

50 Hz



VM Series

CLOSE-COUPLED THREADED VERTICAL MULTISTAGE CENTRIFUGAL ELECTRIC PUMPS
EQUIPPED WITH **IE3** MOTORS

ErP 2009/125/EC

Cod. 191003611 Rev. B Ed.09/2017

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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.

Range declination

The VM series are available as:

- Single pump.
- Variable speed system.

SPECIFICATIONS PUMP

- Flow rate: up to 14 m³/h.
- Head: up to 98 m.
- Ambient temperature:
 - Three-phase motor versions from -15°C to +50°C.
 - Single-phase motor versions from -15°C to +45°C (from -15°C to +40°C for 3VM02P and all models with 0,95 kW motor).
- 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.



MARKET SECTORS

BUILDING SERVICES.

APPLICATIONS

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

MOTOR

- Electric short-circuit squirrel-cage motor (TEFC), enclosed construction, air-cooled, 2-pole:
 - Three-phase, efficiency class IE3 (compliant with Regulation (EC) n. 640/2009 and 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: 220-240V, 50 Hz.
 - Three-phase: 220-240/380-415V, 50 Hz up to 3 kW.

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

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 e-SM Drive: 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 e-SM Drive will secure constant pressures at any points of water in your building and constant temperatures even when other taps are opened!



Features

- Compact design with best-in class performances.
- Wide range of performances with 4 sizes and flow up to 14m³/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)	1,8	3,0	5,0	10,6
Flow range (m ³ /h)	0,7÷2,4	1,2÷4,2	2,4÷7,2	5÷14
Maximum head (m)	92	96	99	93
Motor power (kW)	0,30÷1,1	0,30÷1,5	0,40÷2,2	1,1÷3
Max η (%) of pump	39	47	56	62
Minimum efficiency index MEI (\geq)	0,7	0,7	0,7	0,7
Standard temperature (°C)	-30 +90			

1-10vmp_2p50-en_a_tg

CONNECTIONS

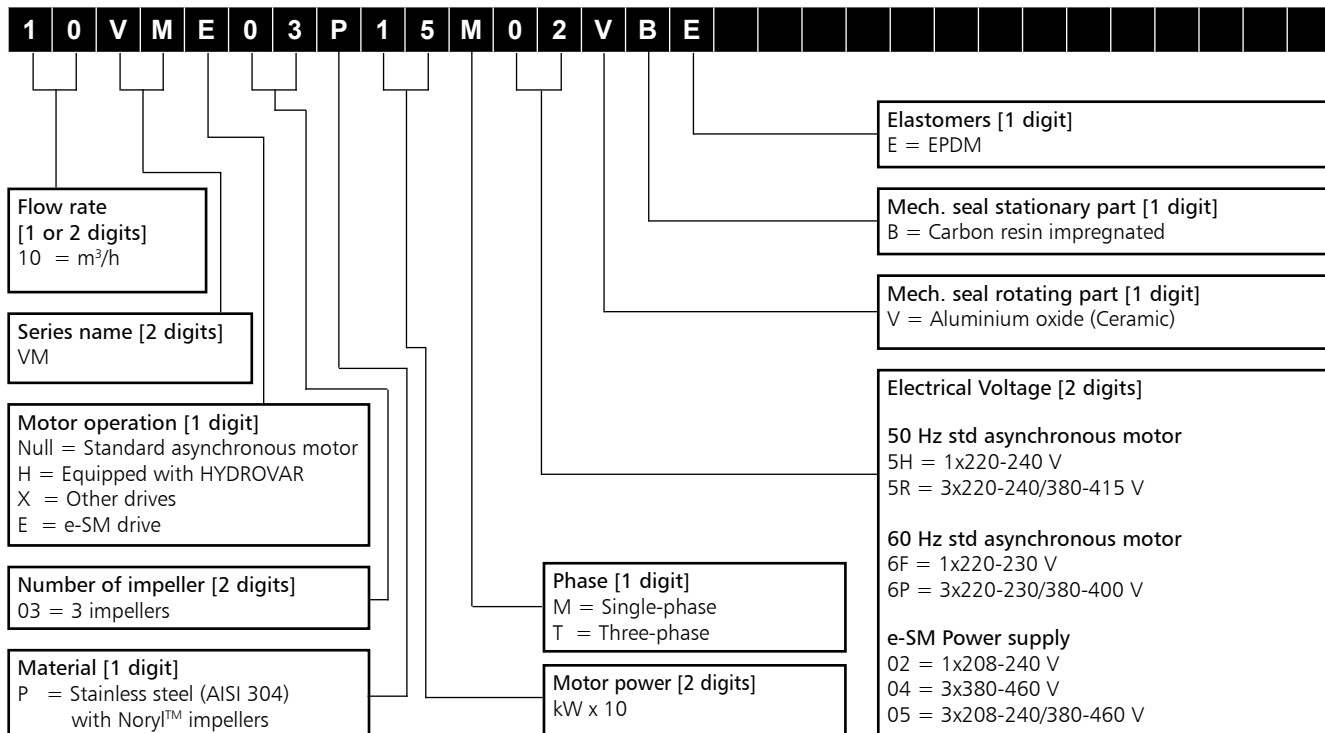
CONNECTION TYPE	VM..P SERIES			
	1	3	5	10
Rp thread (suction)	Rp 1	Rp 1	Rp 1 1/4	Rp 1 1/2
Rp thread (delivery)	Rp 1	Rp 1	Rp 1 1/4	Rp 1 1/2

1-10vm_2p50-en_a_tc

STORAGE AND TRANSPORT TEMPERATURE

-40°C to +60°C

IDENTIFICATION CODE



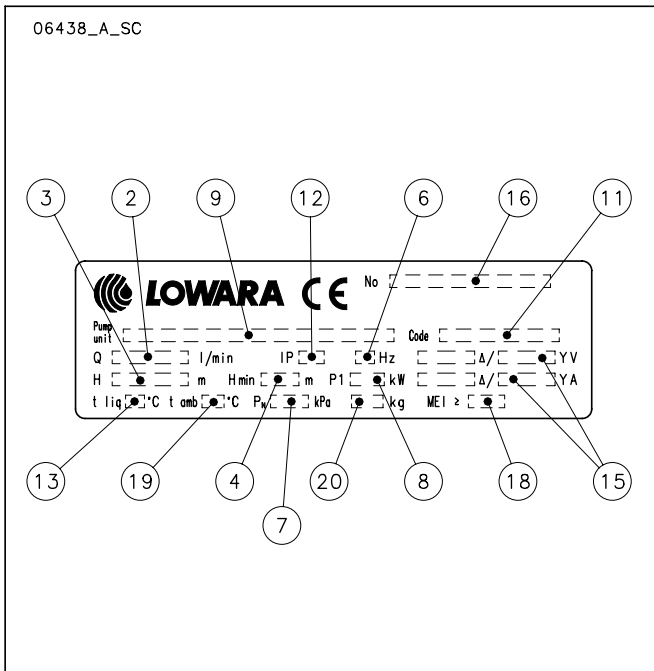
EXAMPLE: 10VM05P30T5RVBE

10 = Flow rate 10 m³/h, **VM** = VM series electric pump, **05** = number of impellers 5, **P** = P version (Noryl™ impellers), **30** = 3 kW rated motor power, **T** = three-phase, **5R** = 50 Hz voltage 220-240/380-415V, **VBE** = Aluminium/Carbon mechanical seal and EPDM elastomers.

EXAMPLE: 10VME02P11M02VBE

10 = Flow rate 10 m³/h, **VM** = VM series electric pump, **E** = e-SM (SMART) coupling, **02** = number of impellers 2, **P** = P version (Noryl™ impellers), **11** = 1,1 kW rated motor power, **M** = single-phase, **02** = e-SM power supply 1x208-240, **VBE** = Aluminium/Carbon mechanical seal and EPDM elastomers.

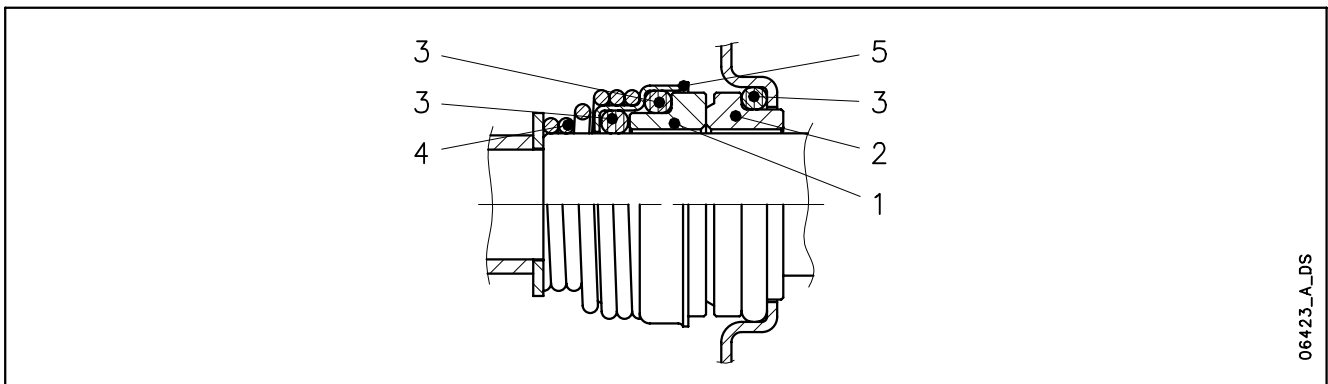
VM SERIES ELECTRIC PUMP RATING PLATE



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)
- 18 - MEI index (Regulation (EU) n. 547/2012)
- 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		

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TYPE OF SEAL

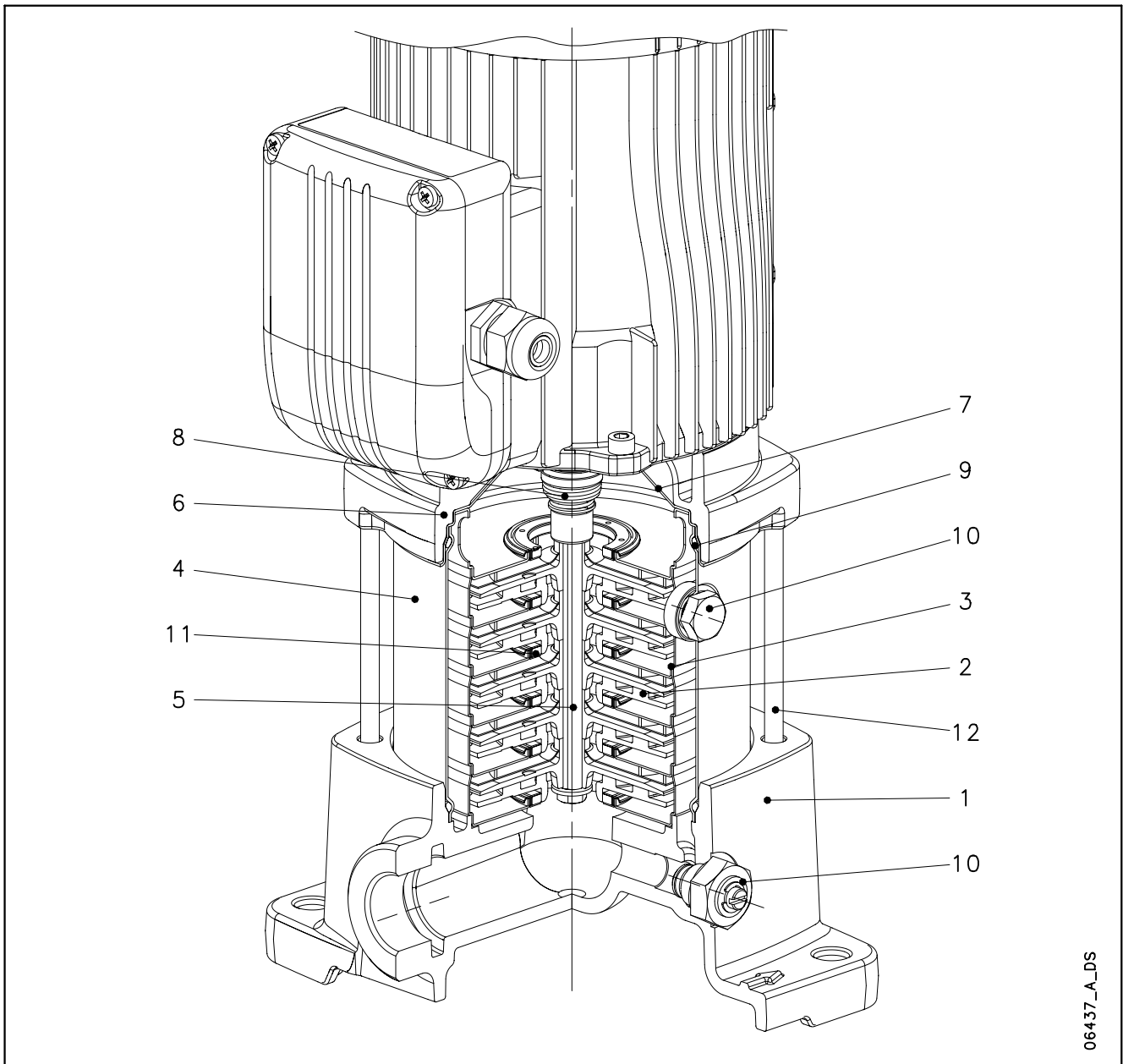
TYPE	POSITION					*TEMPERATURE (°C)	OPERATING PRESSURE
	1 ROTATING PART	2 STATIONARY PART	3 ELASTOMERS	4 SPRINGS	5 OTHER COMPONENTS		
STANDARD MECHANICAL SEAL							
VBEGG	V	B	E	G	G	-30 + 90	PN10

* 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



06437_A_DS

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-AISI11Cu2 (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

VM SERIES MOTORS

With the “Energy using Products” (EuP 2005/32/EC) and “Energy related Products” (ErP 2009/125/EC) directives, the European Commission has established requirements for promoting the use of products with low power consumption.

The various products considered include **three-phase 50 Hz surface motors with power outputs ranging from 0,75 to 375 kW**, also when integrated with other products, with characteristics as defined by the specific **Regulations (EC) No 640/2009** and **(EU) No 4/2014** implementing the requirements of the EuP and ErP Directives.

In accordance with regulations, the **three-phase 50 Hz surface motors with power outputs ranging from 0,75 to 375 kW** have IE3 as minimum level of efficiency or IE2 fitted with variable speed drive. IE2 motor can be supplied without frequency converter as the obligation to have that device is related to when the motor is working and not when placed on the market.

- **Standard three-phase surface motors**
≥ 0,75 kW supplied as IE3.
- Short-circuit squirrel-cage motor, enclosed construction with external ventilation (TEFC).
- IP 55 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:
220-240 V 50 Hz
Built-in automatic reset overload protection up to 2,2 kW.
- **Three-phase** version:
220-240/380-415 V 50 Hz for power up to 3 kW.
380-415/660-690 V 50 Hz for power above 3 kW.
Overload protection to be provided by the user.

SINGLE-PHASE MOTORS AT 50 Hz, 2-POLE

P _N kW	MOTOR TYPE	IEC SIZE	Construction Design	INPUT CURRENT I _n (A) 220-240 V	CAPACITOR		DATA FOR 230 V 50 Hz VOLTAGE						
					μF	V	min ⁻¹	I _s / I _n	η %	cosφ	T _n Nm	T _s /T _n	T _m /T _n
0,50	SM63HM../1055	63	SPECIAL	3,46-3,30	16	450	2705	2,90	66,9	0,98	1,76	0,56	1,61
0,55	SM71HM../1055	71		3,76-3,99	16	450	2820	3,72	68,9	0,91	1,86	0,61	2,00
0,75	SM71HM../1075	71		4,90-4,85	20	450	2765	3,42	70,1	0,96	2,59	0,58	1,75
0,95	SM71HM../1095	71		6,25-5,89	25	450	2740	3,39	71,1	0,98	3,31	0,58	1,66
1,1	SM80HM../1115	80		6,88-6,65	30	450	2800	3,89	74,7	0,96	3,75	0,46	1,72
1,5	SM80HM../1155	80		9,21-8,58	40	450	2810	4,00	76,1	0,98	5,09	0,39	1,74
2,2	PLM90HM../1225	90		12,5-11,6	70	450	2825	4,47	82,4	0,97	7,43	0,53	1,87

1-22hm-motm-2p50-en_a_te

VM SERIES THREE-PHASE MOTORS AT 50 Hz, 2-POLE

P _N kW	Efficiency η_N															IE	Year of manufacture						
	%																						
	Δ 220 V Y 380 V			Δ 230 V Y 400 V			Δ 240 V Y 415 V			Δ 380 V Y 660 V			Δ 400 V Y 690 V					Δ 415 V					
	4/4	3/4	2/4	4/4	3/4	2/4	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	65,1	64,4	59,3	65,2	62,1	54,7	62,8	58,5	50,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0,40	72,7	72,3	67,9	71,4	69,5	63,5	68,7	65,9	58,8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0,50	72,9	73,5	70,3	72,3	71,5	66,7	71,1	69,1	63,0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0,55	77,3	76,9	73,3	77,1	75,8	71,3	76,1	74,3	69,1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0,75	82,5	83,1	81,3	82,8	82,7	80,1	82,6	82,0	78,9	82,5	82,0	78,9	82,5	82,0	78,9	82,5	82,0	78,9	-	-	-	-	-
1,1	84,0	84,7	83,4	84,4	84,5	82,5	84,3	84,0	81,4	84,0	84,0	81,4	84,0	84,0	81,4	84,0	84,0	81,4	-	-	-	-	-
1,5	85,6	86,5	85,8	85,9	86,4	84,9	86,0	86,0	84,0	85,6	86,0	84,0	85,6	86,0	84,0	85,6	86,0	84,0	-	-	-	-	-
2,2	86,5	87,4	86,8	86,4	86,9	85,7	86,6	86,7	85,0	86,4	86,7	85,0	86,4	86,7	85,0	86,4	86,7	85,0	-	-	-	-	-
3	87,2	88,5	88,3	87,5	88,2	87,5	87,5	87,8	86,4	87,2	87,8	86,4	87,2	87,8	86,4	87,2	87,8	86,4	-	-	-	-	-

P _N kW	Manufacturer		IEC SIZE	Construction Design	N. of Poles	f _N Hz	Data for 400 V / 50 Hz Voltage				
	Xylem Service Italia srl Reg. No. 07520560967 Montecchio Maggiore Vicenza - Italia						cos ϕ	I _s / I _N	T _N Nm	T _s /T _N	T _m /T _N
	Model										
0,30	SM63HM../303		63	SPECIAL	2	50	0,63	4,20	1,04	4,18	4,12
0,40	SM63HM../304		63				0,64	4,35	1,37	4,14	4,10
0,50	SM63HM../305		63				0,69	4,72	1,75	4,08	4,00
0,55	SM71HM../305		71				0,71	6,25	1,84	3,96	3,97
0,75	SM80HM../307 E3		80				0,78	7,38	2,48	3,57	3,75
1,1	SM80HM../311 E3		80				0,79	8,31	3,63	3,95	3,95
1,5	SM80HM../315 E3		80				0,80	8,80	4,96	4,31	4,10
2,2	PLM90HM../322 E3		90				0,80	8,77	7,28	3,72	3,70
3	PLM90HM../330 E3		90				0,79	7,81	9,93	4,26	3,94

P _N kW	Voltage U _N V										n _N min ⁻¹	Operating conditions **				
	Δ			Y			Δ			Y		Altitude Above Sea Level (m)	T. amb min/max °C	ATEX		
	220 V	230 V	240 V	380 V	400 V	415 V	380 V	400 V	415 V	660 V					690 V	
	I _N (A)											Observe the regulations and codes locally in force regarding sorted waste disposal.	≤ 1000	-15 / 40	No	
0,30	1,66	1,82	1,96	0,96	1,05	1,13	-	-	-	-	-					2715 ÷ 2775
0,40	2,03	2,18	2,32	1,17	1,26	1,34	-	-	-	-	-					2745 ÷ 2800
0,50	2,42	2,51	2,65	1,40	1,45	1,53	-	-	-	-	-					2690 ÷ 2765
0,55	2,46	2,49	2,56	1,42	1,44	1,48	-	-	-	-	-					2835 ÷ 2865
0,75	2,96	2,94	2,96	1,71	1,70	1,71	1,70	1,69	1,70	0,98	0,98					2875 ÷ 2895
1,1	4,19	4,14	4,16	2,42	2,39	2,40	2,41	2,38	2,38	1,39	1,37					2870 ÷ 2900
1,5	5,56	5,49	5,51	3,21	3,17	3,18	3,21	3,18	3,19	1,85	1,84					2870 ÷ 2895
2,2	7,97	7,90	7,98	4,60	4,56	4,61	4,57	4,54	4,57	2,64	2,62					2880 ÷ 2900
3	11,0	11,0	11,2	6,35	6,33	6,44	6,29	6,27	6,34	3,63	3,62					2865 ÷ 2895

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

1-10vm-ie3-mott-2p50-en_a_te

VM SERIES ELECTRIC PUMP NOISE

The table show the mean sound pressure (Lp) measured as per Curve A (Standard ISO 1680).
Noise values were measured with the 50 Hz running with a tolerance of 3 dB (A).

