60 Hz

VM Series

CLOSE-COUPLED THREADED VERTICAL MULTISTAGE CENTRIFUGAL ELECTRIC PUMPS EQUIPPED WITH IE3 MOTORS COMPLYING WITH IEC 60034-30

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VM SERIES
GENERAL INTRODUCTION

Our customers are central to our business.

Many years of collaboration with them across the different markets and all over the world has taught us that the Building Services market requires specific pump design to meet the challenge of the energy saving and market competitiveness, also through performances and reliability. Therefore Lowara has developed a new range of single piece vertical multistage pumps, the VM, to give an appropriate and dedicated solution to special applications and installations in the residential and commercial building services market.

Pump design
The VM is a non-self-priming vertical multistage, high pressure centrifugal pump, with threaded inlet and outlet manifolds. The pumps are close-coupled design and are equipped with non-standard Lowara motors.
The VM is equipped with mechanical seal.

The VM are highly modular pumps that are fitted with an innovative hydraulic design that secures high efficiency performances and an increased Mean Time Between Failure.

The VM is available in four different sizes; the design is made of a cast iron pump body coupled to an external stainless steel (EN 1.4301/ AISI 304) TIG welded sleeve with the mean of stainless steel tie rods screwed in the aluminium motor flange. The impellers are made in Noryl™.

Motor
The VM are equipped with Lowara designed and manufactured surface motors in accordance with EN standards.
The VM series can be equipped as well with Lowara variable speed drivers such as the Teknospeed.

Range declination
The VM series are available as:
- Fix speed Electric pump.
- Variable speed system with Lowara Teknospeed variable driver embedded (on request).

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VM SERIES
APPLICATIONS, BENEFITS – BUILDING SERVICES

The VM series have been designed to cover a wide range of applications in the residential and small commercial building services from water supply to pressure boosting.

Applications
The VM series could be installed both in single private own house and in small/medium residential buildings.
The VM series will be as well your preferred choice for water supply and pressure boosting in small block offices and shops. The VM series could be finally installed as well for small/medium irrigation installation.

Benefits
Ease of installation: thanks to the limited dimensions due to the close-coupled vertical design, the VM is easy to handle and install.

Payback: Installing the VM series guarantee a very short payback period thanks to the high performance and to the competitive market positioning.

Reliability: The VM series secures as well reliable operations over time thanks to its robust and innovative design, heritage of the e-HM™. This could be increased with the installation of the Teknospeed: variable speed operation reduces mechanical stress on the pump components and water hammering during stopping.

Comfort: The VM series guarantee as well an increased user comfort thanks to very silent operation. The combination of the VM series with the Teknospeed will secure constant pressures at any points of water in your building and constant temperatures even when other taps are opened!

For the installers, the VM series are easy to install and the best choice for the end user in term of energy savings. The combination of the VM with the Teknospeed is the guarantee of quick and easy installation.

Features
- Compact design with best-in class performances.
- Wide range of performances with 4 sizes and flow up to 17 m^3/h.
- Nominal pressure up to 10 bars.
- Robust and silent design due the sleeve configuration.
- IE3 Lowara manufactured motors: high performances and silent operations.
- "Essential O-ring design" that highly reduces the sealing weaknesses (Only 2 OR in the sleeve design).

VM SERIES
GENERAL CHARACTERISTICS

VM..P SERIES	1	3	5	10
Max efficiency flow (m^3/h)	2,3	3,6	6,2	11
Flow range (m^3/h)	0,8÷3	1,4÷5,2	3÷8,4	6÷17
Maximum head (m)	99,8	104,7	106,6	96,5
Motor power (kW)	0,40÷1,1	0,50÷2,2	0,75÷2,2	1,1÷4
Max η (%) of pump	38	47	57	62
Standard temperature (°C)	-30 +90			

1-10vmp_2p60-en_a_tg

CONNECTIONS

CONNECTION TYPE	VM..P SERIES			
	1	3	5	10
Rp thread (suction)	Rp 1	Rp 1	Rp 1 1/4	Rp 1 1/2
Rp thread (delivery)	Rp 1	Rp 1	Rp 1 1/4	Rp 1 1/2

1-10vm_2p50-en_a_tc

ELECTRIC PUMP NOISE

POWER kW	NOISE LpA dB
0,40	55
0,50	55
0,75	59
0,95	59
1,1	65
1,5	65
2,2	65
3	65
4	65

1-10vm_mot_2p60_a_tr

The table show the mean sound pressure (Lp) measured as per Curve A (Standard ISO 1680).
Noise values were measured with the 60 Hz running with a tolerance of 3 dB (A).

STORAGE AND TRANSPORT TEMPERATURE

from -40°C to +60°C

VM SERIES

High efficiency close-coupled vertical multistage pump

MARKET SECTORS
BUILDING SERVICES.

APPLICATIONS
Pressure boosting and water supply systems.
Small to medium irrigation systems.
Liquid handling systems.

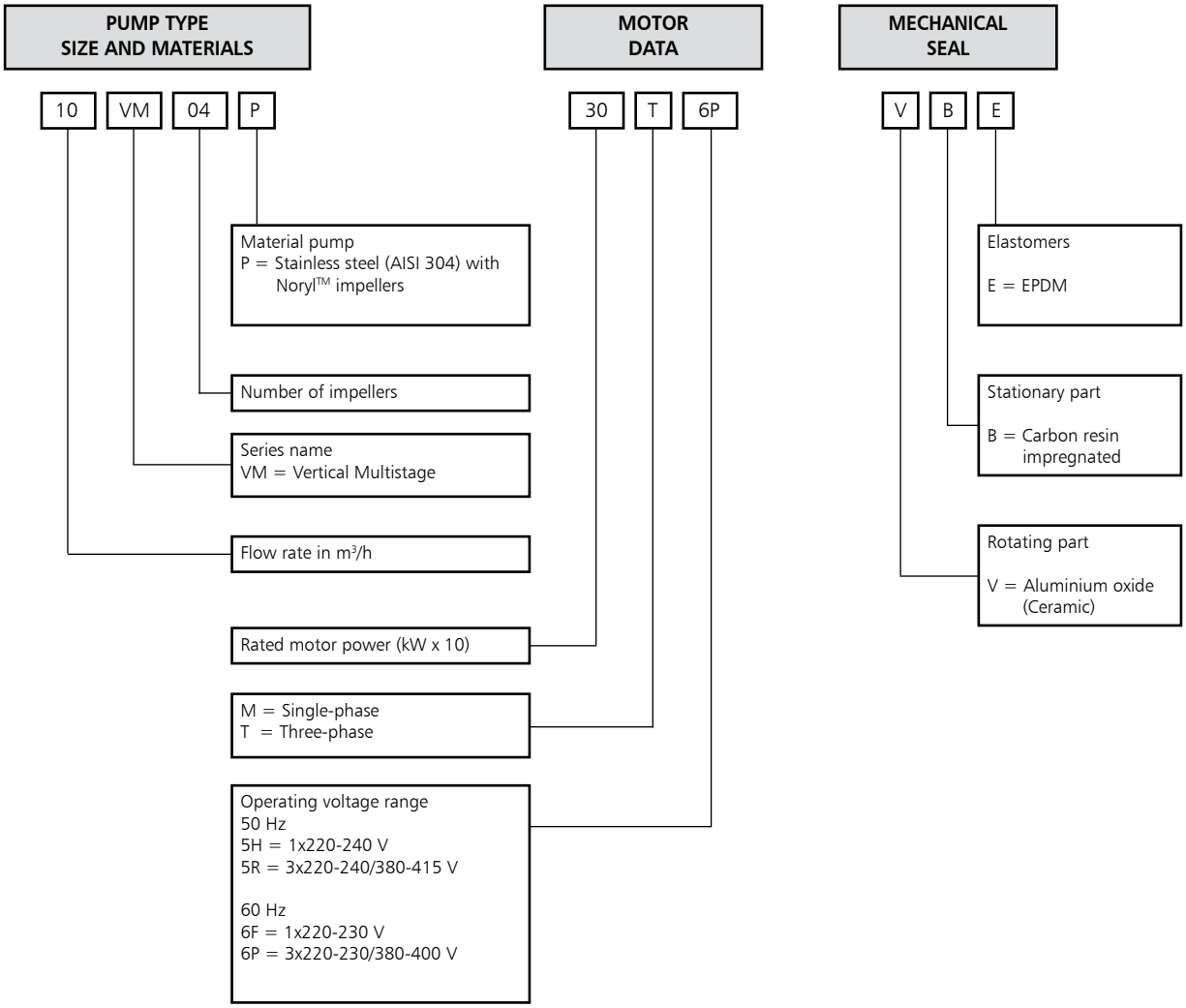
SPECIFICATIONS

PUMP
- Flow rate: up to 17 m^3/h.
- Head: up to 106 m.
- Ambient temperature:
  - Single-phase and three-phase motor versions from -15°C to +50°C.
- Temperature of the pumped liquid:
  - +90°C for versions with three-phase motor uses as EN 60335-2-41.
  - +60°C for versions with single-phase motor.
- Maximum operating pressure: 10 bar (PN 10).
- Connections: Rp threaded for both suction and discharge manifold.
- Hydraulic performances compliant with ISO 9906:2012 - Grade 3B.

MOTOR
- Electric short-circuit squirrel-cage motor (TEFC), enclosed construction, air-cooled, 2-pole:
  - Three-phase, efficiency class IE3 (compliant with IEC 60034-30).
  - Single-phase version up to 2,2 kW (with built-in automatic reset overload protection).
- IP55 protection degree.
- Insulation class 155 (F).
- Performances according to EN 60034-1.
- Standard voltage:
  - Single-phase: 220-230V, 60 Hz, 2 poles.
  - Three-phase: 220-230/380-400, 60 Hz, 2 poles.

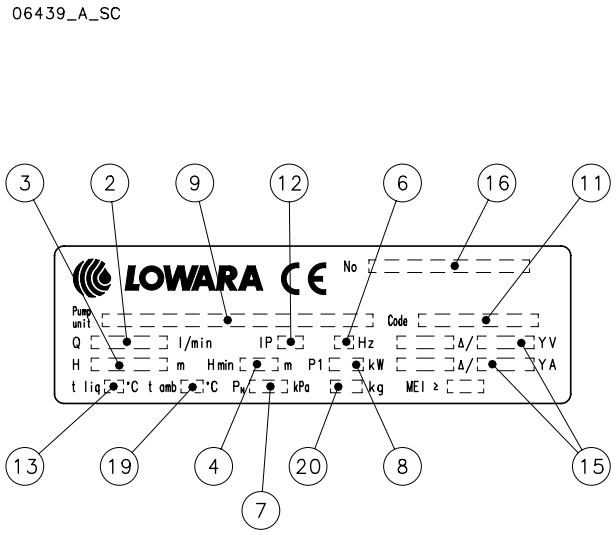
All pumps are certified for drinking water use (WRAS and ACS).

VM SERIES
IDENTIFICATION CODE



EXAMPLE: 10VM04P30T6PVBE
VM series electric pump, flow rate 10 m³/h, number of impellers 4, P version (Noryl™ impellers), rated motor power 3 kW, three-phase 60 Hz, voltage 220-230/380-400V, Ceramic/Carbon/EPDM mechanical seal.

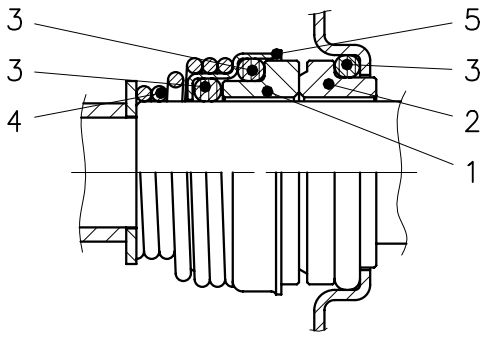
VM SERIES
ELECTRIC PUMP RATING PLATE



LEGEND

2 - Capacity range
3 - Head range
4 - Minimum head (EN 60335-2-41)
6 - Frequency
7 - Maximum operating pressure
8 - Electric pump unit absorbed power
9 - Pump / electric pump unit type
11 - Electric pump unit / pump part number
12 - Protection degree
13 - Maximum operating liquid temperature (uses as EN 60335-2-41)
15 - Rated voltage range
16 - Serial number (date + progressive number)
19 - Maximum operating ambient temperature
20 - Electric pump weight

MECHANICAL SEAL



LIST OF MATERIALS ACCORDING TO EN 12756

POSITION 1 - 2	POSITION 3	POSITION 4 - 5
V : Aluminium oxide (Ceramic)	E : EPDM	G : AISI 316
B : Carbon, resin-impregnated		

1-10vm_ten-mec-en_a_tm

TYPE OF SEAL

TYPE	POSITION 1	2	3	4	5	*TEMPERATURE (°C)	OPERATING PRESSURE
	ROTATING PART	STATIONARY PART	ELASTOMERS	SPRINGS	OTHER COMPONENTS		
STANDARD MECHANICAL SEAL							
VBEGG	V	B	E	G	G	-30 + 90	PN10

* For single-phase versions limit the temperature to +60°C.

