 3500 rpm.
- **Maximum pump overall diameter**
(cable cover included): 99 mm.
- **Maximum immersion depth:**
150 m (with 4OS motor).
300 m (with L4C motor).
- **Maximum permissible quantity of sand:** 150 g/m³.
- **1GSL - 2GS - 4GS - 6GS versions:**
Rp 1 1/4 delivery port.
- **8GS - 12GS - 16GS versions:**
Rp 2 delivery port.
- **Motor power:**
from 0,37 to 7,5 kW.

MOTOR

- **4OS single-phase version:**
from 0,37 to 2,2 kW 220-230 V,60 Hz.
- **4OS three-phase version:**
from 0,37 to 7,5 kW 220-230 V,60 Hz.
from 0,37 to 7,5 kW 380 V,60 Hz.
- **L4C single-phase version:**
from 0,37 to 4 kW 220-230 V,60 Hz.
- **L4C three-phase version:**
from 0,37 to 5,5 kW 220-230 V,60 Hz.
from 0,37 to 7,5 kW 380 V,60 Hz.
- **Maximum supply voltage variations:**
 $\pm 10\%$ (4OS)
 $\pm 6\%$ (L4C).
- **Maximum number of starts for hour evenly distributed:**
30 (4OS)
40 (L4C).
- **Horizontal operation:**
4OS up to 2,2 kW.
L4C up to 7,5 kW.
- **Maximum temperature of water in contact with motor:**
35°C

CONSTRUCTION CHARACTERISTICS PUMP

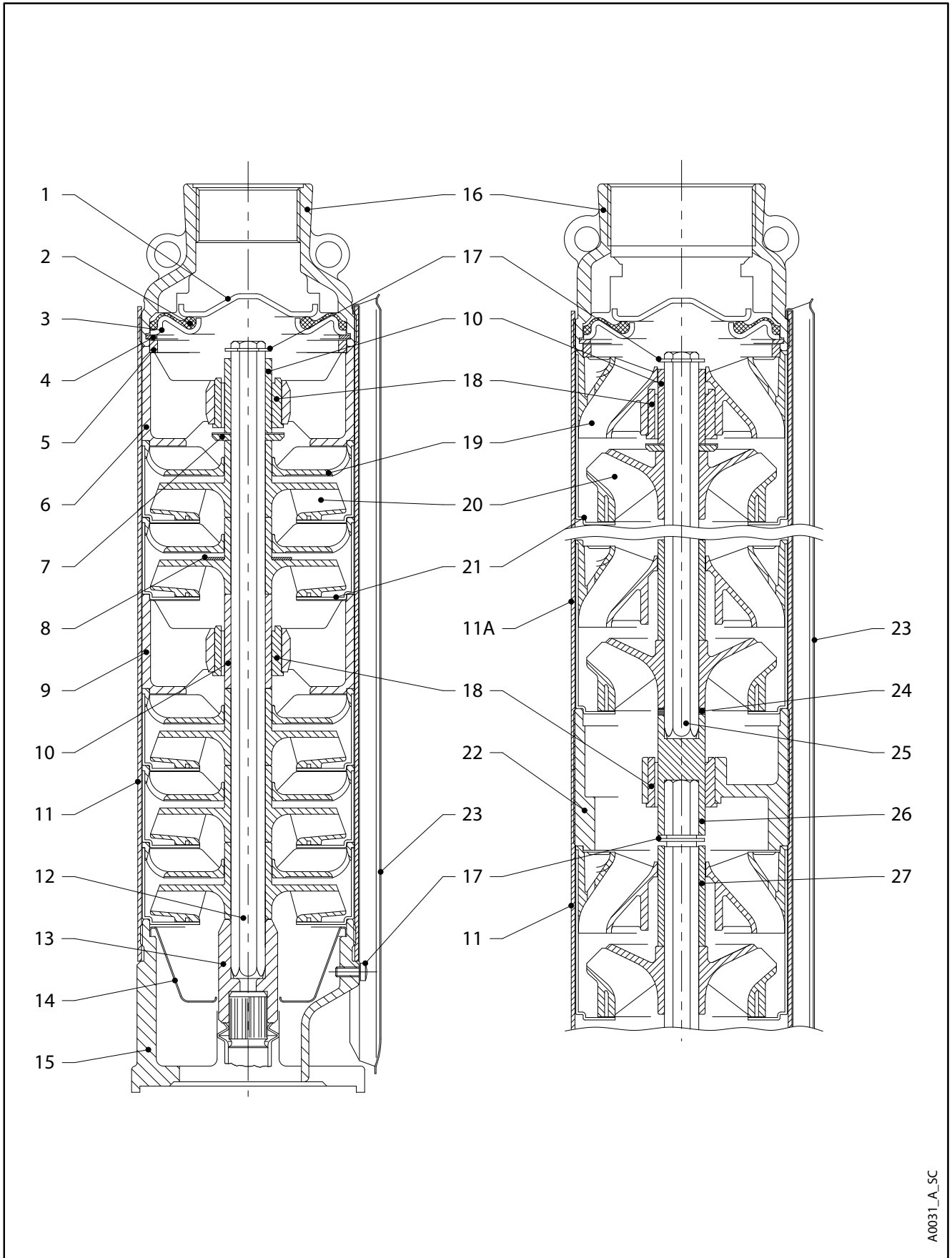
- Abrasion-resistant construction. The front wear ring, combined with the floating impellers, ensures optimum resistance to sand abrasion.
- The upper and lower supports are made of precision-cast stainless steel, ensuring resistance to corrosion, durability and a sturdy coupling to the motor.
- The hexagonal pump shaft guarantees an effective impeller driving.
- Stainless steel non-return valve integrated in the head
- The e-GS series pumps can be coupled to either the 4OS or L4C motors.

MOTOR

For the motor features, please refer to the specific technical brochures.

OPTIONAL FEATURES

- Different voltages and frequencies.
- Motor with built in capacitor (2W = Two Wires)
- Cooling sleeves

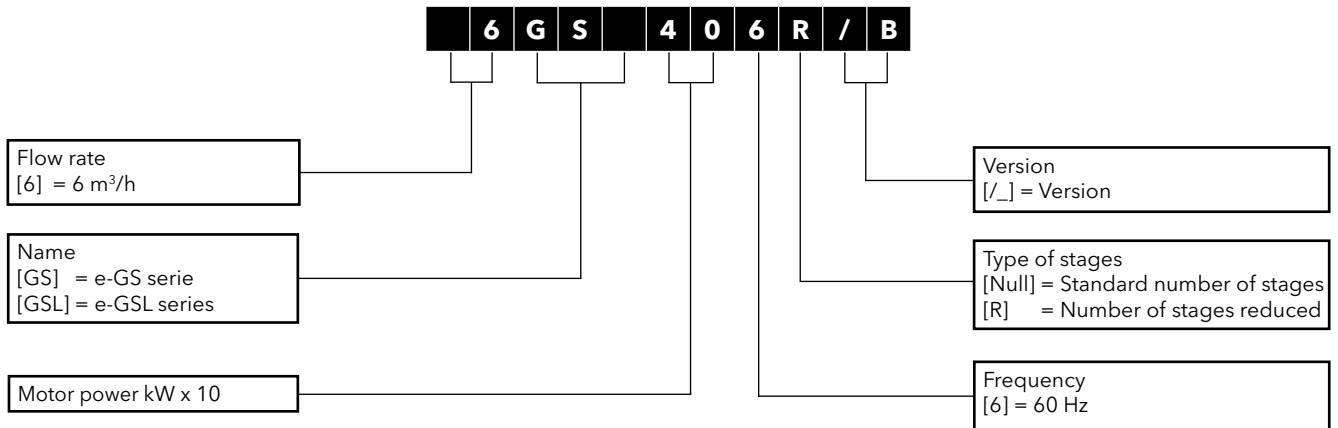
**e-GS SERIES
PUMP SECTION**

e-GS SERIES
TABLE OF MATERIALS

REF. N°	NAME	MATERIAL	REFERENCE STANDARDS	
			EUROPE	USA
1	Valve cap	Stainless steel	EN 10088-2-X5CrNi18-10 (1.4301)	AISI 304
2	Valve gasket	NBR		
3	Valve flange	Stainless steel	EN 10088-2-X5CrNi18-10 (1.4301)	AISI 304
4	Valve locking ring	Stainless steel	DIN 17006 - X5CrNi18-7 (1.4319)	AISI 302
5	Adapter ring	Technopolymer PPO		
6	Upper bush bracket	Technopolymer PPO		
7	Thrust bearing	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
8	Washer	Stainless steel	EN 10088-2-X5CrNi18-10 (1.4301)	AISI 304
9	Intermediate bush bracket	Technopolymer PPO		
10	Shaft sleeve	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
11	Sleeve	Stainless steel	EN 10088-2-X5CrNi18-10 (1.4301)	AISI 304
11A	Upper sleeve	Stainless steel	EN 10088-2-X5CrNi18-10 (1.4301)	AISI 304
12	Pump shaft	Stainless steel	EN 10088-3-X5CrNi18-10 (1.4301)	AISI 304
13	Coupling	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
14	Strainer	Stainless steel	EN 10088-2-X5CrNi18-10 (1.4301)	AISI 304
15	Motor adapter	Stainless steel	EN 10213-4-GX5CrNi19-10 (1.4308)	CF-8 ASTM A743
16	Discharge head	Stainless steel	EN 10213-4-GX5CrNi19-10 (1.4308)	CF-8 ASTM A743
17	Screws, nuts, washers	Stainless steel	EN 10088-1-X5CrNiMo17-12-2 (1.4401)	AISI 316
18	Bush	Technopolymer PU		
19	Diffuser	Technopolymer PPO		
20	Impeller	Technopolymer PPO		
21	Bowl	Stainless steel	EN 10088-2-X5CrNi18-10 (1.4301)	AISI 304
22	Intermediate bush bracket	Stainless steel	EN 10213-4-GX5CrNi19-10 (1.4308)	CF-8 ASTM A743
23	Cable guard	Stainless steel	EN 10088-2-X5CrNi18-10 (1.4301)	AISI 304
24	Shim	Stainless steel	EN 10088-2-X5CrNi18-10 (1.4301)	AISI 304
25	Upper pump shaft	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
26	Intermediate coupling	Stainless steel	EN 10088-1-X5CrNiMo17-12-2 (1.4401)	AISI 316
27	Spacer	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304

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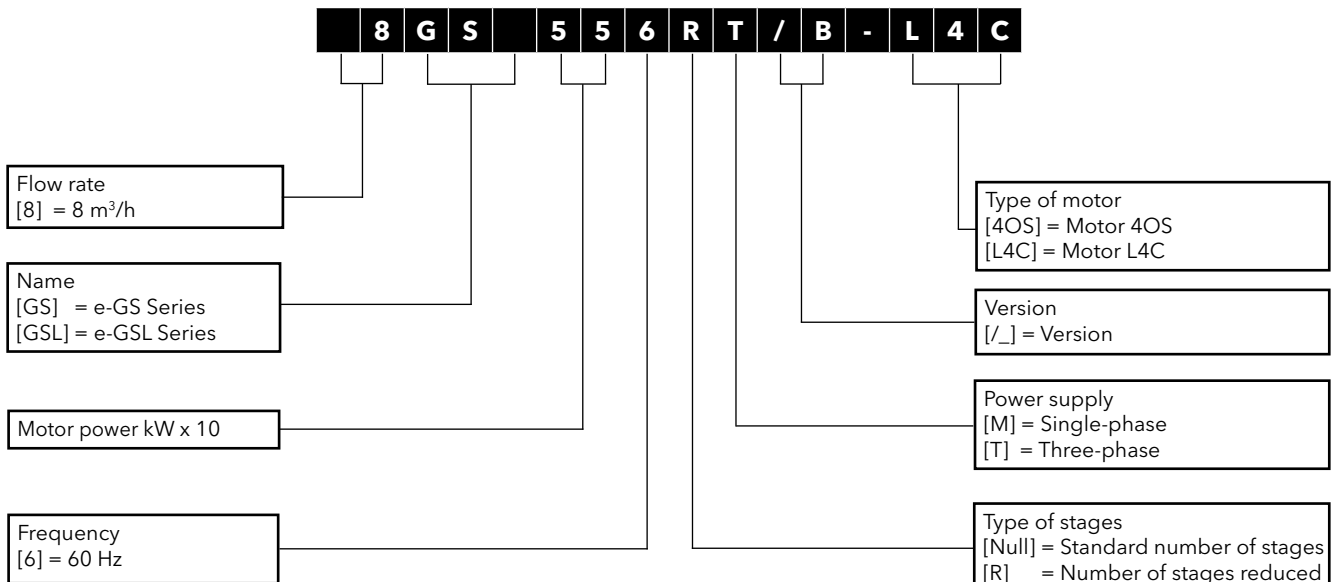
e-GS SERIES IDENTIFICATION CODE (PUMP)



EXAMPLE: 6GS406R/B

6 = Nominal flow 6 m³/h
GS = e-GS Series,
40 = Motor power 4 kW
6 = 60 Hz
R = Numero di stadi ridotto
/B = version

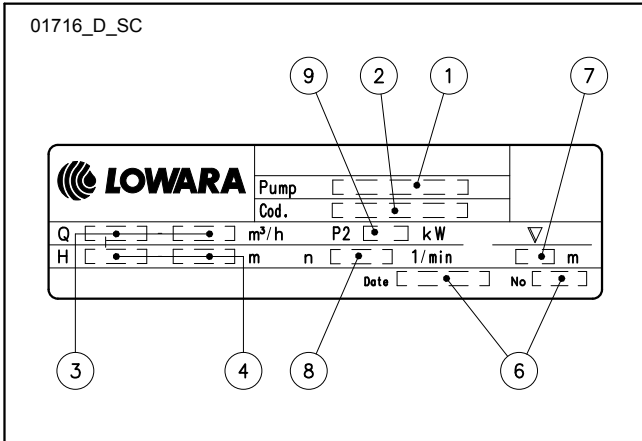
e-GS SERIES IDENTIFICATION CODE (ELECTRIC PUMP)



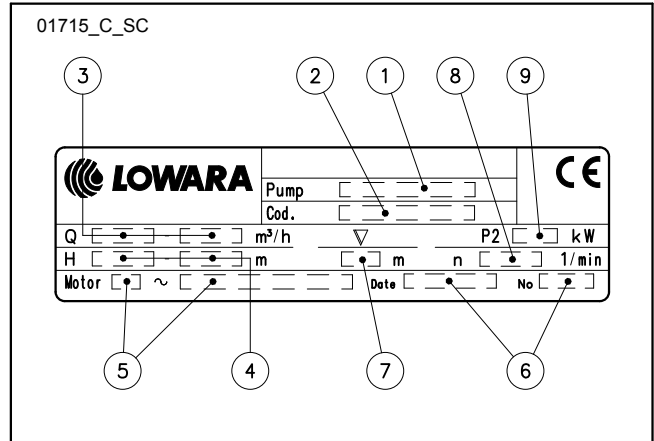
EXAMPLE: 8GS55RT/B

8 = Nominal flow 8 m³/h
GS = e-GS Series,
55 = Motor power 5,5 kW
6 = 60 Hz,
R = Number of stages reduced
T = Power supply three-phase
/B = version.