POWER kW	NOISE LpA dB
0,30	52
0,40	52
0,50	52
0,55	55
0,75	55
0,95	55
1,1	60
1,5	60
2,2	60
3	60

1-10vm_mot_2p50-en_a_tr

AVAILABLE MOTOR VOLTAGES, 2-POLE

P _N kW	SINGLE-PHASE								THREE-PHASE																		
	50 Hz				60 Hz				50 Hz						60 Hz						50/60 Hz						
	1 x 220-240	1 x 100	1 x 110-120	1 x 220-230	1 x 100	1 x 110-115	1 x 120-127	1 x 200-210	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
0,50	s	-	-	s	-	o	-	s	o	o	o	o	o	o	s	o	o	o	o	o	o	o	o	o	o	o	o
0,55	s	o	o	s	o	o	o	s	o	o	o	o	o	o	s	o	o	o	o	o	o	o	o	o	o	o	o
0,75	s	o	o	s	o	o	o	s	o	o	o	o	o	o	s	o	o	o	o	o	o	o	o	o	o	o	o
0,95	s	o	o	s	o	o	o	s	o	o	o	o	o	o	s	o	o	o	o	o	o	o	o	o	o	o	o
1,1	s	-	o	s	-	o	-	o	-	o	-	o	-	o	s	o	o	o	o	o	o	o	o	o	o	o	o
1,5	s	-	-	s	-	o	-	o	-	o	-	o	-	o	s	o	o	o	o	o	o	o	o	o	o	o	o
2,2	s	-	-	s	-	-	-	o	-	o	-	o	-	o	s	o	o	o	o	o	o	o	o	o	o	o	o

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

vm-volt-low-a-en_b_te

Tolerances on nominal voltages

- **50 Hz:**
 - +/- 10% on the single voltage value shown on the rating plate.
 - +/- 5% on voltage range shown on the rating plate.
- **60 Hz:**
 - +/- 10% on the voltage values shown on the rating plate.

VM SERIES PUMPS

With the “Energy using Products” (EuP 2005/32/EC) and “Energy related Products” (ErP 2009/125/EC) directives, the European Commission has established requirements for promoting the use of products with low power consumption.

Among the various products considered there are also some typologies of pumps with the characteristics defined by the specific **Regulation (EU) n. 547/2012** implementing the requirements of Directives EuP and ErP.

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

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

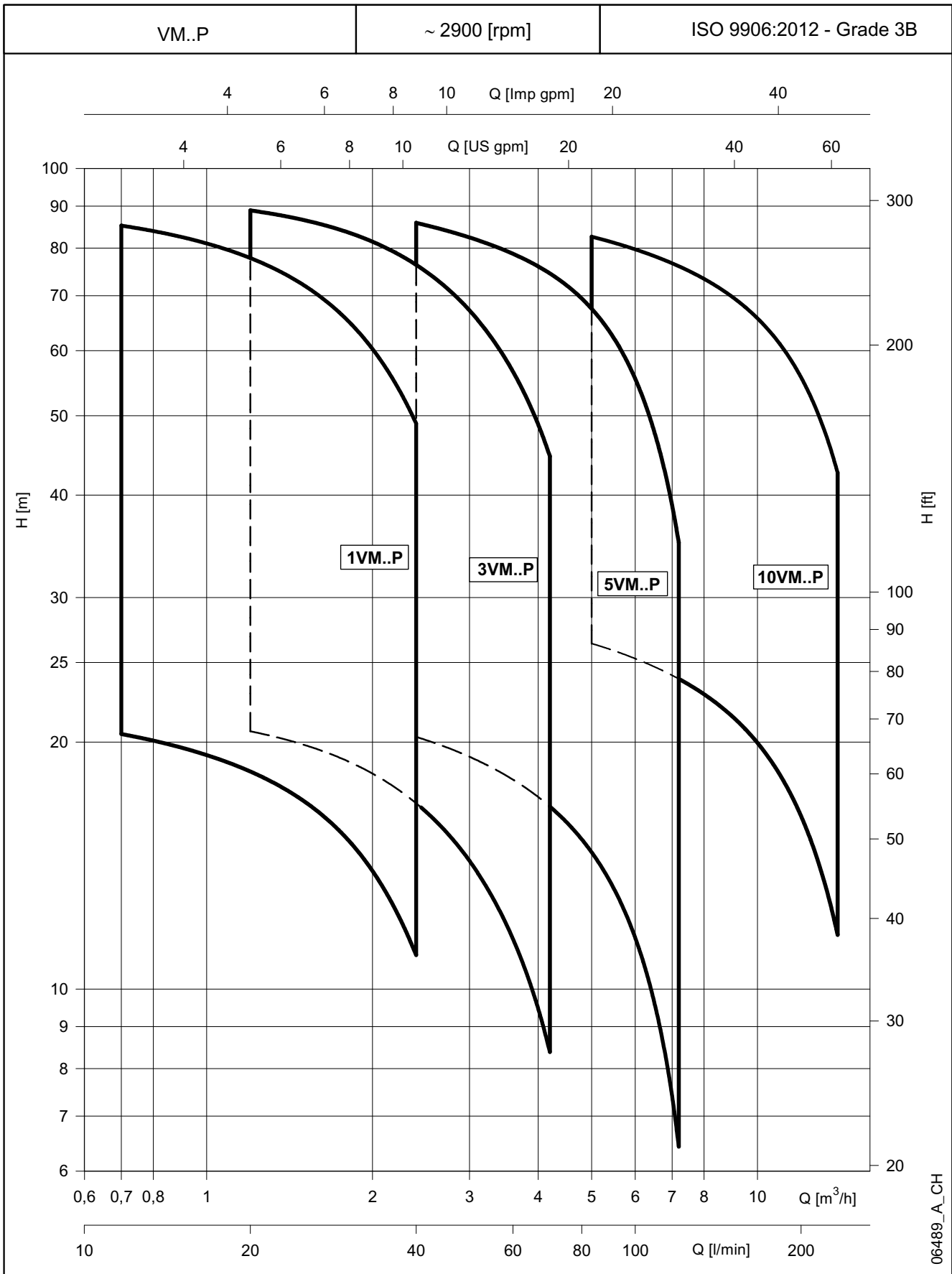
The Regulation also establishes the following deadlines:

from	minimum efficiency index (MEI)
1st January 2013	MEI ≥ 0,1
1st January 2015	MEI ≥ 0,4

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

- 1) Minimum efficiency index: see the MEI column in the tables in the *General Characteristics* section.
- 2) “The benchmark for most efficient water pumps is MEI ≥ 0,70”.
- 3) Year of manufacture: from January 2013.
- 4) Manufacturer: Xylem Service Italia srl - Reg. No. 07520560967 - Montecchio Maggiore, Vicenza, Italia.
- 5) Product type: see the PUMP TYPE column in the tables in the *Hydraulic performance* section.
- 6) Hydraulic pump efficiency with trimmed impeller: not applicable to these products.
- 7) Pump performance curves, including the performance curve: see the *Operating Characteristics* graphs in the following pages.
- 8) “The efficiency of a pump with a trimmed impeller is usually lower than that of a pump with the full impeller diameter. The trimming of the impeller will adapt the pump to a fixed duty point, leading to reduced energy consumption. The minimum efficiency index (MEI) is based on the full impeller diameter”.
- 9) “The operation of this water pump with variable duty points may be more efficient and economic when controlled, for example, by the use of a variable speed drive that matches the pump duty to the system”.
- 10) Information relevant for disassembly, recycling or disposal at end-of-life: observe the current laws and by-laws governing sorted waste disposal. Consult the product operating manual.
- 11) “Designed for use below – 10 °C only”: note not applicable to these products.
- 12) “Designed for use above 120 °C only”: note not applicable to these products.
- 13) Specific instructions for pumps as per points 11 and 12: not applicable to these products.
- 14) “Information on benchmark efficiency is available at”: www.europump.org (Ecodesign section).
- 15) The benchmark efficiency graphs with MEI = 0.7 and MEI = 0.4 are available at www.europump.org/efficiencycharts (refer to “Multistage Vertical 2900 rpm”).

VM..P SERIES
HYDRAULIC PERFORMANCE RANGE AT 50 Hz, 2 POLES



06489_A_CH

VM..P SERIES HYDRAULIC PERFORMANCE TABLE AT 50 Hz, 2 POLES

PUMP TYPE VM..P	VERSION	MOTOR		ELECTRIC PUMP			Q = DELIVERY								
		P _N kW	TYPE	* P ₁ kW	* I		V _{min} 0 m ³ /h 0	11,7 0,7	16,0 1,0	21,0 1,3	26,0 1,6	31,0 1,9	36,0 2,2	40,0 2,4	
					220-240 V A	380-415 V A									H = TOTAL HEAD IN METRES OF COLUMN OF WATER
1VM03	1 ~	0,50	SM63HM../1055	0,55	2,60	-	33,3	30,6	29,2	27,3	25,0	22,4	19,3	16,7	
1VM04		0,50	SM63HM../1055	0,63	2,85	-	43,8	39,9	37,9	35,2	32,1	28,5	24,5	21,0	
1VM05		0,50	SM63HM../1055	0,72	3,15	-	53,9	48,7	46,1	42,6	38,6	34,0	28,9	24,5	
1VM06		0,75	SM71HM../1075	0,91	4,25	-	66,5	60,9	58,0	54,1	49,5	44,1	38,0	32,8	
1VM07		0,75	SM71HM../1075	1,01	4,58	-	76,9	70,1	66,6	61,9	56,4	50,1	42,9	36,8	
1VM08		0,95	SM71HM../1095	1,17	5,18	-	88,3	80,5	76,4	71,1	64,8	57,6	49,4	42,5	
1VM02		3 ~	0,30	SM63HM../303	0,34	1,87	1,08	22,5	20,7	19,7	18,4	16,9	15,1	13,1	11,3
1VM03			0,30	SM63HM../303	0,46	1,94	1,12	32,6	29,6	28,1	26,1	23,7	21,0	17,9	15,4
1VM04	0,40		SM63HM../304	0,56	2,32	1,34	43,9	39,9	37,9	35,2	32,1	28,4	24,4	20,9	
1VM05	0,50		SM63HM../305	0,67	2,61	1,51	54,2	49,0	46,3	42,9	38,9	34,4	29,3	25,0	
1VM06	0,75		SM80HM../307 E3	0,80	2,75	1,59	68,5	63,6	60,9	57,2	52,7	47,5	41,5	36,2	
1VM07	0,75		SM80HM../307 E3	0,92	2,97	1,71	79,5	73,6	70,4	66,0	60,7	54,6	47,6	41,5	
1VM08	1,1		SM80HM../311 E3	1,05	3,68	2,12	91,6	85,2	81,7	76,8	70,9	63,9	55,9	48,9	

PUMP TYPE VM..P	VERSION	MOTOR		ELECTRIC PUMP			Q = DELIVERY							
		P _N kW	TYPE	* P ₁ kW	* I		V _{min} 0 m ³ /h 0	20,0 1,2	28,0 1,7	36,0 2,2	44,0 2,6	52,0 3,1	60,0 3,6	70,0 4,2
					220-240 V A	380-415 V A								
3VM02	1 ~	0,50	SM63HM../1055	0,53	2,55	-	23,6	21,5	20,4	18,9	17,1	15,0	12,8	9,6
3VM03		0,50	SM63HM../1055	0,64	2,87	-	34,4	31,2	29,5	27,2	24,6	21,7	18,4	14,0
3VM04		0,50	SM63HM../1055	0,76	3,29	-	45,0	40,3	37,7	34,5	30,9	26,8	22,5	16,6
3VM05		0,75	SM71HM../1075	0,99	4,51	-	57,8	52,5	49,6	45,9	41,5	36,5	31,1	23,7
3VM06		0,95	SM71HM../1095	1,18	5,22	-	69,4	63,1	59,4	54,9	49,6	43,7	37,2	28,3
3VM07		0,95	SM71HM../1095	1,31	5,68	-	80,3	72,3	67,9	62,5	56,2	49,2	41,6	31,2
3VM08		1,1	SM80HM../1115	1,48	6,59	-	93,0	84,6	79,9	73,9	66,8	58,9	50,2	38,3
3VM02		3 ~	0,30	SM63HM../303	0,43	1,92	1,11	23,2	20,9	19,6	18,1	16,2	14,1	11,9
3VM03	0,40		SM63HM../304	0,57	2,32	1,34	34,5	31,3	29,4	27,2	24,5	21,6	18,4	13,9
3VM04	0,50		SM63HM../305	0,71	2,67	1,54	45,3	40,6	38,0	34,9	31,3	27,3	23,0	17,1
3VM05	0,75		SM80HM../307 E3	0,90	2,93	1,69	59,5	55,0	52,4	49,0	44,8	39,9	34,5	27,1
3VM06	1,1		SM80HM../311 E3	1,08	3,71	2,14	71,8	66,7	63,7	59,7	54,7	48,9	42,5	33,5
3VM07	1,1		SM80HM../311 E3	1,24	4,02	2,32	83,5	77,3	73,7	68,9	63,1	56,3	48,8	38,3
3VM08	1,5		SM80HM../315 E3	1,41	4,83	2,79	95,8	88,9	84,9	79,5	72,9	65,2	56,6	44,6

PUMP TYPE VM..P	VERSION	MOTOR		ELECTRIC PUMP			Q = DELIVERY							
		P _N kW	TYPE	* P ₁ kW	* I		V _{min} 0 m ³ /h 0	40,0 2,4	53,0 3,2	66,0 4,0	79,0 4,7	92,0 5,5	105 6,3	120 7,2
					220-240 V A	380-415 V A								
5VM02	1 ~	0,50	SM63HM../1055	0,61	2,76	-	23,9	20,4	18,9	17,4	15,5	13,3	10,6	6,6
5VM03		0,50	SM63HM../1055	0,78	3,36	-	35,0	28,7	26,5	24,2	21,5	18,2	14,0	8,0
5VM04		0,75	SM71HM../1075	1,06	4,75	-	47,6	39,8	37,1	34,3	30,8	26,4	20,9	12,9
5VM05		0,95	SM71HM../1095	1,29	5,64	-	59,5	49,4	46,0	42,4	38,0	32,5	25,6	15,6
5VM06		1,1	SM80HM../1115	1,51	6,76	-	72,1	60,5	56,6	52,3	47,2	40,6	32,3	20,4
5VM07		1,5	SM80HM../1155	1,81	7,97	-	84,6	72,1	67,8	63,0	57,2	49,7	40,1	26,1
5VM08		1,5	SM80HM../1155	2,00	8,92	-	96,3	81,4	76,2	70,6	63,7	55,1	44,0	28,1
5VM02		3 ~	0,40	SM63HM../304	0,53	2,29	1,32	24,1	20,4	18,9	17,3	15,5	13,3	10,5
5VM03	0,50		SM63HM../305	0,73	2,69	1,55	35,3	28,9	26,8	24,5	21,9	18,6	14,4	8,4
5VM04	1,1		SM80HM../311 E3	1,00	3,57	2,06	49,3	43,0	40,7	38,2	35,1	30,9	25,6	17,6
5VM05	1,1		SM80HM../311 E3	1,22	3,99	2,30	61,4	53,2	50,3	47,1	43,1	37,9	31,1	21,1
5VM06	1,5		SM80HM../315 E3	1,45	4,92	2,84	73,8	64,1	60,7	56,9	52,1	45,9	37,8	25,8
5VM07	1,5		SM80HM../315 E3	1,67	5,35	3,09	85,8	74,2	70,1	65,6	60,0	52,7	43,2	29,2
5VM08	2,2		PLM90HM../322 E3	1,94	6,77	3,91	98,6	85,9	81,4	76,3	70,0	61,8	51,0	35,0

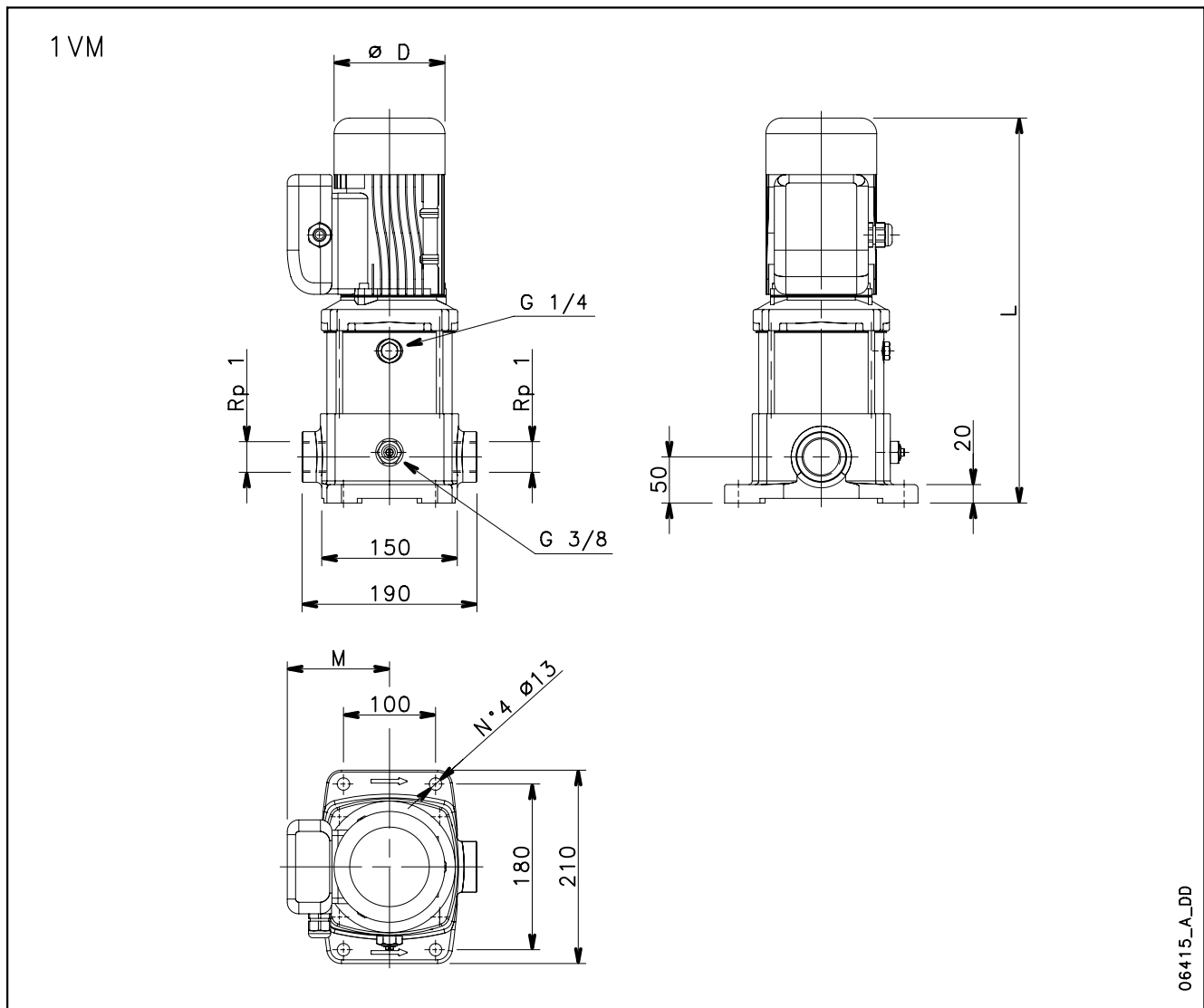
PUMP TYPE VM..P	VERSION	MOTOR		ELECTRIC PUMP			Q = DELIVERY							
		P _N kW	TYPE	* P ₁ kW	* I		V _{min} 0 m ³ /h 0	83,3 5,0	108 6,5	133 8,0	158 9,5	183 11,0	208 12,5	233 14,0
					220-240 V A	380-415 V A								
10VM02	1 ~	1,1	SM80HM../1115	1,33	6,05	-	30,3	26,4	24,7	22,9	20,8	18,3	15,2	11,6
10VM03		1,5	SM80HM../1155	1,87	8,27	-	45,6	40,1	37,8	35,3	32,4	28,9	24,7	19,6
10VM04		2,2	PLM90HM../1225	2,38	10,8	-	61,1	54,2	51,2	47,9	44,1	39,6	33,9	27,1
10VM05		2,2	PLM90HM../1225	2,84	12,7	-	75,9	66,4	62,5	58,2	53,3	47,5	40,4	31,8
10VM02		3 ~	1,1	SM80HM../311 E3	1,22	4,00	2,31	30,8	27,3	25,8	24,0	22,0	19,5	16,5
10VM03	1,5		SM80HM../315 E3	1,75	5,48	3,17	46,2	41,4	39,2	36,8	34,0	30,7	26,5	21,4
10VM04	2,2		PLM90HM../322 E3	2,33	7,54	4,35	61,8	55,4	52,6	49,4	45,8	41,3	35,8	29,0
10VM05	3		PLM90HM../330 E3	2,91	10,0	5,80	77,3	69,5	66,0	62,1	57,5	51,9	45,0	36,5
10VM06	3		PLM90HM../330 E3	3,44	11,1	6,41	92,5	82,6	78,3	73,5	67,9	61,1	52,8	42,6