1-10vm_tipi-ten-mec-en_a_tc

1, 3, 5, 10 VM..P SERIES
ELECTRIC PUMP CROSS SECTION AND MAIN COMPONENTS

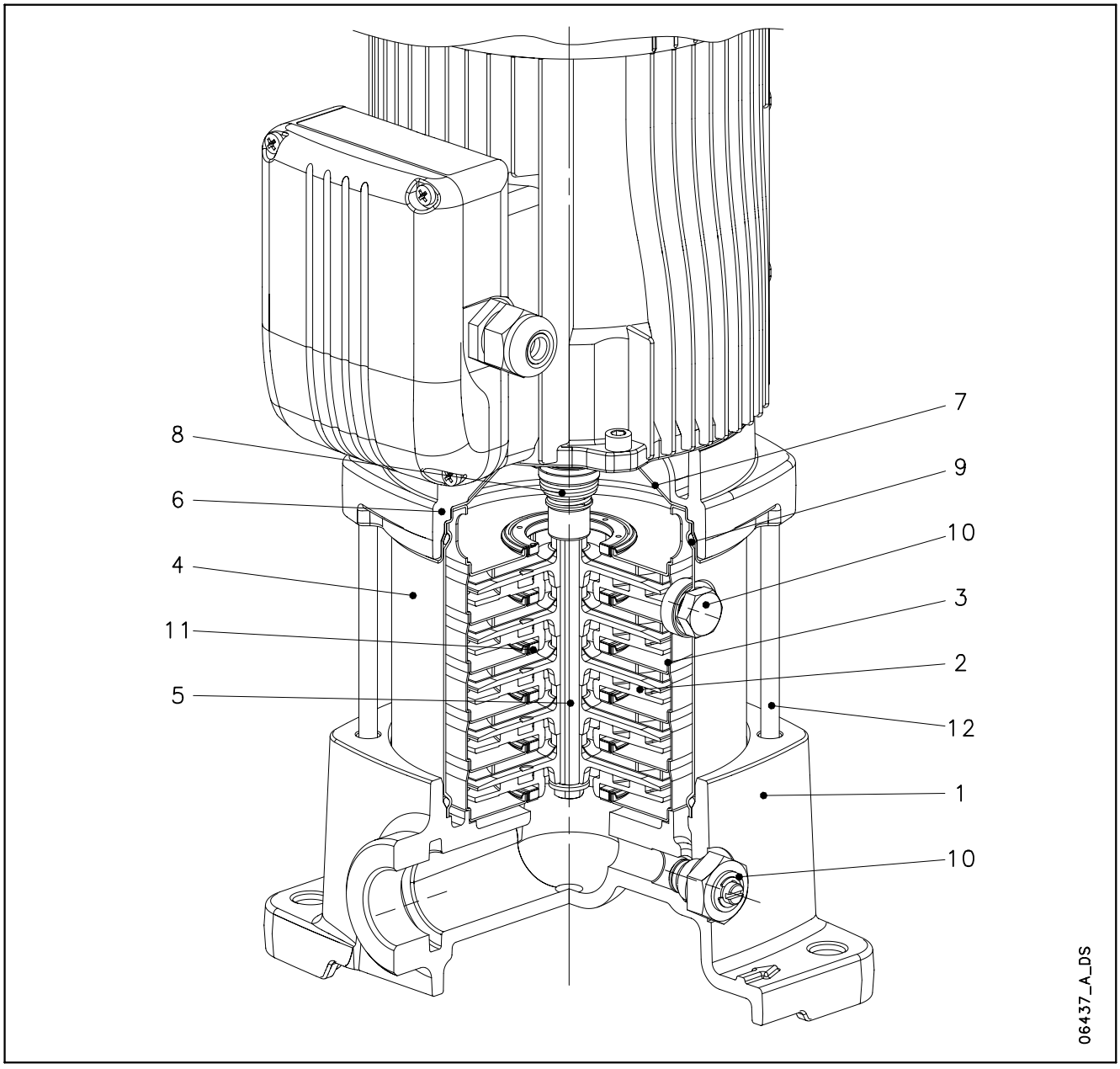


TABLE OF MATERIALS

REF. N.	NAME	MATERIAL	REFERENCE STANDARDS	
			EUROPE	USA
1	Pump body	Cast iron	EN 1561-GJL-200 (JL1030)	ASTM Class 25
2	Impeller	Technopolymer (Noryl™)		
3	Diffuser	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
4	Outer sleeve	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
5	Shaft	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
6	Adapter	Aluminium	EN 1706-AC-AlSi11Cu2 (Fe) (AC46100)	-
7	Seal housing	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
8	Mechanical seal	Ceramic / Carbon / EPDM		
9	Elastomers	EPDM		
10	Fill / drain plugs	Stainless steel	EN 10088-1-X5CrNi18-10 (1.4301)	AISI 304
11	Wear ring	Technopolymer (PPS)		
12	Tie rods	Stainless steel	EN 10088-1-X17CrNi16-2 (1.4057)	AISI 431

1-3-5-10vm-p-en_a_tm

e-HM™ SERIEs MOTORS

- **Standard three-phase surface motors ≥ 0,75 kW supplied as IE3**.
- Short-circuit squirrel-cage motor, enclosed construction with external ventilation (TEFC).
- IP55 protection degree.
- Insulation class 155 (F).
- Electrical performances according to EN 60034-1.
- IE efficiency according to EN 60034-30 (≥ 0,75 kW).
- Cable gland with metric according to EN 50262.
- **Single-phase** version:
  220-230 V, 60 Hz, 2 poles.
  Built-in automatic reset overload protection up to 2,2 kW.
- **Three-phase** version:
  220-230/380-400 V, 60 Hz, 2 poles.
  Overload protection to be provided by the user.

SINGLE-PHASE MOTORS AT 60 Hz, 2-POLE

P_N kW	MOTOR TYPE	IEC SIZE	Construction Design	INPUT CURRENT In (A) 220-230 V	CAPACITOR µF	CAPACITOR V	DATA FOR 220 V 60 Hz VOLTAGE min^{-1}	Is / In	η %	cosφ	Tn Nm	Ts/Tn	Tm/Tn
0,30	SM63HM../1036	63	SPECIAL	2,31-2,36	10	450	3350	3,41	62,0	0,95	0,85	0,68	1,88
0,40	SM71HM../1046	63		2,86-2,94	14	450	3385	3,80	67,5	0,94	1,13	0,73	2,04
0,50	SM63HM../1056	63		3,57-3,65	16	450	3365	3,73	66,8	0,95	1,42	0,69	2,07
0,55	SM71HM../1056	71		3,68-3,62	16	450	3400	4,28	70,2	0,97	1,54	0,66	2,11
0,75	SM71HM../1076	71		4,98-4,88	20	450	3380	3,90	69,8	0,98	2,12	0,64	1,91
0,95	SM71HM../1096	71		6,04-5,96	25	450	3370	3,80	72,9	0,98	2,69	0,58	1,86
1,1	SM80HM../1116	80		6,94-6,89	30	450	3435	4,54	74,2	0,97	3,06	0,62	2,03
1,5	SM80HM../1156	80		9,28-9,35	40	450	3455	4,91	76,3	0,96	4,14	0,49	2,19
2,2	PLM90HM../1226	90		12,3-11,7	60	450	3455	4,99	83,4	0,98	6,08	0,54	2,06

1-22hm-motm-2p60-en_a_te

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VM SERIES
THREE-PHASE MOTORS AT 60 Hz, 2-POLE

P_N	Efficiency η_N %												
	Δ 220 V Y 380 V			Δ 230 V Y 400 V			Δ 380 V Y 660 V			Δ 400 V Y 690 V			IE
kW	4/4	3/4	2/4	4/4	3/4	2/4	4/4	3/4	2/4	4/4	3/4	2/4	
0,30	69,5	69,4	65,5	71,0	69,6	64,5	-	-	-	-	-	-	-
0,40	74,1	74,4	71,2	74,7	74,1	70,2	-	-	-	-	-	-	-
0,50	74,3	75,9	74,3	75,7	76,1	73,5	-	-	-	-	-	-	-
0,55	78,6	78,7	76,0	78,9	78,5	75,1	-	-	-	-	-	-	-
0,75	83,4	82,4	79,0	83,4	82,4	79,0	83,4	82,4	79,0	83,4	82,4	79,0	
1,1	85,6	85,0	82,1	85,6	85,0	82,1	85,6	85,0	82,1	85,6	85,0	82,1	
1,5	87,2	87,0	84,6	87,2	87,0	84,6	87,2	87,0	84,6	87,2	87,0	84,6	3
2,2	87,7	87,2	84,7	87,7	87,2	84,7	87,7	87,2	84,7	87,7	87,2	84,7	
3	89,1	88,8	86,9	89,1	88,8	86,9	89,1	88,8	86,9	89,1	88,8	86,9	
4	90,1	90,0	88,1	90,1	90,0	88,1	90,1	90,0	88,1	90,1	90,0	88,1	

P_N kW	Model	IEC SIZE	Construction Design	N. of Poles	f_N Hz	Data for 380 V / 60 Hz Voltage cosφ	Is / I_N	T_N Nm	Ts/T_N	Tm/Tn
0,30	SM63HM../303	63	SPECIAL	2	60	0,79	4,81	0,87	3,44	3,50
0,40	SM63HM../304	63				0,79	5,03	1,16	3,42	3,44
0,50	SM63HM../305	63				0,83	4,94	1,48	3,31	3,33
0,55	SM71HM../305	71				0,81	6,15	1,54	3,23	3,30
0,75	SM80HM../307 E3	80				0,79	8,25	2,05	3,80	4,02
1,1	SM80HM../311 E3	80				0,80	9,11	3,01	4,15	4,29
1,5	SM80HM../315 E3	80				0,82	9,79	4,10	4,36	4,37
2,2	PLM90HM../322 E3	90				0,82	9,80	6,01	3,80	4,01
3	PLM90HM../330 E3	90				0,82	9,35	8,21	4,26	4,10
4	PLM100HM../340 E3	100				0,87	10,0	10,9	2,81	4,57

P_N	Voltage U_N V								n_N	Operating conditions **		
	Δ		Y		Δ		Y			Altitude Above Sea Level (m)	T. amb min/max °C	
kW	220 V	230 V	380 V	400 V	380 V	400 V	660 V	690 V	min^{-1}			
	I_N (A)											
0,30	1,42	1,42	0,82	0,82					3275 ÷ 3385	≤ 1000	-15 / 40	
0,40	1,75	1,75	1,01	1,01					3290 ÷ 3390			
0,50	2,15	2,10	1,24	1,21					3220 ÷ 3360			
0,55	2,27	2,22	1,31	1,28					3405 ÷ 3465			
0,75	3,03	3,01	1,75	1,74	1,75	1,74	1,01	1,00	3490 ÷ 3500			
1,1	4,24	4,24	2,45	2,45	2,44	2,43	1,41	1,40	3490 ÷ 3505			
1,5	5,58	5,53	3,22	3,19	3,23	3,22	1,86	1,86	3485 ÷ 3505			
2,2	7,97	7,93	4,60	4,58	4,59	4,57	2,65	2,64	3490 ÷ 3505			
3	10,9	10,8	6,30	6,23	6,32	6,29	3,65	3,63	3485 ÷ 3500			
4	13,5	13,2	7,81	7,61	7,82	7,62	4,52	4,40	3505 ÷ 3520			

** Operating conditions to be referred to motor only. About electric pump, refer to limits in user's manual.

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VM SERIES
AVAILABLE VOLTAGES FOR SM and PLM MOTORS, 2-POLE

	SINGLE-PHASE							
	50 Hz			60 Hz				
P_N kW	1 x 220-240	1 x 100	1 x 110-120	1 x 220-230	1 x 100	1x 110-115	1 x 120-127	1 x 200-210
0,40	s	o	o	s	-	o	-	-
0,50	s	-	-	s	-	o	-	-
0,75	s	o	o	s	o	o	o	o
0,95	s	o	o	s	o	o	o	o
1,1	s	-	o	s	-	o	-	o
1,5	s	-	-	s	-	o	-	o
2,2	s	-	-	s	-	-	-	-

