

**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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 **LOWARA**  
a xylem brand

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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).

## 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<sup>3</sup>/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 <sup>3</sup> /h)	2,3	3,6	6,2	11
Flow range (m <sup>3</sup> /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 $\eta$ ( % ) of pump	38	47	57	62
Standard temperature ( °C )	-30 +90			

1-10vm\_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	NOISE
kW	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<sup>3</sup>/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.

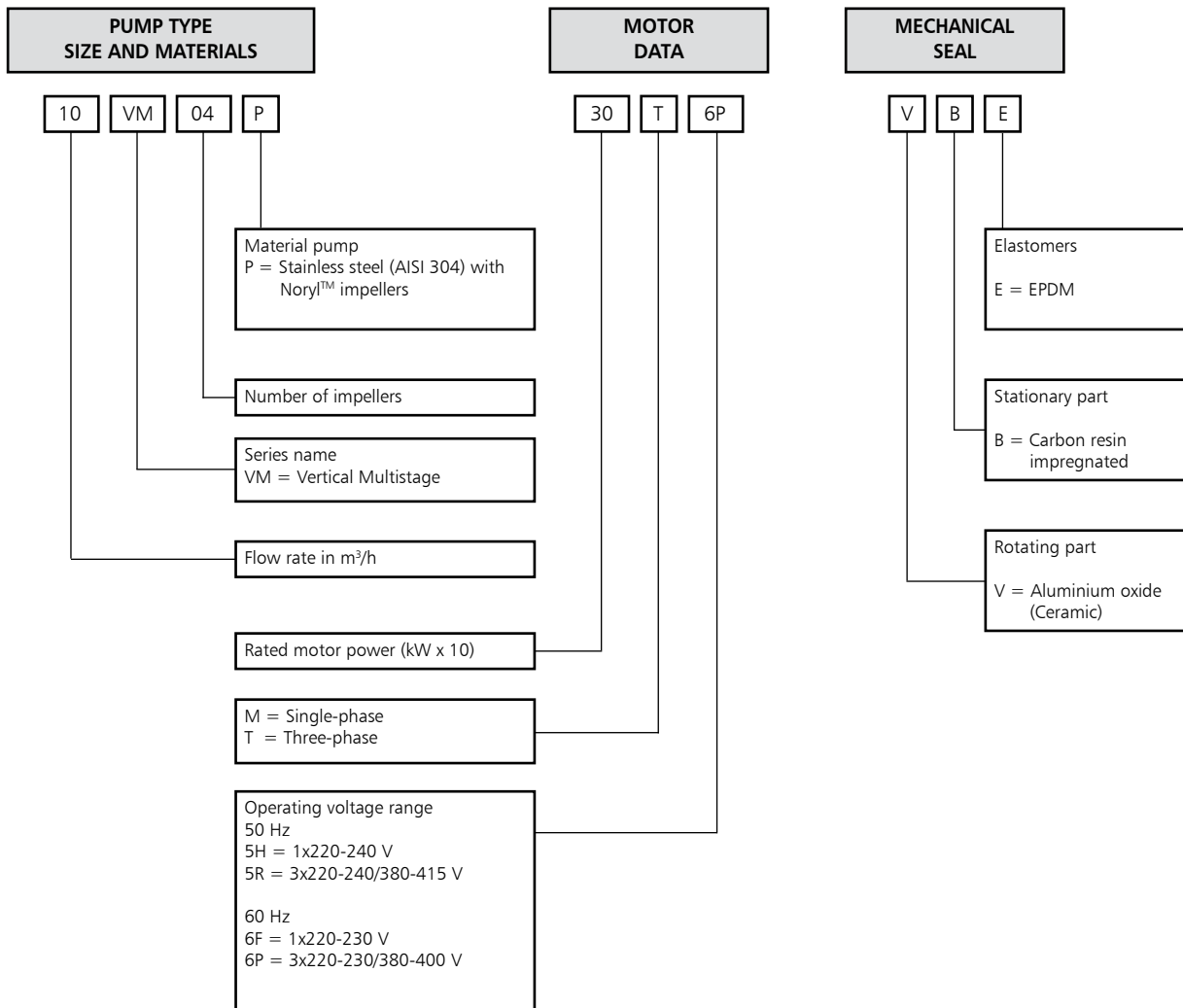
#### MOTOR

- 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).**

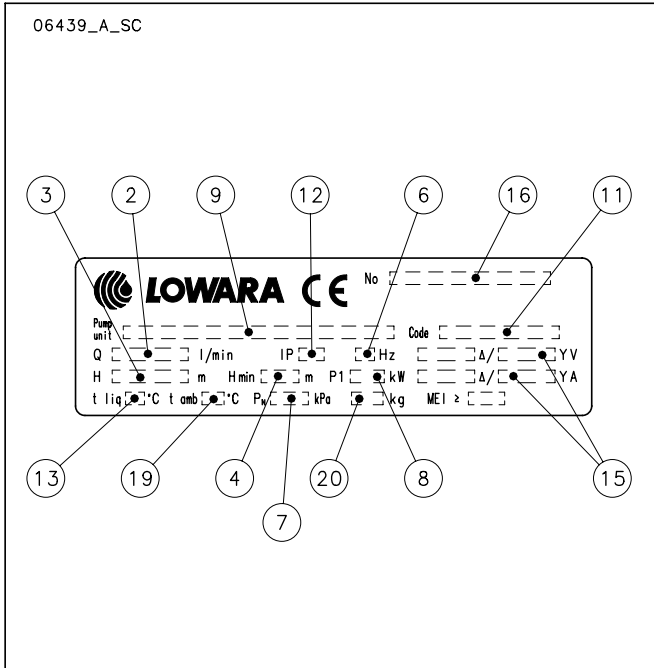
## VM SERIES IDENTIFICATION CODE



EXAMPLE: 10VM04P30T6PVBE  
 VM series electric pump, flow rate 10 m<sup>3</sup>/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.