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

1-10vm-p-2p50-en_a_th

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

1VM..P SERIES DIMENSIONS AND WEIGHTS AT 50 HZ, 2 POLES



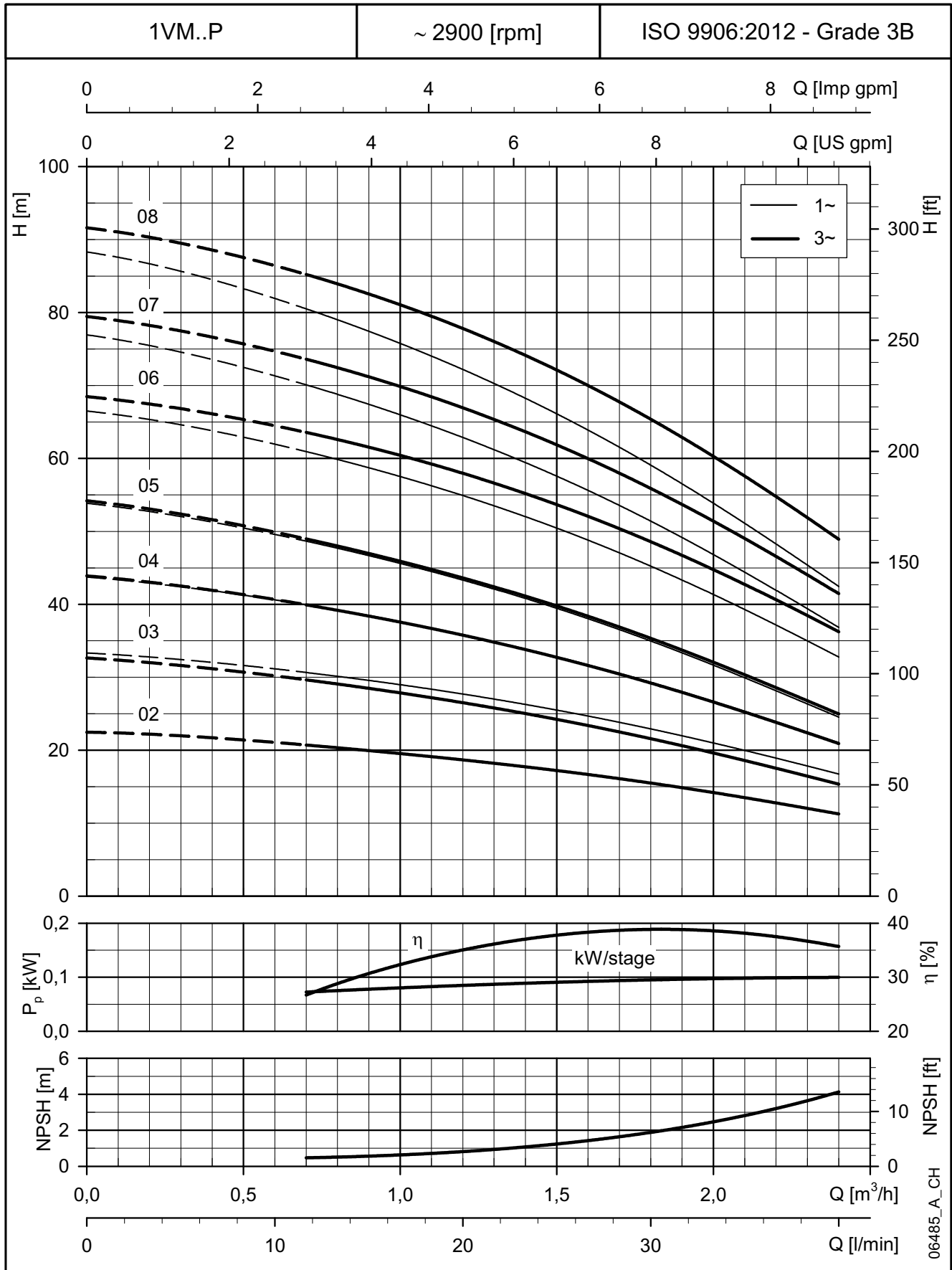
PUMP TYPE	VERSION	MOTOR		DIMENSIONS (mm)			PN bar	WEIGHT kg
		kW	SIZE	D	M	L		
1VM03	SINGLE-PHASE	0,50	63	120	111	379	10	12
1VM04		0,50	63	120	111	399	10	13
1VM05		0,50	63	120	111	419	10	13
1VM06		0,75	71	140	121	453	10	15
1VM07		0,75	71	140	121	473	10	16
1VM08		0,95	71	140	130	493	10	17

1VM02	THREE-PHASE	0,30	63	120	111	379	10	11
1VM03		0,30	63	120	111	379	10	11
1VM04		0,40	63	120	111	399	10	12
1VM05		0,50	63	120	111	419	10	13
1VM06		0,75	80	155	129	497	10	18
1VM07		0,75	80	155	129	517	10	19
1VM08		1,1	80	155	129	537	10	20

1vm-2p50-en_a_td

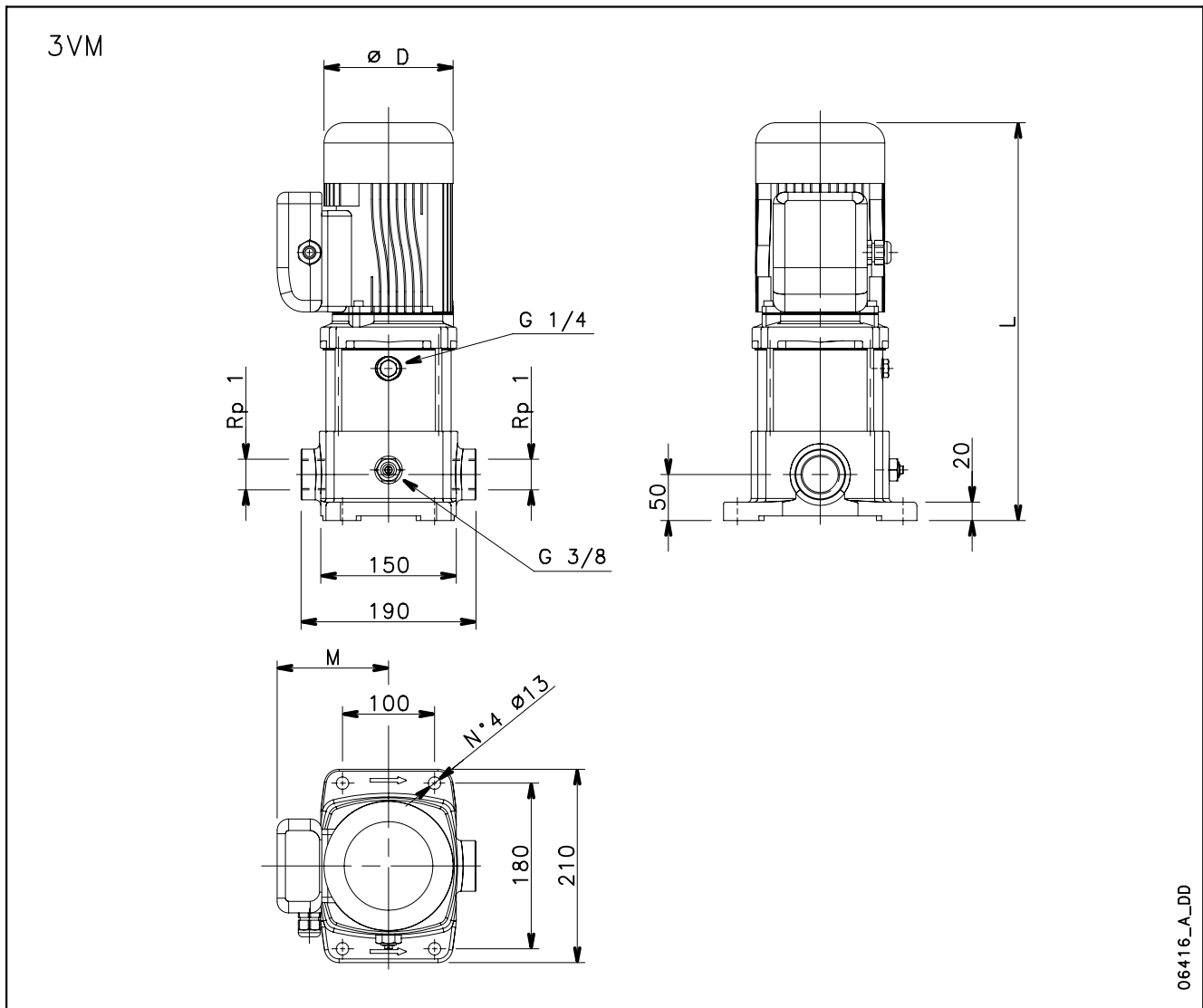
1VM..P SERIES

OPERATING CHARACTERISTICS AT 50 Hz, 2 POLES



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

3VM..P SERIES DIMENSIONS AND WEIGHTS AT 50 HZ, 2 POLES

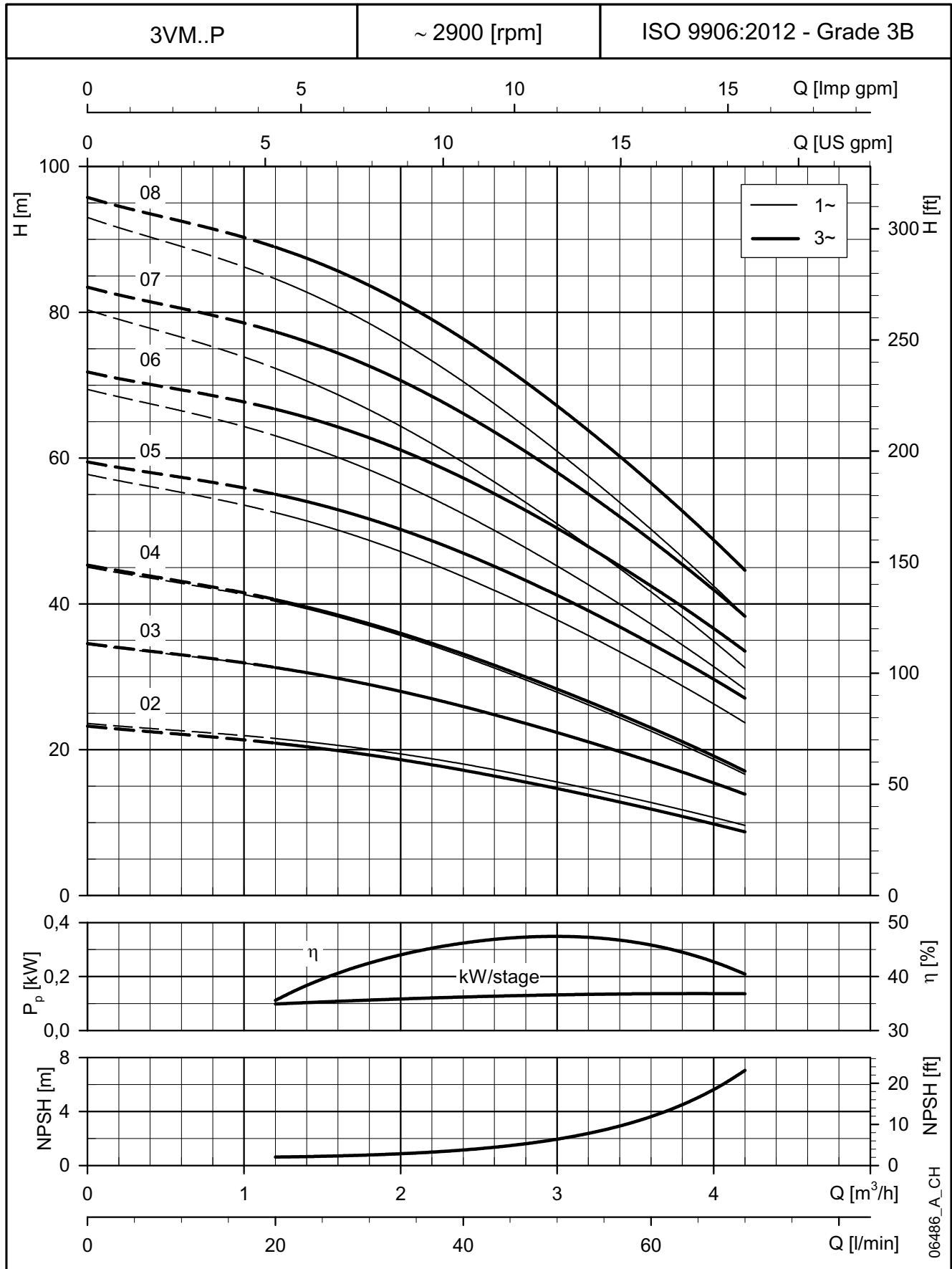


PUMP TYPE	VERSION	MOTOR		DIMENSIONS (mm)			PN bar	WEIGHT kg
		kW	SIZE	D	M	L		
3VM02	SINGLE-PHASE	0,50	63	120	111	379	10	12
3VM03		0,50	63	120	111	379	10	12
3VM04		0,50	63	120	111	399	10	13
3VM05		0,75	71	140	121	433	10	15
3VM06		0,95	71	140	130	453	10	16
3VM07		0,95	71	140	130	473	10	17
3VM08		1,1	80	155	137	537	10	20

3VM02	THREE-PHASE	0,30	63	120	111	379	10	11
3VM03		0,40	63	120	111	379	10	12
3VM04		0,50	63	120	111	399	10	13
3VM05		0,75	80	155	129	477	10	18
3VM06		1,1	80	155	129	497	10	19
3VM07		1,1	80	155	129	517	10	20
3VM08		1,5	80	155	129	537	10	21

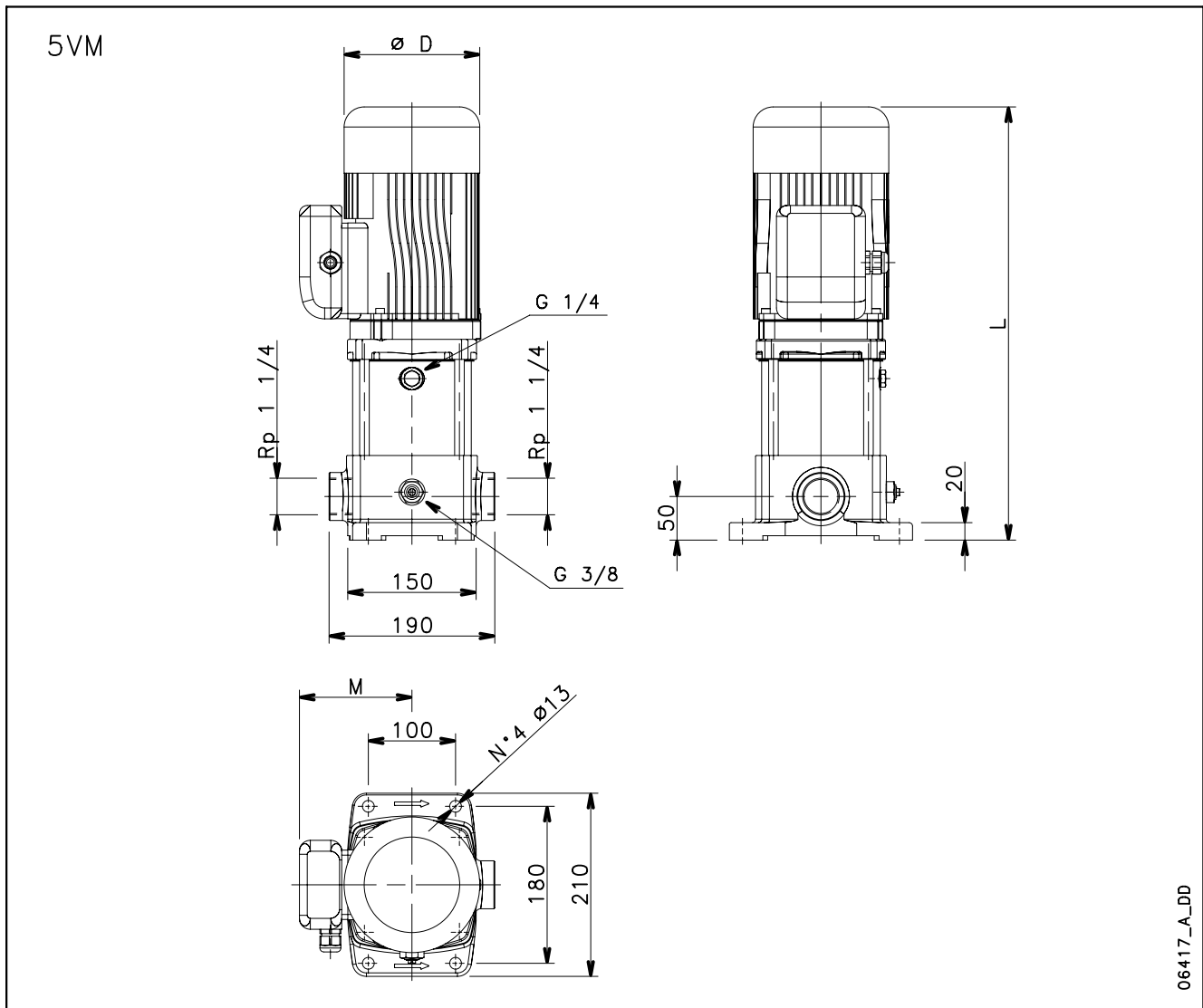
3VM..P SERIES

OPERATING CHARACTERISTICS AT 50 Hz, 2 POLES



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

5VM..P SERIES DIMENSIONS AND WEIGHTS AT 50 HZ, 2 POLES



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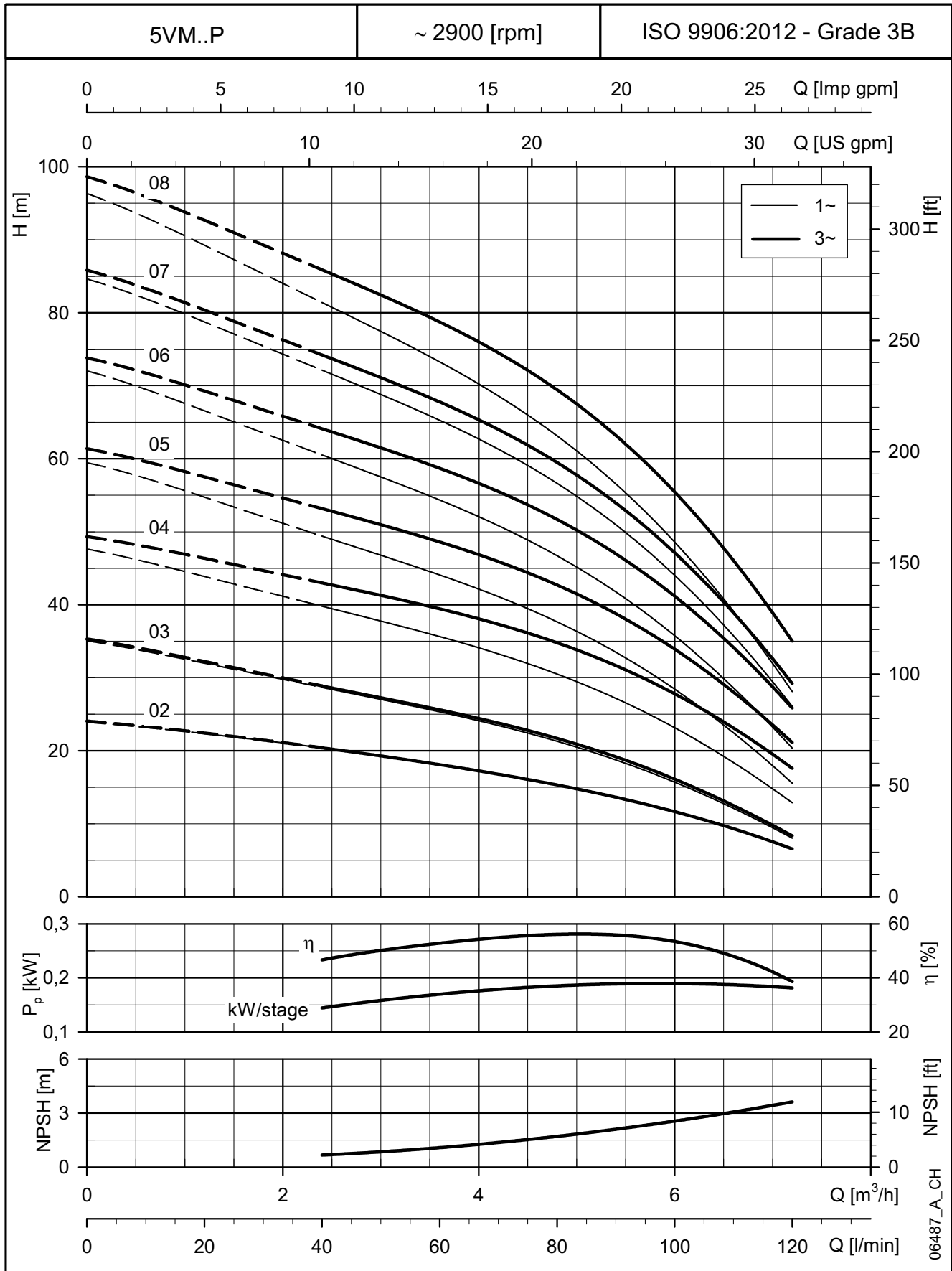
PUMP TYPE	VERSION	MOTOR		DIMENSIONS (mm)			PN bar	WEIGHT kg
		kW	SIZE	D	M	L		
5VM02	SINGLE-PHASE	0,50	63	120	111	379	10	12
5VM03		0,50	63	120	111	379	10	12
5VM04		0,75	71	140	121	413	10	15
5VM05		0,95	71	140	130	433	10	16
5VM06		1,1	80	155	137	497	10	19
5VM07		1,5	80	155	137	517	10	21
5VM08		1,5	80	155	137	537	10	21