**e-GS SERIES
RATING PLATE (PUMP)**



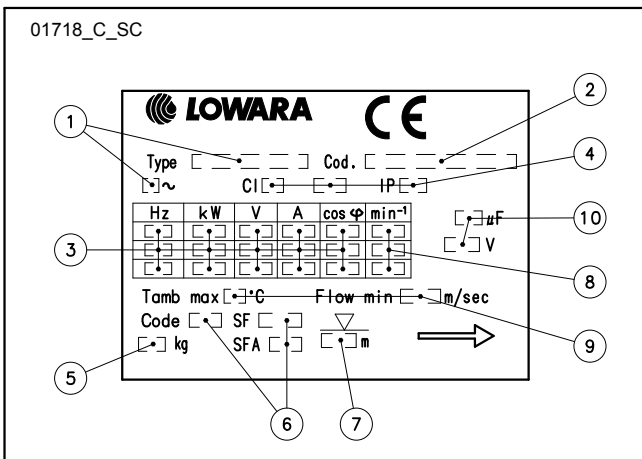
RATING PLATE (ELECTRIC PUMP)



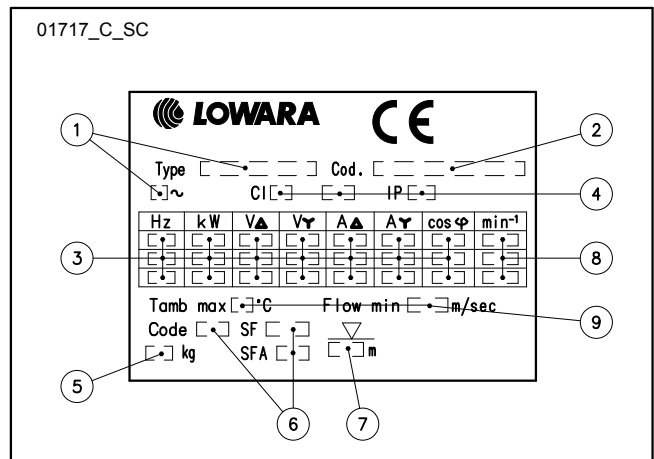
LEGEND

- 1 - Pump / electric pump type
- 2 - Code
- 3 - Delivery range
- 4 - Head range
- 5 - Characteristics motor
- 6 - Manufacturing data and serial number
- 7 - Maximum immersion depth
- 8 - Speed
- 9 - Rated output

**RATING PLATE
(SINGLE-PHASE MOTOR)**



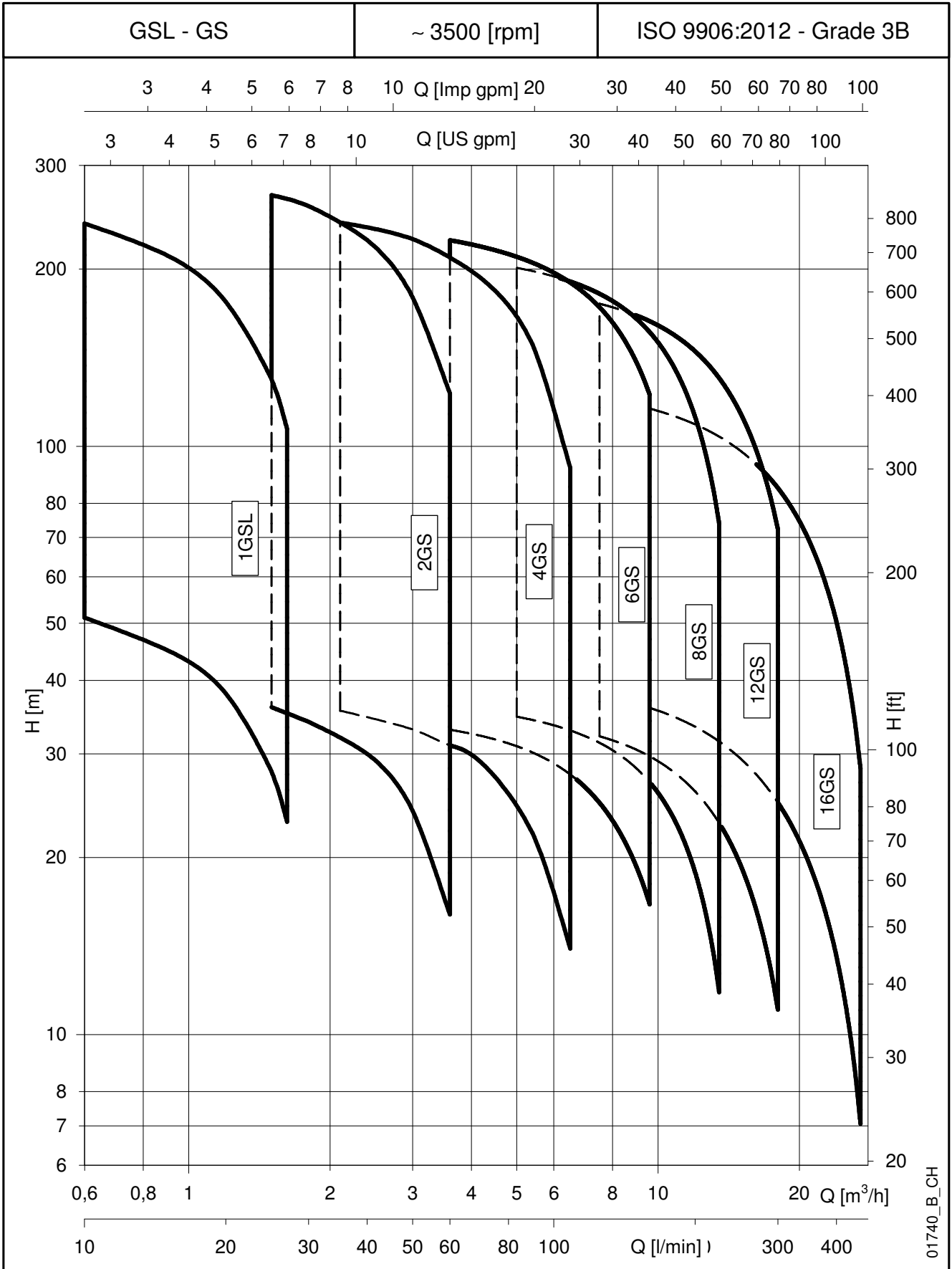
**RATING PLATE
(THREE-PHASE MOTOR)**



LEGEND

- 1 - Motor type
- 2 - Code
- 3 - Electrical data
- 4 - Characteristics motor
- 5 - Motor weight
- 6 - Service factors
- 7 - Maximum immersion depth
- 8 - Speed
- 9 - Temperature and speed water
- 10 - Capacitor data

e-GS SERIES
HYDRAULIC PERFORMANCE RANGE AT 60 Hz

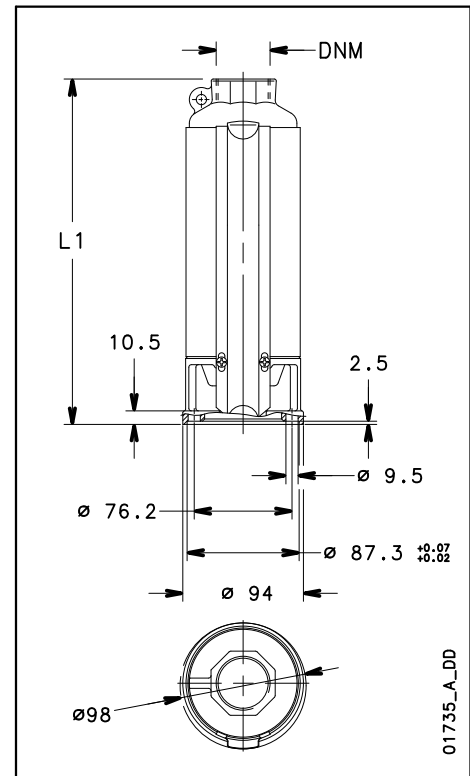


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1GSL SERIES OPERATING CHARACTERISTICS AT 60 Hz

PUMP TYPE	N. OF STAGES	MOTOR POWER		Q = DELIVERY					
				m ³ /h					
				0	10	15	20	25	27
				58	51,1	45	38	28	23
				96	85,2	75	63	46	38,3
				135	119	105	88	65	53,6
				192	171	151	126	93	76,6
				269	239	211	176	130	107

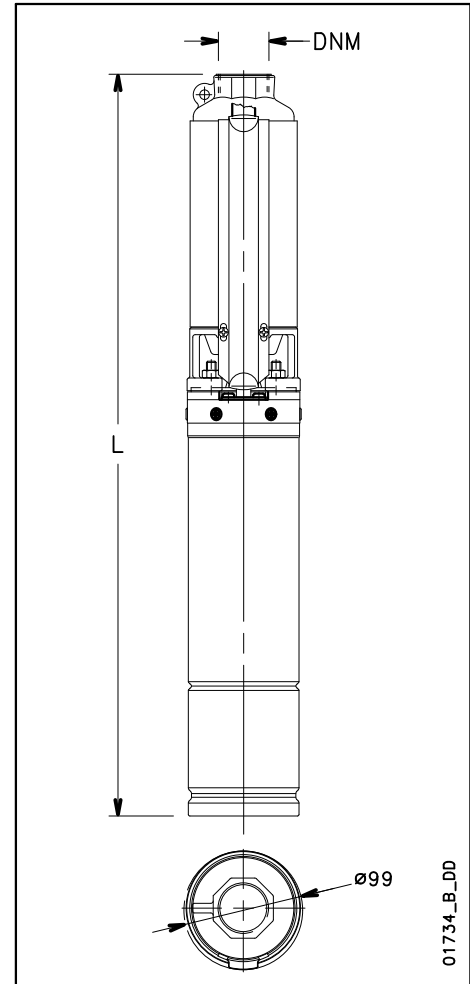
Hydraulic performances in compliance with ISO 9906:2012 - Grade 3B (ex ISO 9906:1999 - Annex A) 1gsl-2p60-en_c_th



1GSL..4OS SERIES DIMENSIONS AND WEIGHTS

ELECTRIC PUMP TYPE*	N. OF STAGES	DNM	DIMENSIONS (mm)		PUMP WEIGHT kg	ELECTRIC PUMP WEIGHT kg
			L1	L		
1GSL036M-4OS	6	Rp 1 1/4	263	616	2,6	10
1GSL056M-4OS	10	Rp 1 1/4	332	685	3,4	11,5
1GSL076M-4OS	14	Rp 1 1/4	402	780	4,2	13,5
1GSL116M-4OS	20	Rp 1 1/4	507	920	5,2	16,5
1GSL156M-4OS	28	Rp 1 1/4	677	1125	6,7	19,5
1GSL036T-4OS	6	Rp 1 1/4	263	595	2,6	9,5
1GSL056T-4OS	10	Rp 1 1/4	332	685	3,4	11
1GSL076T-4OS	14	Rp 1 1/4	402	755	4,2	12,5
1GSL116T-4OS	20	Rp 1 1/4	507	885	5,2	14,5
1GSL156T-4OS	28	Rp 1 1/4	677	1090	6,7	18

* Pump and motor are supplied uncoupled
 - the motor is single-phase $\geq 2,2$ kW or three-phase ≥ 3 kW
 - or the total length is > 1500 mm
 1gsl-4os-2p60-en_a_td

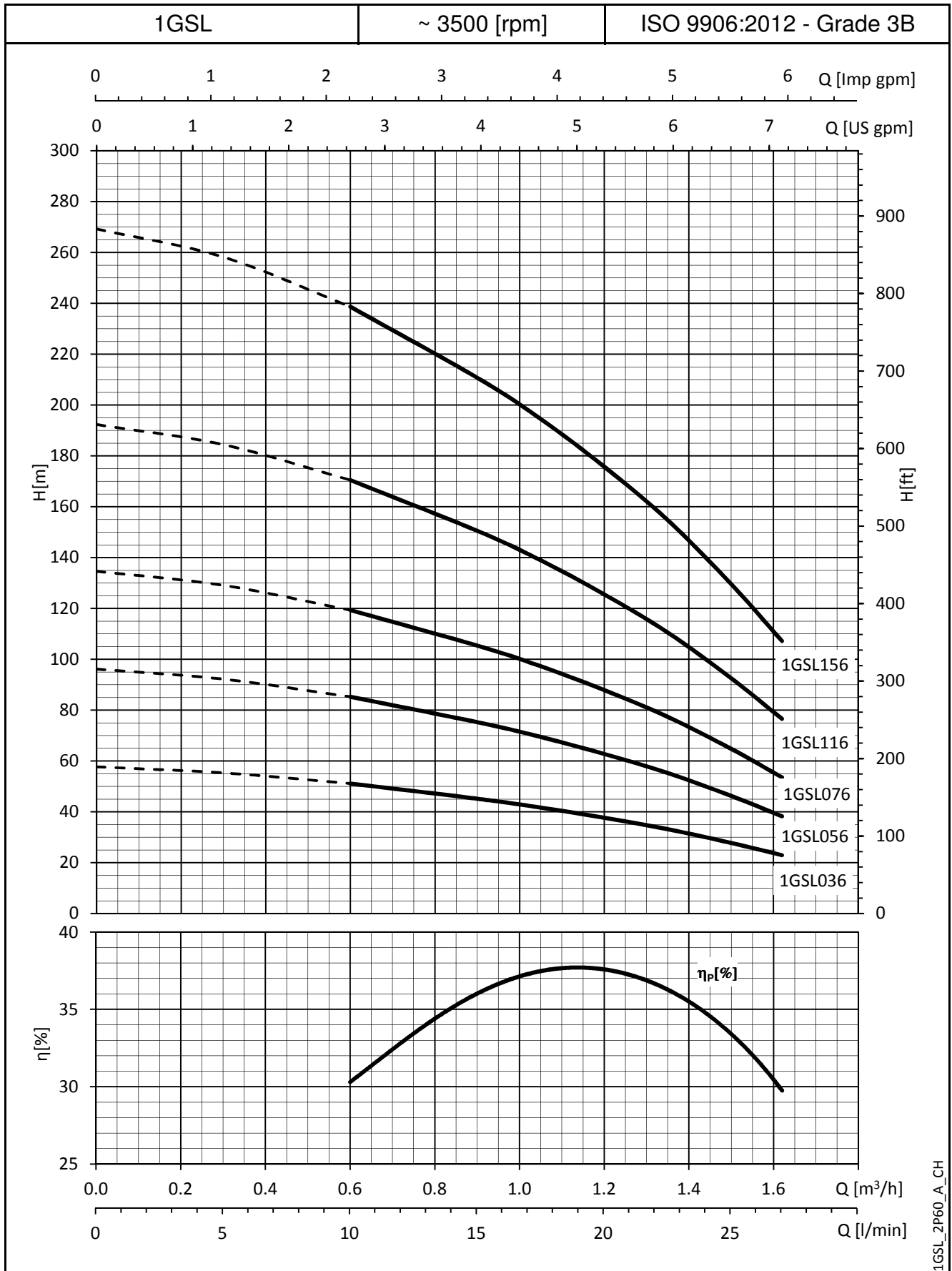


1GSL..L4C SERIES DIMENSIONS AND WEIGHTS

ELECTRIC PUMP TYPE*	N. OF STAGES	DNM	DIMENSIONS (mm)		PUMP WEIGHT kg	ELECTRIC PUMP WEIGHT kg
			L1	L		
1GSL036M-L4C	6	Rp 1 1/4	263	527	2,6	11,5
1GSL056M-L4C	10	Rp 1 1/4	332	616	3,4	13
1GSL076M-L4C	14	Rp 1 1/4	402	731	4,2	16
1GSL116M-L4C	20	Rp 1 1/4	507	896	5,2	19,5
1GSL156M-L4C	28	Rp 1 1/4	677	1086	6,7	22
1GSL036T-L4C	6	Rp 1 1/4	263	497	2,6	10,5
1GSL056T-L4C	10	Rp 1 1/4	332	596	3,4	12,5
1GSL076T-L4C	14	Rp 1 1/4	402	686	4,2	14
1GSL116T-L4C	20	Rp 1 1/4	507	851	5,2	17
1GSL156T-L4C	28	Rp 1 1/4	677	1066	6,7	21

* Pump and motor are supplied uncoupled in two separated packages if:
 - the motor is single-phase $\geq 2,2$ kW or three-phase ≥ 3 kW
 - or the total length is > 1500 mm
 1gsl-l4c-2p60-en_a_td

**1GSL SERIES
OPERATING CHARACTERISTICS AT 60 Hz**



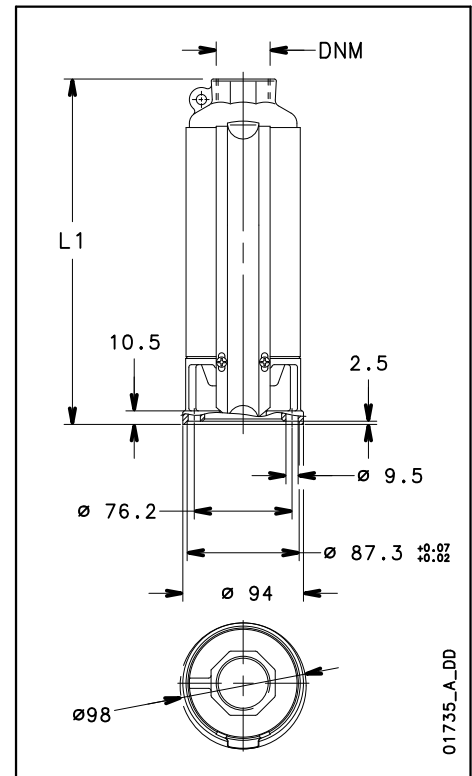
These performances are valid for liquids with density $\rho = 1.0 \text{ Kg/dm}^3$ and kinematic viscosity $\nu = 1 \text{ mm}^2/\text{sec}$.