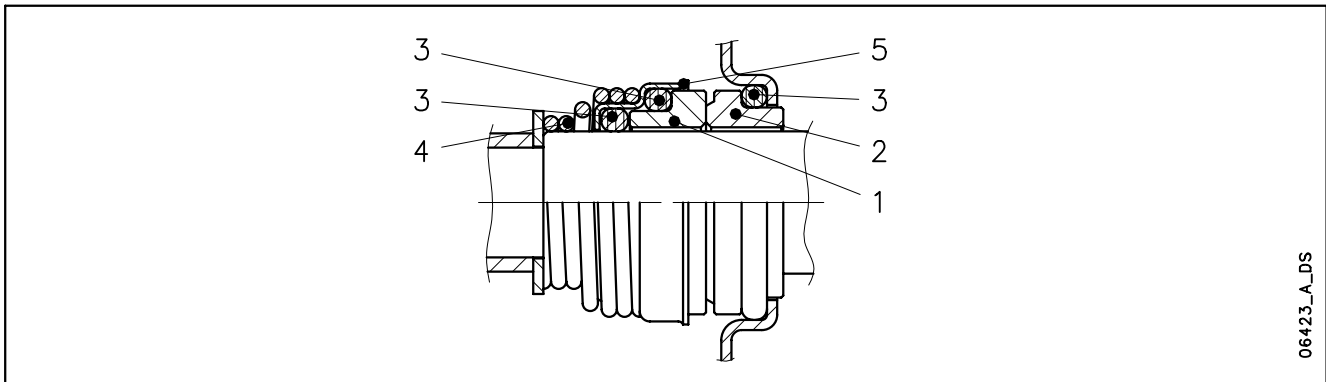
## VM SERIES ELECTRIC PUMP RATING PLATE

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

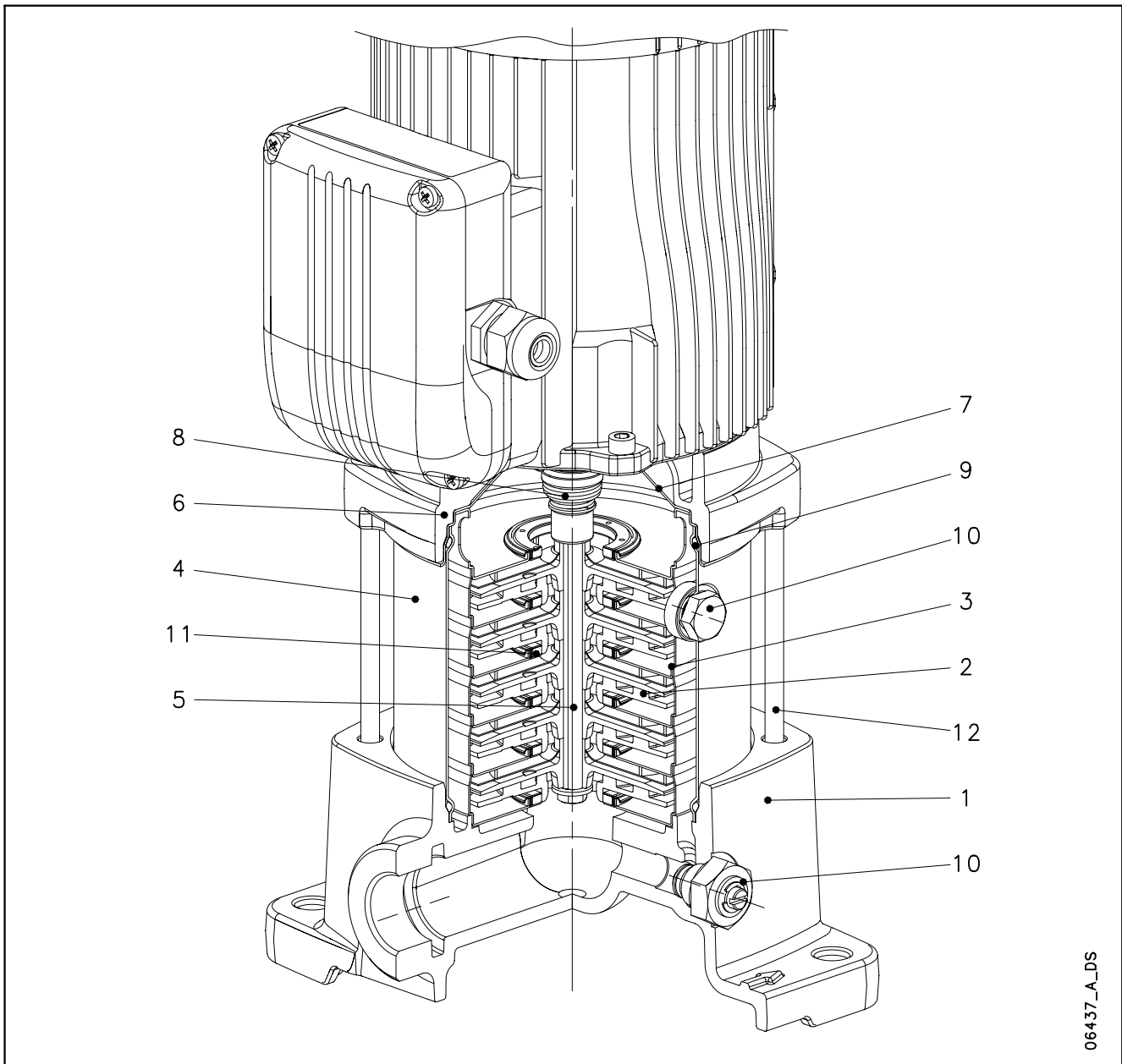
\* For single-phase versions limit the temperature to +60°C.