5VM02	THREE-PHASE	0,40	63	120	111	379	10	12
5VM03		0,50	63	120	111	379	10	12
5VM04		1,1	80	155	129	457	10	19
5VM05		1,1	80	155	129	477	10	19
5VM06		1,5	80	155	129	497	10	20
5VM07		1,5	80	155	129	517	10	21
5VM08		2,2	90	174	134	593	10	26

5vm-2p50-en_a_td

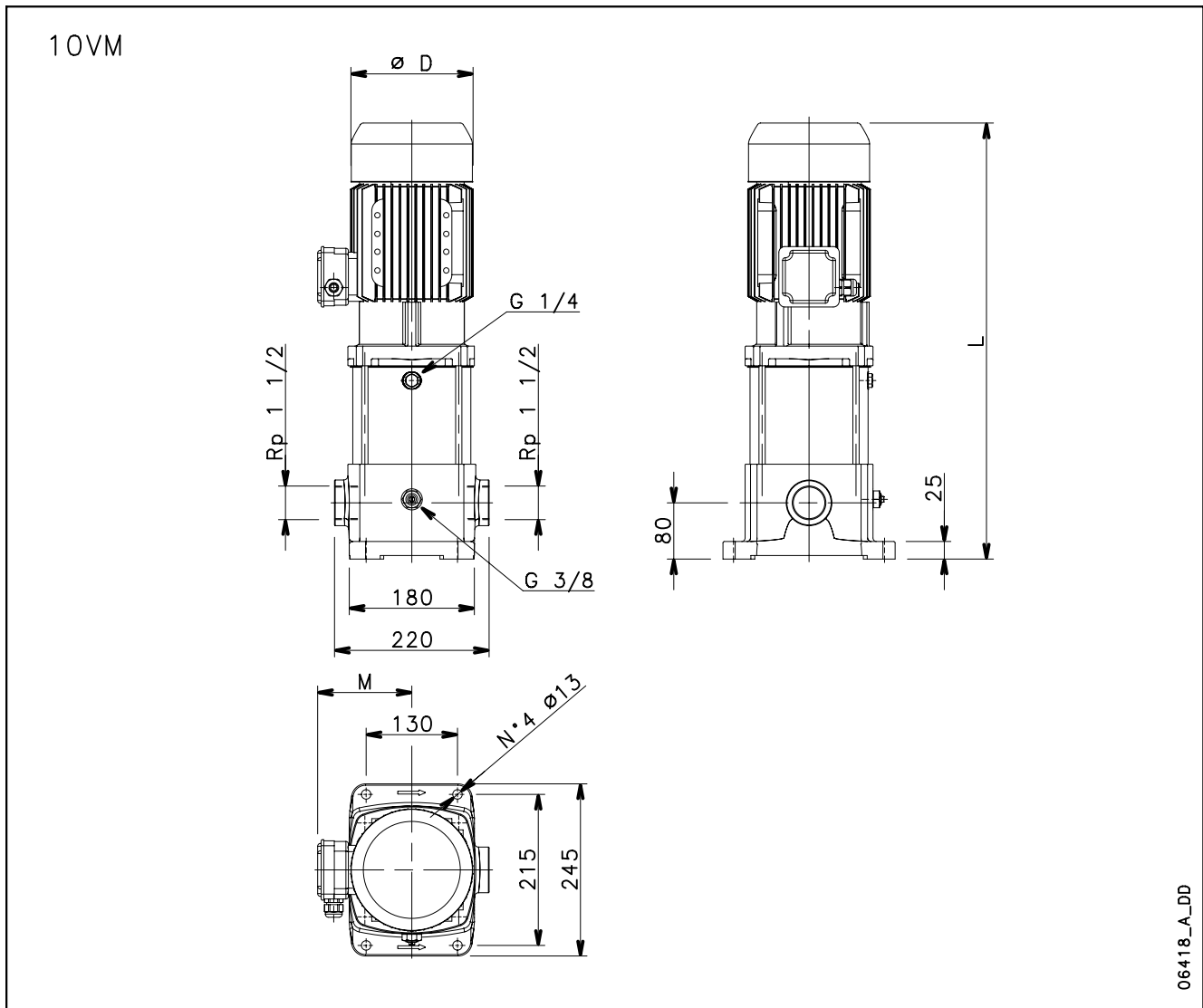
5VM..P SERIES

OPERATING CHARACTERISTICS AT 50 Hz, 2 POLES



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

10VM..P SERIES DIMENSIONS AND WEIGHTS AT 50 HZ, 2 POLES

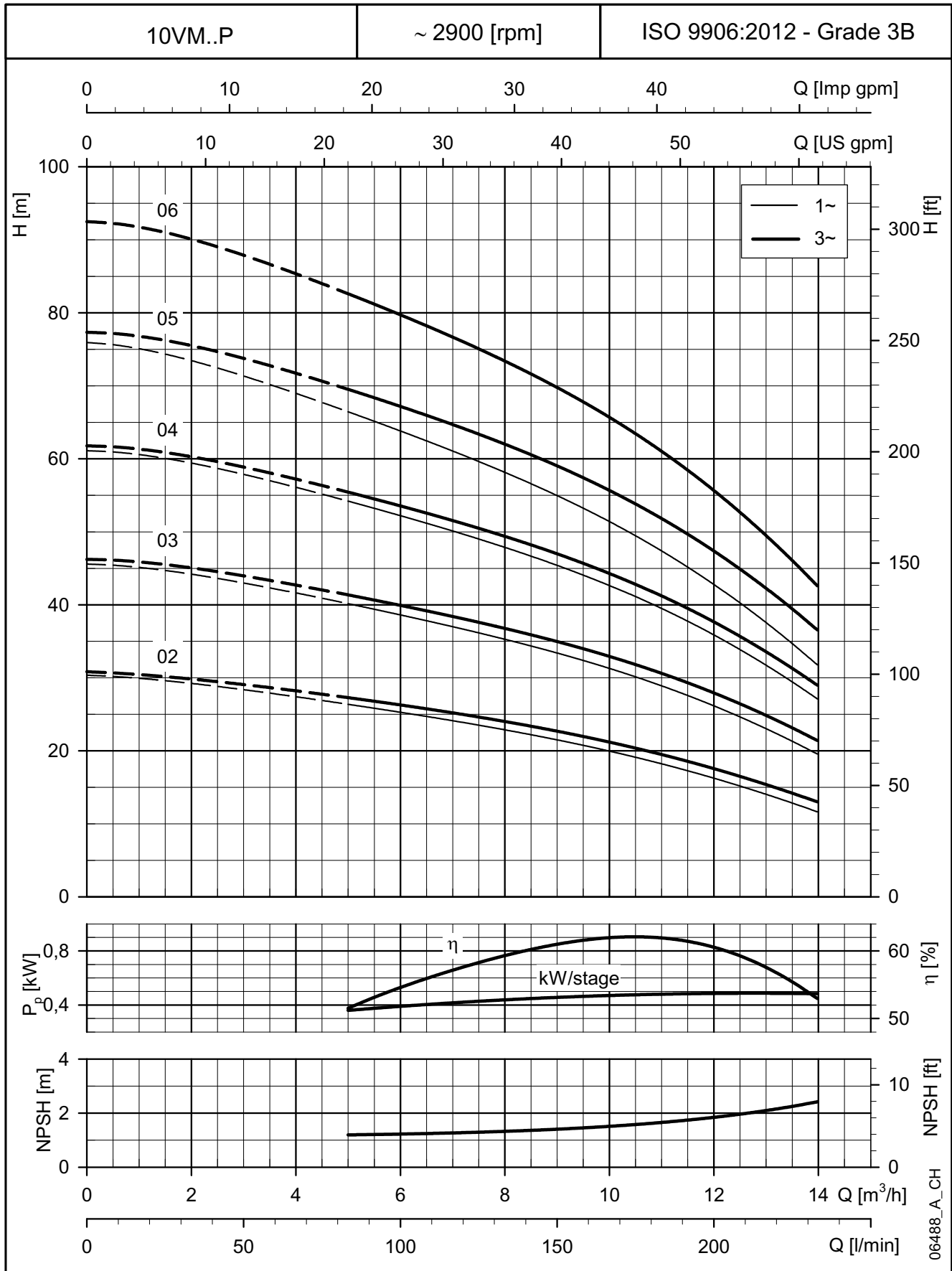


PUMP TYPE	VERSION	MOTOR		DIMENSIONS (mm)			PN bar	WEIGHT kg
		kW	SIZE	D	M	L		
10VM02	SINGLE-PHASE	1,1	80	155	137	501	10	23
10VM03		1,5	80	155	137	533	10	25
10VM04		2,2	90	174	159	621	10	34
10VM05		2,2	90	174	159	653	10	35

10VM02	THREE-PHASE	1,1	80	155	129	501	10	23
10VM03		1,5	80	155	129	533	10	25
10VM04		2,2	90	174	134	621	10	31
10VM05		3	90	174	134	653	10	35
10VM06		3	90	174	134	685	10	36

10VM..P SERIES

OPERATING CHARACTERISTICS AT 50 Hz, 2 POLES



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

VM WITH VARIABLE FREQUENCY DRIVE

ECODESIGN DIRECTIVE (ErP)

The Ecodesign directive was put in place in 2011 and introduced minimum requirements for the efficiency of **AC motors and pumps**. Over the last few years, these requirements have been gradually intensified.

Motors are classified based on their mode of operation. Fixed speed motors are classified according to IEC 60034-30-1 and the minimum acceptable level of efficiency is IE3 since January 2017 for 0.75 to 375 kW rated powers 3 phase motors, according to the Directive 2009/125/EC.

Variable speed motors (not covered in IEC 60034-30-1), which are not designed to operate direct on-line, are classified according to the technical specification IEC/TS 60034-30-2. This Technical Specification introduced the “ultra-premium” **IE5 efficiency performance**, the best efficiency existing level for this kind of motors.

In 2014, with the standard EN 50598, there was a switch in the definition of efficiency class from an individual component approach towards an overall system one; which is the basic point for the “Extended product approach” (EPA).

Taking this concept further, the EN50598-2 introduced IES efficiency classes for frequency converters + motor systems (known as power drive systems-PDS) with power rating **from 0.12 kW to 1000kW and from 100V to 1000V**. For Power Drive System (PDS) the defined efficiency classes are IES0, IES1, IES2. If a PDS has 20% greater losses than the reference value of IES1 then it is classified as IES0; if it has 20% lower losses than the reference value of IES1 then it is classified as IES2.

With the eSM drive, which powers an IE5 permanent magnet motor, the system surpasses the highest IES class – IES2.



The VM pump series is therefore already ready for the 2020 EU Ecodesign energy efficiency objectives.

VME

Version with drive and permanent magnet motor (e-SM Drive)

VME VM SMART SERIES

Background and context

In every sector, from construction and industry to agriculture and building services the need for intelligent, compact and high-efficiency pumping systems is constantly growing. That's why Lowara has developed the VM series: an integrated intelligent pumping system with electronically driven, permanent magnet motor (IE5 efficiency level). The integrated control system, combined with the high performance, power and efficiency from the motor and hydraulics, guarantees impressively low operating costs. You also benefit from flexibility, precision and its ultra-compact size.

Savings

The electronics and permanent magnet motor are highly efficient and minimize power losses while transferring maximum energy to the hydraulic parts of the pump. The refined control system with integrated microprocessor adjusts the motor speed, matching the required operating point of the pump or system requirements. This reduces demand on electricity according to the required working conditions. This creates economies, especially in systems where pump demand varies over time.

Flexibility

The compact size, low loss and increased control make the VM Smart series a good choice in applications and systems where fixed speed pumps are commonly used. The VM Smart series is easy to integrate in control and regulation loops thanks to the wide availability of compatible communication protocols, including analog and digital inputs. The pump is supplied with a pressure sensor.

Ease of use and commissioning

VM Smart has an intuitive interface that guides the user through the installation, and a practical area to assist with connections. The control system is integrated and no additional external electrical panel is required.

Application sectors

- Water supply systems in residential buildings
- Air conditioning
- Water treatment plants
- Industrial installations



e-SM System

- 230V +/- 10% single phase power supply, 50/60 Hz
- Power up to 1,5 kW
- Protection class IP55
- Can be linked up to 3 VM Smart pumps

Pump

- Flow rate: up to 17 m³/h
- Head: up to 100 m
- Environment temperature: -20°C to + 50°C with no performance derating
- Temperature of pumped liquid: up to + 90°C for single-phase motor versions
- Maximum operating pressure 10 bar (PN 10)
- The hydraulic performances meet the tolerances specified in ISO 9906:2012

Motor

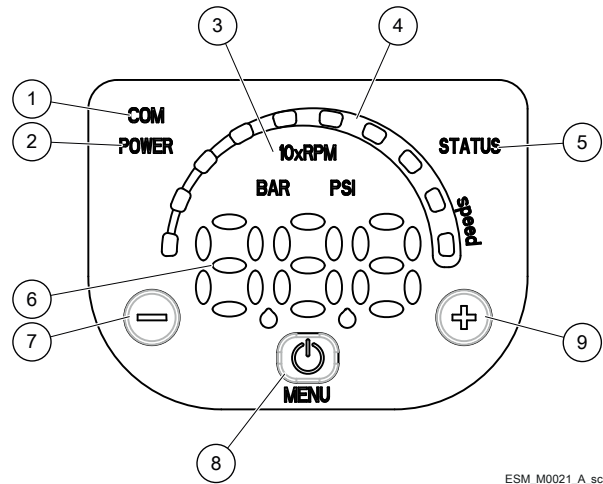
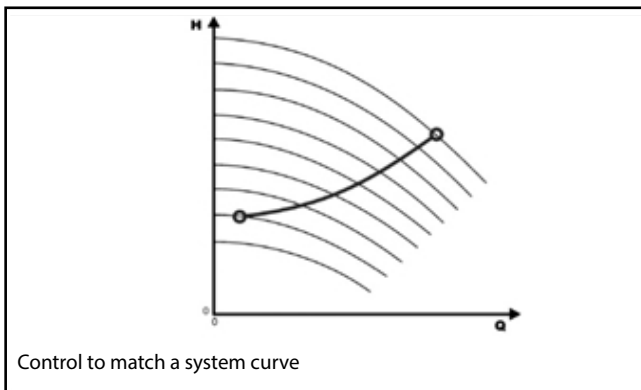
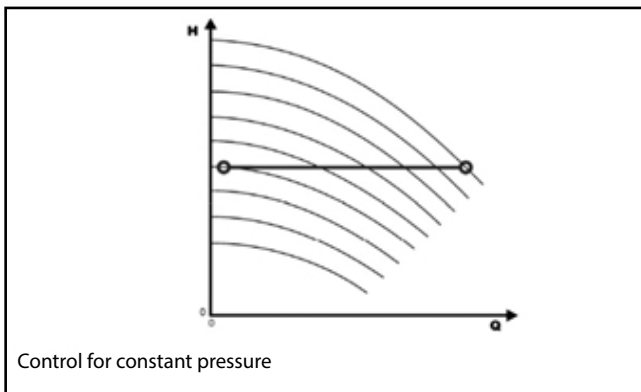
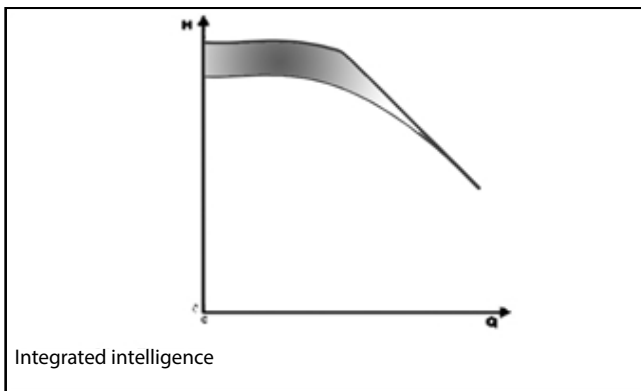
- IE5 efficiency level (IEC TS 60034-30-3:2016)
- Synchronous electric motor with permanent magnets (TEFC), closed structure, air-cooled
- Insulation class 155 (F)
- Overload protection and locked rotor with automatic reset incorporated

VME VM SMART SERIES

VM Smart series is equipped with an intelligent control that optimizes hydraulic performance while minimizing waste.

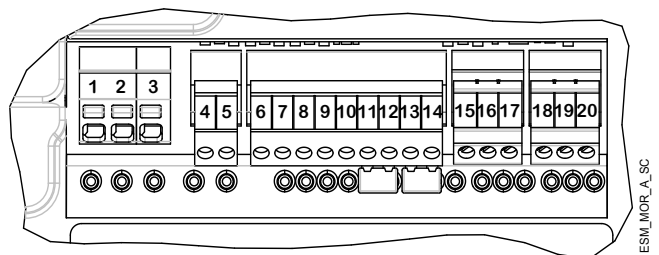
Integrated intelligence: The electronic control of the motor enables a 20% increase in performance compared to an equivalent fixed speed pump (area highlighted in figure “Integrated Intelligence”).

Adjustment: This is possible both at constant pressure and according to the characteristic curve of the system, based on the customer’s preferences. Another option is according to an external signal or at a preset speed.



Intuitive and simple interface: You can control the unit from just three buttons, with an easy to read display for parameters and alarms, designed for complete control of system operation.