2GS SERIES OPERATING CHARACTERISTICS AT 60 Hz

PUMP TYPE	N. OF STAGES	MOTOR POWER		Q = DELIVERY						
				l/min	0	25	30	40	50	60
				m^3/h	0	1,5	1,8	2,4	3	3,6
				H = TOTAL HEAD METRES COLUMN OF WATER						
2GS036	4	0,37	0,5	39	36	34	30	24	16	
2GS056	6	0,55	0,75	59	53	51	45	36	25	
2GS076	8	0,75	1	79	71	68	60	48	33	
2GS116	12	1,1	1,5	118	107	102	90	72	49	
2GS156	16	1,5	2	158	142	137	119	96	66	
2GS226	22	2,2	3	217	196	188	164	132	90	
2GS306	30	3	4	296	267	256	224	179	123	

Prestazioni idrauliche conformi ISO 9906:2012 - Grade 3B (ex ISO 9906:1999 - Annex A)

2gs-2p60-en_c_th



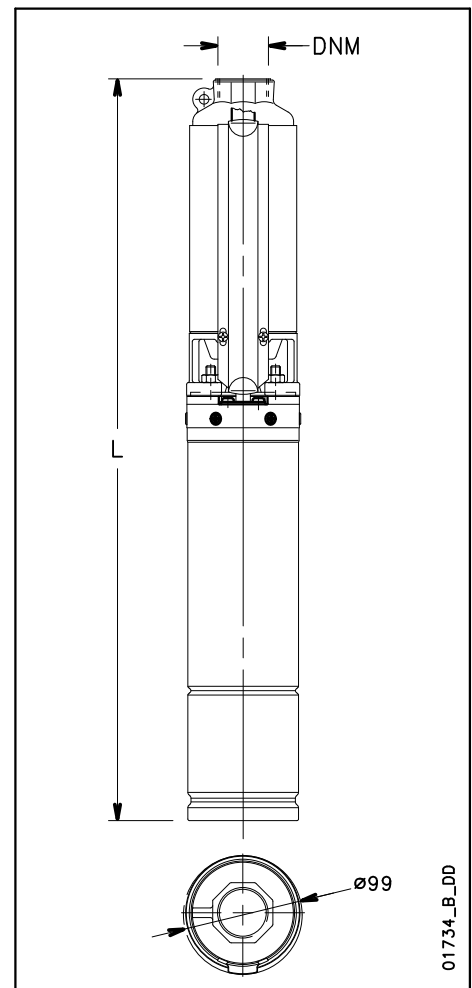
2GS..4OS SERIES DIMENSIONS AND WEIGHTS

ELECTRIC PUMP TYPE*	N. OF STAGES	DNM	DIMENSIONS (mm)		PUMP WEIGHT kg	ELECTRIC PUMP WEIGHT kg
			L1	L		
			2GS036M-4OS	4		
2GS056M-4OS	6	Rp 1 1/4	263	616	2,8	11
2GS076M-4OS	8	Rp 1 1/4	298	676	3,1	12,5
2GS116M-4OS	12	Rp 1 1/4	367	780	3,9	15
2GS156M-4OS	16	Rp 1 1/4	437	885	4,6	17,5
2GS226M-4OS	22	Rp 1 1/4	542	1040	5,8	21
2GS036T-4OS	4	Rp 1 1/4	228	560	2,4	9,5
2GS056T-4OS	6	Rp 1 1/4	263	616	2,8	10,5
2GS076T-4OS	8	Rp 1 1/4	298	651	3,1	11
2GS116T-4OS	12	Rp 1 1/4	367	745	3,9	13
2GS156T-4OS	16	Rp 1 1/4	437	850	4,6	16
2GS226T-4OS	22	Rp 1 1/4	542	990	5,8	18,5
2GS306T-4OS	30	Rp 1 1/4	712	1160	7,6	26,5

* Pump and motor are supplied uncoupled in two separated packages if:

- the motor is single-phase $\geq 2,2$ kW or three-phase ≥ 3 kW
- or the total length is > 1500 mm

2gs-4os-2p60-en_a_td



2GS..L4C SERIES DIMENSIONS AND WEIGHTS

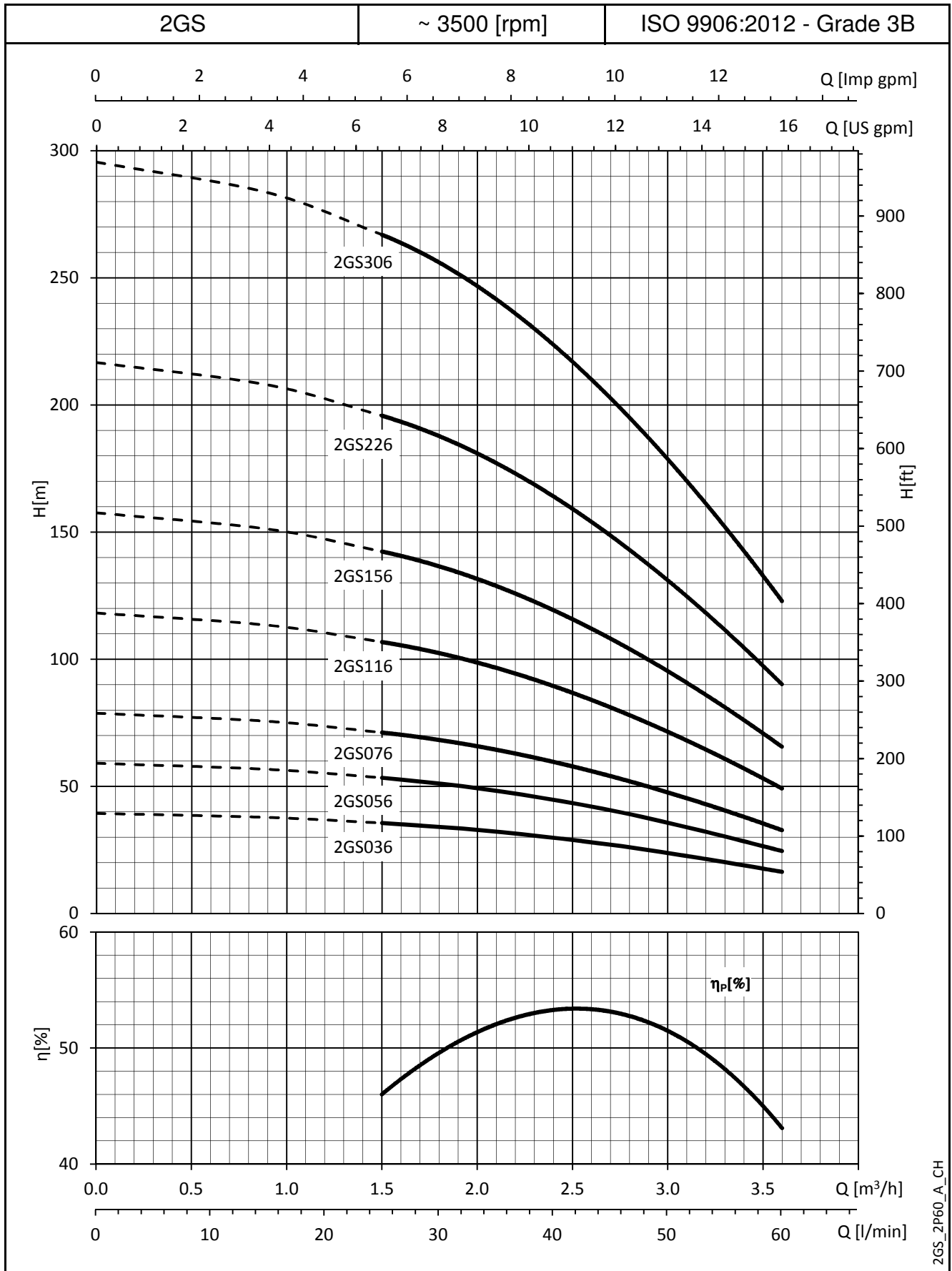
ELECTRIC PUMP TYPE*	N. OF STAGES	DNM	DIMENSIONS (mm)		PUMP WEIGHT kg	ELECTRIC PUMP WEIGHT kg
			L1	L		
			2GS036M-L4C	4		
2GS056M-L4C	6	Rp 1 1/4	263	547	2,8	12,5
2GS076M-L4C	8	Rp 1 1/4	298	627	3,1	15
2GS116M-L4C	12	Rp 1 1/4	367	756	3,9	18
2GS156M-L4C	16	Rp 1 1/4	437	846	4,6	20
2GS226M-L4C	22	Rp 1 1/4	542	991	5,8	24
2GS036T-L4C	4	Rp 1 1/4	228	462	2,4	10,5
2GS056T-L4C	6	Rp 1 1/4	263	527	2,8	11,5
2GS076T-L4C	8	Rp 1 1/4	298	582	3,1	13
2GS116T-L4C	12	Rp 1 1/4	367	711	3,9	16
2GS156T-L4C	16	Rp 1 1/4	437	826	4,6	18,5
2GS226T-L4C	22	Rp 1 1/4	542	951	5,8	21
2GS306T-L4C	30	Rp 1 1/4	712	1254	7,6	29

* Pump and motor are supplied uncoupled in two separated packages if:

- the motor is single-phase $\geq 2,2$ kW or three-phase ≥ 3 kW
- or the total length is > 1500 mm

2gs-l4c-2p60-en_b_td

**2GS SERIES
OPERATING CHARACTERISTICS AT 60 Hz**

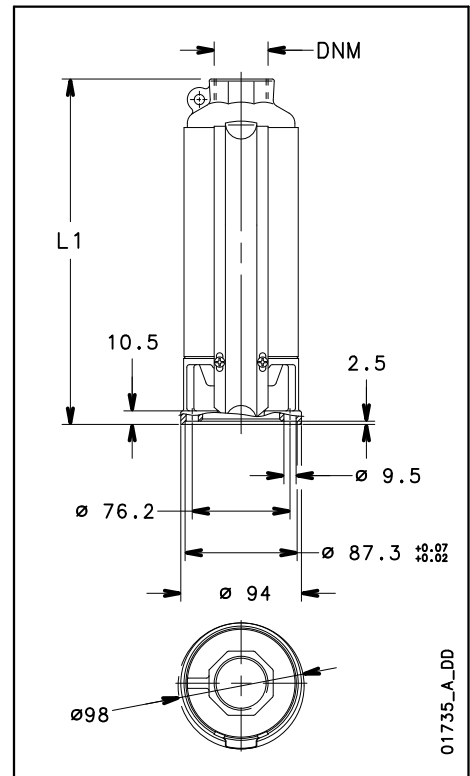


These performances are valid for liquids with density $\rho = 1.0 \text{ Kg/dm}^3$ and kinematic viscosity $\nu = 1 \text{ mm}^2/\text{sec}$.

4GS SERIES OPERATING CHARACTERISTICS AT 60 Hz

PUMP TYPE	N. OF STAGES	MOTOR POWER		Q = DELIVERY						
				l/min	0	35	50	70	90	108
				m ³ /h	0	2,1	3	4,2	5,4	6,5
				H = TOTAL HEAD METRES COLUMN OF WATER						
4GS056	4	0,55	0,75	39	35,5	33	29	22	14	
4GS076	5	0,75	1	49	44,5	42	36	28	17	
4GS116	8	1,1	1,5	79	71	67	58	43	27	
4GS156	10	1,5	2	99	89	83	72	55	34	
4GS226	15	2,2	3	148	133	125	108	82	51	
4GS306	19	3	4	187	169	158	137	105	65	
4GS406	27	4	5,5	266	240	225	193	149	92	

Hydraulic performances in compliance with ISO 9906:2012 - Grade 3B (ex ISO 9906:1999 - Annex A) 4gs-2p60-en_c_th



4GS..4OS SERIES DIMENSIONS AND WEIGHTS

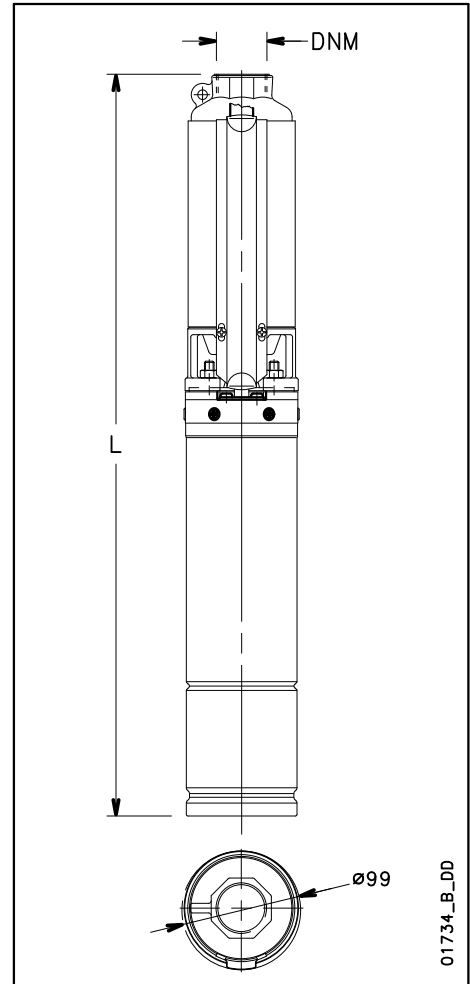
ELECTRIC PUMP TYPE	N. OF STAGES	DNM	DIMENSIONS (mm)		PUMP WEIGHT kg	ELECTRIC PUMP WEIGHT kg
			L1	L		
			4GS056M-4OS	4		
4GS076M-4OS	5	Rp 1 1/4	266	644	2,7	12
4GS116M-4OS	8	Rp 1 1/4	330	743	3,3	14,5
4GS156M-4OS	10	Rp 1 1/4	374	822	3,8	16,5
4GS226M-4OS	15	Rp 1 1/4	481	979	4,8	20
4GS056T-4OS	4	Rp 1 1/4	244	597	2,5	10
4GS076T-4OS	5	Rp 1 1/4	266	619	2,7	11
4GS116T-4OS	8	Rp 1 1/4	330	708	3,3	12,5
4GS156T-4OS	10	Rp 1 1/4	374	787	3,8	15
4GS226T-4OS	15	Rp 1 1/4	481	929	4,8	17,5
4GS306T-4OS	19	Rp 1 1/4	568	1016	5,7	19,5
4GS406T-4OS	27	Rp 1 1/4	770	1338	7,6	25,5