1-10vm\_tipi-ten-mec-en\_a\_tm



## 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

## e-HM™ SERIES MOTORS

- **Standard three-phase surface motors**  $\geq 0,75$  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 ( $\geq 0,75$  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 <sub>N</sub> kW	MOTOR TYPE	IEC SIZE	Construction Design	INPUT CURRENT I <sub>n</sub> (A) 220-230 V	CAPACITOR		DATA FOR 220 V 60 Hz VOLTAGE						
					μF	V	min <sup>-1</sup>	I <sub>s</sub> / I <sub>n</sub>	η %	cosφ	T <sub>n</sub> Nm	T <sub>s</sub> /T <sub>n</sub>	T <sub>m</sub> /T <sub>n</sub>
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

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

P <sub>N</sub> kW	Efficiency $\eta_N$												IE
	%												
	$\Delta$ 220 V Y 380 V			$\Delta$ 230 V Y 400 V			$\Delta$ 380 V Y 660 V			$\Delta$ 400 V Y 690 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	
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	3
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	
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 <sub>N</sub> kW	Model	IEC SIZE	Construction Design	N. of Poles	f <sub>N</sub> Hz	Data for 380 V / 60 Hz Voltage				
						cos $\phi$	I <sub>s</sub> / I <sub>N</sub>	T <sub>N</sub> Nm	T <sub>s</sub> /T <sub>N</sub>	T <sub>m</sub> /T <sub>N</sub>
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 <sub>N</sub> kW	Voltage U <sub>N</sub>								$\eta_N$ min <sup>-1</sup>	Operating conditions **	
	V									Altitude Above Sea Level (m)	T. amb min/max °C
	$\Delta$	$\Delta$	Y		$\Delta$		Y				
	220 V	230 V	380 V	400 V	380 V	400 V	660 V	690 V			
	I <sub>N</sub> (A)										
0,30	1,42	1,42	0,82	0,82					3275 ÷ 3385	1000 VI	-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.

1-10vm-ie3-mott-2p60-en\_a\_te

## VM SERIES

### AVAILABLE VOLTAGES FOR SM and PLM MOTORS, 2-POLE

P <sub>N</sub> kW	SINGLE-PHASE							
	50 Hz				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
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	-	-	-	-

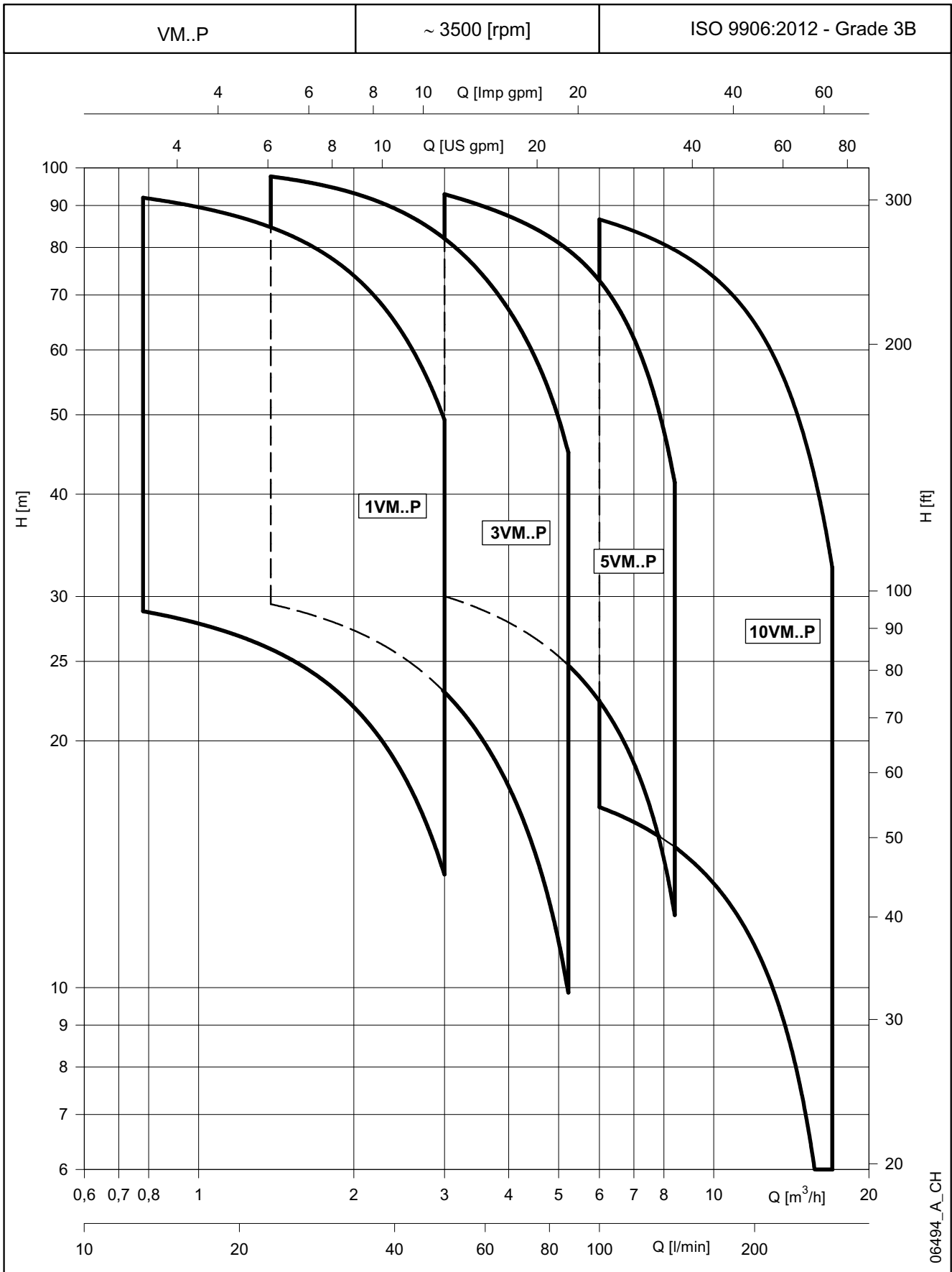
P <sub>N</sub> kW	THREE-PHASE																
	50 Hz								60 Hz								
	3 x 220-230-240/380-400-415	3 x 380-400-415/660-690	3 x 200-208/346-360	3 x 255-265/440-460	3 x 290-300/500-525	3 x 440-460/-	3 x 500-525/-	3 x 220-230/380-400	3 x 255-265-277/440-460-480	3 x 380-400/660-690	3 x 440-460-480/-	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
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