- ① Communication LED
- ② Power on LED
- ③ Unit of measure LED
- ④ Speed LED bar
- ⑤ Status LED
- ⑥ Numeric display
- ⑦ \ominus Decrease key
- ⑧ ⏻ On/off and menu key
- ⑨ \oplus Increase key



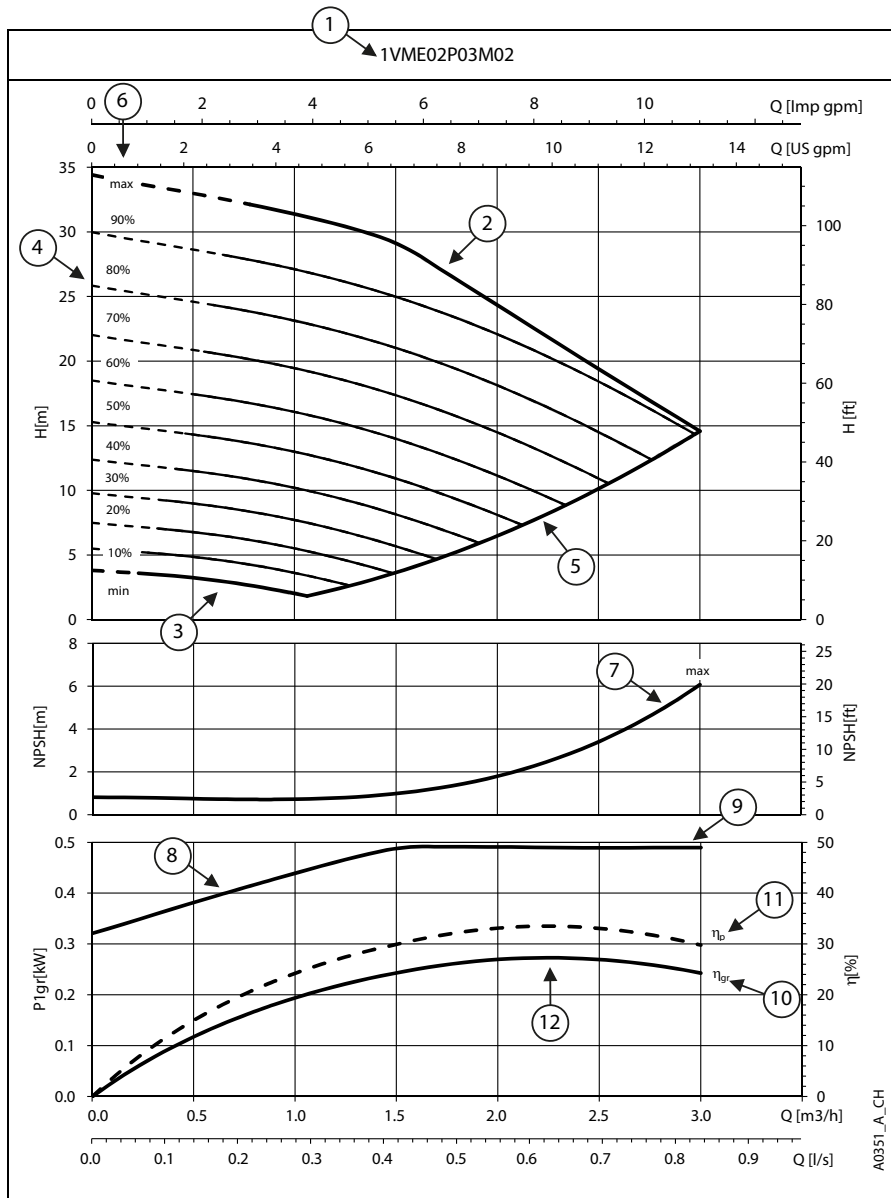
Terminal block

VM Smart has the following terminals:

- 1, 2, 3 = Power supply (\oplus , L, N)
- 4, 5 = Fault signal (NO) - (Ext $V_{max} < 250 \text{ VAC}$ - $I_{max} < 2\text{A}$)
- 6 = Auxiliary voltage supply + 15 VDC
- 7, 8 = Analog 0-10V
- 9 = Power supply external sensor + 15 VDC
- 10 = External sensor 4-20 mA input
- 11, 12 = External start/stop
- 13, 14 = External lack of water
- 15, 16, 17 = Communication bus RS485, protocol Modbus and BACnet
- 18, 19, 20 = Communication bus RS485, enabled via dedicated module

VME HOW TO READ SMART PUMP SERIES CURVES

To exploit to the maximum potential of Smart Pumps it's important to properly read working curves:



① **Pump model**

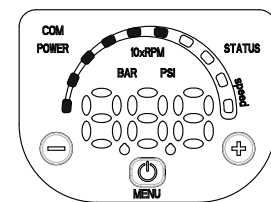
② **Maximum speed curve:** equal to 3600 rpm

③ **Minimum speed curve:** it refers to the minimum rpm level the motor can work at, it's calculated depending on the model of pump maximizing for each one the working area and allowing the highest system flexibility.

④ The **area with dotted lines** is where the pump can only operate intermittently for short periods of time.

⑤ Each **intermediate curve** between max and min speed shows the percentage of load the pump+motor+drive system is working at; it's easy to read also from the LED speed bar on the HMI keypad: at 90% there will be 9 led, at 80% there will be 8 and so on.

Example: at 60% there will be 6 lit led's



⑥ The **part load percentage** is calculated depending on maximum speed (*max*, 100%) and minimum speed (*min*, equal to 0%, which is the minimum part load step, below it the drive stays powered up but cannot work).

⑦ **NPSH**: is the net positive suction head of pump+motor+drive system working at maximum speed.

⑧ **P1_{gr}** is the power absorption in kW of pump+motor+drive system working at maximum speed.

⑨ **Load control**: the Smart Pump controls and limits power consumption at high flow/low head, in this way the motor stays protected from overload and ensure a longer life of pump+motor+drive system.

⑩ **η_{gr}** is the efficiency of pump+motor+drive system working at maximum speed.

⑪ **η_p** is the efficiency of the hydraulic part, working at maximum speed.

⑫ **Working point**: it's important to make sure the pump is working at the best working point, the one at highest efficiency.

It's easy to find it: it's the highest point of the η_p pump efficiency curve; once you found it, you can learn also flow values from x-axis called Q and head values from y-axis called H which allow the system to work at the best working point.

1, 3, 5, 10VME SERIES HYDRAULIC PERFORMANCE TABLE

PUMP TYPE VME Single-phase	MOTOR		e-SM SET		Q = DELIVERY							
	P _N kW	TYPE 1x230 V	* P ₁ kW	* I 208-240 V A	l/min 0	6,7	13,3	20,0	26,7	33,3	40,0	50,0
					m ³ /h 0	0,4	0,8	1,2	1,6	2,0	2,4	3,0
H = TOTAL HEAD IN METRES OF COLUMN OF WATER												
1VME02P03M02	0,37	ESM80/103 HM..	0,49	2,24	34,4	33,3	32,1	30,6	28,3	24,4	20,4	14,6
1VME04P05M02	0,55	ESM80/105 HM..	0,69	3,07	57,5	55,3	53,1	50,4	46,7	39,3	32,0	21,9
1VME05P07M02	0,75	ESM80/107 HM..	0,91	4,04	80,8	78,0	75,0	71,7	63,0	53,5	44,1	30,8
1VME06P11M02	1,1	ESM80/111 HM..	1,33	5,85	99,8	96,3	92,8	88,5	83,2	76,1	65,5	47,9

PUMP TYPE VME Single-phase	MOTOR		e-SM SET		Q = DELIVERY							
	P _N kW	TYPE 1x230 V	* P ₁ kW	* I 208-240 V A	l/min 0	13,3	26,7	40,0	53,3	66,7	80,0	86,7
					m ³ /h 0	0,8	1,6	2,4	3,2	4,0	4,8	5,2
H = TOTAL HEAD IN METRES OF COLUMN OF WATER												
3VME02P03M02	0,37	ESM80/103 HM..	0,49	2,24	35,5	34,3	31,2	25,0	19,5	14,5	9,8	7,5
3VME03P05M02	0,55	ESM80/105 HM..	0,69	3,07	53,2	51,3	47,1	37,9	29,8	22,7	16,1	12,4
3VME04P07M02	0,75	ESM80/107 HM..	0,91	4,06	70,9	68,3	63,9	51,6	40,6	31,1	22,3	17,3
3VME05P11M02	1,1	ESM80/111 HM..	1,33	5,85	88,6	85,5	82,4	74,3	59,5	46,6	34,8	28,8
3VME06P15M02	1,5	ESM80/115 HM..	1,78	7,78	100,5	96,8	93,2	86,6	77,0	64,1	49,3	42,0

PUMP TYPE VME Single-phase	MOTOR		e-SM SET		Q = DELIVERY							
	P _N kW	TYPE 1x230 V	* P ₁ kW	* I 208-240 V A	l/min 0	20,0	40,0	60,0	80,0	100,0	120,0	140,0
					m ³ /h 0	1,2	2,4	3,6	4,8	6,0	7,2	8,4
H = TOTAL HEAD IN METRES OF COLUMN OF WATER												
5VME02P05M02	0,55	ESM80/105 HM..	0,69	3,07	36,3	34,8	33,4	29,1	23,4	18,7	14,1	8,9
5VME03P07M02	0,75	ESM80/107 HM..	0,92	4,06	54,2	52,4	49,8	39,9	32,5	25,8	18,8	11,5
5VME04P11M02	1,1	ESM80/111 HM..	1,33	5,85	72,3	69,9	66,3	57,8	47,4	38,2	28,6	18,6
5VME05P15M02	1,5	ESM80/115 HM..	1,78	7,80	90,4	87,4	82,9	77,9	64,2	52,3	40,1	27,3

PUMP TYPE VME Single-phase	MOTOR		e-SM SET		Q = DELIVERY							
	P _N kW	TYPE 1x230 V	* P ₁ kW	* I 208-240 V A	l/min 0	40,0	80,0	120,0	160,0	200,0	240,0	283,3
					m ³ /h 0	2,4	4,8	7,2	9,6	12,0	14,4	17,0
H = TOTAL HEAD IN METRES OF COLUMN OF WATER												
10VME01P07M02	0,75	ESM80/107 HM..	0,91	4,04	22,6	22,2	21,2	20,0	16,6	13,5	10,4	6,8
10VME02P11M02	1,1	ESM80/111 HM..	1,34	5,86	38,0	37,2	35,4	30,7	24,7	19,2	13,4	6,7

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

1-10vme-esm-2p50-en_a_th

ELETTICAL DATA TABLE

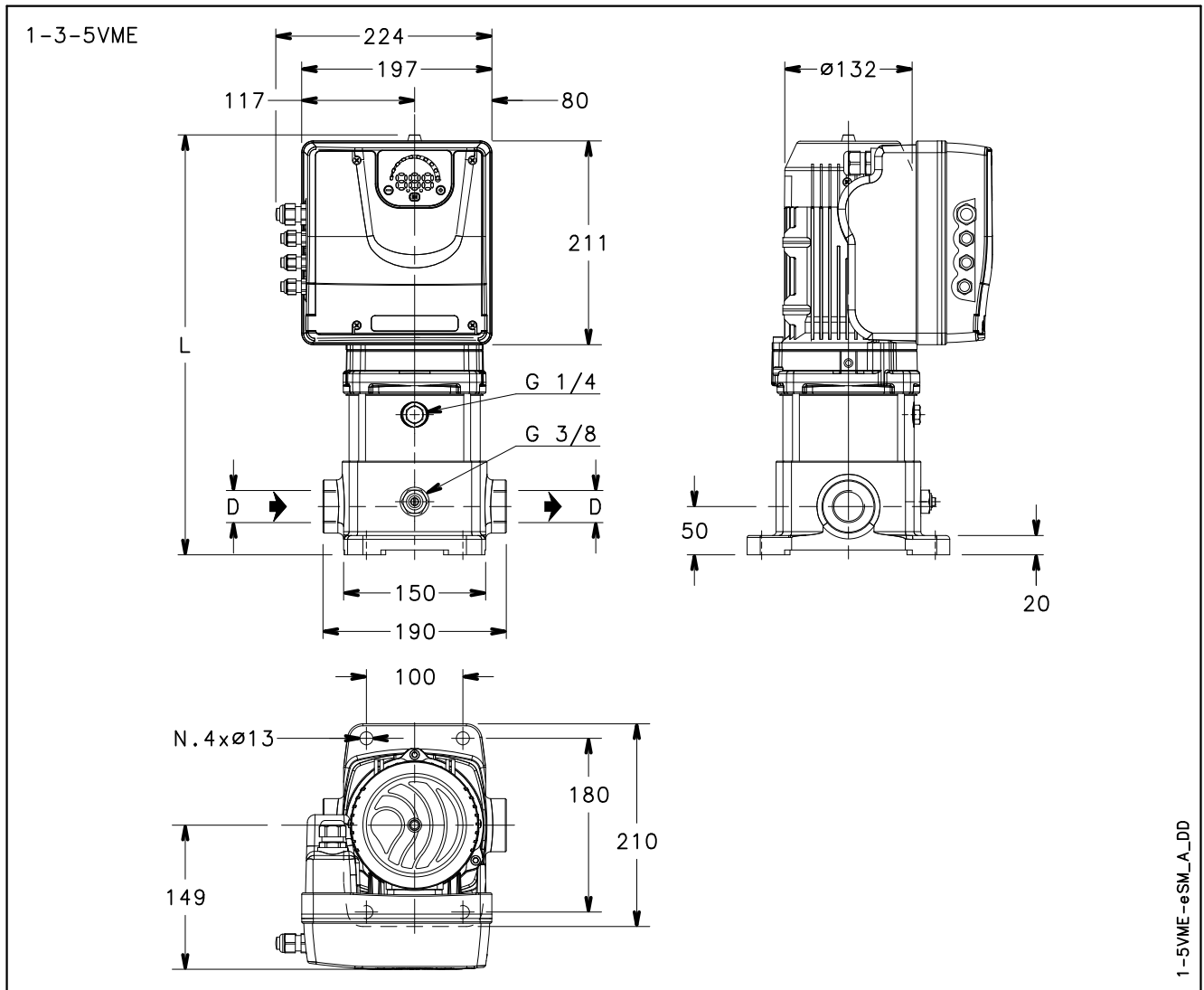
P _N kW	MOTOR TYPE	IEC SIZE	Construction Design	SPEED (RPM) min ⁻¹	INPUT CURRENT I (A) 208-240 V	DATA RELATED TO THE VOLTAGE OF 230V						IES
						In A	cosφ	Tn Nm	η % 4/4 3/4 2/4			
0,37	ESM80/103 HM..	80	SPECIAL	3000	2,28-1,99	2,08	0,95	1,18	81,3	79,1	74,3	2
				3600	2,30-2,02	2,10		0,98	80,6	77,5	72,0	
0,55	ESM80/105 HM..	80		3000	3,27-2,85	2,96	0,97	1,75	83,3	82,2	78,8	2
				3600	3,27-2,85	2,96		1,46	83,3	81,5	77,5	
0,75	ESM80/107 HM..	80		3000	4,43-3,84	4,00	0,98	2,39	83,3	83,3	81,5	2
				3600	4,38-3,79	3,94		1,99	84,5	83,5	80,6	
1,10	ESM80/111 HM..	80		3000	6,26-5,35	5,64	0,99	3,50	85,7	85,1	82,7	2
				3600	6,20-5,32	5,63		2,92	85,9	84,6	81,4	
1,50	ESM80/115 HM..	80		3000	8,57-7,32	7,69	0,99	4,77	85,6	85,7	84,7	2
				3600	8,42-7,25	7,62		3,98	86,3	85,9	84,0	

* The indicated rotational speed are representing the upper and lower limits of the rated power operational speed range.

eHM-eVM_Smart-motm_en_a_te

In the range 3000-3600 rpm the nominal motor power is guaranteed. Above 3600 rpm it isn't possible work and the motor is automatically limited; below 3000 rpm it works partially load.

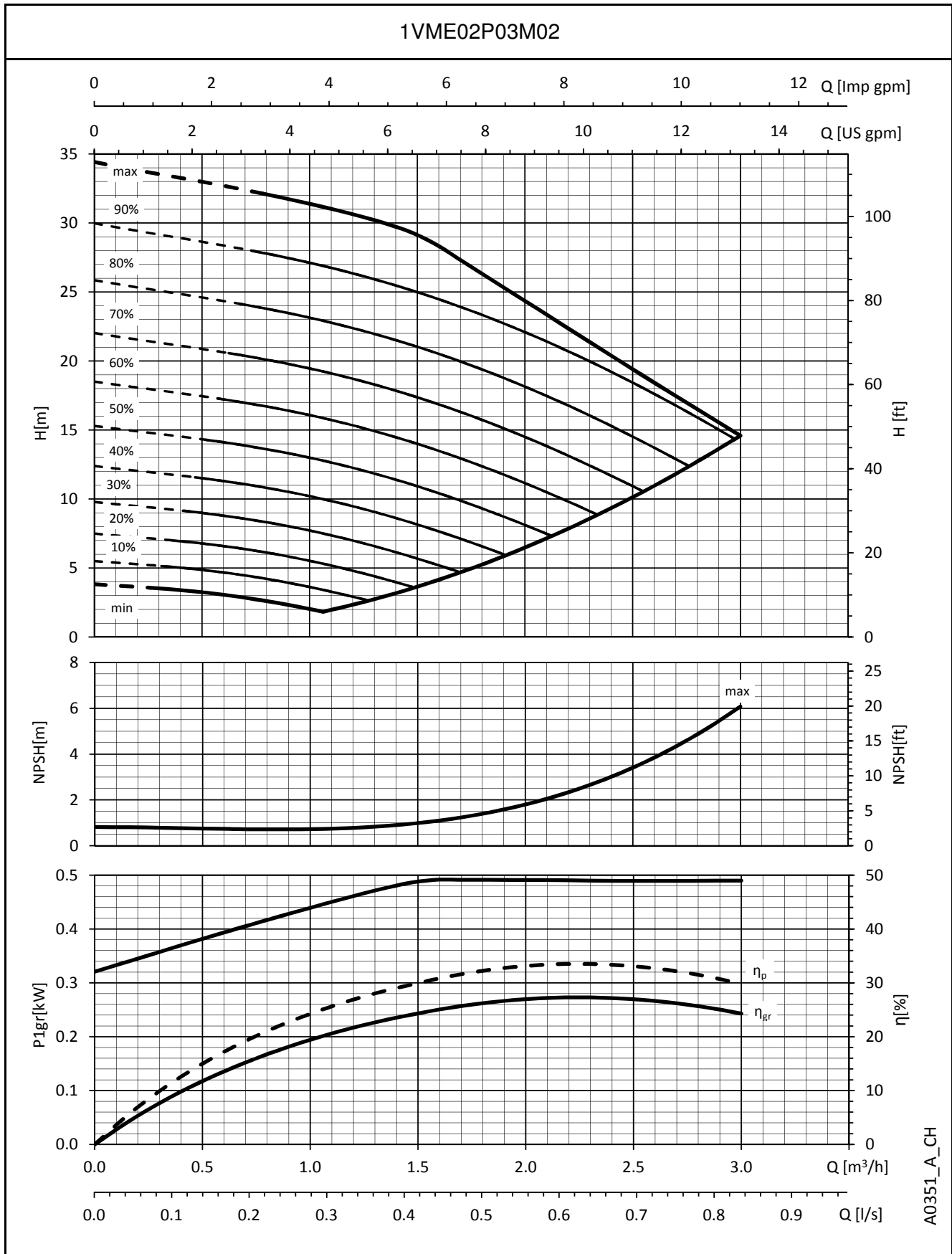
1, 3, 5VME SERIES DIMENSIONS AND WEIGHTS



PUMP TYPE	VERSION	MOTOR		DIMENSIONS (mm)		PN bar	WEIGHT kg
		kW	SIZE	D	L		
1VME02P03M02	SINGLE-PHASE	0,37	80	Rp 1	415	10	14,8
1VME04P05M02		0,55	80	Rp 1	435	10	15,3
1VME05P07M02		0,75	80	Rp 1	455	10	15,6
1VME06P11M02		1,1	80	Rp 1	475	16	17,3
3VME02P03M02		0,37	80	Rp 1	415	10	14,8
3VME03P05M02		0,55	80	Rp 1	415	10	14,9
3VME04P07M02		0,75	80	Rp 1	435	10	15,3
3VME05P11M02		1,1	80	Rp 1	455	10	17,0
3VME06P15M02		1,5	80	Rp 1	475	16	17,5
5VME02P05M02		0,55	80	Rp 1 1/4	415	10	14,8
5VME03P07M02		0,75	80	Rp 1 1/4	415	10	14,9
5VME04P11M02		1,10	80	Rp 1 1/4	435	10	16,6
5VME05P15M02		1,5	80	Rp 1 1/4	455	10	17,0