	THREE-PHASE															
	50 Hz							60 Hz							50/60 Hz	
P_N kW	3 x 220-230-240/380-400-415	3 x 380-400-415/660-690	3 x 200-208/346-360	3 x 255-265/440-460	3 x 290-300/500-525	3 x 440-460/-	3 x 500-525/-	3 x 220-230/380-400	3 x 255-265-277/440-460-480	3 x 380-400/660-690	3 x 440-460-480/-	3 x 110-115/190-200	3 x 200-208/346-360	3 x 330-346/575-600	3 x 575/-	3 x 230/400 50 Hz 3 x 265/460 60 Hz	3 x 400/690 50 Hz 3 x 460/- 60 Hz
0,40	s	o	o	o	o	o	o	s	o	o	o	o	o	o	o	o	o
0,50	s	o	o	o	o	o	o	s	o	o	o	o	o	o	o	o	o
0,75	s	o	o	o	o	o	o	s	o	o	o	o	o	o	o	o	o
1,1	s	o	o	o	o	o	o	s	o	o	o	o	o	o	o	o	o
1,5	s	o	o	o	o	o	o	s	o	o	o	o	o	o	o	o	o
2,2	s	o	o	o	o	o	o	s	o	o	o	o	o	o	o	o	o
3	s	o	o	o	o	o	o	s	o	o	o	o	o	o	o	o	o
4	o	s	o	o	o	o	o	s	o	o	o	o	o	o	o	o	o

s = Standard voltage o = voltage upon request - = Not available

vm-volt60-lowa_b_te

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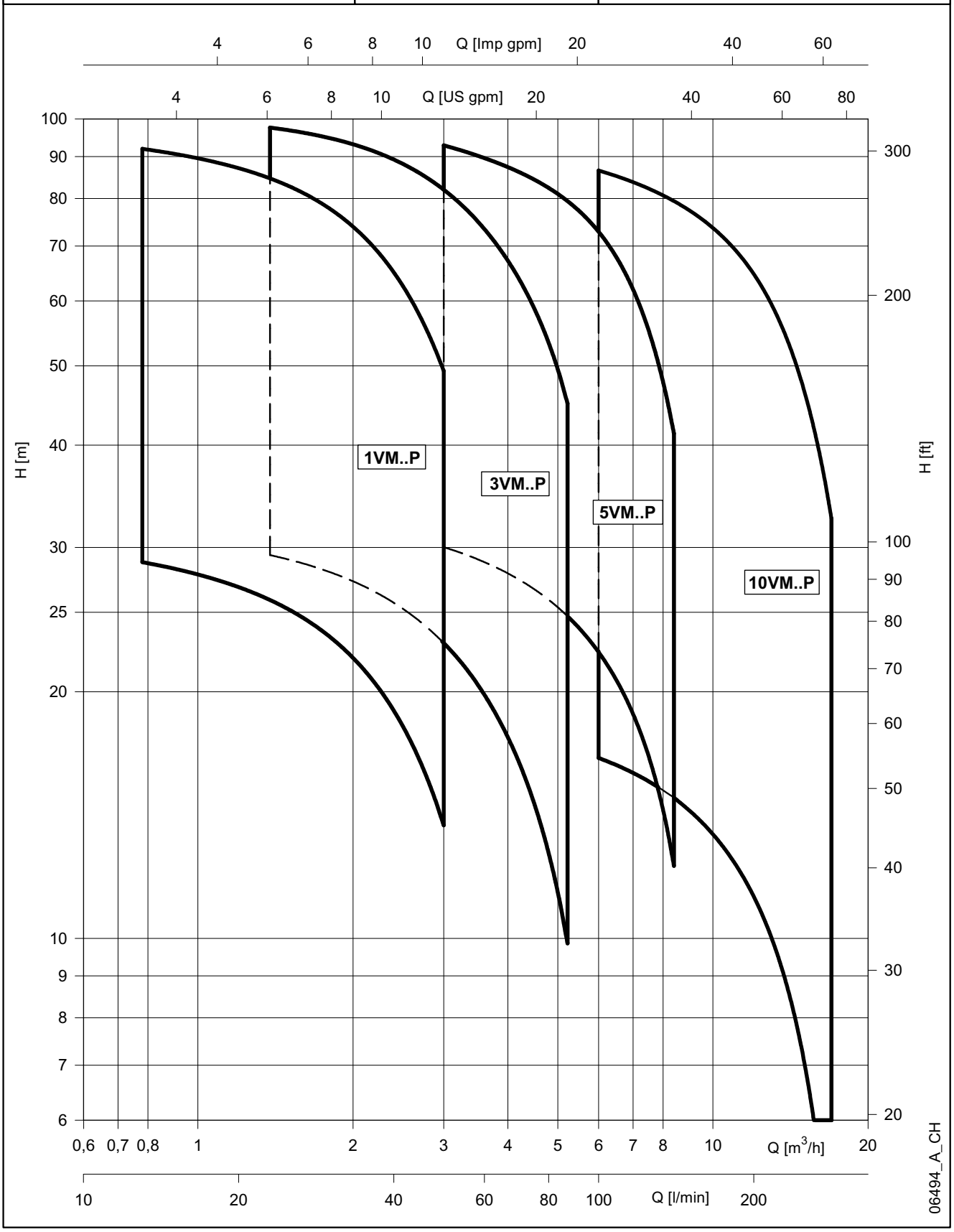
VM..P SERIES
HYDRAULIC PERFORMANCE RANGE AT 60 Hz, 2 POLES

VM..P	~ 3500 [rpm]	ISO 9906:2012 - Grade 3B



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VM..P SERIES
HYDRAULIC PERFORMANCE TABLE AT 60 Hz, 2 POLES

PUMP TYPE VM..P	VERSION	MOTOR P_N kW	MOTOR TYPE	ELECTRIC PUMP * P_1 kW	ELECTRIC PUMP * I 220-230 V A	ELECTRIC PUMP * I 380-400 V A	Q = DELIVERY l/min 0	13,0	19,0	25,0	31,0	37,0	43,0	50,0
							m^3/h 0	0,8	1,1	1,5	1,9	2,2	2,6	3,0
							H = TOTAL HEAD IN METRES OF COLUMN OF WATER							
1VM02	1 ~	0,40	SM63HM../1046	0,59	2,85	-	32,3	29,6	28,1	26,2	24,0	21,5	18,6	14,8
1VM03	1 ~	0,50	SM63HM../1056	0,78	3,67	-	47,9	43,5	41,1	38,4	35,0	31,2	26,8	21,2
1VM04	1 ~	0,75	SM71HM../1076	1,02	4,62	-	64,8	59,1	56,1	52,5	48,1	43,0	37,1	29,7
1VM05	1 ~	0,95	SM71HM../1096	1,23	5,58	-	80,8	73,5	69,7	65,2	59,8	53,4	46,1	36,8
1VM06	1 ~	1,1	SM80HM../1116	1,48	6,76	-	98,0	89,7	85,4	80,2	73,8	66,2	57,4	46,2
1VM02	3 ~	0,40	SM63HM../304	0,48	1,66	0,96	31,8	28,8	27,1	25,2	23,0	20,4	17,5	13,7
1VM03	3 ~	0,50	SM63HM../305	0,62	2,01	1,16	46,7	41,6	39,0	36,1	32,6	28,7	24,3	18,9
1VM04	3 ~	0,75	SM80HM../307 E3	0,90	3,01	1,74	66,6	61,4	58,7	55,3	51,2	46,2	40,4	33,0
1VM05	3 ~	1,1	SM80HM../311 E3	1,13	3,89	2,25	83,5	77,2	73,8	69,7	64,5	58,3	51,1	41,8
1VM06	3 ~	1,1	SM80HM../311 E3	1,33	4,31	2,49	99,8	92,0	87,9	82,9	76,7	69,2	60,6	49,3

PUMP TYPE VM..P	VERSION	MOTOR P_N kW	MOTOR TYPE	ELECTRIC PUMP * P_1 kW	ELECTRIC PUMP * I 220-230 V A	ELECTRIC PUMP * I 380-400 V A	Q = DELIVERY l/min 0	23,0	34,0	45,0	56,0	67,0	78,0	87,0
							m^3/h 0	1,4	2,0	2,7	3,4	4,0	4,7	5,2
							H = TOTAL HEAD IN METRES OF COLUMN OF WATER							
3VM02	1 ~	0,50	SM63HM../1056	0,75	3,58	-	33,5	30,5	28,6	25,9	22,8	19,1	15,1	11,5
3VM03	1 ~	0,75	SM71HM../1076	1,04	4,72	-	50,6	46,4	43,5	39,6	35,0	29,8	24,1	18,7
3VM04	1 ~	1,1	SM80HM../1116	1,39	6,40	-	68,3	63,0	59,5	54,5	48,5	41,7	34,1	27,0
3VM05	1 ~	1,5	SM80HM../1156	1,75	8,34	-	85,9	79,6	75,3	69,3	61,8	53,3	43,8	35,0
3VM06	1 ~	2,2	PLM90HM../1226	1,93	9,20	-	103,8	96,4	91,4	84,3	75,3	65,1	53,8	43,2
3VM02	3 ~	0,50	SM63HM../305	0,59	1,96	1,13	32,9	29,4	27,1	24,4	21,1	17,5	13,5	9,9
3VM03	3 ~	1,1	SM80HM../311 E3	0,95	3,55	2,05	52,3	48,7	46,3	42,8	38,4	33,3	27,7	22,4
3VM04	3 ~	1,1	SM80HM../311 E3	1,23	4,10	2,37	69,3	64,4	61,1	56,4	50,4	43,6	36,1	29,0
3VM05	3 ~	1,5	SM80HM../315 E3	1,51	5,04	2,91	86,9	80,8	76,7	70,8	63,4	54,9	45,5	36,6
3VM06	3 ~	2,2	PLM90HM../322 E3	1,82	6,44	3,72	104,7	97,7	92,8	85,8	77,0	66,8	55,5	45,0

PUMP TYPE VM..P	VERSION	MOTOR P_N kW	MOTOR TYPE	ELECTRIC PUMP * P_1 kW	ELECTRIC PUMP * I 220-230 V A	ELECTRIC PUMP * I 380-400 V A	Q = DELIVERY l/min 0	50,0	65,0	80,0	95,0	110	125	140
							m^3/h 0	3,0	3,9	4,8	5,7	6,6	7,5	8,4
							H = TOTAL HEAD IN METRES OF COLUMN OF WATER							
5VM02	1 ~	0,75	SM71HM../1076	0,99	4,48	-	34,9	30,0	28,1	25,9	23,3	20,3	16,7	12,3
5VM03	1 ~	1,1	SM80HM../1116	1,41	6,48	-	52,6	45,2	42,6	39,7	36,2	31,6	25,8	18,9
5VM04	1 ~	1,5	SM80HM../1156	1,87	8,76	-	70,3	60,8	57,4	53,6	48,9	42,9	35,2	25,9
5VM05	1 ~	2,2	PLM90HM../1226	2,12	10,0	-	88,4	76,7	72,5	67,8	62,0	54,6	45,0	33,4
5VM06	1 ~	2,2	PLM90HM../1226	2,46	11,5	-	105,6	91,1	85,9	80,2	73,2	64,1	52,6	38,7
5VM02	3 ~	0,75	SM80HM../307 E3	0,87	2,92	1,69	35,7	31,3	29,5	27,4	24,9	22,0	18,5	14,1
5VM03	3 ~	1,1	SM80HM../311 E3	1,26	4,15	2,40	53,3	46,4	43,9	41,1	37,7	33,2	27,5	20,5
5VM04	3 ~	1,5	SM80HM../315 E3	1,63	5,30	3,06	71,1	61,9	58,6	54,9	50,3	44,4	36,8	27,5
5VM05	3 ~	2,2	PLM90HM../322 E3	2,04	6,91	3,99	89,1	77,9	73,9	69,3	63,7	56,3	46,8	35,2
5VM06	3 ~	2,2	PLM90HM../322 E3	2,41	7,71	4,45	106,6	92,9	88,0	82,4	75,6	66,7	55,3	41,3