* Pump and motor are supplied uncoupled in two separated packages if:
 - the motor is single-phase $\geq 2,2$ kW or three-phase ≥ 3 kW
 - or the total length is > 1500 mm 4gs-4os-2p60-en_a_th

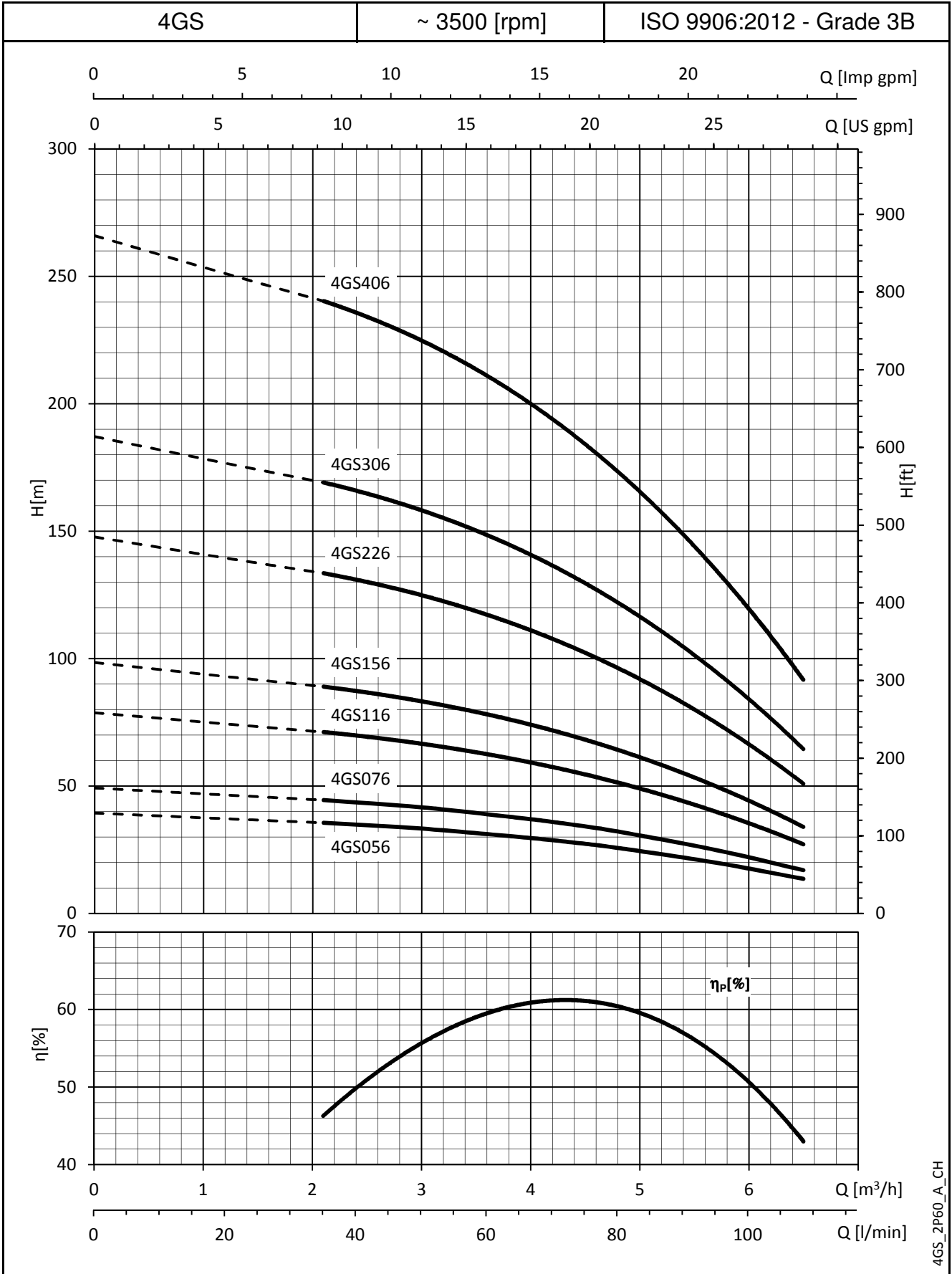
4GS..L4C SERIES DIMENSIONS AND WEIGHTS

ELECTRIC PUMP TYPE*	N. OF STAGES	DNM	DIMENSIONS (mm)		PUMP WEIGHT kg	ELECTRIC PUMP WEIGHT kg
			L1	L		
			4GS056M-L4C	4		
4GS076M-L4C	5	Rp 1 1/4	266	595	2,7	14,5
4GS116M-L4C	8	Rp 1 1/4	330	719	3,3	17,5
4GS156M-L4C	10	Rp 1 1/4	374	783	3,8	19
4GS226M-L4C	15	Rp 1 1/4	481	930	4,8	23
4GS056T-L4C	4	Rp 1 1/4	244	508	2,5	11,5
4GS076T-L4C	5	Rp 1 1/4	266	550	2,7	12,5
4GS116T-L4C	8	Rp 1 1/4	330	674	3,3	15
4GS156T-L4C	10	Rp 1 1/4	374	763	3,8	18
4GS226T-L4C	15	Rp 1 1/4	481	890	4,8	20
4GS306T-L4C	19	Rp 1 1/4	568	1110	5,7	27
4GS406T-L4C	27	Rp 1 1/4	770	1384	7,6	31,5

* Pump and motor are supplied uncoupled in two separated packages if:
 - the motor is single-phase $\geq 2,2$ kW or three-phase ≥ 3 kW
 - or the total length is > 1500 mm 4gs-l4c-2p60-en_b_th



**4GS SERIES
OPERATING CHARACTERISTICS AT 60 Hz**



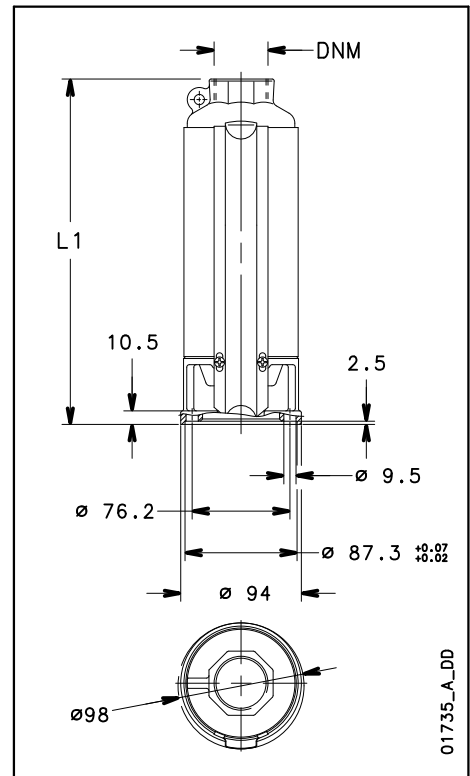
4GS_2P60_A_CH

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

6GS SERIES OPERATING CHARACTERISTICS AT 60 Hz

PUMP TYPE	N. OF STAGES	MOTOR POWER		Q = DELIVERY						
				l/min	0	60,0	80,0	120,0	140,0	160,0
				m ³ /h	0	3,6	4,8	7,2	8,4	9,6
				H = TOTAL HEAD METRES COLUMN OF WATER						
6GS076	4	0,75	1	37	33	31	26	22	17	
6GS116	6	1,1	1,5	55	49	47	39	32	25	
6GS156	8	1,5	2	74	66	62	51	43	33	
6GS226	11	2,2	3	101	91	86	71	60	46	
6GS306	15	3	4	142	127	121	99	84	64	
6GS406	19	4	5,5	175	158	149	125	108	86	
6GS556R	23	5,5	7,5	211	191	181	152	131	104	
6GS556	27	5,5	7,5	248	224	212	178	153	122	

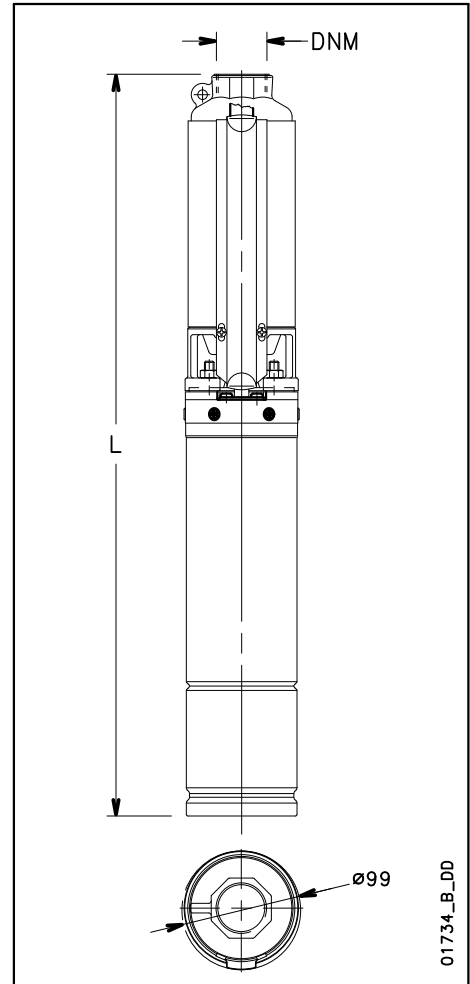
Hydraulic performances in compliance with ISO 9906:2012 - Grade 3B (ex ISO 9906:1999 - Annex A) 6gs-2p60-en_d_th



6GS..4OS SERIES DIMENSIONS AND WEIGHTS

ELECTRIC PUMP TYPE *	N. OF STAGES	DNM	DIMENSIONS (mm)		PUMP WEIGHT kg	ELECTRIC PUMP WEIGHT kg
			L1	L		
6GS076M-4OS	4	Rp 1 1/4	297	677	3,0	12,0
6GS116M-4OS	6	Rp 1 1/4	359	774	3,6	14,5
6GS156M-4OS	8	Rp 1 1/4	421	871	4,1	16,6
6GS226M-4OS	11	Rp 1 1/4	514	1014	5,0	19,8
6GS076T-4OS	4	Rp 1 1/4	297	652	3,0	10,9
6GS116T-4OS	6	Rp 1 1/4	359	739	3,6	12,6
6GS156T-4OS	8	Rp 1 1/4	421	836	4,1	15,2
6GS226T-4OS	11	Rp 1 1/4	514	964	5,0	17,6
6GS306T-4OS	15	Rp 1 1/4	676	1126	6,4	20,0
6GS406T-4OS	19	Rp 1 1/4	800	1370	7,5	25,0
6GS556RT-4OS	23	Rp 1 1/4	924	1554	8,7	29,7
6GS556T-4OS	27	Rp 1 1/4	1066	1696	10,7	31,7

* Pump and motor are supplied uncoupled in two separated packages if:
 - the motor is single-phase $\geq 2,2$ kW or three-phase ≥ 3 kW
 - or the total length is > 1500 mm 6gs-4os-2p60-en_b_td

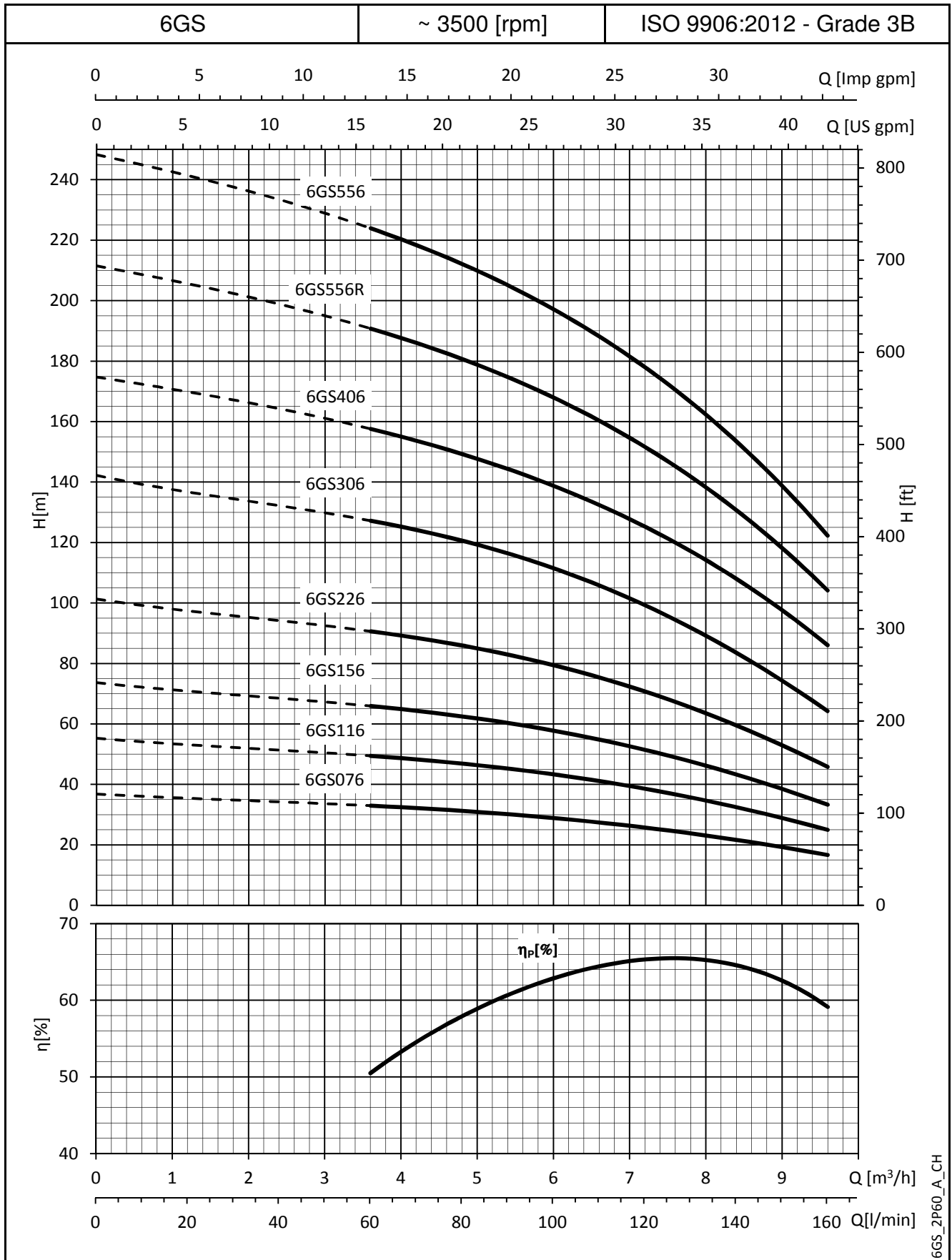


6GS..L4C SERIES DIMENSIONS AND WEIGHTS

ELECTRIC PUMP TYPE *	N. OF STAGES	DNM	DIMENSIONS (mm)		PUMP WEIGHT kg	ELECTRIC PUMP WEIGHT kg
			L1	L		
6GS076M-L4C	4	Rp 1 1/4	297	628	3,0	14,7
6GS116M-L4C	6	Rp 1 1/4	359	750	3,6	17,5
6GS156M-L4C	8	Rp 1 1/4	421	832	4,1	19,3
6GS226M-L4C	11	Rp 1 1/4	514	965	5,0	22,8
6GS076T-L4C	4	Rp 1 1/4	297	583	3,0	12,8
6GS116T-L4C	6	Rp 1 1/4	359	705	3,6	15,3
6GS156T-L4C	8	Rp 1 1/4	421	812	4,1	18,0
6GS226T-L4C	11	Rp 1 1/4	514	925	5,0	19,8
6GS306T-L4C	15	Rp 1 1/4	676	1220	6,4	27,4
6GS406T-L4C	19	Rp 1 1/4	800	1414	7,5	31,2
6GS556RT-L4C	23	Rp 1 1/4	924	1608	8,7	35,5
6GS556T-L4C	27	Rp 1 1/4	1066	1750	10,7	37,5