1-5vme-esm-2p50-en_a_td

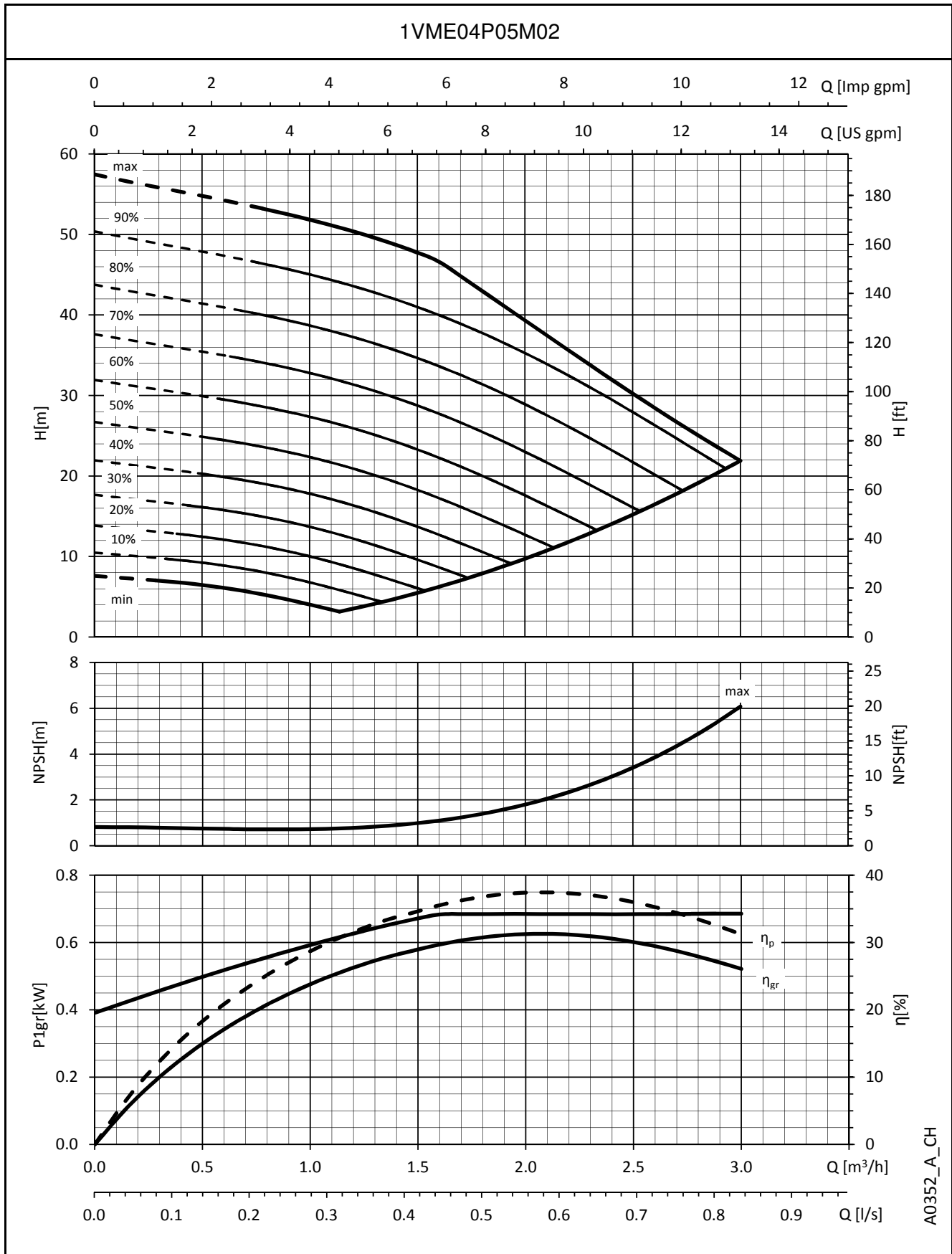
1VME SERIES OPERATING CHARACTERISTICS



A0351_A_CH

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

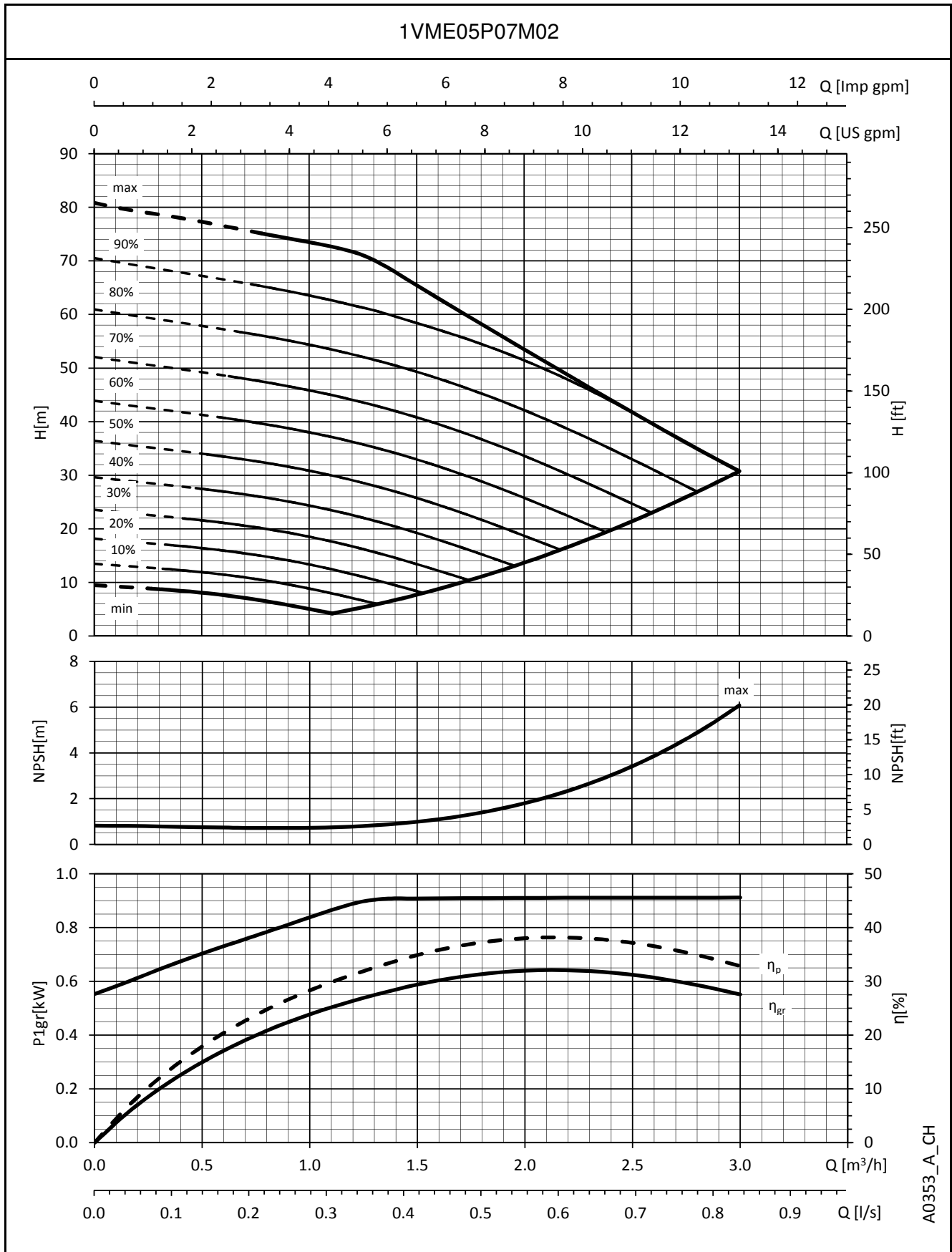
1VME SERIES OPERATING CHARACTERISTICS



A0352_A_CH

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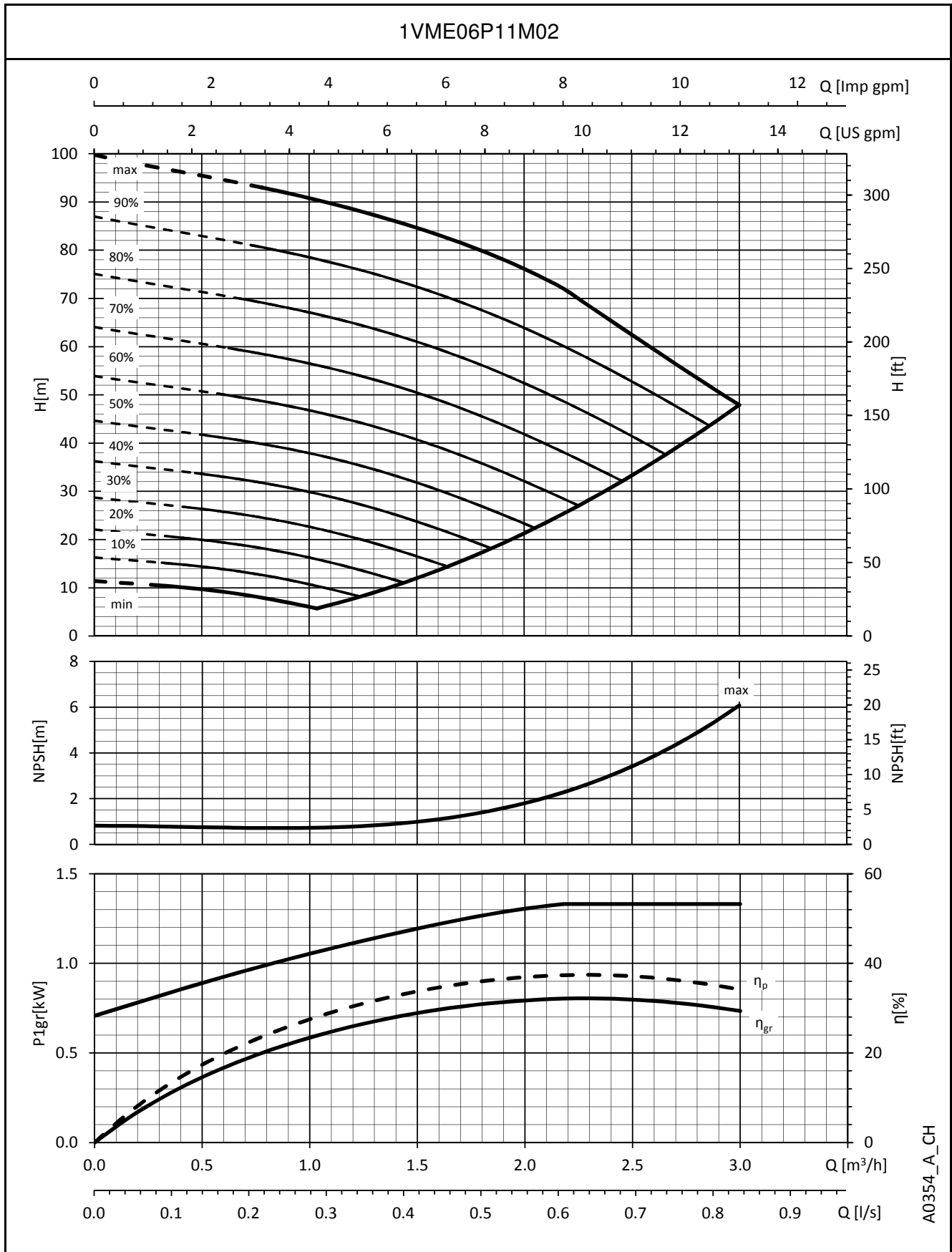
1VME SERIES OPERATING CHARACTERISTICS



A0353_A_CH

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

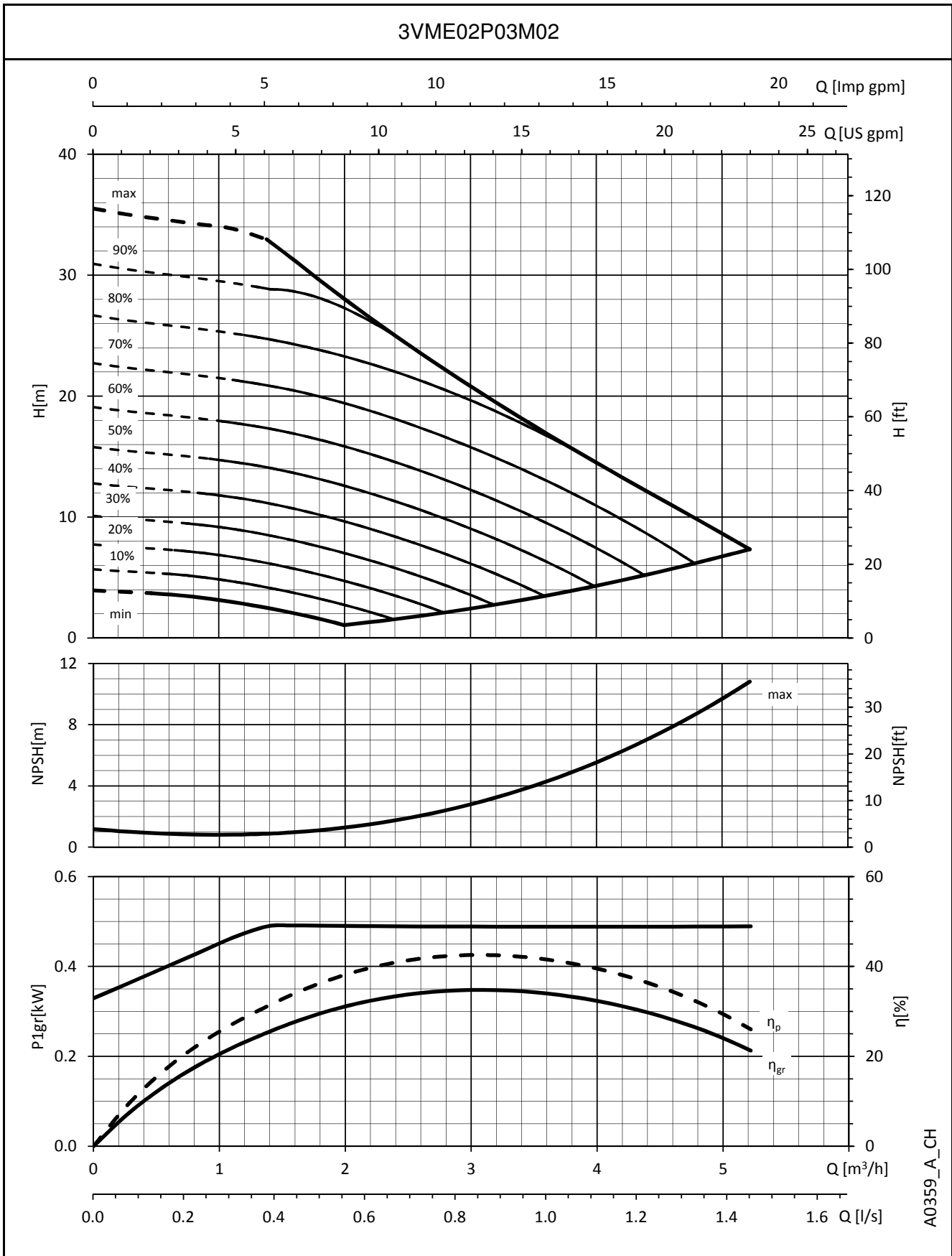
**1VME SERIES
OPERATING CHARACTERISTICS**