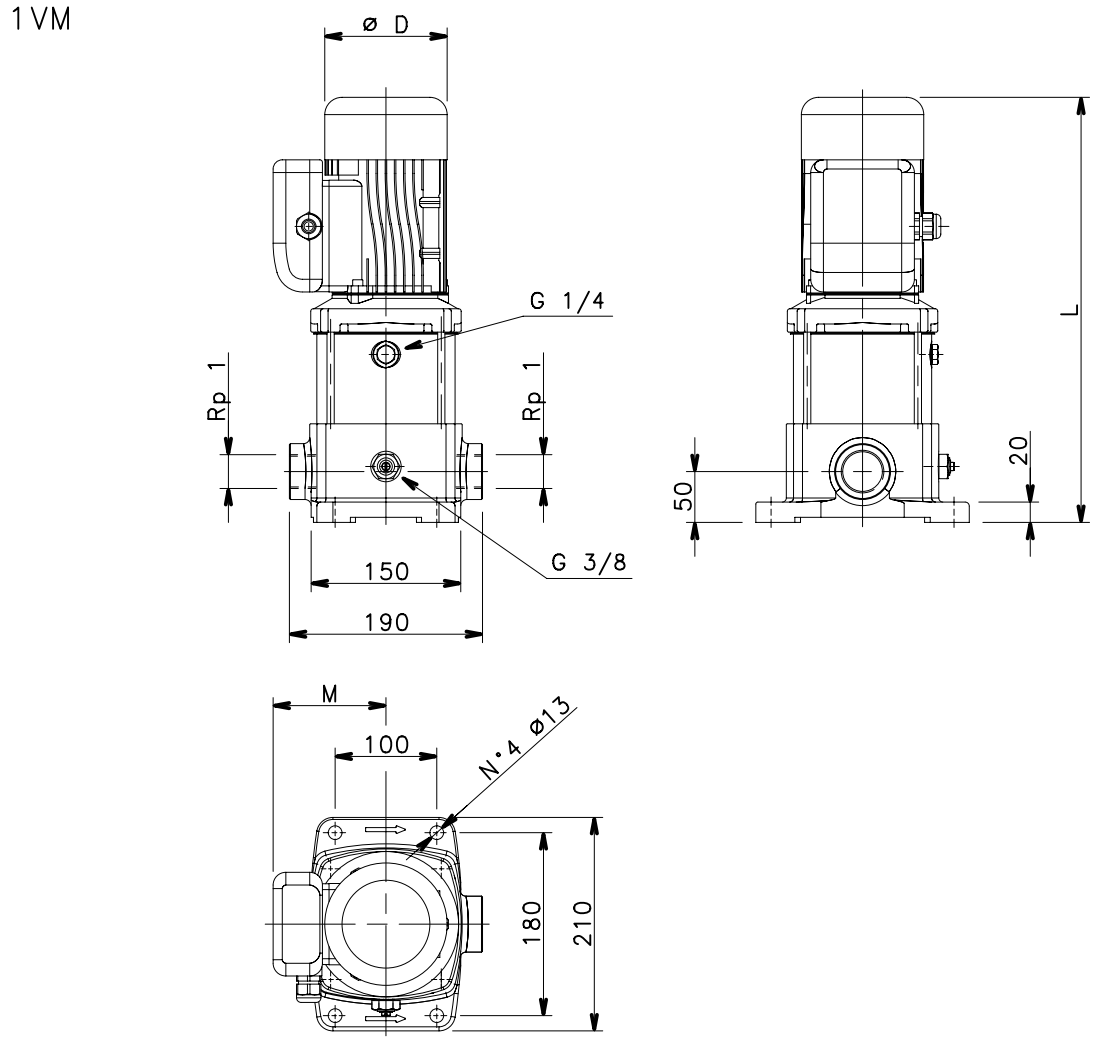
PUMP TYPE VM..P	VERSION	MOTOR P_N kW	MOTOR TYPE	ELECTRIC PUMP * P_1 kW	ELECTRIC PUMP * I 220-230 V A	ELECTRIC PUMP * I 380-400 V A	Q = DELIVERY l/min 0	100	131	162	193	224	255	283
							m^3/h 0	6,0	7,9	9,7	11,6	13,4	15,3	17,0
							H = TOTAL HEAD IN METRES OF COLUMN OF WATER							
10VM01	1 ~	1,1	SM80HM../1116	1,05	5,12	-	18,9	16,5	15,2	13,6	11,6	9,3	6,5	3,6
10VM02	1 ~	1,5	SM80HM../1156	1,78	8,47	-	37,8	33,2	30,7	27,8	24,3	20,0	14,8	9,6
10VM03	1 ~	2,2	PLM90HM../1226	2,34	11,0	-	57,2	50,6	47,2	43,2	38,3	32,3	25,0	17,8
10VM01	3 ~	0,75	SM80HM../307 E3	0,82	2,84	1,64	19,0	16,6	15,3	13,7	11,7	9,4	6,7	3,7
10VM02	3 ~	1,5	SM80HM../315 E3	1,54	5,12	2,96	38,2	33,7	31,3	28,5	25,0	20,8	15,6	10,4
10VM03	3 ~	2,2	PLM90HM../322 E3	2,28	7,44	4,30	57,7	51,5	48,3	44,4	39,6	33,6	26,4	19,1
10VM04	3 ~	3	PLM90HM../330 E3	3,01	9,96	5,75	76,9	68,7	64,3	59,1	52,7	44,7	35,0	25,3
10VM05	3 ~	4	PLM100HM../340 E3	3,75	11,7	6,77	96,5	86,6	81,2	74,7	66,8	56,8	44,8	32,6

Hydraulic performances in compliance with ISO 9906:2012 - Grade 3B (ex ISO 9906:1999 - Annex A)

1-10vm-p-2p60_a_th

* Maximum value in specified range: P1 = input power; I = input current.

1VM..P SERIES
DIMENSIONS AND WEIGHTS AT 60 HZ, 2 POLES



PUMP TYPE	VERSION	MOTOR		DIMENSIONS (mm)			PN	WEIGHT
		kW	SIZE	D	M	L	bar	kg
1VM02	SINGLE-PHASE	0,40	63	120	111	379	10	12
1VM03		0,50	63	120	111	379	10	12
1VM04		0,75	71	140	121	413	10	15
1VM05		0,95	71	140	130	433	10	16
1VM06		1,1	80	155	137	497	10	19
1VM02	THREE-PHASE	0,40	63	120	111	379	10	12
1VM03		0,50	63	120	111	379	10	12
1VM04		0,75	80	155	129	457	10	18
1VM05		1,1	80	155	129	477	10	19
1VM06		1,1	80	155	129	497	10	19

1vm-2p60_a_td

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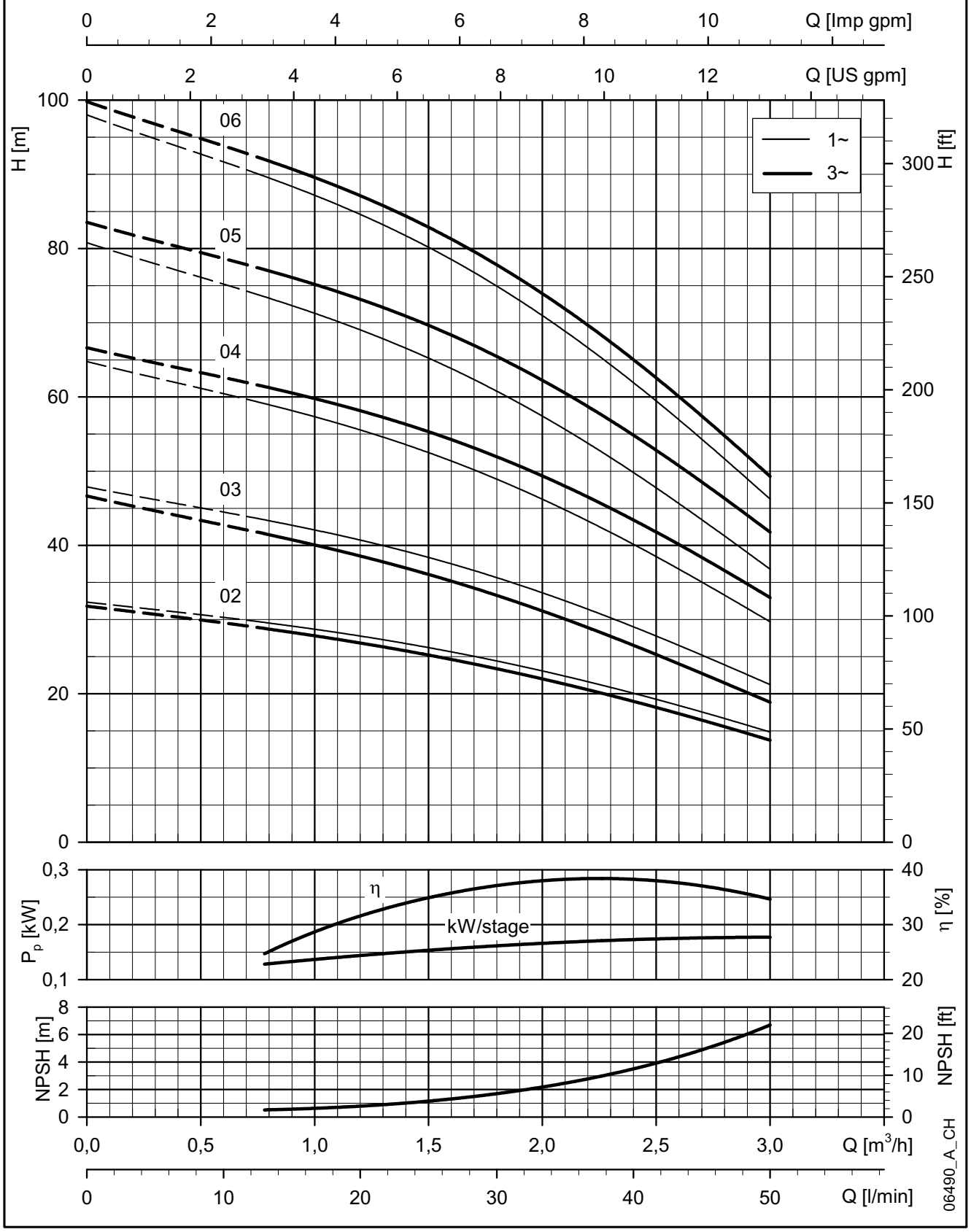
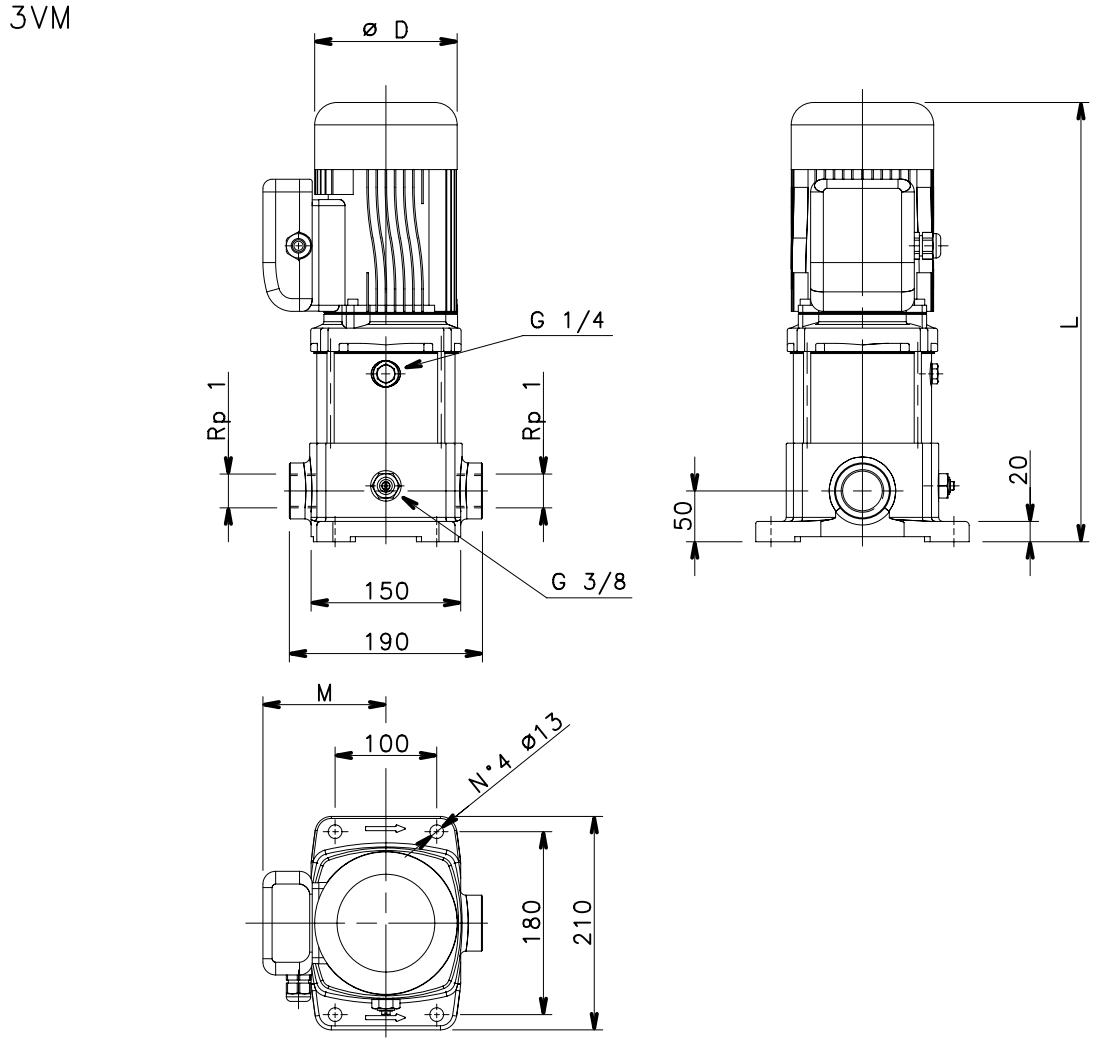
1VM..P SERIES
OPERATING CHARACTERISTICS AT 60 Hz, 2 POLES

1VM..P	~ 3500 [rpm]	ISO 9906:2012 - Grade 3B



These performances are valid for liquids with density ρ = 1.0 Kg/dm³ and kinematic viscosity ν = 1 mm²/sec.