* Pump and motor are supplied uncoupled in two separated packages if:
 - the motor is single-phase $\geq 2,2$ kW or three-phase ≥ 3 kW
 - or the total length is > 1500 mm 6gs-l4c-2p60-en_b_td

**6GS SERIES
OPERATING CHARACTERISTICS AT 60 Hz**



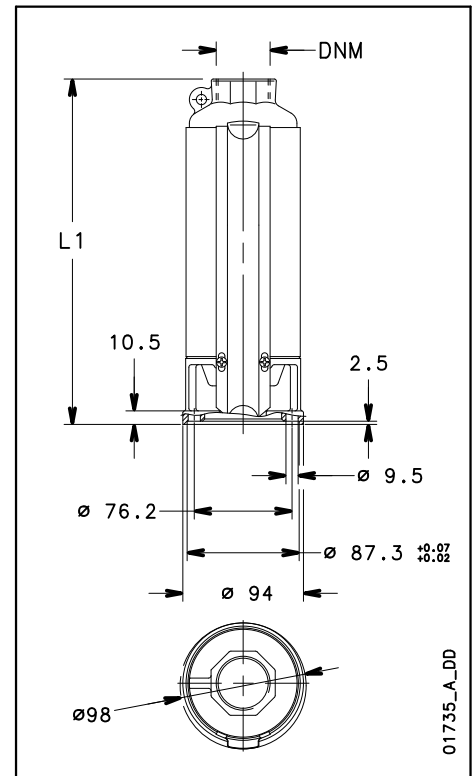
6GS_2P60_A_CH

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

8GS SERIES OPERATING CHARACTERISTICS AT 60 Hz

PUMP TYPE	N. OF STAGES	MOTOR POWER		Q = DELIVERY						
				l/min	0	83	120	160	200	225
				m ³ /h	0	5	7,2	9,6	12	13,5
		kW	HP	H = TOTAL HEAD METRES COLUMN OF WATER						
8GS116	4	1,1	1,5	39	35	32	27	19	12	
8GS156	6	1,5	2	59	52	48	40	28	18	
8GS226	8	2,2	3	79	69	64	54	38	24	
8GS306	11	3	4	108	95	88	74	52	32	
8GS406	14	4	5,5	138	122	112	95	68	45	
8GS556R	17	5,5	7,5	167	149	136	116	83	55	
8GS556	20	5,5	7,5	197	175	160	136	97	64	
8GS756R	23	7,5	11	226	201	185	156	112	74	

Hydraulic performances in compliance with ISO 9906:2012 - Grade 3B (ex ISO 9906:1999 - Annex A) 8gs-2p60-en_d_th

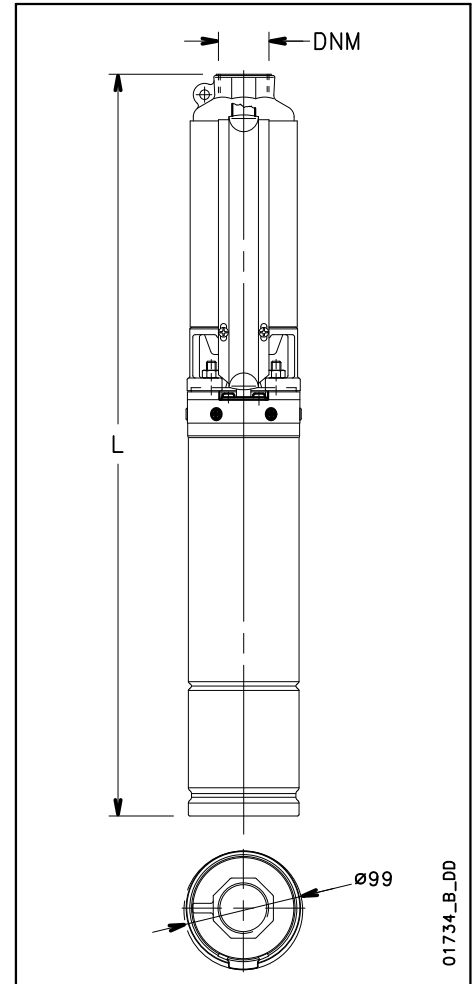


8GS..4OS SERIES DIMENSIONS AND WEIGHTS

ELECTRIC PUMP TYPE *	N. OF STAGES	DNM	DIMENSIONS (mm)		PUMP WEIGHT kg	ELECTRIC PUMP WEIGHT kg
			L1	L		
8GS116M-4OS	4	Rp 2	299	714	3,0	13,9
8GS156M-4OS	6	Rp 2	361	811	3,6	16,1
8GS226M-4OS	8	Rp 2	423	923	4,2	19,0
8GS116T-4OS	4	Rp 2	299	679	3,0	12,0
8GS156T-4OS	6	Rp 2	361	776	3,6	14,7
8GS226T-4OS	8	Rp 2	423	873	4,2	16,8
8GS306T-4OS	11	Rp 2	516	966	5,1	18,7
8GS406T-4OS	14	Rp 2	647	1217	6,2	23,7
8GS556RT-4OS	17	Rp 2	740	1370	7,0	28,0
8GS556T-4OS	20	Rp 2	833	1463	7,9	28,9
8GS756RT-4OS	23	Rp 2	926	1762	8,7	37,2

* Pump and motor are supplied uncoupled in two separated packages if:
 - the motor is single-phase $\geq 2,2$ kW or three-phase ≥ 3 kW
 - or the total length is > 1500 mm

8gs-4os-2p60-en_b_td



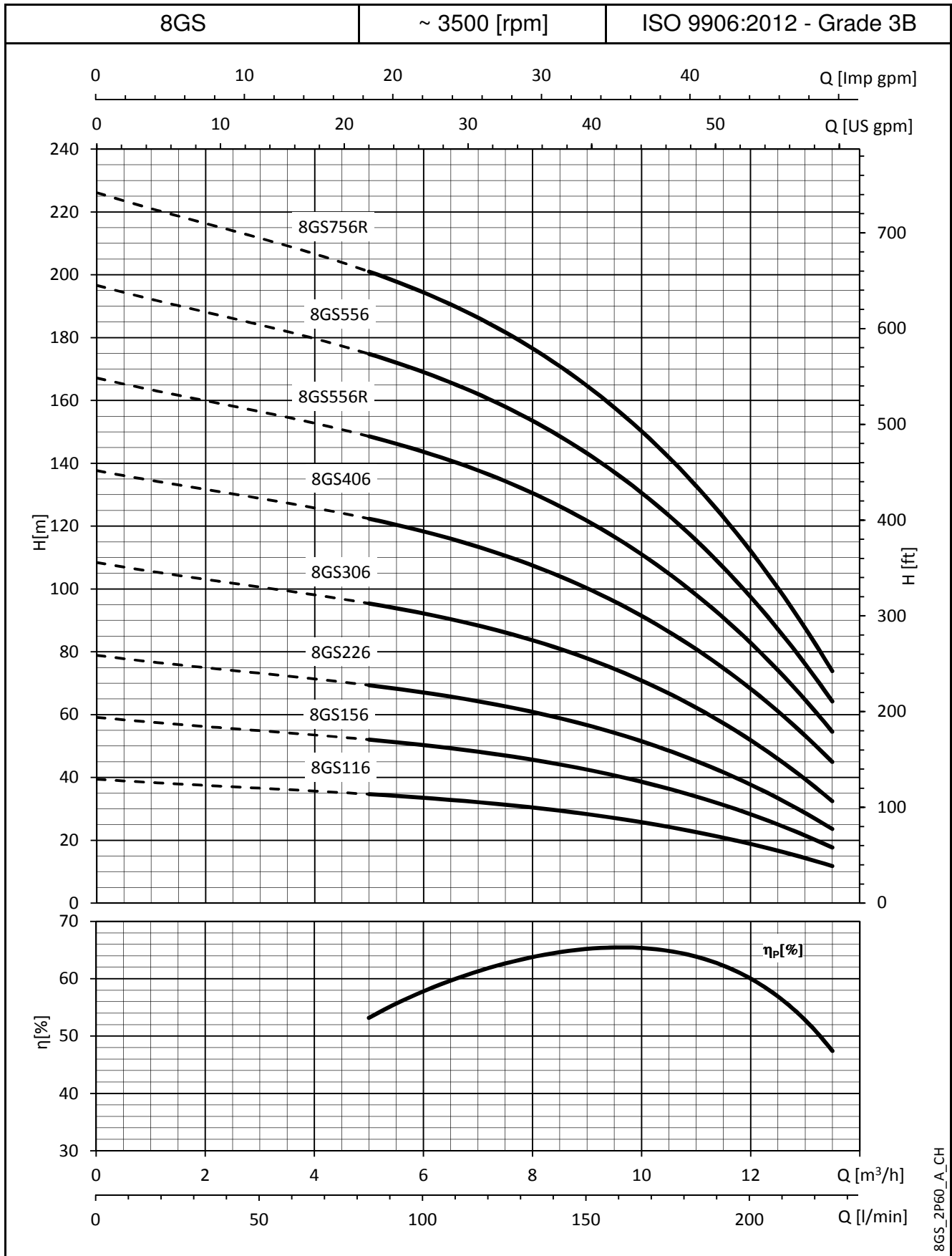
8GS..L4C SERIES DIMENSIONS AND WEIGHTS

ELECTRIC PUMP TYPE *	N. OF STAGES	DNM	DIMENSIONS (mm)		PUMP WEIGHT kg	ELECTRIC PUMP WEIGHT kg
			L1	L		
8GS116M-L4C	4	Rp 2	299	690	3,0	16,9
8GS156M-L4C	6	Rp 2	361	772	3,6	18,8
8GS226M-L4C	8	Rp 2	423	874	4,2	22,0
8GS116T-L4C	4	Rp 2	299	645	3,0	14,7
8GS156T-L4C	6	Rp 2	361	752	3,6	17,5
8GS226T-L4C	8	Rp 2	423	834	4,2	19,0
8GS306T-L4C	11	Rp 2	516	1060	5,1	26,1
8GS406T-L4C	14	Rp 2	647	1261	6,2	29,9
8GS556RT-L4C	17	Rp 2	740	1424	7,0	33,8
8GS556T-L4C	20	Rp 2	833	1517	7,9	34,7
8GS756RT-L4C	23	Rp 2	926	1690	8,7	38,9

* Pump and motor are supplied uncoupled in two separated packages if:
 - the motor is single-phase $\geq 2,2$ kW or three-phase ≥ 3 kW
 - or the total length is > 1500 mm

8gs-l4c-2p60-en_b_td

**8GS SERIES
OPERATING CHARACTERISTICS AT 60 Hz**

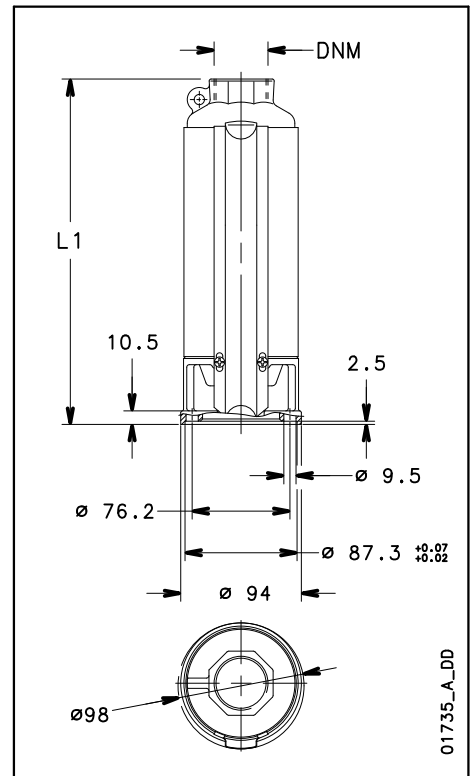


These performances are valid for liquids with density $\rho = 1.0 \text{ Kg/dm}^3$ and kinematic viscosity $\nu = 1 \text{ mm}^2/\text{sec}$.

12GS SERIES OPERATING CHARACTERISTICS AT 60 Hz

PUMP TYPE	N. OF STAGES	MOTOR POWER		Q = DELIVERY						
				l/min	0	125	160	200	250	300
				m ³ /h	0	7,5	9,6	12	15	18
				H = TOTAL HEAD METRES COLUMN OF WATER						
12GS156	5	1,5	2	37	32	30	26	19	11	
12GS226	8	2,2	3	60	51	48	41	31	18	
12GS306	11	3	4	82	71	65	57	43	24	
12GS406	14	4	5,5	104	90	83	72	54	31	
12GS556	19	5,5	7,5	145	128	119	106	83	53	
12GS756	26	7,5	11	198	175	163	145	114	72	

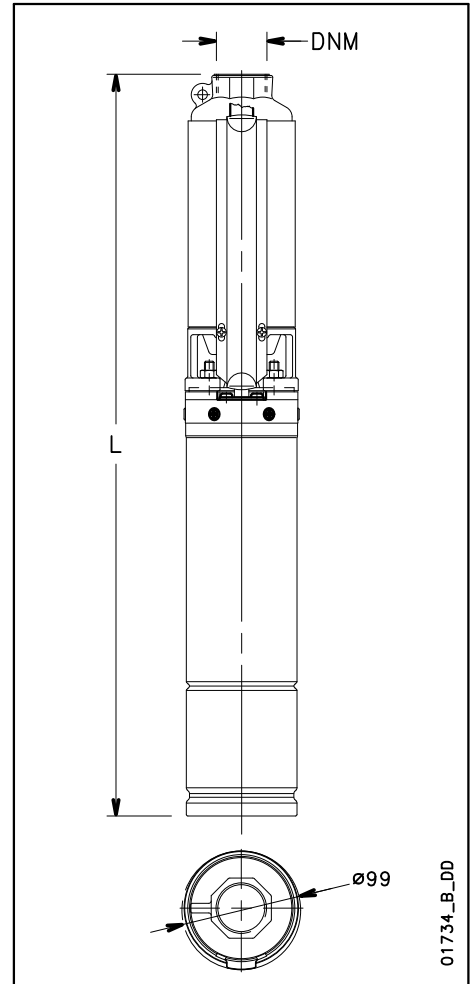
Hydraulic performances in compliance with ISO 9906:2012 - Grade 3B (ex ISO 9906:1999 - Annex A) 12gs-2p60-en_d_th



12GS..4OS SERIES DIMENSIONS AND WEIGHTS

ELECTRIC PUMP TYPE *	N. OF STAGES	DNM	DIMENSIONS (mm)		PUMP WEIGHT kg	ELECTRIC PUMP WEIGHT kg
			L1	L		
			12GS156M-4OS	5		
12GS226M-4OS	8	Rp 2	591	1091	5,8	20,6
12GS156T-4OS	5	Rp 2	435	850	4,3	15,4
12GS226T-4OS	8	Rp 2	591	1041	5,8	18,4
12GS306T-4OS	11	Rp 2	785	1235	7,5	21,1
12GS406T-4OS	14	Rp 2	940	1510	8,9	26,4
12GS556T-4OS	19	Rp 2	1200	1830	11,3	32,3
12GS756T-4OS	26	Rp 2	1581	2417	15,5	44,0