A0354_A_CH

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

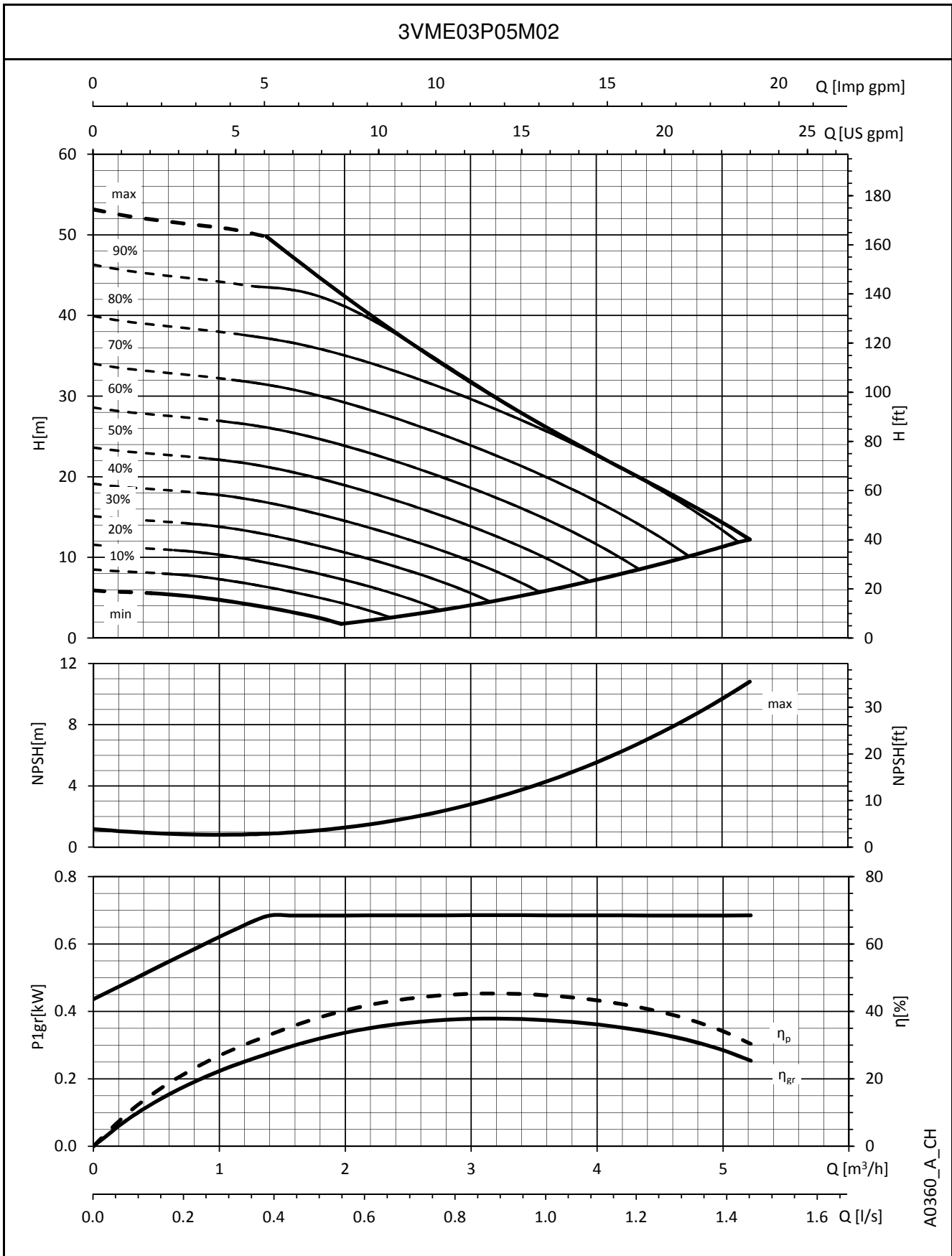
3VME SERIES OPERATING CHARACTERISTICS



A0359_A_CH

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

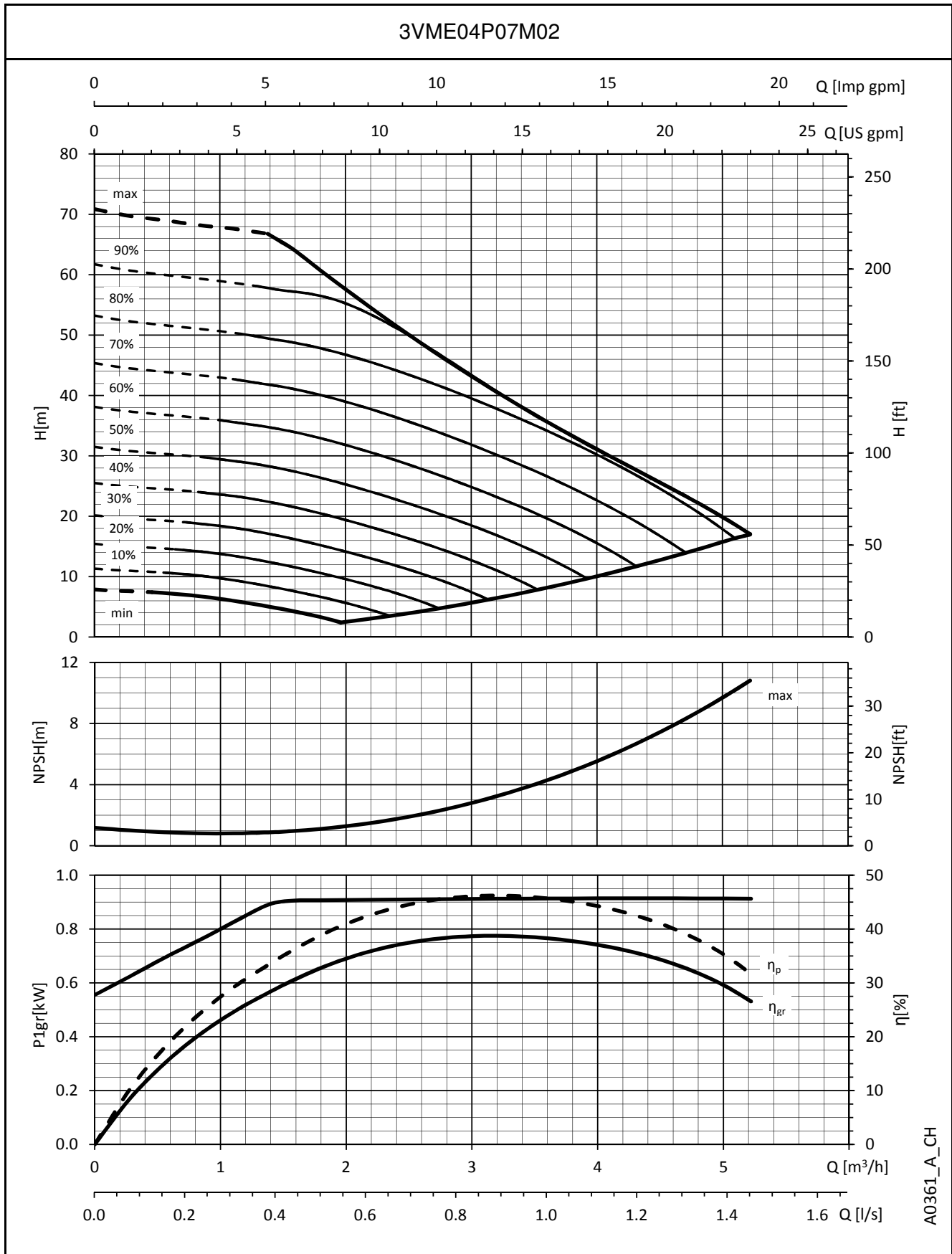
3VME SERIES OPERATING CHARACTERISTICS



A0360_A_CH

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

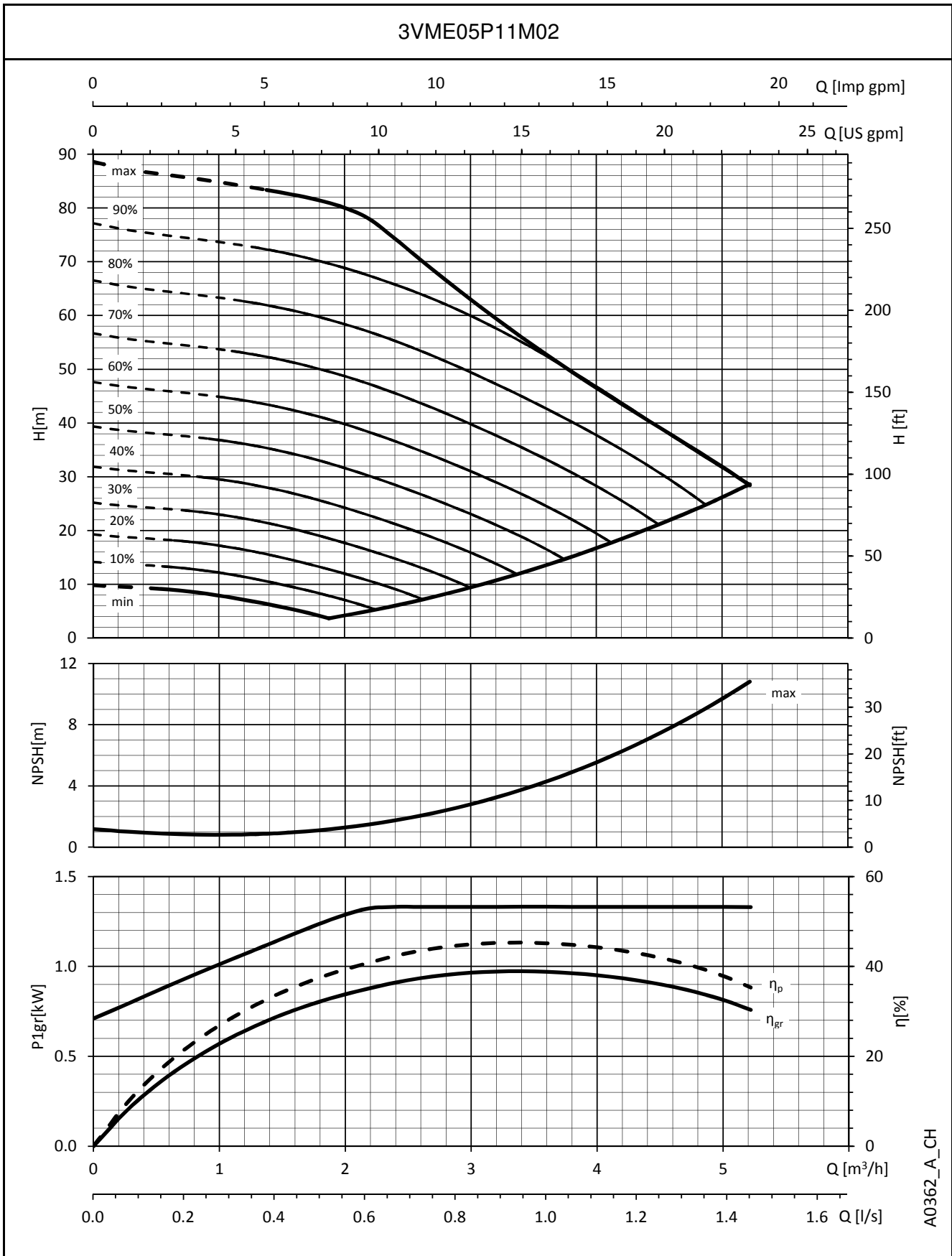
3VME SERIES OPERATING CHARACTERISTICS



A0361_A_CH

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

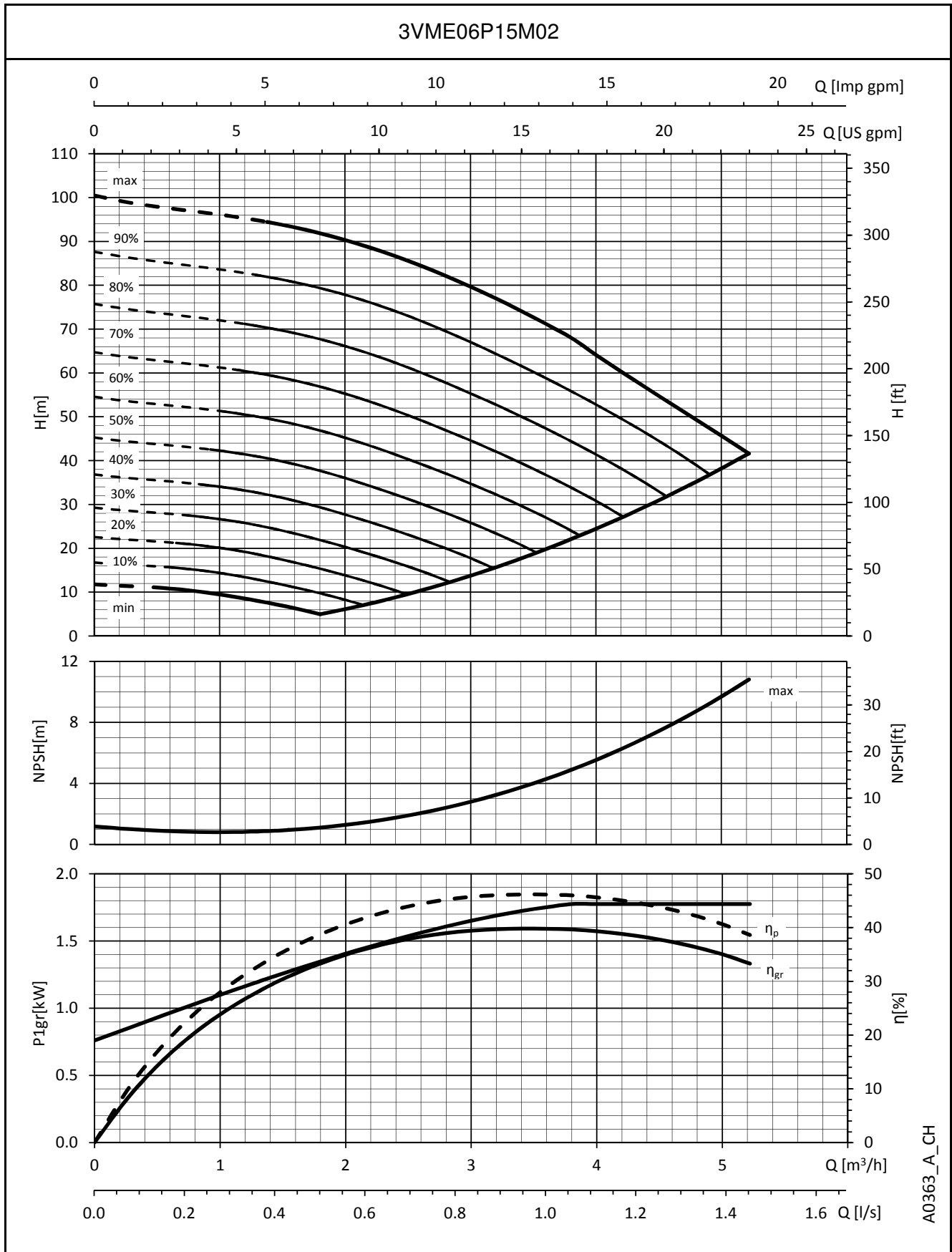
3VME SERIES OPERATING CHARACTERISTICS



A0362_A_CH

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

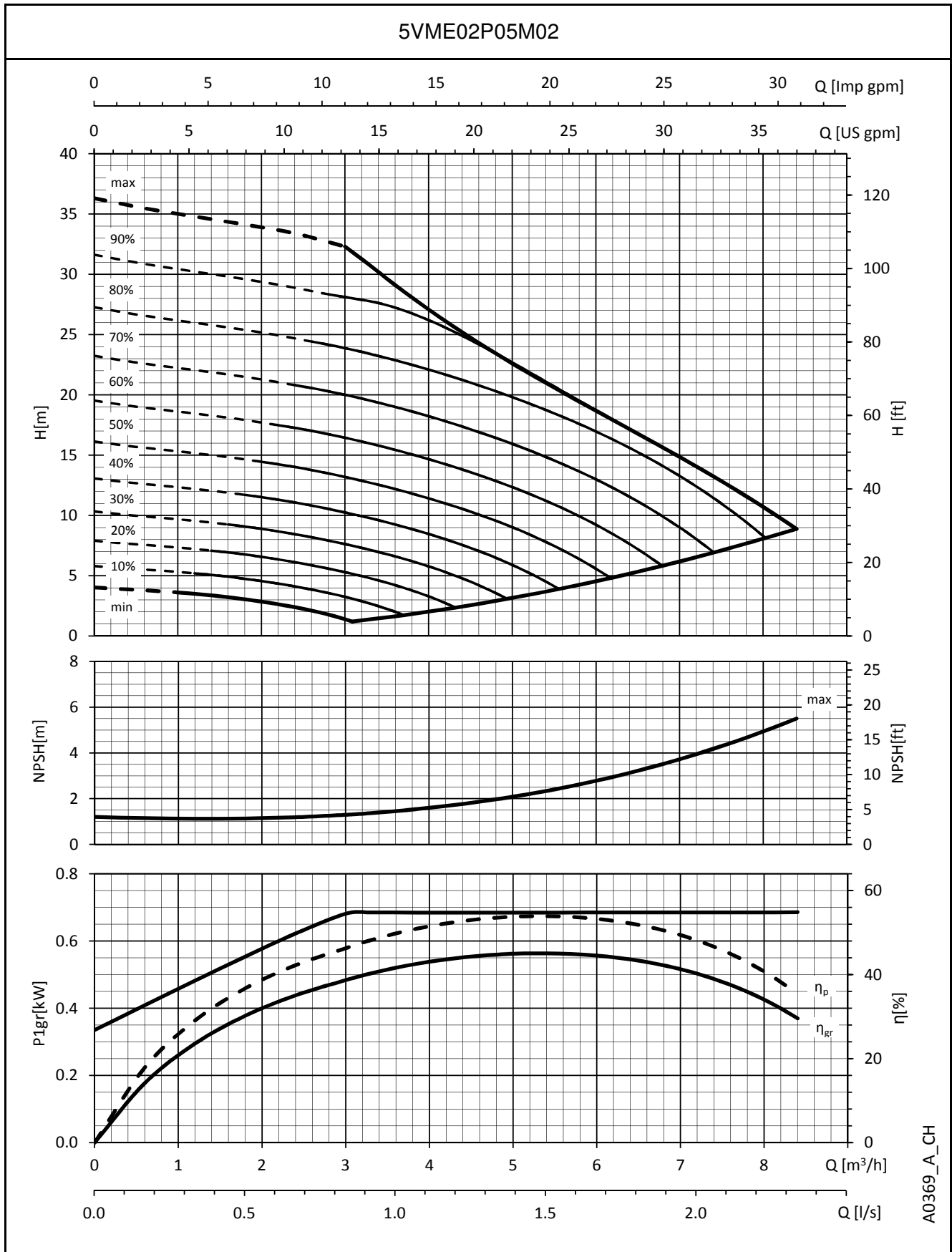
**3VME SERIES
OPERATING CHARACTERISTICS**



A0363_A_CH

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

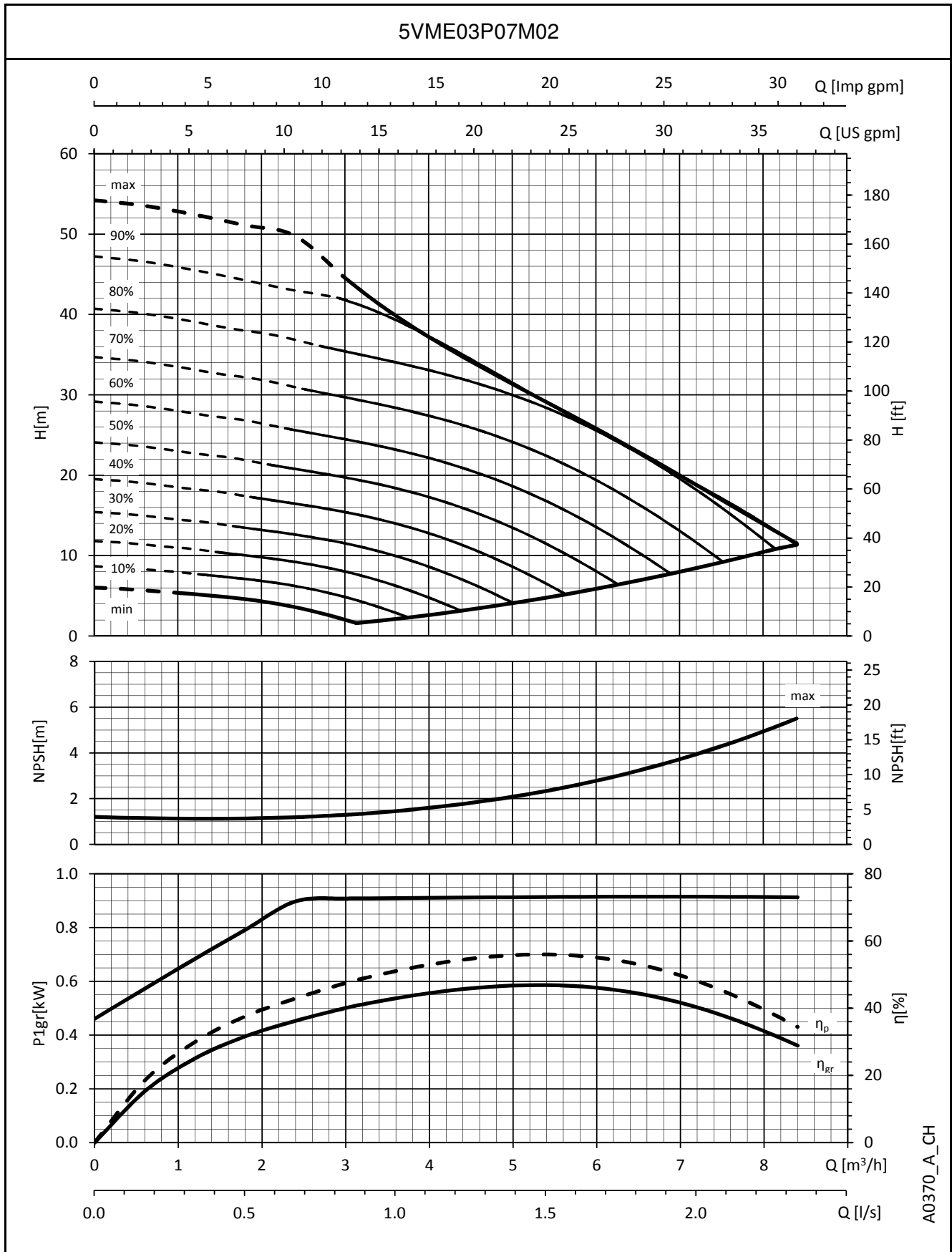
**5VME SERIES
OPERATING CHARACTERISTICS**



A0369_A_CH

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

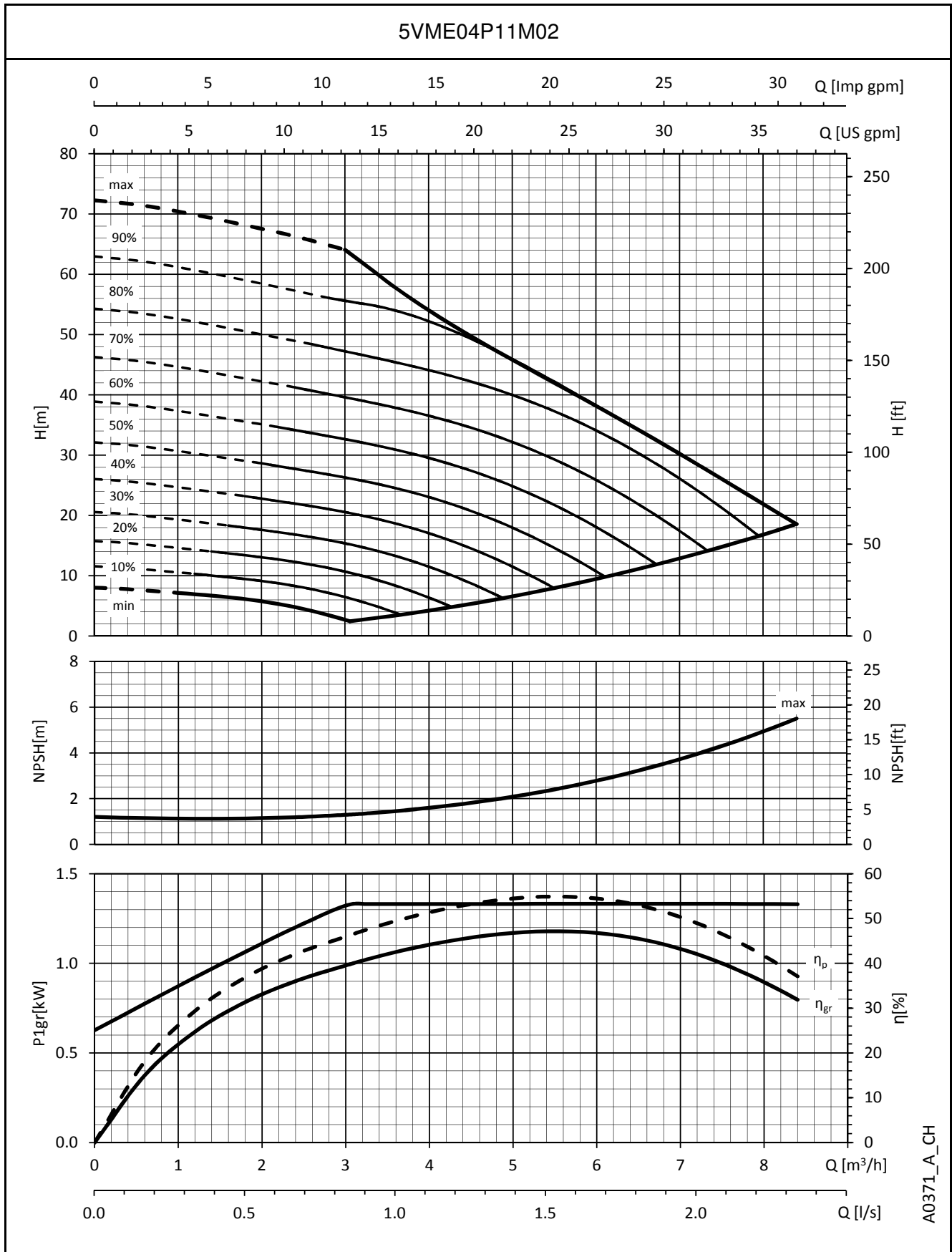
5VME SERIES OPERATING CHARACTERISTICS



A0370_A_CH

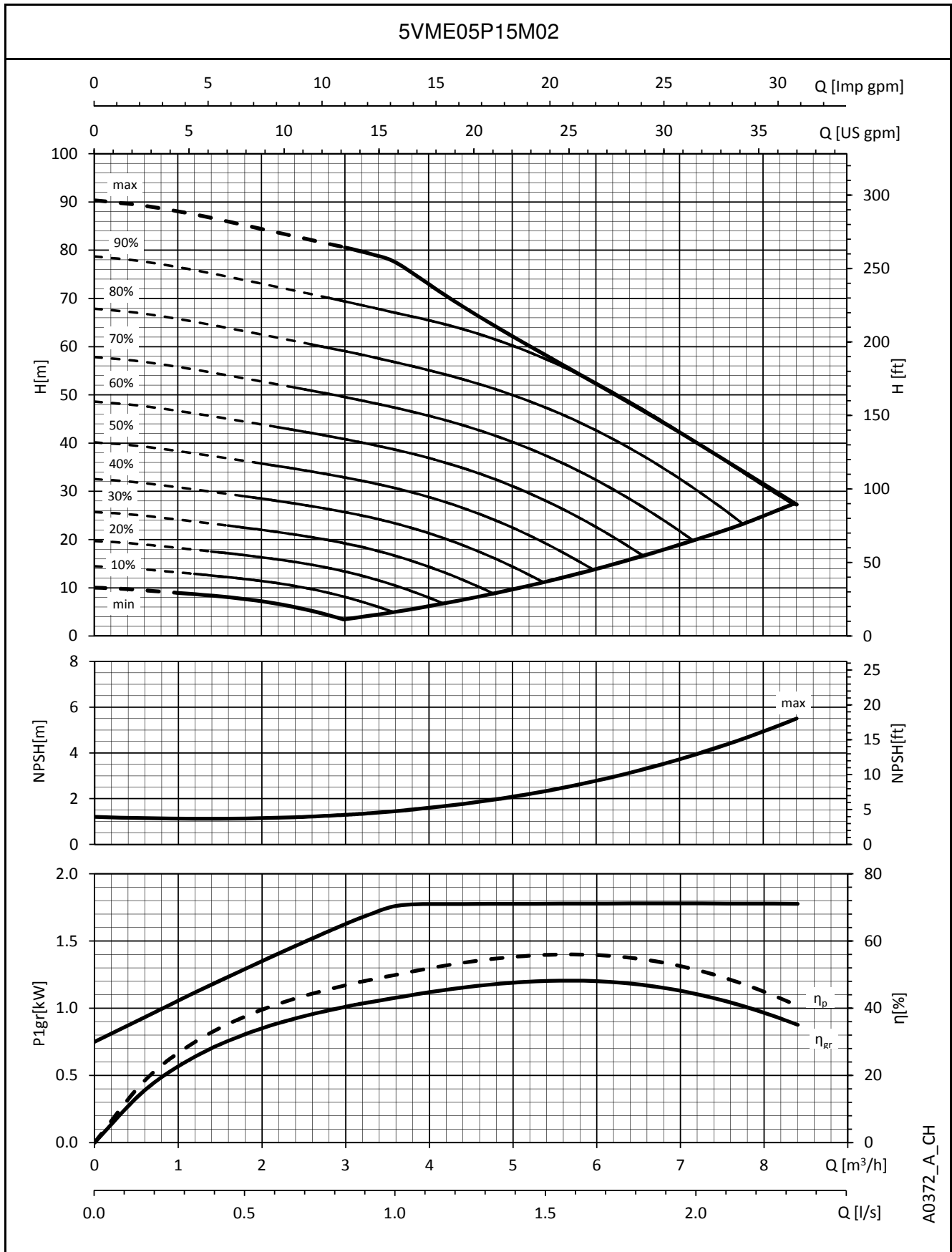
The performances are valid for liquid with density $\rho = 1 \text{ Kg/dm}^3$ and kinematic viscosity $\nu = 1 \text{ mm}^2/\text{sec}$.