3VM..P SERIES
DIMENSIONS AND WEIGHTS AT 60 HZ, 2 POLES



PUMP TYPE	VERSION	MOTOR		DIMENSIONS (mm)			PN	WEIGHT
		kW	SIZE	D	M	L	bar	kg
3VM02	SINGLE-PHASE	0,50	63	120	111	379	10	12
3VM03		0,75	71	140	121	393	10	14
3VM04		1,1	80	155	137	457	10	19
3VM05		1,5	80	155	137	477	10	20
3VM06		2,2	90	174	159	553	10	28
3VM02	THREE-PHASE	0,50	63	120	111	379	10	12
3VM03		1,1	80	155	129	437	10	18
3VM04		1,1	80	155	129	457	10	19
3VM05		1,5	80	155	129	477	10	20
3VM06		2,2	90	174	134	553	10	25

3vm-2p60_a_td

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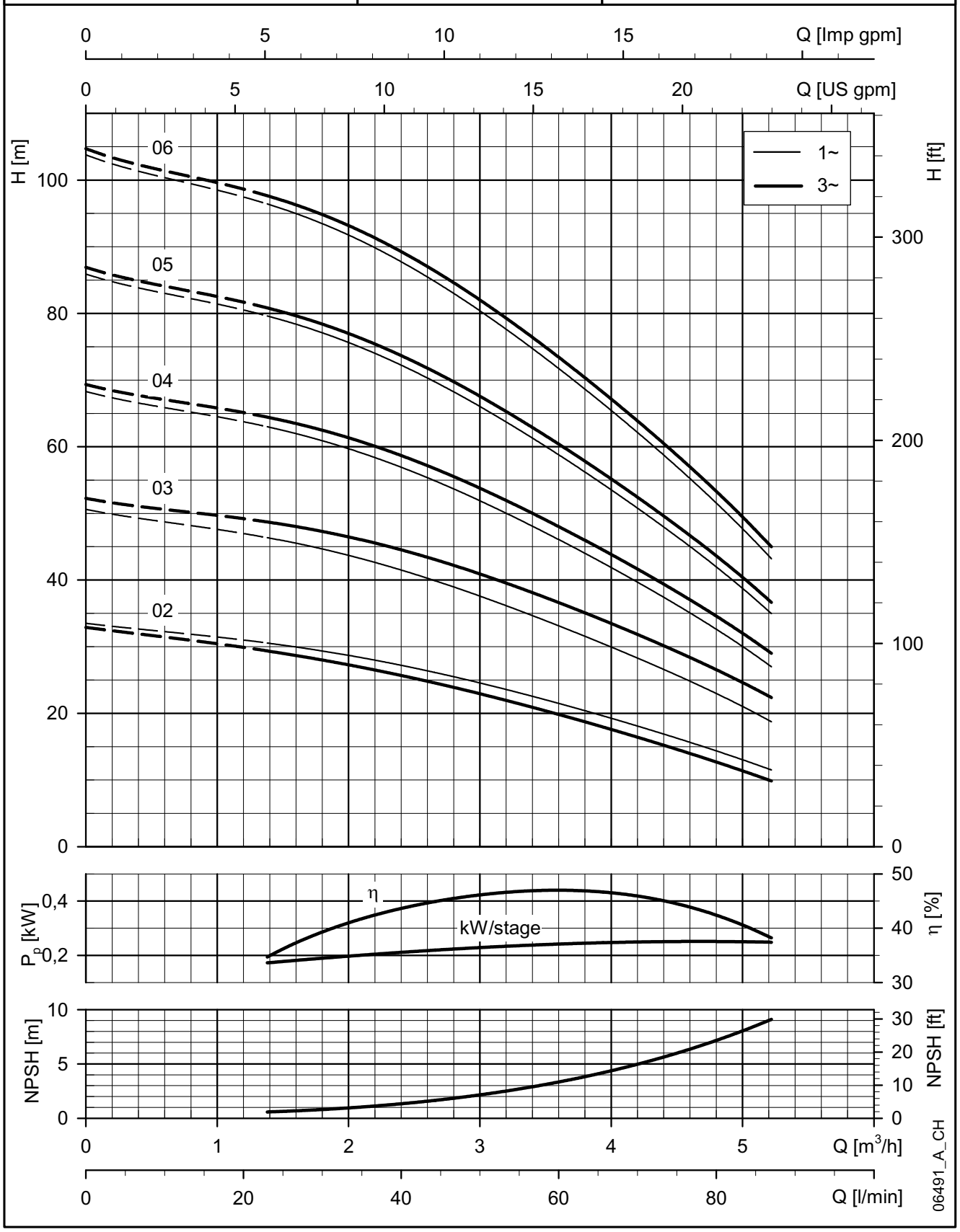
3VM..P SERIES
OPERATING CHARACTERISTICS AT 60 Hz, 2 POLES

3VM..P	~ 3500 [rpm]	ISO 9906:2012 - Grade 3B



These performances are valid for liquids with density ρ = 1.0 Kg/dm³ and kinematic viscosity ν = 1 mm²/sec.

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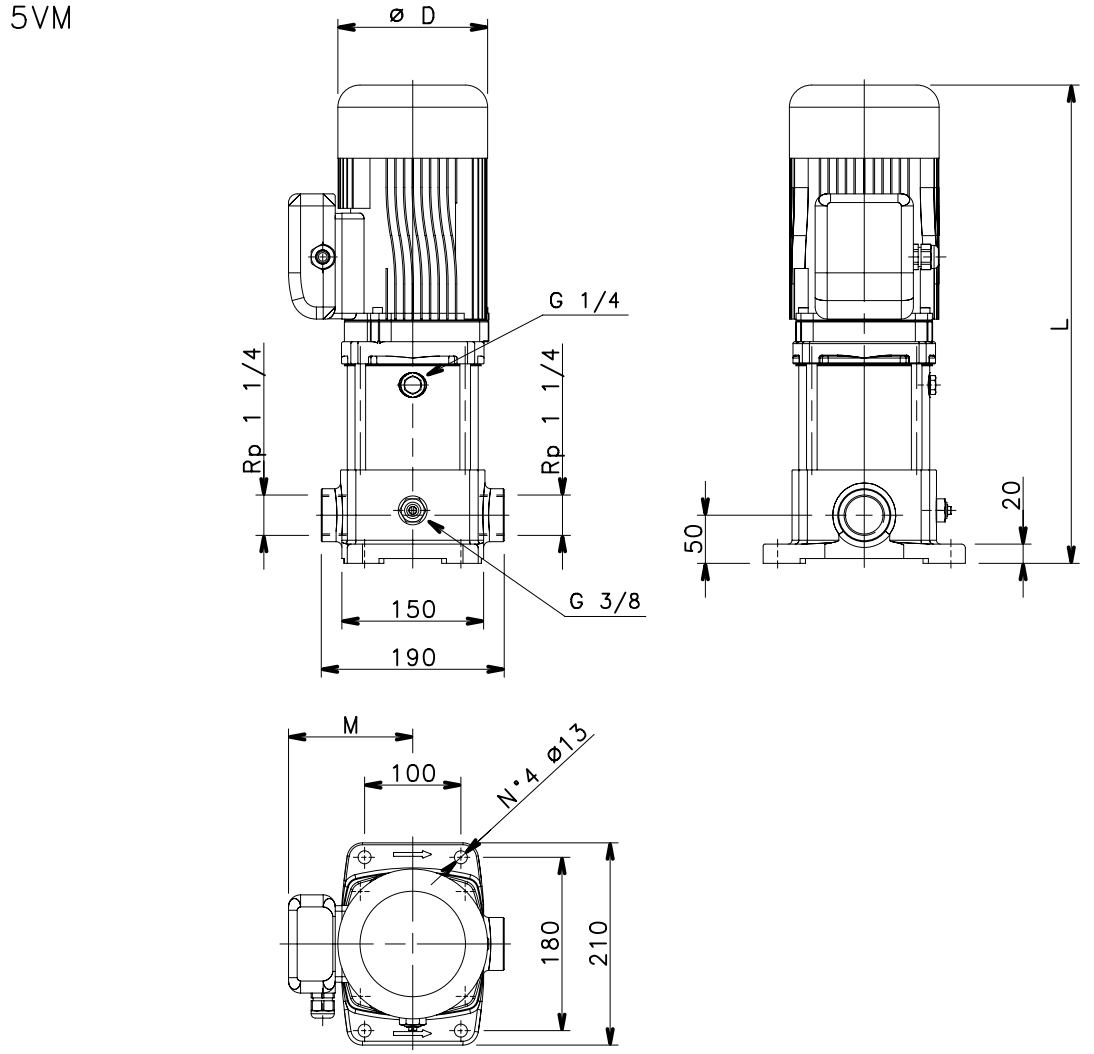
5VM..P SERIES
DIMENSIONS AND WEIGHTS AT 60 HZ, 2 POLES

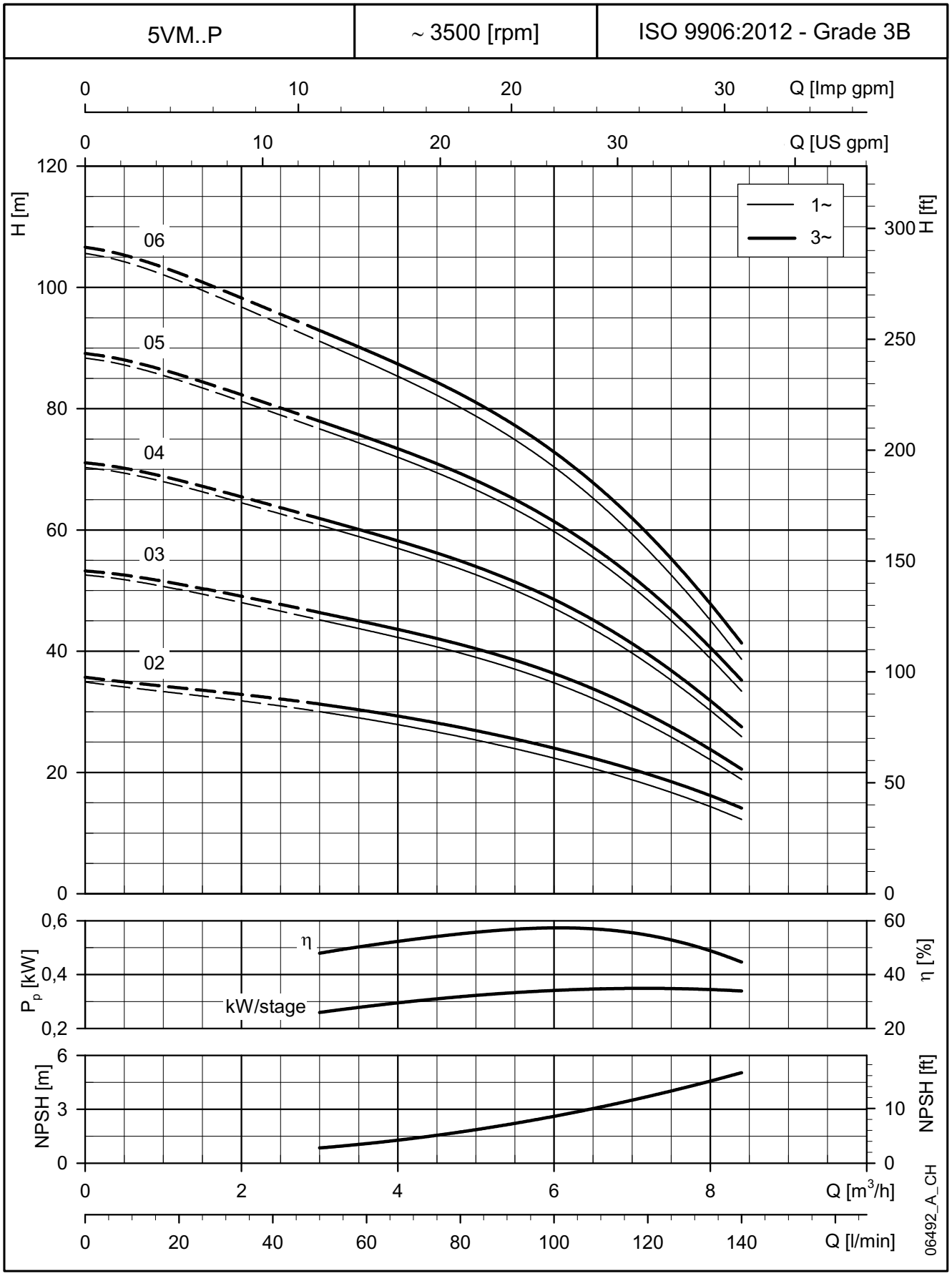


PUMP TYPE	VERSION	MOTOR		DIMENSIONS (mm)			PN	WEIGHT
		kW	SIZE	D	M	L	bar	kg
5VM02	SINGLE-PHASE	0,75	71	140	121	393	10	14
5VM03		1,1	80	155	137	437	10	18
5VM04		1,5	80	155	137	457	10	20
5VM05		2,2	90	174	159	533	10	28
5VM06		2,2	90	174	159	553	10	28
5VM02	THREE-PHASE	0,75	80	155	129	437	10	17
5VM03		1,1	80	155	129	437	10	18
5VM04		1,5	80	155	129	457	10	20
5VM05		2,2	90	174	134	533	10	25
5VM06		2,2	90	174	134	553	10	25