* Pump and motor are supplied uncoupled in two separated packages if:
 - the motor is single-phase $\geq 2,2$ kW or three-phase ≥ 3 kW
 - or the total length is > 1500 mm 12gs-4os-2p60-en_b_td

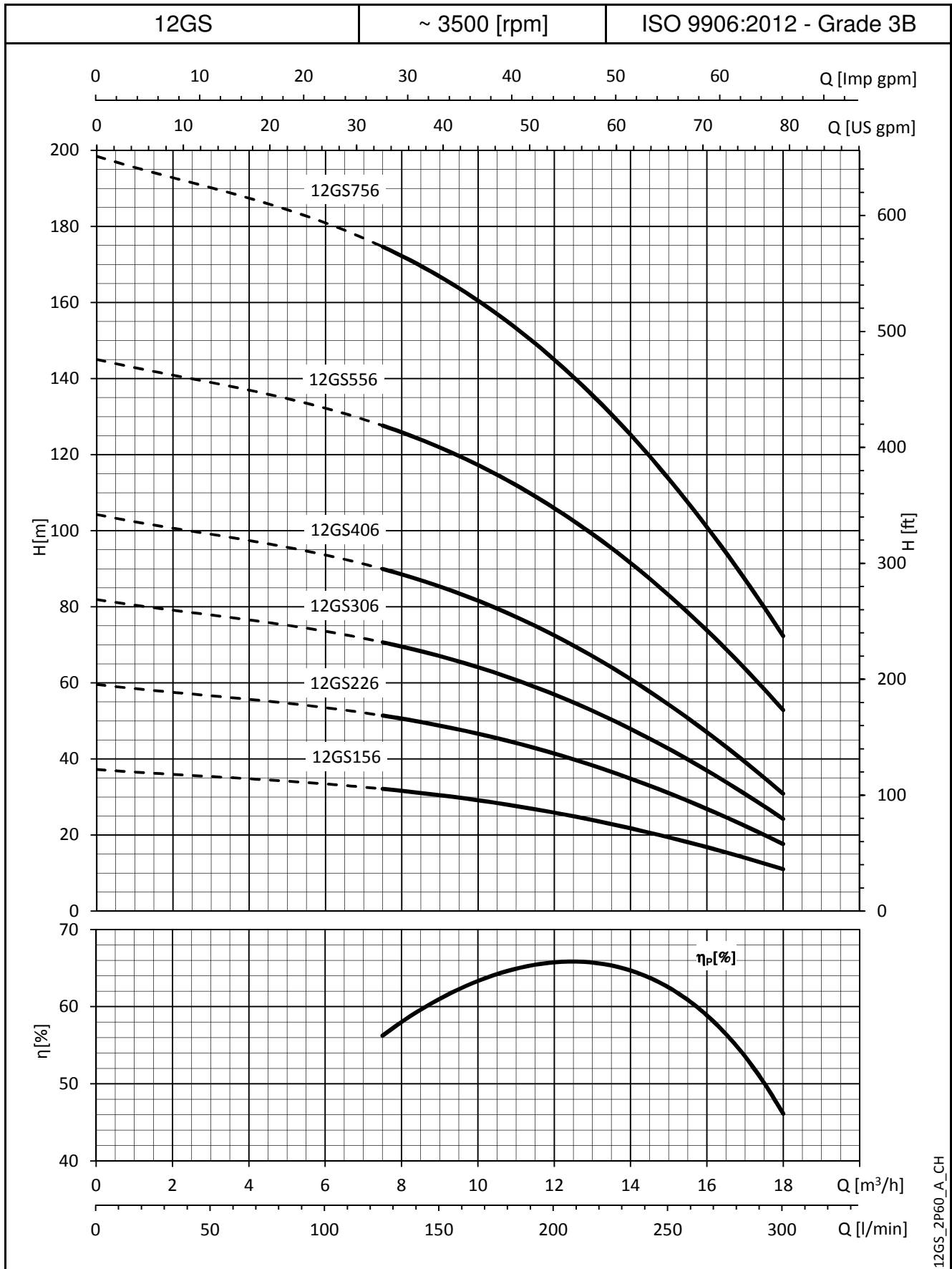


12GS..L4C SERIES DIMENSIONS AND WEIGHTS

ELECTRIC PUMP TYPE *	N. OF STAGES	DNM	DIMENSIONS (mm)		PUMP WEIGHT kg	ELECTRIC PUMP WEIGHT kg
			L1	L		
			12GS156M-L4C	5		
12GS226M-L4C	8	Rp 2	591	1042	5,8	23,6
12GS156T-L4C	5	Rp 2	435	826	4,3	18,2
12GS226T-L4C	8	Rp 2	591	1002	5,8	20,6
12GS306T-L4C	11	Rp 2	785	1329	7,5	28,5
12GS406T-L4C	14	Rp 2	940	1554	8,9	32,6
12GS556T-L4C	19	Rp 2	1200	1884	11,3	38,1
12GS756T-L4C	26	Rp 2	1581	2345	15,5	45,7

* Pump and motor are supplied uncoupled in two separated packages if:
 - the motor is single-phase $\geq 2,2$ kW or three-phase ≥ 3 kW
 - or the total length is > 1500 mm 12gs-l4c-2p60-en_b_td

**12GS SERIES
OPERATING CHARACTERISTICS AT 60 Hz**



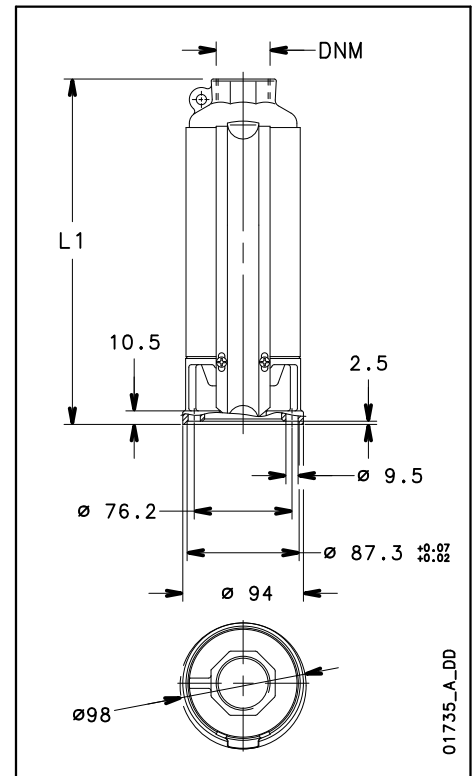
12GS_2P60_A_CH

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

16GS SERIES OPERATING CHARACTERISTICS AT 60 Hz

PUMP TYPE	N. OF STAGES	MOTOR POWER		Q = DELIVERY						
				H = TOTAL HEAD METRES COLUMN OF WATER						
				l/min	0	160	200	300	350	450
				m ³ /h	0	9,6	12	18	21	27
		kW	HP							
16GS226	6	2,2	3	41	36	33	25	20	7	
16GS306	9	3	4	61	54	50	37	29	11	
16GS406	12	4	5,5	79	70	65	51	41	17	
16GS556R	14	5,5	7,5	92	81	76	59	48	20	
16GS556	16	5,5	7,5	105	93	87	68	55	23	
16GS756R	19	7,5	11	131	116	109	85	69	28	

Hydraulic performances in compliance with ISO 9906:2012 - Grade 3B (ex ISO 9906:1999 - Annex A) 16gs-2p60-en_d_th

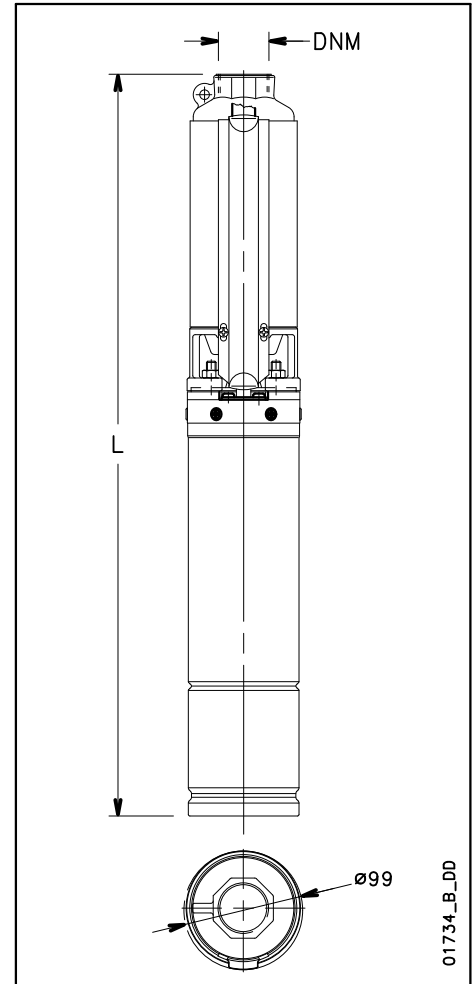


16GS..4OS SERIES DIMENSIONS AND WEIGHTS

ELECTRIC PUMP TYPE *	N. OF STAGES	DNM	DIMENSIONS (mm)		PUMP WEIGHT kg	ELECTRIC PUMP WEIGHT kg
			L1	L		
			16GS226M-4OS	6		
16GS226T-4OS	6	Rp 2	545	995	5,1	17,7
16GS306T-4OS	9	Rp 2	749	1199	6,8	20,4
16GS406T-4OS	12	Rp 2	953	1523	8,5	26,0
16GS556RT-4OS	14	Rp 2	1088	1718	9,6	30,6
16GS556T-4OS	16	Rp 2	1224	1854	10,8	31,8
16GS756RT-4OS	19	Rp 2	1484	2320	13,5	42,0

* Pump and motor are supplied uncoupled in two separated packages if:
 - the motor is single-phase $\geq 2,2$ kW or three-phase ≥ 3 kW
 - or the total length is > 1500 mm

16gs-4os-2p60-en_b_td



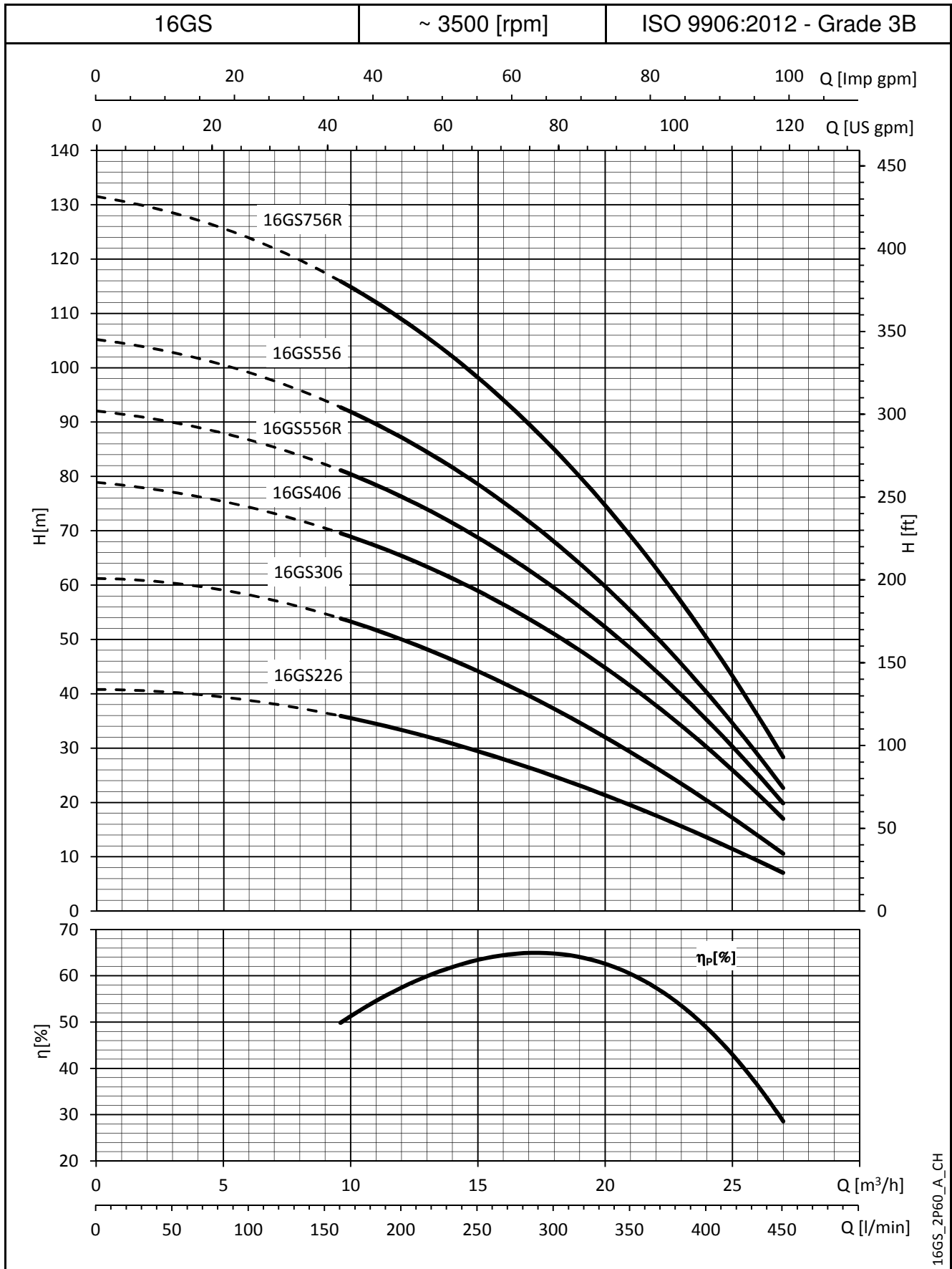
16GS..L4C SERIES DIMENSIONS AND WEIGHTS

ELECTRIC PUMP TYPE *	N. OF STAGES	DNM	DIMENSIONS (mm)		PUMP WEIGHT kg	ELECTRIC PUMP WEIGHT kg
			L1	L		
			16GS226M-L4C	6		
16GS226T-L4C	6	Rp 2	545	956	5,1	19,9
16GS306T-L4C	9	Rp 2	749	1293	6,8	27,8
16GS406T-L4C	12	Rp 2	953	1567	8,5	32,2
16GS556RT-L4C	14	Rp 2	1088	1772	9,6	36,4
16GS556T-L4C	16	Rp 2	1224	1908	10,8	37,6
16GS756RT-L4C	19	Rp 2	1484	2248	13,5	43,7

* Pump and motor are supplied uncoupled in two separated packages if:
 - the motor is single-phase $\geq 2,2$ kW or three-phase ≥ 3 kW
 - or the total length is > 1500 mm

16gs-l4c-2p60-en_b_td

**16GS SERIES
OPERATING CHARACTERISTICS AT 60 Hz**



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

4OS - L4C SERIES MOTORS MOTOR - CONTROL PANEL COMBINATION TABLE

MOTOR TYPE 4OS - 4" SINGLE-PHASE	RATED POWER		CURRENT AT S.F. 220-230 V	CAPACITOR	PANEL TYPE				
	kW	HP	A	μF / 450 V	QSC...	QSCS...			
	0,37	0,5	3,45	20	...036	...036			
	0,55	0,75	4,73	25	...056	...056			
	0,75	1	6,09	35	...076	...076			
	1,1	1,5	7,61	40	...116	...116			
	1,5	2	10,1	50	...156	...156			
	2,2	3	15,7	50	...226	...226			

For different voltages, please contact our sales network.