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



## VM..P SERIES

### HYDRAULIC PERFORMANCE TABLE AT 60 Hz, 2 POLES

PUMP TYPE VM..P	VERSION	MOTOR		ELECTRIC PUMP			Q = DELIVERY							
		P <sub>N</sub> kW	TYPE	* P <sub>1</sub> kW	* I		l/min 0	13,0	19,0	25,0	31,0	37,0	43,0	50,0
					220-230 V	380-400 V								
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		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		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		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	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		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		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		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		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		ELECTRIC PUMP			Q = DELIVERY							
		P <sub>N</sub> kW	TYPE	* P <sub>1</sub> kW	* I		l/min 0	23,0	34,0	45,0	56,0	67,0	78,0	87,0
					220-230 V	380-400 V								
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		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	SM80HM../1116	1,39	6,40	-	68,3	63,0	59,5	54,5	48,5	41,7	34,1	27,0
3VM05		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		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		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		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		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		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		ELECTRIC PUMP			Q = DELIVERY							
		P <sub>N</sub> kW	TYPE	* P <sub>1</sub> kW	* I		l/min 0	50,0	65,0	80,0	95,0	110	125	140
					220-230 V	380-400 V								
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	SM80HM../1116	1,41	6,48	-	52,6	45,2	42,6	39,7	36,2	31,6	25,8	18,9
5VM04		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		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		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		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		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		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		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