5vm-2p60_a_td

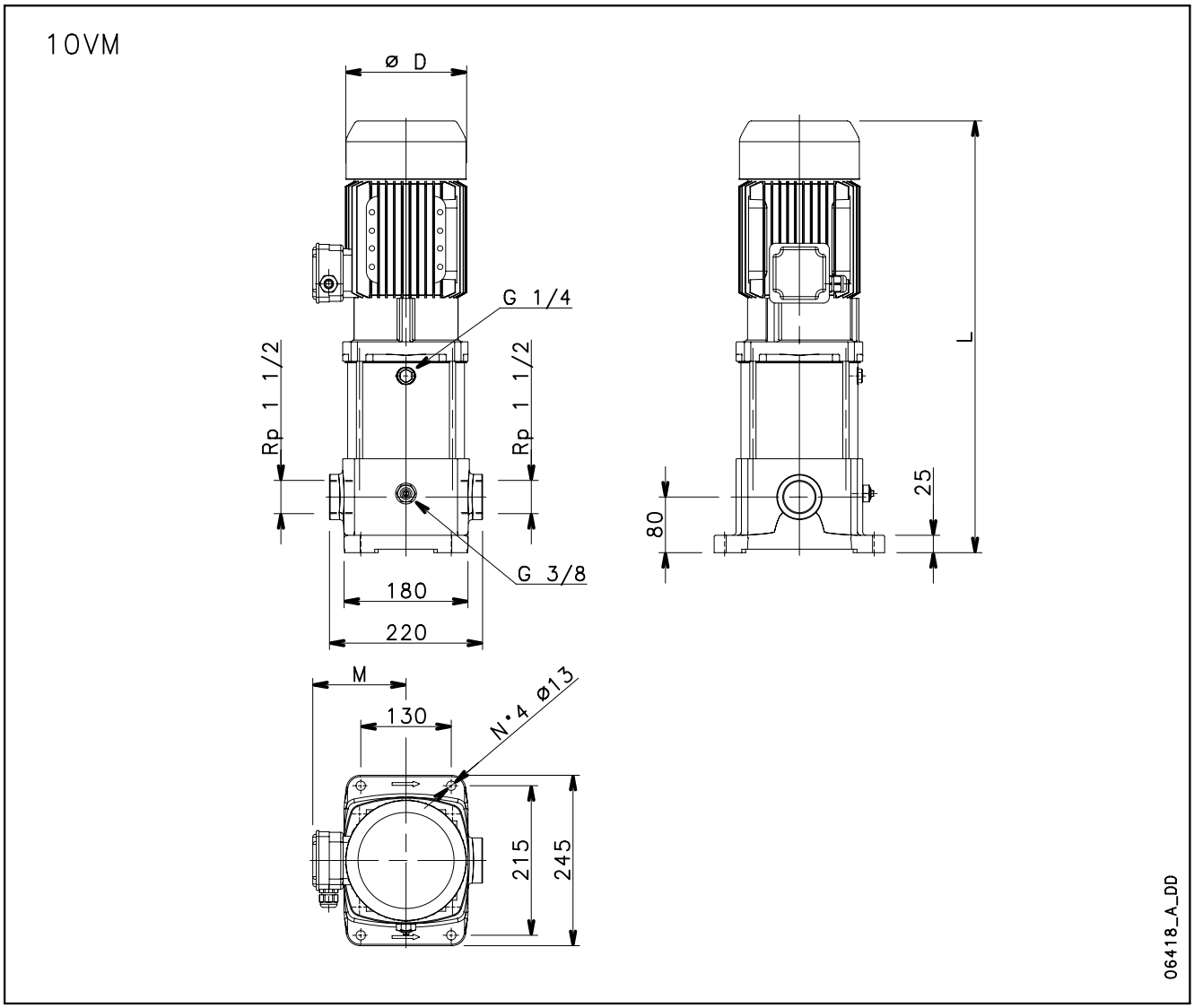
5VM..P SERIES
OPERATING CHARACTERISTICS AT 60 Hz, 2 POLES

5VM..P	~ 3500 [rpm]	ISO 9906:2012 - Grade 3B



These performances are valid for liquids with density ρ = 1.0 Kg/dm³ and kinematic viscosity ν = 1 mm²/sec.

10VM..P SERIES
DIMENSIONS AND WEIGHTS AT 60 HZ, 2 POLES



PUMP TYPE	VERSION	MOTOR		DIMENSIONS (mm)			PN	WEIGHT
		kW	SIZE	D	M	L	bar	kg
10VM01	SINGLE-PHASE	1,1	80	155	137	501	10	23
10VM02		1,5	80	155	137	501	10	24
10VM03		2,2	90	174	159	589	10	33
10VM01	THREE-PHASE	0,75	80	155	129	501	10	22
10VM02		1,5	80	155	129	501	10	24
10VM03		2,2	90	174	134	589	10	30
10VM04		3	90	174	134	621	10	34
10VM05		4	100	197	154	682	10	41

10vm-2p60_a_td

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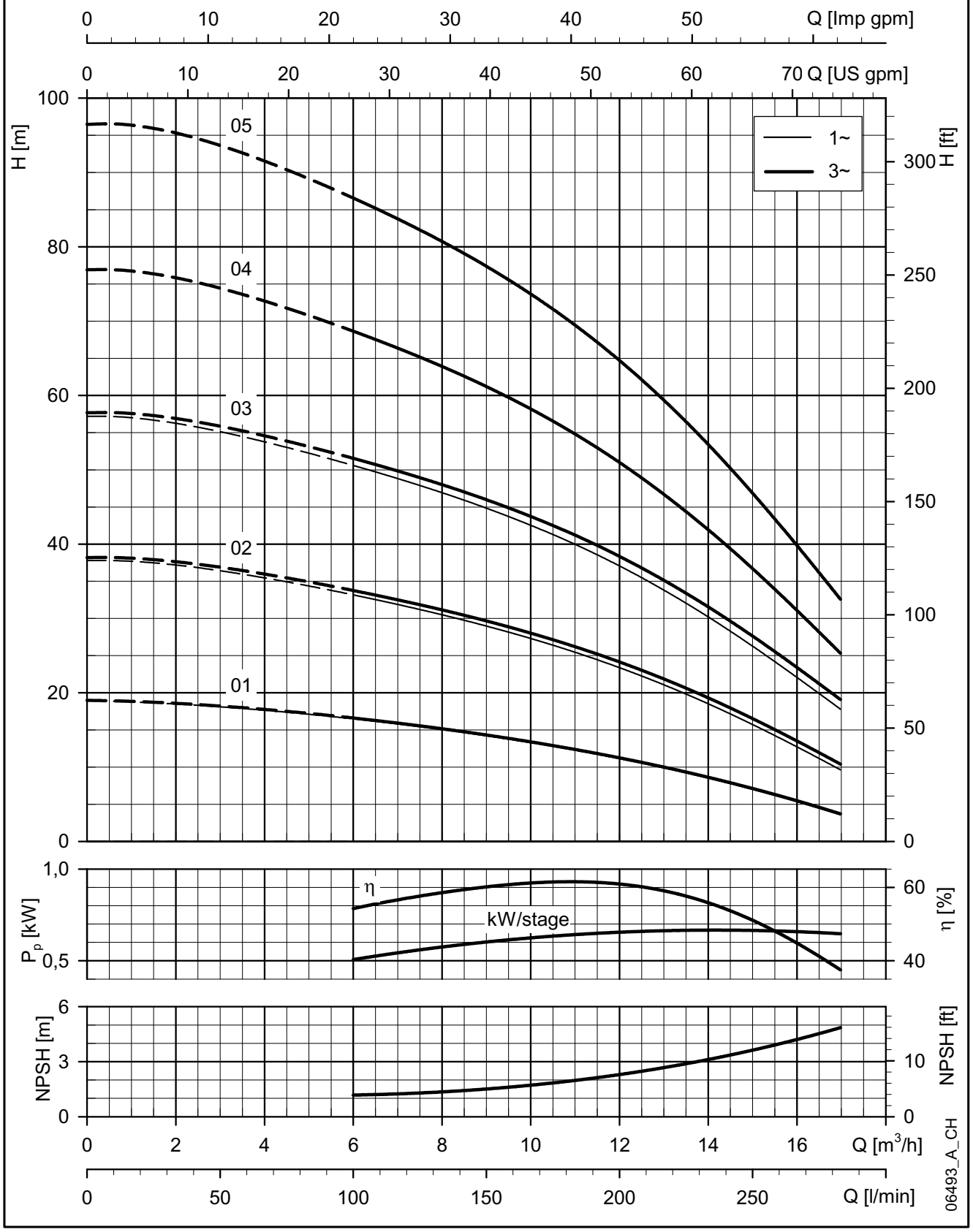
10VM..P SERIES
OPERATING CHARACTERISTICS AT 60 Hz, 2 POLES

10VM..P	~ 3500 [rpm]	ISO 9906:2012 - Grade 3B



These performances are valid for liquids with density ρ = 1.0 Kg/dm³ and kinematic viscosity ν = 1 mm²/sec.

ACCESSORIES

ACCESSORIES

MODEL	REF.	CODE	DESCRIPTION
Ball valve 	1"	002676438	1" FF PN38 WITH DRAIN, CHROME PLATED BRASS
	1"	002679402	1" FF PN30, CHROME PLATED BRASS
	1" 1/4	R02661422	1"1/4 FF PN30, CHROME PLATED BRASS
	1" 1/2	R02661427	1"1/2 FF PN30, CHROME PLATED BRASS
	2"	R02661424	2" FF PN25, CHROME PLATED BRASS
	1"	002675155	1" MF PN40, CHROME PLATED BRASS
	1" 1/4	R02661318	1"1/4 MF PN30, CHROME PLATED BRASS
	1" 1/2	002675369	1"1/2 MF PN25. CHROME PLATED BRASS
	2"	002679408	2" MF PN25, CHROME PLATED BRASS
	1"	002679403	1" MF WITH UNION JOINT, CHROME PLATED BRASS
	1" 1/4	002679404	1"1/4 MF WITH UNION JOINT, CHROME PLATED BRASS
	1" 1/2	002676452	1"1/2 MF WITH UNION JOINT, CHROME PLATED BRASS
	2"	NO CODE	2" MF WITH UNION JOINT, CHROME PLATED BRASS
Non-return valve 	1"	002675029	1" MF SUCTION MALE, PN 25, BRASS
	1" 1/4	002675036	1"1/4 MF SUCTION MALE, PN 25, BRASS
	1" 1/2	002675043	1"1/2 MF SUCTION MALE, PN 25, BRASS
	2"	002675032	2" MF SUCTION MALE, PN 40, BRASS
	1"	002675300	1" MF SUCTION MALE, PN16, STAINLESS STEEL AISI304
	1" 1/4	002675301	1"1/4 MF SUCTION MALE, PN16, STAINLESS STEEL AISI304
	1" 1/2	002675302	1"1/2 MF SUCTION MALE, PN16, STAINLESS STEEL AISI304
	2"	002675303	2" MF SUCTION MALE, PN16, STAINLESS STEEL AISI304
	1"	002675295	1" FF PN32, STAINLESS STEEL AISI316
	1" 1/4	002675296	1"1/4 FF PN28, STAINLESS STEEL AISI316
	1" 1/2	002675297	1"1/2 FF PN28, STAINLESS STEEL AISI316
	2"	002675298	2" FF PN23, STAINLESS STEEL AISI316
Union 3 Pieces MF 	1"	R02671048	1" MF, GALVANISED STEEL
	1" 1/4	R02671050	1"1/4 MF, GALVANISED STEEL
	1" 1/2	R02671052	1"1/2 MF, GALVANISED STEEL
	2"	R02671054	2" MF, GALVANISED STEEL
	1"	002672655	1" MF, STAINLESS STEEL AISI 316
	1" 1/4	002672656	1"1/4 MF, STAINLESS STEEL AISI 316
	1" 1/2	002672657	1"1/2 MF, STAINLESS STEEL AISI 316
	2"	002672658	2" MF, STAINLESS STEEL AISI 316
GENYO 	1"	109120160	GENYO 8A/F12
		109120161	GENYO 8A/F12, WITH ELECTRICAL CABLE
		109120170	GENYO 8A/F15
		109120171	GENYO 8A/F15 WITH ELECTRICAL CABLE
		109120180	GENYO 8A/F22
		109120181	GENYO 8A/F22 WITH ELECTRICAL CABLE
		109120210	GENYO 16A/R15-30
		109120211	GENYO 16A/R15-30 WITH ELECTRICAL CABLE
Diaphragm tank 	8 lt	106110550	8 LITRES-8 BAR, 1" CONNECTION, FLANGE IN GALVANISED STEEL
	24 lt	106110560	24 LITRES-8 BAR, 1" CONNECTION, FLANGE IN GALVANISED STEEL
	24 lt	106111180	24 LITRES-10 BAR, 1" CONNECTION, FLANGE IN GALVANISED STEEL
	24 lt	106111190	24 LITRES-16 BAR, 1" CONNECTION, FLANGE IN GALVANISED STEEL
	18 lt	106227110	18 LITRES-10 BAR, 1" CONNECTION, FLANGE IN STAINLESS STEEL AISI304
	24 lt	106110660	24 LITRES-10 BAR, 1" CONNECTION, FLANGE IN STAINLESS STEEL AISI304
	24 lt	106110630	24 LITRES-16 BAR, 1" CONNECTION, FLANGE IN STAINLESS STEEL AISI304