4OSM-2p60-en_c_tc

MOTOR TYPE 4OS - 4" THREE-PHASE	RATED POWER		CURRENT AT S.F. 380 V	PANEL TYPE					
	kW	HP	A	QTD/...	Q3D/...	Q3I/...	Q3A/...	*Q3Y/...	Q3SF/...
	0,37	0,5	1,55	...05-07	...05-07	-	-	-	-
	0,55	0,75	1,88	...05-07	...05-07	-	-	-	-
	0,75	1	2,62	...07-15	...07-15	-	-	-	-
	1,1	1,5	3,27	...07-15	...07-15	-	-	-	-
	1,5	2	4,30	...15-22	...15-22	-	-	-	-
	2,2	3	6,25	...22-40	...22-40	-	-	-	-
	3	4	7,61	...22-40	...22-40	-	-	-	-
	4	5,5	9,05	...40-75	...40-75	...40-75	...40-75	...40-75	...75
	5,5	7,5	12,3	...40-75	...40-75	...40-75	...40-75	...40-75	...75
	7,5	10	19,4	-	...92-110	...92-110	...92-110	...92-110	...150

For different voltages, please contact our sales network.

4OST-2p60-en_c_tc

* require 6-wire suitable motor

MOTOR TYPE L4C - 4" SINGLE PHASE	RATED POWER		CURRENT AT S.F. 220-230 V	CAPACITOR	PANEL TYPE				
	kW	HP	A	μF / 450 V	QSC/...	QSCS/...			
	0,37	0,5	5,5	20	...036	...036			
	0,55	0,75	7,4	25	...056A	...056A			
	0,75	1	8,9	35	...076	...076			
	1,1	1,5	12,7	40	...116A	...116A			
	1,5	2	13,1	50	...156	...156			
	2,2	3	17,6	50	...226	...226			
	3,7	5	30,7	75	...406	...406			

For different voltages please contact our sales network

L4cm-2p60_d_tc

MOTOR TYPE L4C - 4" THREE PHASE	RATED POWER		CURRENT AT S.F. 380 V	PANEL TYPE					
	kW	HP	A	QTD/...	Q3D/...	Q3I/...	Q3A/...	*Q3Y/...	Q3SF/...
	0,37	0,5	2,3	...05-07	...05-07	-	-	-	-
	0,55	0,75	2,9	...07-15	...07-15	-	-	-	-
	0,75	1	3,4	...07-15	...07-15	-	-	-	-
	1,1	1,5	4,7	...15-22	...15-22	-	-	-	-
	1,5	2	5,9	...15-22	...15-22	-	-	-	-
	2,2	3	7,2	...22-40	...22-40	-	-	-	-
	3	4	9,5	...22-40	...22-40	-	-	-	...75
	4	5,5	11,6	...40-75	...40-75	...40-75	...40-75	...40-75	...75
	5,5	7,5	15,7	...40-75	...40-75	...40-75	...40-75	...40-75	...75
	7,5	10	20	-	...92-110	...92-110	...92-110	...92-110	...150

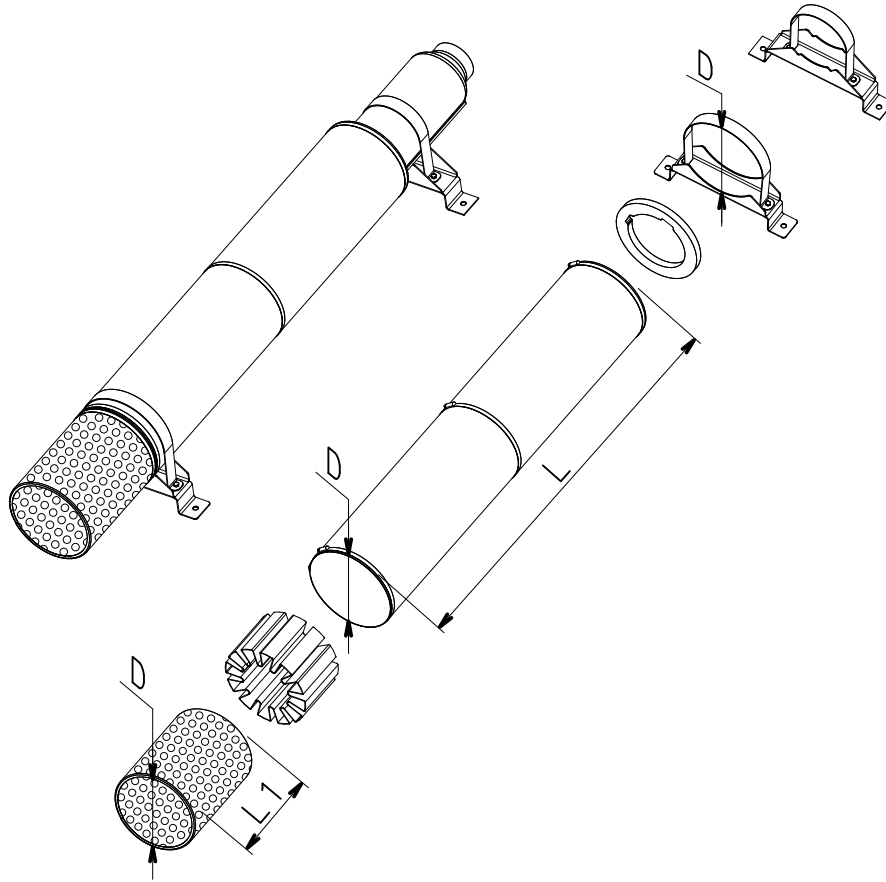
For different voltages please contact our sales network

L4ct-2p60_b_tc

* Require 6-wire suitable motor

COOLING SLEEVE

01890_B_DD

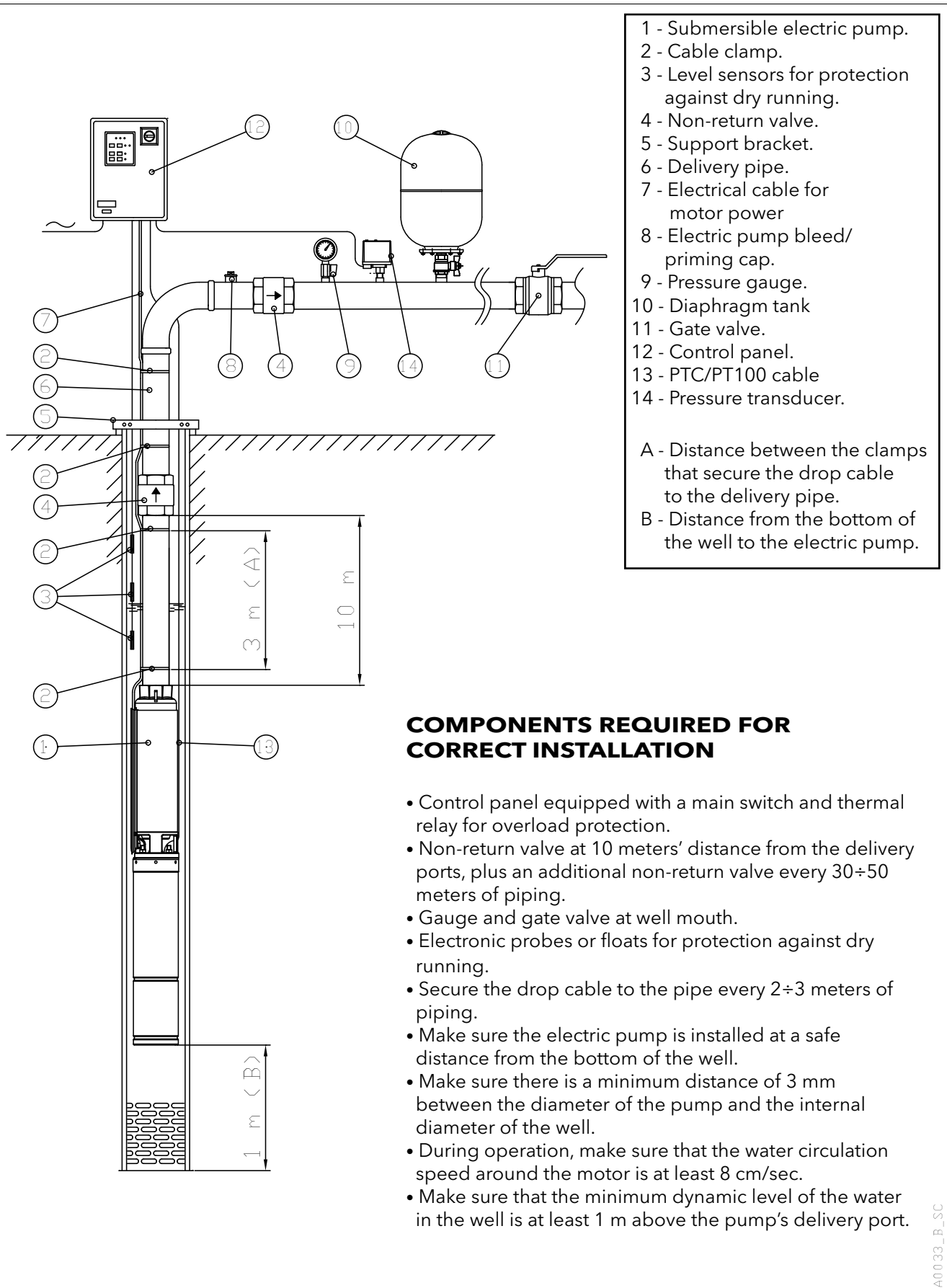


PUMP TYPE	MOTOR TYPE		COOLING SET SHROUD (D x L)	COOLING SET FILTER (D x L1)	COOLING SET BRACKETS (D)
	40S	L4C			
1GSL 2GS 4GS 6GS 8GS 12GS	0,37	0,37	D115 x 500	D115 x 117	D115 - 2PZ
	0,55	0,55			
	0,75	0,75			
	1,1	1,1	D115 x 800	D115 x 117	D115 - 2PZ
	1,5	1,5			
	2,2	2,2			
	3	3			
	4	4	D115 x 1000	D115 x 117	D115 - 2PZ
5,5	5,5				
7,5	7,5				
16GS	1,5	1,5	D145 x 800	D145 x 158	D145 - 2PZ
	2,2	2,2			
	3	3			
	4	4	D145 x 1000	D145 x 158	D145 - 2PZ
	5,5	5,5			
	7,5	7,5			

gs_kit-raf50_en_c_ta

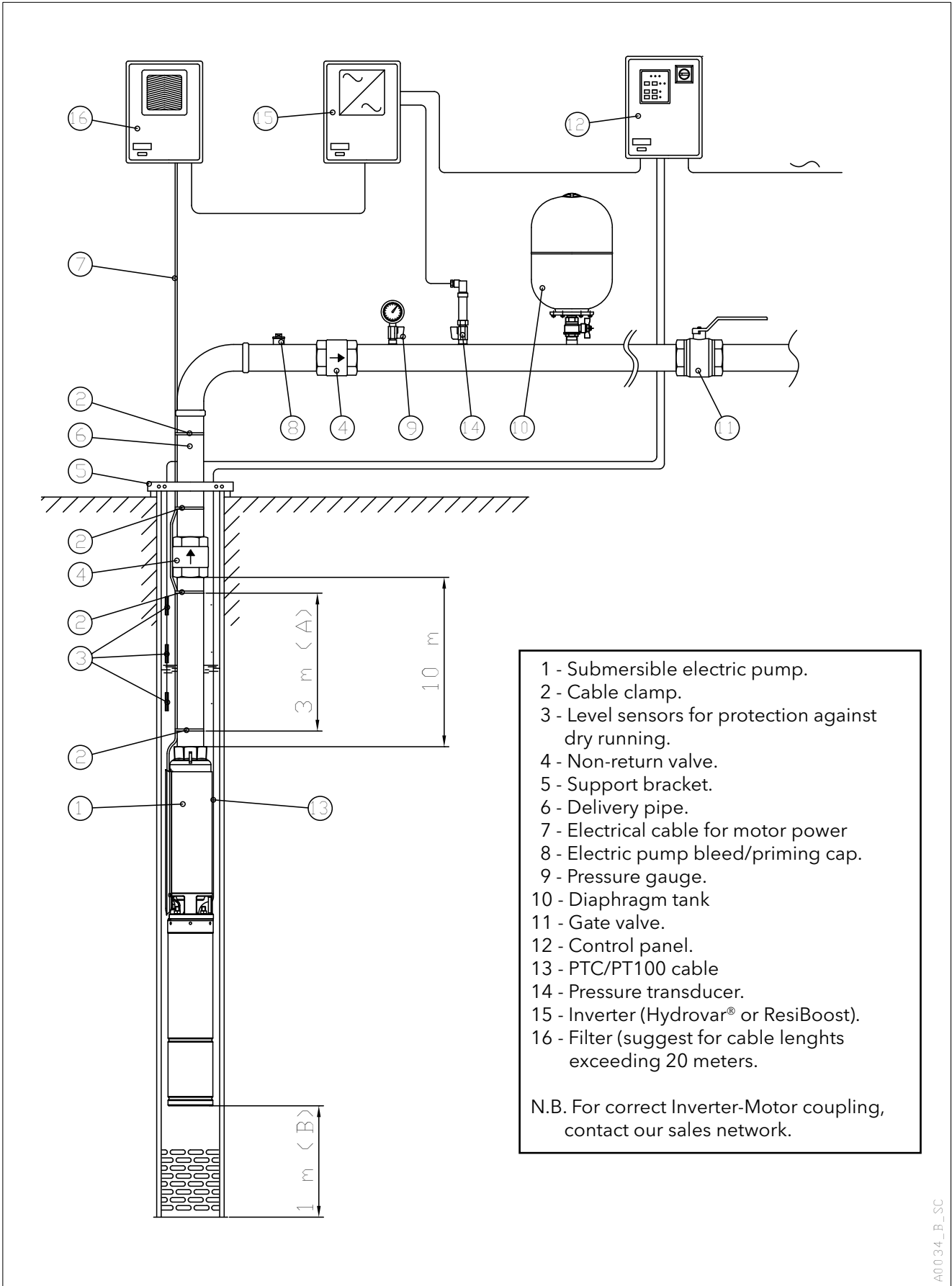
TECHNICAL APPENDIX

SUBMERSIBLE ELECTRIC PUMP INSTALLATION DIAGRAM



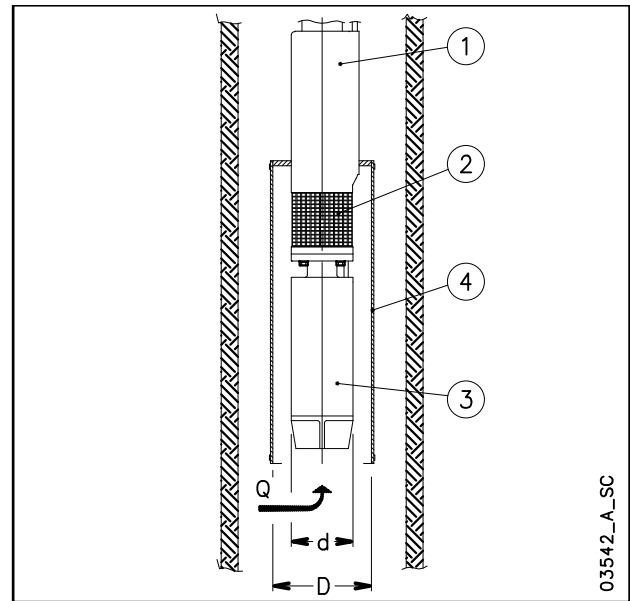
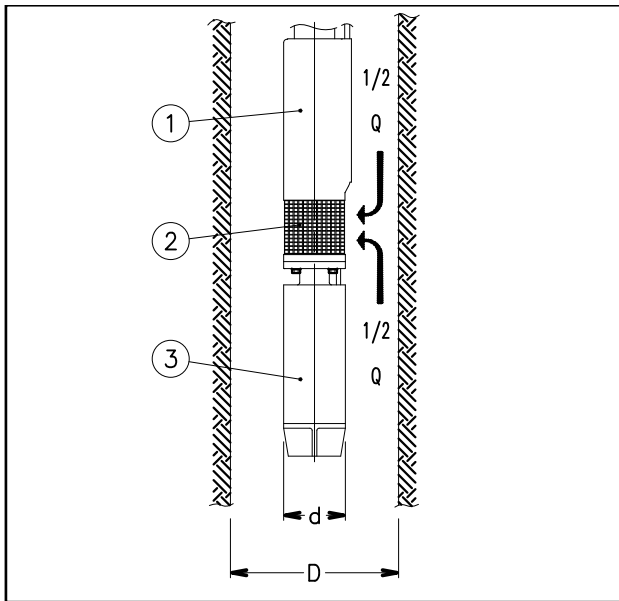
A0033_E_SC

EXAMPLE OF INSTALLATION OF A SUBMERSIBLE ELECTRIC PUMP CONTROLLED BY AN INVERTER



A0034_B_SC

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] corresponds to the diameter of the well;

d in [m] corresponds to 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 it means that the motor is properly cooled, if v < v_m will be necessary to mount a cooling sleeve (4).