**5VME SERIES
OPERATING CHARACTERISTICS**



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

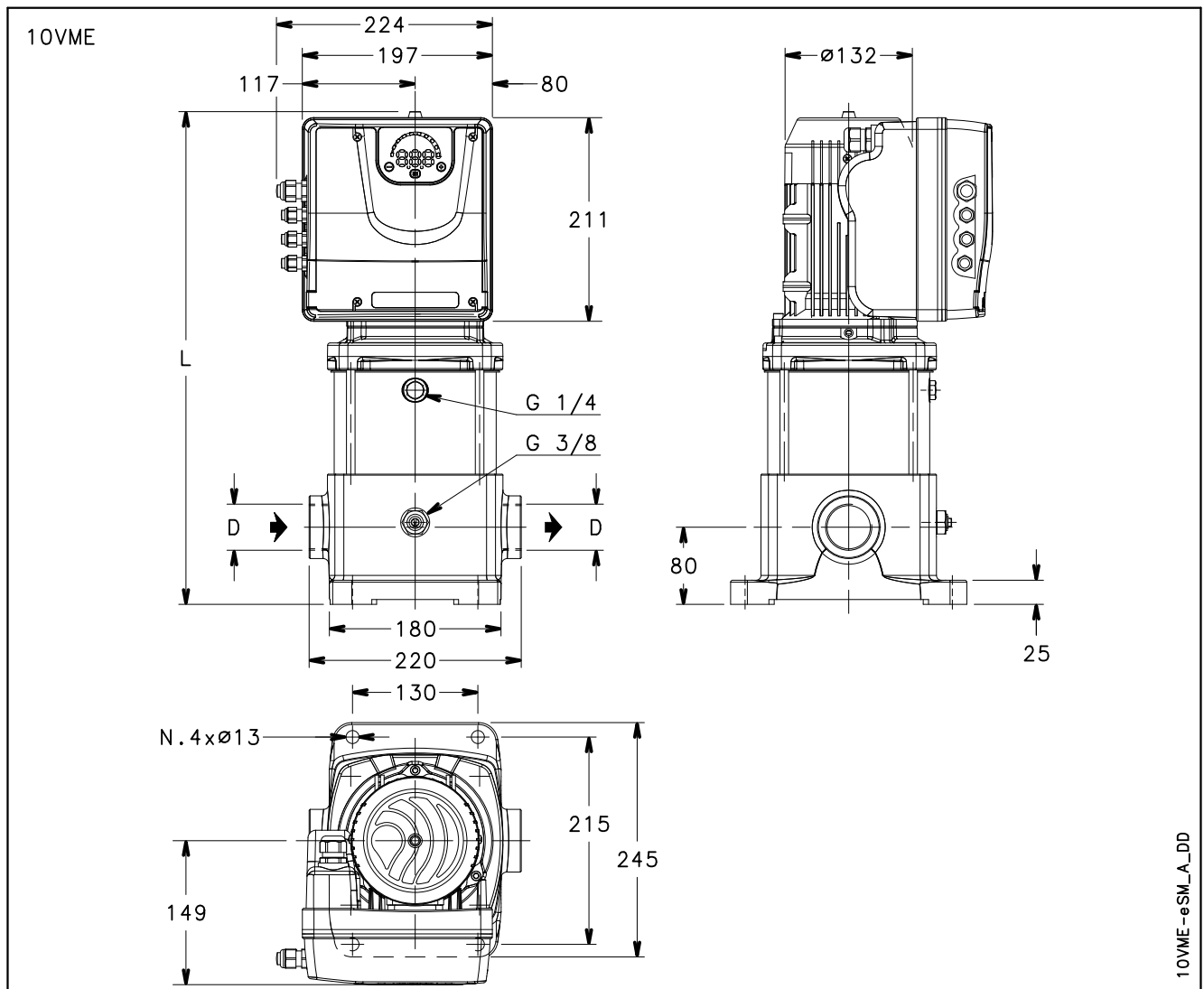
**5VME SERIES
OPERATING CHARACTERISTICS**



A0372_A_CH

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

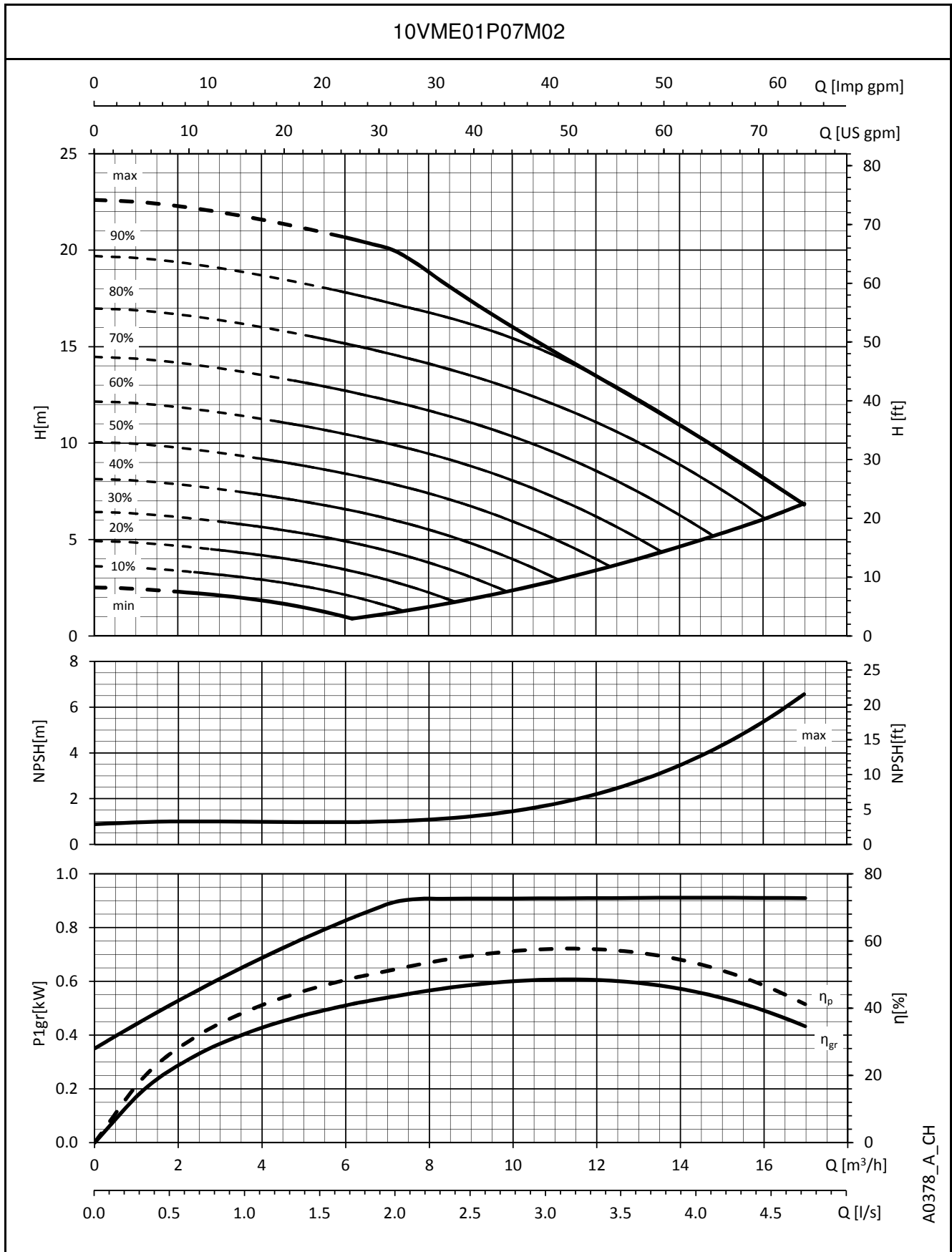
10VME SERIES DIMENSIONS AND WEIGHTS



PUMP TYPE	VERSION	MOTOR		DIMENSIONS (mm)		PN bar	WEIGHT kg
		kW	SIZE	D	L		
10VME01P07M02	SINGLE-PHASE	0,75	80	Rp 1 1/2	479	10	19,9
10VME02P11M02		1,1	80	Rp 1 1/2	479	10	21,5

10vme-esm-2p50-en_a_td

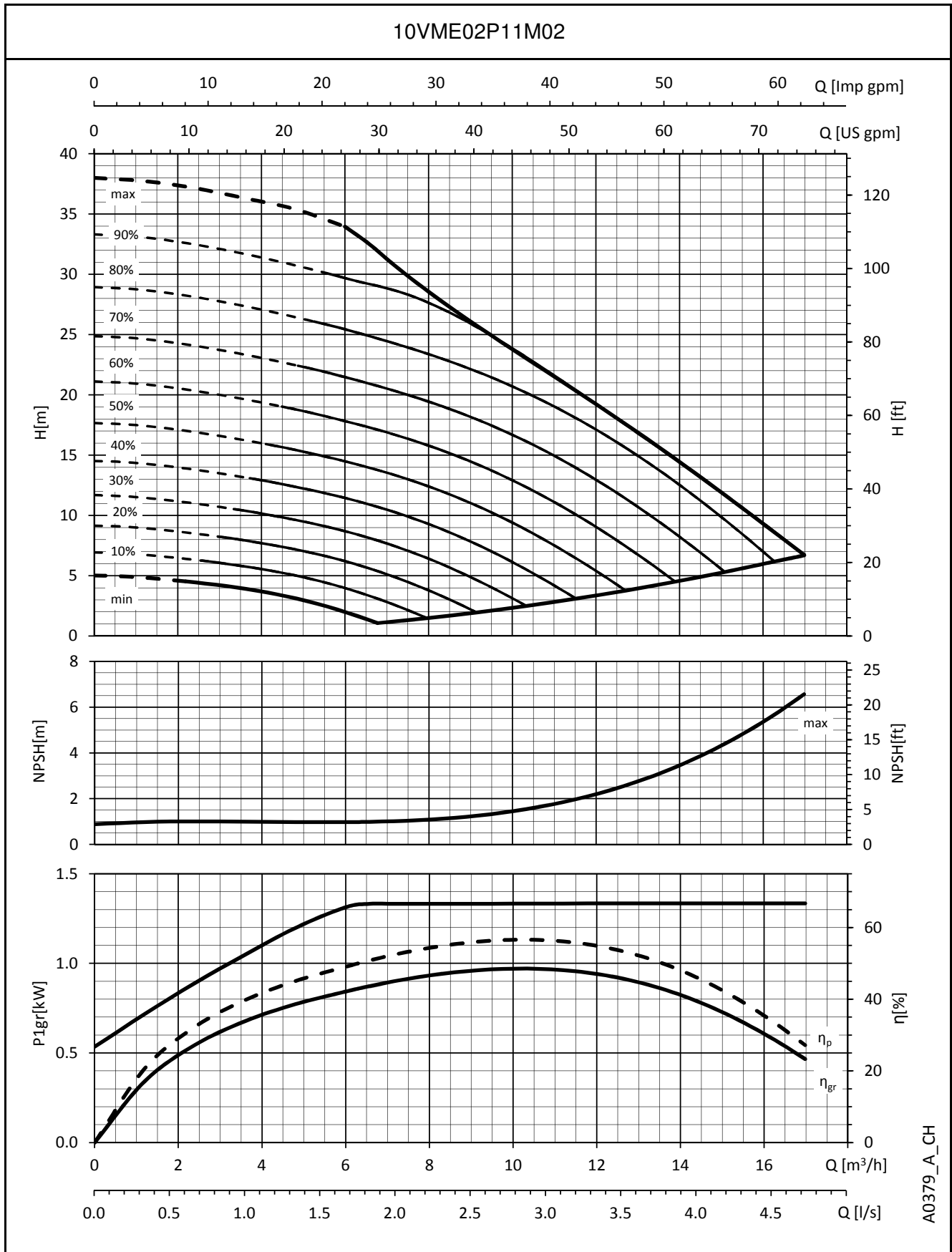
10VME SERIES OPERATING CHARACTERISTICS



A0378_A_CH

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

10VME SERIES OPERATING CHARACTERISTICS



A0379_A_CH







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

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 GLAVANISED STEEL
		002161200	SQUARE-D FYG22(2,8-7), Rp1/4" CONNECTION GLAVANISED STEEL
		002161201	SQUARE-D FYG32(5,6-10,5), Rp1/4" CONNECTION GLAVANISED STEEL
		002161336	ITALTECNICA PM/5(1-5), Rp1/4" CONNECTION GLAVANISED STEEL
		002161337	ITALTECNICA PM/12(2,5-12), Rp1/4" CONNECTION GLAVANISED STEEL
		002161338	ITALTECNICA PM/12S(1-8,5), Rp1/4" CONNECTION GLAVANISED STEEL
Pressure gauge 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

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: 1B / 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: 1B / 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.

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.

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

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

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 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: 25 m³/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 m³/h, of 2 m.

For water at 15 °C

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

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

By substituting the parameters in formula $\textcircled{1}$ 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 p_s AND ρ DENSITY OF WATER TABLE

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

G-at_npsb_sc

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 valve	-	-	-	0,2	0,2	0,2	0,4	0,4	0,6	0,9	1,1	1,3
Foot check valve	1,1	1,5	1,9	2,4	3,0	3,4	4,7	5,9	7,4	9,6	11,8	13,9
Non return valve	1,1	1,5	1,9	2,4	3,0	3,4	4,7	5,9	7,4	9,6	11,8	13,9

G-a-pcv-en_b_th

The table is valid for the Hazen Williams coefficient $C=100$ (cast iron pipework);

for steel pipework, multiply the values by 1,41;

for stainless steel, copper and coated cast iron pipework, multiply the values by 1,85;

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

The values given are guideline values which are bound to vary slightly according to the model, especially for gate valves and non-return valves, for which it is a good idea to check the values supplied by 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	1,0000	35,3147	0,5886	3,6662	4,4029
0,4719	0,0283	1,0000	0,0167	0,1038	0,1247
28,3168	1,6990	60,0000	1,0000	6,2288	7,4805
4,5461	0,2728	9,6326	0,1605	1,0000	1,2009
3,7854	0,2271	8,0208	0,1337	0,8327	1,0000

PRESSURE AND HEAD

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

LENGTH

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

VOLUME

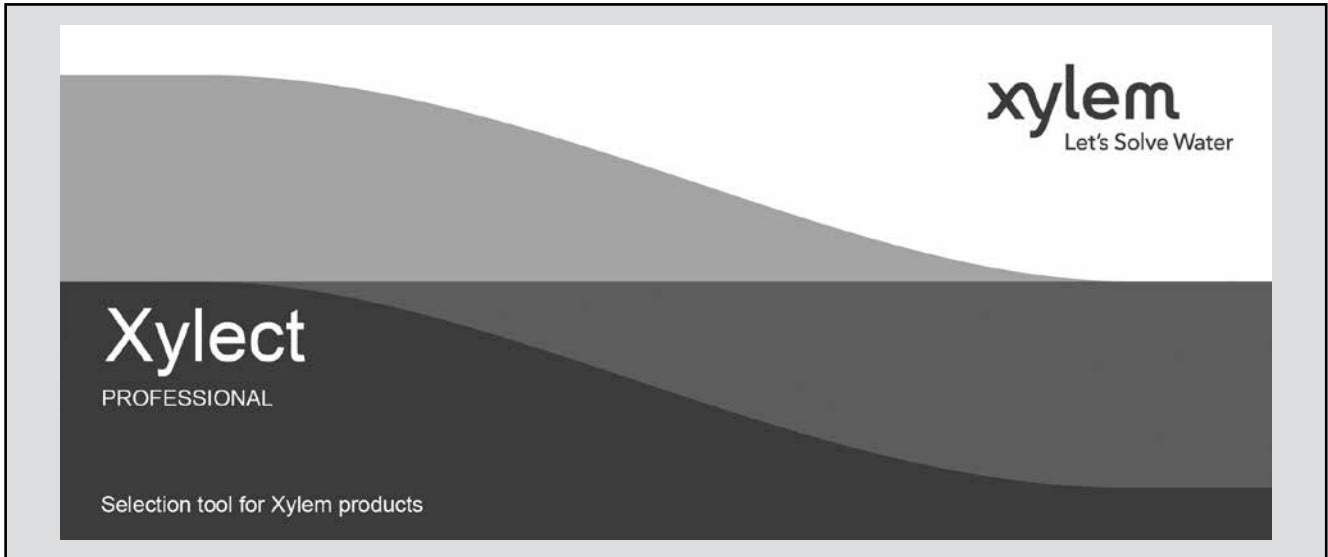
Cubic metre m ³	Litre L	Millilitre ml	Imperial gallon imp. gal.	U.S. gallon US gal.	Cubic foot ft ³
1,0000	1 000,0000	1×10^6	219,9694	264,1720	35,3147
0,0010	1,0000	1 000,0000	0,2200	0,2642	0,0353
1×10^{-6}	0,0010	1,0000	$2,2 \times 10^{-4}$	$2,642 \times 10^{-4}$	$3,53 \times 10^{-5}$
0,0045	4,5461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

TEMPERATURE

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

G-at_pp-en_b_sc

FURTHER PRODUCT SELECTION AND DOCUMENTATION Xylect™



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

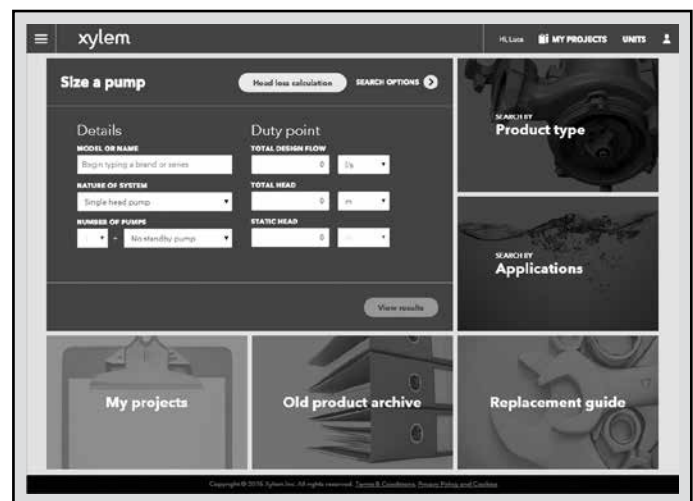
The possibility to search by applications and the detailed information output given makes it easy to make the optimal selection without having detailed knowledge about the Lowara products.

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™



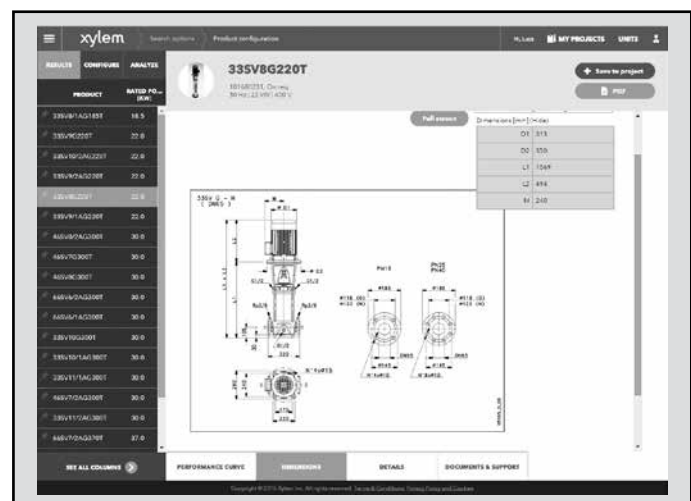
The detailed output makes it easy to select the optimal pump from the given alternatives.

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 re-used 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 www.xylem.com.



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