ACCESSORIES

MODEL	REF.	CODE	DESCRIPTION
Flexible Hose 	1"	002542016	1" MF, L=170MM PN16, REINFORCING BRADING IN GALVANISED STEEL
		002542001	1" MF, L=180MM PN16, REINFORCING BRADING IN GALVANISED STEEL
		002542002	1" MF, L=230MM PN16, REINFORCING BRADING IN GALVANISED STEEL
		002542018	1" MF, L=360MM PN16, REINFORCING BRADING IN GALVANISED STEEL
		002542012	1" MF, L=400MM PN16, REINFORCING BRADING IN GALVANISED STEEL
		002542007	1" MF, L=430MM PN16, REINFORCING BRADING IN GALVANISED STEEL
		002542003	1" MF, L=450MM PN16, REINFORCING BRADING IN GALVANISED STEEL
		002542010	1" MF, L=500MM PN16, REINFORCING BRADING IN GALVANISED STEEL
		002542000	1" MF L=550MM PN16, REINFORCING BRADING IN GALVANISED STEEL
		002542014	1" MF L=600MM PN16, REINFORCING BRADING IN GALVANISED STEEL
		002542004	1" MF, L=700MM PN16, REINFORCING BRADING IN GALVANISED STEEL
		002542019	1" MF, L=800MM PN16, REINFORCING BRADING IN GALVANISED STEEL
		002542022	1" MF, L=1000MM PN16, REINFORCING BRADING IN GALVANISED STEEL
	1" 1/4	002542040	1"1/4 MF L=700MM PN16, REINFORCING BRADING IN GALVANISED STEEL
		002542041	1"1/4 MF L=800MM PN16, REINFORCING BRADING IN GALVANISED STEEL
		002542042	1"1/4 MF L=900MM PN16, REINFORCING BRADING IN GALVANISED STEEL
		002542044	1"1/4 MF L=1000MM PN16, REINFORCING BRADING IN GALVANISED STEEL
	1"1/2	002542050	1"1/2 MF L=500MM PN16, REINFORCING BRADING IN GALVANISED STEEL
		002542054	1"1/2 MF L=800MM PN16, REINFORCING BRADING IN GALVANISED STEEL
	2"	002542069	2" MF L=500MM PN16, REINFORCING BRADING IN GALVANISED STEEL
		002542070	2" MF L=600MM PN16, REINFORCING BRADING IN GALVANISED STEEL
	1" + Elbow	002542006	1" MF 440+ELBOW PN16, REINFORCING BRADING IN GALVANISED STEEL
		002542008	1" MF 480+ELBOW PN16, REINFORCING BRADING IN GALVANISED STEEL
		002542013	1" MF 500+ELBOW PN16, REINFORCING BRADING IN GALVANISED STEEL
		002542011	1" MF 550+ELBOW PN16, REINFORCING BRADING IN GALVANISED STEEL
		002542043	1" MF800+ELBOW PN16, REINFORCING BRADING IN GALVANISED STEEL
Pressure Switch 	1/4"	002161101	SQUARE-D FSG2(1,4-4,6), Rp1/4" CONNECTION GALVANISED STEEL
		002161200	SQUARE-D FYG22(2,8-7), Rp1/4" CONNECTION GALVANISED STEEL
		002161201	SQUARE-D FYG32(5,6-10,5), Rp1/4" CONNECTION GALVANISED STEEL
		002161336	ITALTECNICA PM/5(1-5), Rp1/4" CONNECTION GALVANISED STEEL
		002161337	ITALTECNICA PM/12(2,5-12), Rp1/4" CONNECTION GALVANISED STEEL
		002161338	ITALTECNICA PM/12S(1-8,5), Rp1/4" CONNECTION GALVANISED STEEL
Pressure gaude with radial connection 	1/4"	002110201	0-6 BAR, DRY TYPE, ABS CASE, 1/4" BRASS CONNECTION, D=50MM
		002110242	0-10 BAR, DRY TYPE, ABS CASE, 1/4" BRASS CONNECTION, D=63MM
		002110243	0-16 BAR,DRY TYPE, ABS CASE, 1/4" BRASS CONNECTION, D=63MM
		002110251	0-10 BAR, DRY TYPE, AISI304 CASE, 1/4" AISI316 CONNECTION, D=63MM
		002110252	0-16 BAR, DRY TYPE, AISI304 CASE, 1/4" AISI316 CONNECTION, D=63MM
Hexagon Nipple 	1"	002671855	1", GALVANISED STEEL
	1" 1/4	002671856	1"1/4, GALVANISED STEEL
	1" 1/2	002671857	1"1/2, GALVANISED STEEL
	2"	002671858	2", GALVANISED STEEL
	1"	002671820	1", STAINLESS STEEL AISI 316
	1" 1/4	002671821	1"1/4, STAINLESS STEEL AISI316
	1" 1/2	002671822	1"1/2, STAINLESS STEEL AISI316
	2"	002671823	2", STAINLESS STEEL AISI 316
90° Elbow 	1"	002670655	1" MF, GALVANISED STEEL
	1" 1/4	002670656	1"1/4 MF, GALVANISED STEEL
	1" 1/2	002670657	1"1/2 MF, GALVANISED STEEL
	2"	002670658	2" MF, GALVANISED STEEL

ACCESSORIES

MODEL	REF.	CODE	DESCRIPTION
	1"	002670505	1" FF, GALVANISED STEEL
	1" 1/4	R02671434	1"1/4 FF, GALVANISED STEEL
	1" 1/2	002670557	1"1/2 FF, GALVANISED STEEL
	2"	002670558	2" FF, GALVANISED STEEL
	1"	002670633	1" MF, STAINLESS STEEL AISI 316
	1" 1/4	002670634	1"1/4 MF, STAINLESS STEEL AISI 316
	1" 1/2	002670635	1"1/2 MF, STAINLESS STEEL AISI 316
	2"	002670636	2" MF, STAINLESS STEEL AISI 316
	1"	002670594	1" FF, STAINLESS STEEL AISI 316
	1" 1/4	002670595	1"1/4 FF, STAINLESS STEEL AISI 316
	1" 1/2	002670596	1"1/2 FF, STAINLESS STEEL AISI 316
	2"	002670597	2" FF, STAINLESS STEEL AISI 316
Fittings    	1/4"	R02671244	CROSS 1/4" 3F1M, CHROME PLATED BRASS
		002670881	CROSS 1/4" 4F, STAINLESS STEEL AISI 316
		R02671020	90° ELBOW 90° 1/4" FF, CHROME PLATED BRASS
		R02671018	90° ELBOW 90° 1/4" MF, CHROME PLATED BRASS
		002670590	90° ELBOW 90° 1/4" FF, STAINLESS STEEL AISI 316
		002670629	90° ELBOW 90° 1/4" MF, STAINLESS STEEL AISI 316
		002670777	TEE 1/4"" FFF, STAINLESS STEEL AISI 316
		R02672030	TEE 1/4"" FFF, CHROME PLATED BRASS
		002679216	TEE 1/4"" FFM, CHROME PLATED BRASS
		002679215	TEE 1/4"" FMF, CHROME PLATED BRASS
		002679225	TEE 1/4"" MFM, CHROME PLATED BRASS
		002679221	TEE 1/4"" MMF, CHROME PLATED BRASS
		002679217	TEE 1/4"" MMM, CHROME PLATED BRASS
		R02661811	BALL VALVE 1/4" FF PN15, CHROME PLATED BRASS
		002675311	BALL VALVE 1/4" FF PN60, STAINLESS STEEL AISI 316
		002675345	BALL VALVE 1/4" MF PN15, CHROME PLATED BRASS
		002675351	BALL VALVE 1/4" MF PN63, STAINLESS STEEL AISI 316
	1/2"	002679264	CROSS 1/2" 4F, CHROME PLATED BRASS
		002670883	CROSS 1/2" 4F, STAINLESS STEEL AISI 316
		R02671420	90° ELBOW 90° 1/2" FF, GALVANISED STEEL
		002670592	90° ELBOW 90° 1/2" FF, STAINLESS STEEL AISI 316
		002670631	90° ELBOW 90° 1/2" MF, STAINLESS STEEL AISI 316
		002670779	TEE 1/2" FFF, STAINLESS STEEL AISI 316
		R02672034	TEE 1/2" FFF, CHROME PLATED BRASS
		002679222	TEE 1/2" MMF, CHROME PLATED BRASS
		002679223	TEE 1/2" MMM, CHROME PLATED BRASS
		002679226	TEE 1/2" MFM, CHROME PLATED BRASS
		002679230	TEE 1/2" FFM, CHROME PLATED BRASS
		002675313	BALL VALVE 1/2" FF PN60, STAINLESS STEEL AISI 316
		R02661820	BALL VALVE 1/2" MF PN15, CHROME PLATED BRASS
		002675352	BALL VALVE 1/2" MF PN63, STAINLESS STEEL AISI 316
		002675327	BALL VALVE 1/2" FF PN15, CHROME PLATED BRASS
	1"	002670755	TEE 1" FFF, GALVANISED STEEL
		002670781	TEE 1" FFF, STAINLESS STEEL AISI 316
5 Ways Fitting 	1"	167320240	R1", BRASS

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REPORTS AND DECLARATIONS

REPORTS AND DECLARATIONS

i) Test reports

a) **Factory Test Report** (Lowara identity code: 1A)
(not available for all pump types; contact Customer Service in advance)
- Test report compiled at the end of the assembly line, including flow-head performance test (ISO 9906:2012 – Grade 3B) and tightness test.

b) **Audit Test Report** (Lowara identity code: 1B)
- Test report for electric pumps compiled in the test room, comprising flow-head-pump input-pump efficiency performance test (ISO 9906:2012 – Grade 3B)

c) **NPSH Test Report** (Lowara identity code: 1A / CTF-NP)
(unavailable for submerged or submergible pumps)
- Test report for electric pumps compiled in the test room, comprising flow-NPSH performance test (ISO 9906:2012 – Grade 3B)

d) **Noise Test Report** (Lowara identity code: 1A / CTF-RM)
(unavailable for submerged pumps)
- Report indicating sound pressure and power measurements (EN ISO 20361, EN ISO 11203, EN ISO 4871) using the
  - intensimetric (EN ISO 9614-1, EN ISO 9614-2), or
  - phonometric method.

e) **Vibration Test Report**
(unavailable for submerged or submergible pumps)
- Report indicating vibration measurements (ISO 10816-1)

ii) Declaration of product conformity with the technical requirements indicated in the order

a) **EN 10204:2004 - type 2.1** (Lowara identity code: CTF-21)
- does not include test results on supplied or similar products.

b) **EN 10204:2004 - type 2.2** (Lowara identity code: CTF-22)
- includes test results (materials certificates) on similar products.

c) **EN 10204:2004 - type 3.1** (Lowara identity code: 1A / CTF-31 or 1B / CTF-31)
- includes test report (*Factory Test Report* or *Audit Test Report*), list of materials, EC Declaration of Conformity (in addition to the one accompanying the product), certificates / declarations concerning materials in contact with water.

iii) Issue of a further EC Declaration of Conformity,

- in addition to the one accompanying the product, it comprises references to European law and the main technical standards (e.g.: MD 2006/42/EC, EMCD 2004/108/EC, ErP 2009/125/EC).