Example:

An electric pump OZ630/12 (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.

Speed of 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.

Because 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 the electric pump OZ615/24 (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 of 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.

TECHNICAL APPENDIX

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

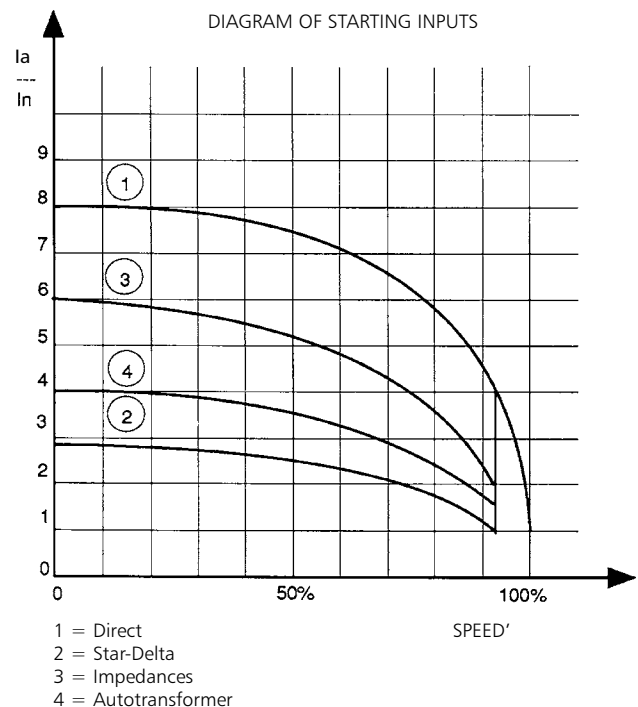
The pump is started with a voltage which is lower than the rated one.
The Lowara panels use an autotransformer with a voltage that is 70% the value of the line voltage.
The switch to the rated voltage occurs without any interruptions of the power supply.
Rated voltage $U_n = 400 \text{ V}$

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

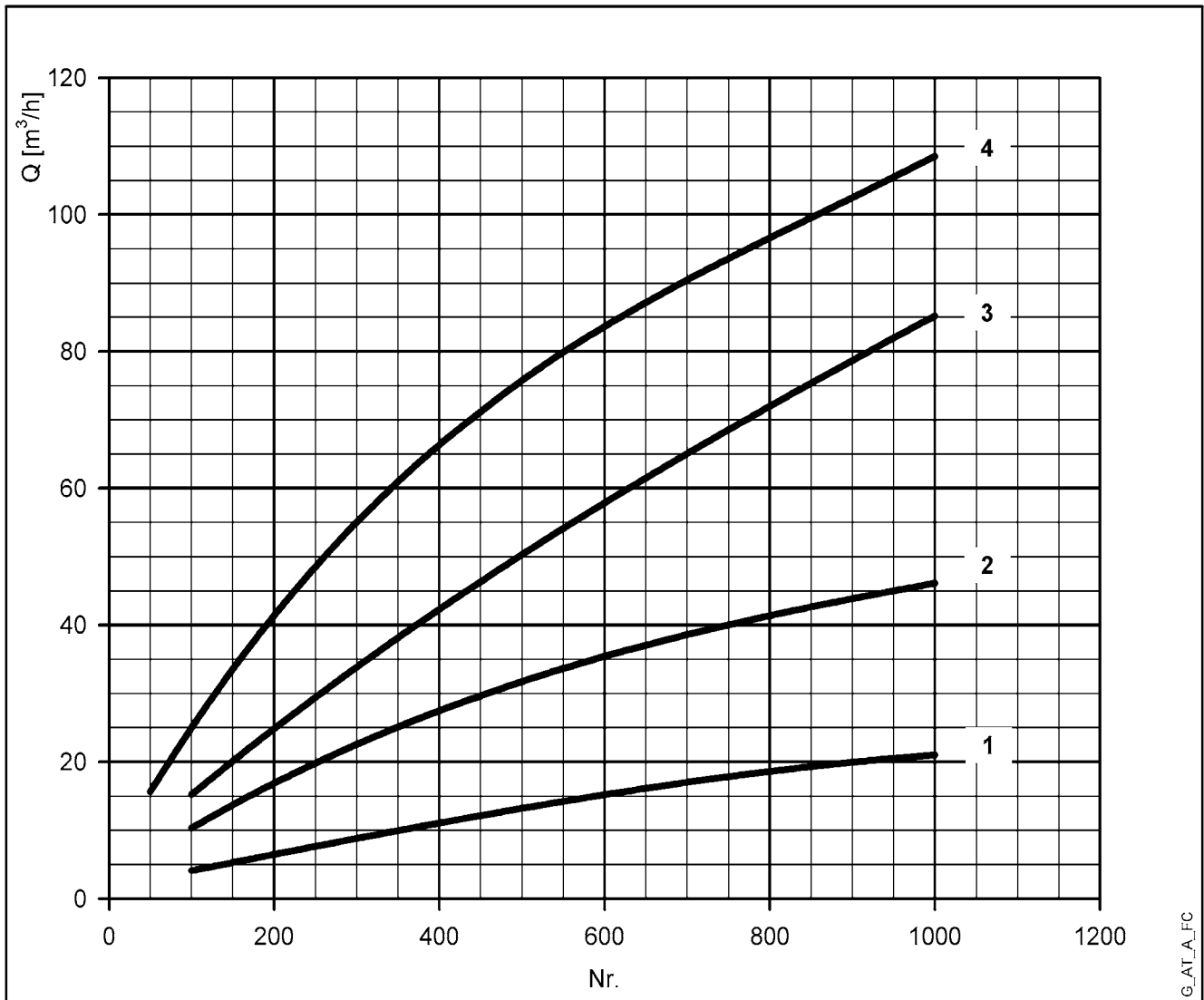
NUMBER OF APARTMENTS	WITH FLUSH TANK WC		WITH CONTROLLED FLUSHING SYSTEM WC	
	1	2	1	2
	FLOW RATE (l/min)			
1	32	40	60	79
2	45	56	85	111
3	55	68	105	136
4	63	79	121	157
5	71	88	135	176
6	78	97	148	193
7	84	105	160	208
8	90	112	171	223
9	95	119	181	236
10	100	125	191	249
11	105	131	200	261
12	110	137	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:

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

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 temperature (°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 117-118 of this catalogue. 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 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 VAPOUR PRESSURE p_s 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	433,15	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				

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

G-at-pct_a_th

hr = flow resistance for 100m of straight pipeline (m)
V = water speed (m/s)

FLOW RESISTANCE

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	-	-	-	0,2	0,2	0,2	0,4	0,4	0,6	0,9	1,1	1,3
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_a_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
1,000	0,0600	2,1189	0,0353	0,2200	0,2642
16,6667	1,000	35,3147	0,5886	3,6662	4,4029
0,4719	0,0283	1,000	0,0167	0,1038	0,1247
28,3168	1,6990	60,0000	1,000	6,2288	7,4805
4,5461	0,2728	9,6326	0,1605	1,000	1,2009
3,7854	0,2271	8,0208	0,1337	0,8327	1,000

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
1,000	0,0010	1×10^{-5}	$1,45 \times 10^{-4}$	$1,02 \times 10^{-4}$	0,0075
1 000,0000	1,000	0,0100	0,1450	0,1020	7,5006
1×10^5	100,0000	1,000	14,5038	10,1972	750,0638
6 894,7570	6,8948	0,0689	1,000	0,7031	51,7151
9 806,6500	9,8067	0,0981	1,4223	1,000	73,5561
133,3220	0,1333	0,0013	0,0193	0,0136	1,000

LENGTH

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

VOLUME

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

TEMPERATURE

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

G-at_pp-en_b_sc

FURTHER PRODUCT SELECTION AND DOCUMENTATION

Xylect™



Xylect is pump solution selection software with an extensive online database of product information across the entire Lowara, and Vogel 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.

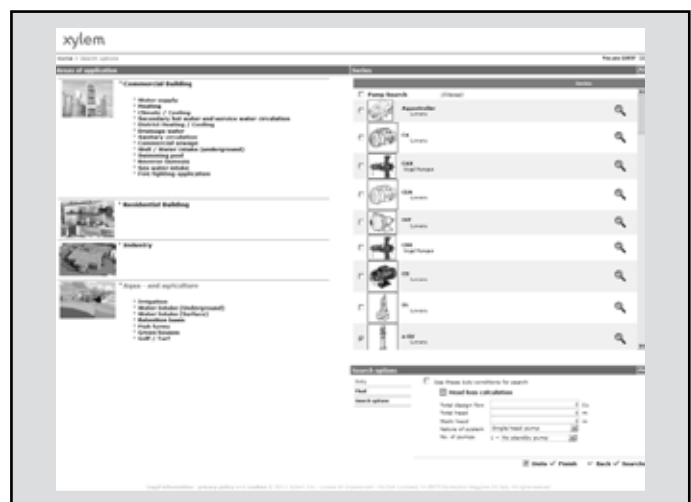
The possibility to search by applications and the detailed information output given makes it easy to make the optimal selection without having detailed knowledge about the Lowara and Vogel products.

The search can be made by:

- Application
- Product type
- Duty point

Xylect gives a detailed output:

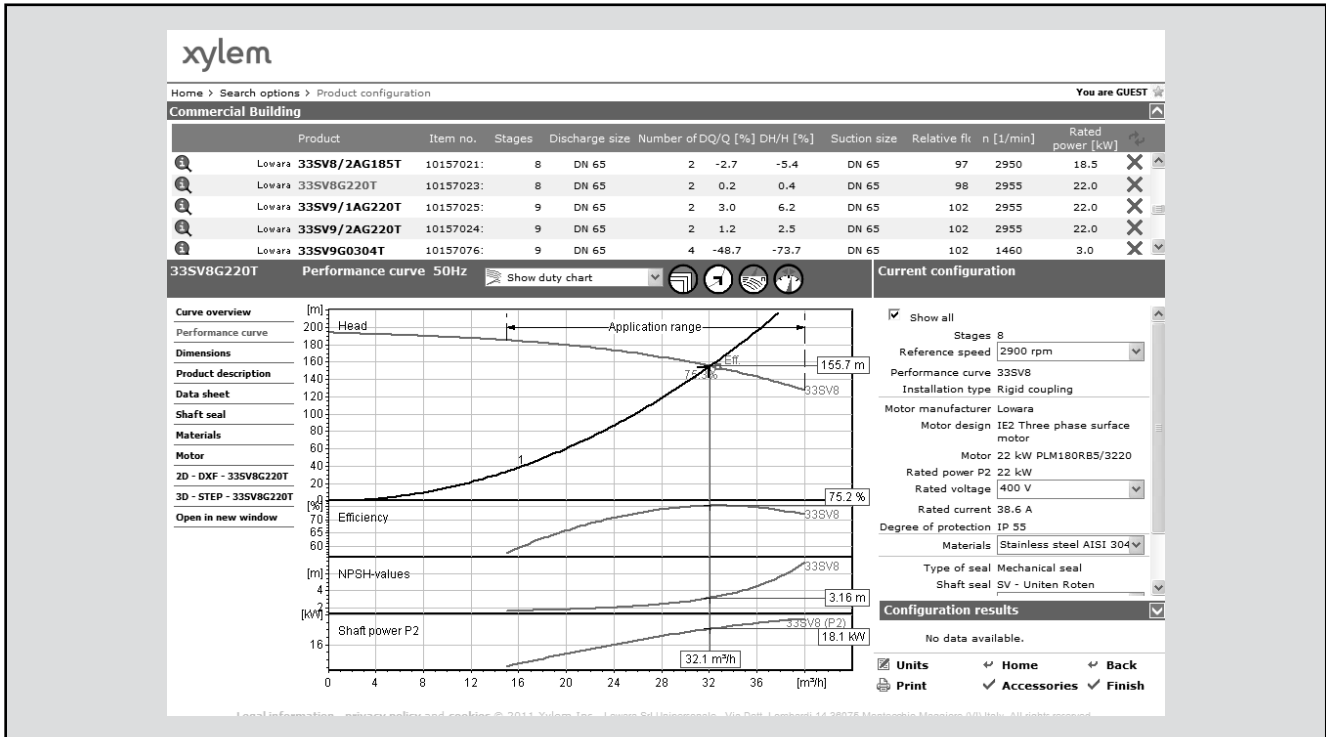
- List with search results
- Performance curves (flow, head, power, efficiency, NPSH)
- Motor data
- Dimensional drawings
- Options
- Data sheet printouts
- Document downloads incl dxf files



The search by application guides users not familiar with the product range to the right choice.

FURTHER PRODUCT SELECTION AND DOCUMENTATION

Xylect™



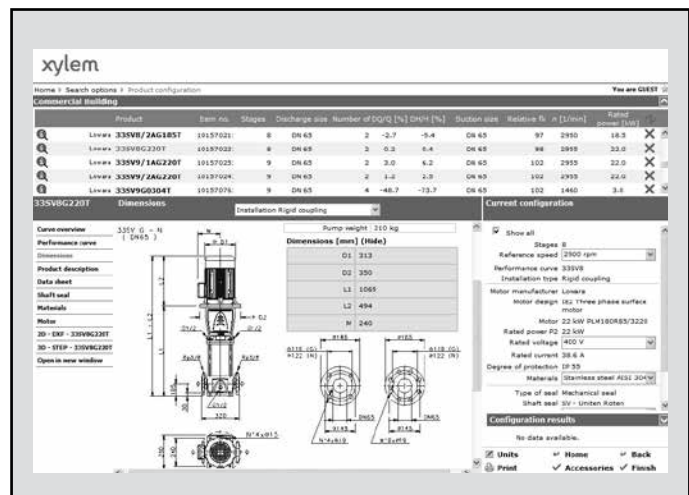
The detailed output makes it easy to select the optimal pump from the given alternatives.

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

- Set own standard units
- Create and save projects
- Share projects with other Xylect users

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

For more information about Xylect please contact our sales network or visit www.xylect.com.



Dimensional drawings appear on the screen and can be downloaded in dxf format.

Xylem |'zīləm|

- 1) The tissue in plants that brings water upward from the roots;
- 2) a leading global water technology company.

We're a global team unified in a common purpose: creating advanced technology solutions to the world's water challenges. Developing new technologies that will improve the way water is used, conserved, and reused in the future is central to our work. Our products and services move, treat, analyze, monitor and return water to the environment, in public utility, industrial, residential and commercial building services, and agricultural settings. With its October 2016 acquisition of Sensus, Xylem added smart metering, network technologies and advanced data analytics for water, gas and electric utilities to its portfolio of solutions. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise with a strong focus on developing comprehensive, sustainable solutions.

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



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