N.B.: if the request is made after receipt of the product, communicate the code (name) and serial number (date + progressive number).

iv) Manufacturer's declaration of conformity

- relative to one of more types of products without indicating specific codes and serial numbers.

v) Other certificates and/or documentation on request

- subject to availability or feasibility.

vi) Duplication of certificates and/or documentation on request

- subject to availability or feasibility.

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TECHNICAL APPENDIX

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 hz at which to install the machine under safe conditions, the following formula must be verified:

hp + hz $\geq$ **(NPSHr + 0.5) + hf + hpv** ①

where:

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

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

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

hpv is the vapour pressure of the liquid at the operating temperature, expressed in m. of liquid. hpv is the quotient between the Pv 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 33-34 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 $\gamma = 1$ kg/dm^3
Flow rate required: 25 m^3/h
Head for required delivery: 70 m.
Suction lift: 3,5 m.
The selection is an 33SV3G075T pump whose NPSH required value is, at 25 m^3/h, of 2 m.

For water at 15 °C

hp = Pa / γ = 10,33m, hpv = Pv / γ = 0,174m (0,01701 bar)

The Hf 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:

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

from which we have: $6,8 > 3,9$

The relation is therefore verified.

VAPOUR PRESSURE
VAPOUR PRESSURE ps AND ρ DENSITY OF WATER TABLE

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

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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												
		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		
		hr										51,6	21,2	10,0	5,23	1,77	0,73		
360	6000	v										8,15	5,66	4,16	3,18	2,04	1,42		
		hr										72,3	29,8	14,1	7,33	2,47	1,02		
420	7000	v											6,61	4,85	3,72	2,38	1,65	1,21	
		hr											39,6	18,7	9,75	3,29	1,35	0,64	
480	8000	v											7,55	5,55	4,25	2,72	1,89	1,39	
		hr											50,7	23,9	12,49	4,21	1,73	0,82	
540	9000	v											8,49	6,24	4,78	3,06	2,12	1,56	1,19
		hr											63,0	29,8	15,5	5,24	2,16	1,02	0,53
600	10000	v												6,93	5,31	3,40	2,36	1,73	1,33
		hr												36,2	18,9	6,36	2,62	1,24	0,65

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

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hr = flow resistance for 100 m 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-en_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 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	Imp. gal. per minute Imp. gal/min	US gal. 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_2O	millimetre of mercury mm Hg
1,0000	0,0010	1×10^{-5}	1.45×10^{-4}	1.02×10^{-4}	0,0075
1000,0000	**1,0000**	0,0100	0,1450	0,1020	7,5006
1×10^5	100,0000	**1,0000**	14,5038	10,1972	750,0638
6894,7570	6,8948	0,0689	**1,0000**	0,7031	51,7151
9806,6500	9,8067	0,0981	1,4223	**1,0000**	73,5561
133,3220	0,1333	0,0013	0,0193	0,0136	**1,0000**

LENGTH

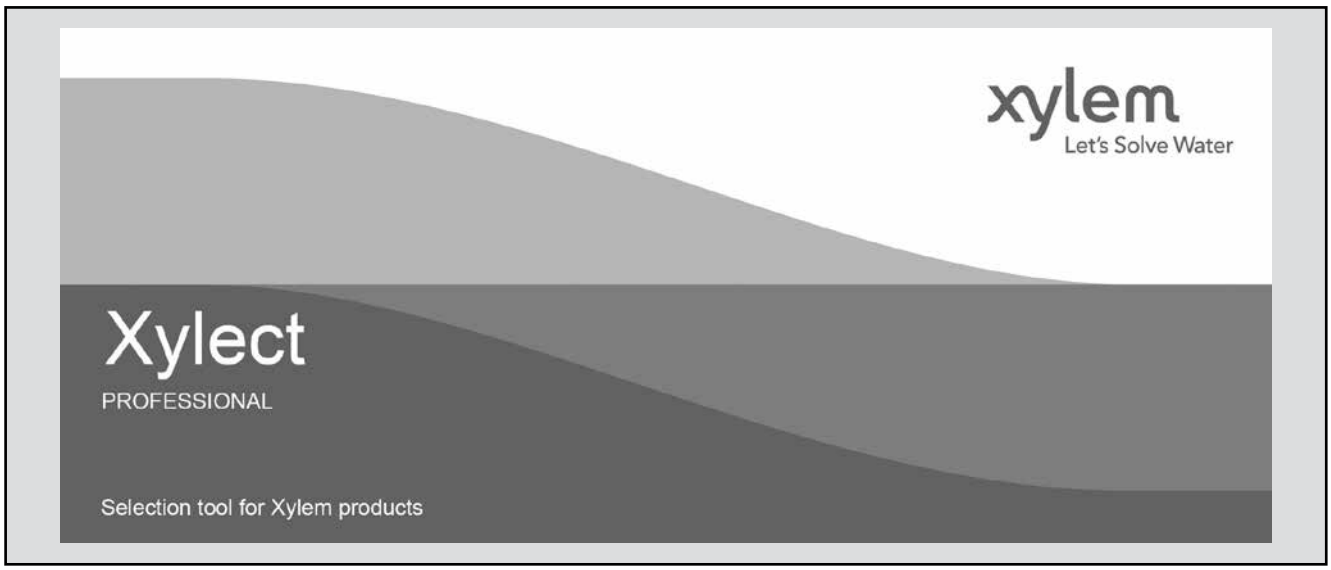
millimetre mm	centimetre cm	metre m	inch in	foot ft	yard yd
1,0000	0,1000	0,0010	0,0394	0,0033	0,0011
10,0000	**1,0000**	0,0100	0,3937	0,0328	0,0109
1000,0000	100,0000	**1,0000**	39,3701	3,2808	1,0936
25,4000	2,5400	0,0254	**1,0000**	0,0833	0,0278
304,8000	30,4800	0,3048	12,0000	**1,0000**	0,3333
914,4000	91,4400	0,9144	36,0000	3,0000	**1,0000**

VOLUME

cubic metre m^3	litre litro	millilitre ml	imp. Gallon imp. gal.	US gallon US gal.	cubic foot ft^3
1,0000	1000,0000	1×10^6	219,9694	264,1720	35,3147
0,0010	**1,0000**	1000,0000	0,2200	0,2642	0,0353
1×10^{-6}	0,0010	**1,0000**	2.2×10^{-4}	2.642×10^{-4}	3.53×10^{-5}
0,0045	4,5461	4546,0870	**1,0000**	1,2009	0,1605
0,0038	3,7854	3785,4120	0,8327	**1,0000**	0,1337
0,0283	28,3168	28316,8466	6,2288	7,4805	**1,0000**

G-at_pp-en_a_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.

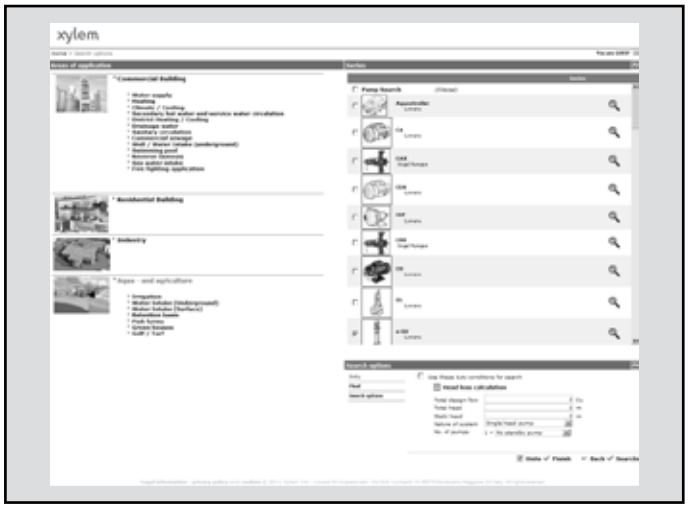
The possibility to search by applications and the detailed information output given makes it easy to make the optimal selection without having detailed knowledge about the Lowara and Vogel products.

The search can be made by:

- Application
- Product type
- Duty point

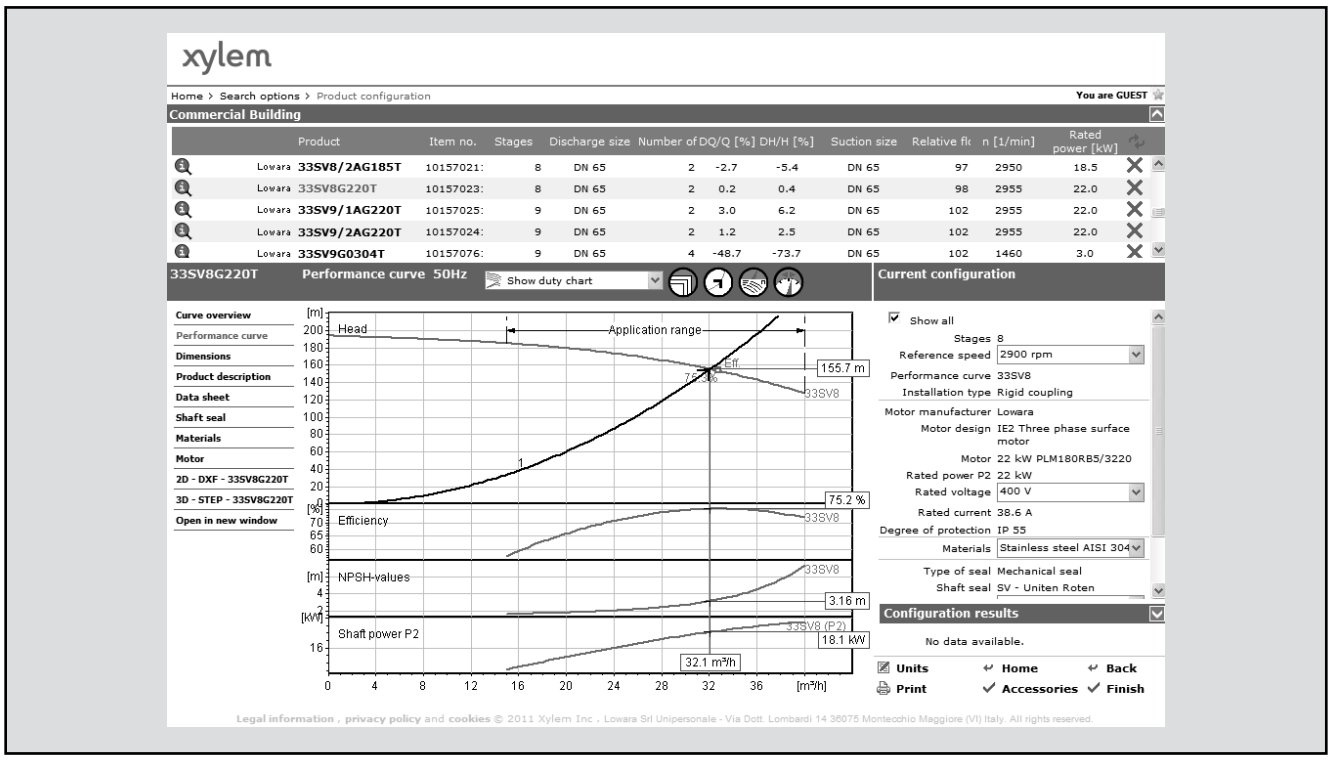
Xylect™ gives a detailed output:

- 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™

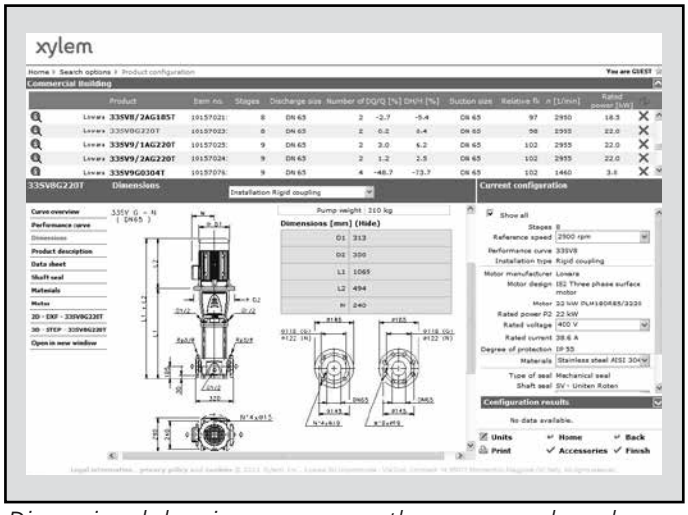


The detailed output makes it easy to select the optimal pump from the given alternatives.

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 user have a My Xylect space, where all projects are saved.



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

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