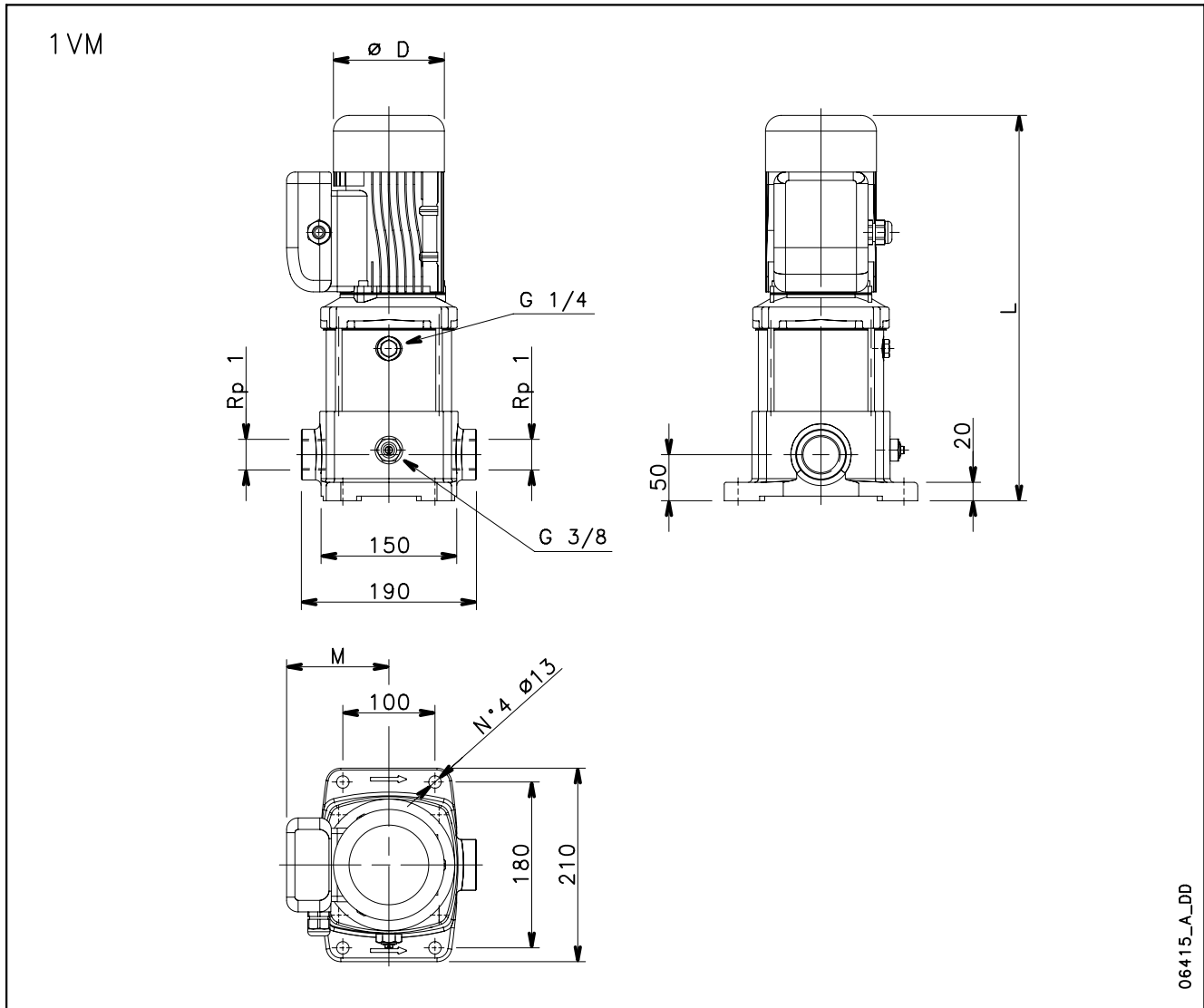
PUMP TYPE VM..P	VERSION	MOTOR		ELECTRIC PUMP			Q = DELIVERY							
		P <sub>N</sub> kW	TYPE	* P <sub>1</sub> kW	* I		l/min 0	100	131	162	193	224	255	283
					220-230 V	380-400 V								
H = TOTAL HEAD IN METRES OF COLUMN OF WATER														
10VM01	1 ~	1,1	SM80HM../1116	1,05	5,12	-	18,9	16,5	15,2	13,6	11,6	9,3	6,5	3,6
10VM02		1,5	SM80HM../1156	1,78	8,47	-	37,8	33,2	30,7	27,8	24,3	20,0	14,8	9,6
10VM03		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		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		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	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		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: P<sub>1</sub> = input power; I = input current.

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



PUMP TYPE	VERSION	MOTOR		DIMENSIONS (mm)			PN bar	WEIGHT kg
		kW	SIZE	D	M	L		
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

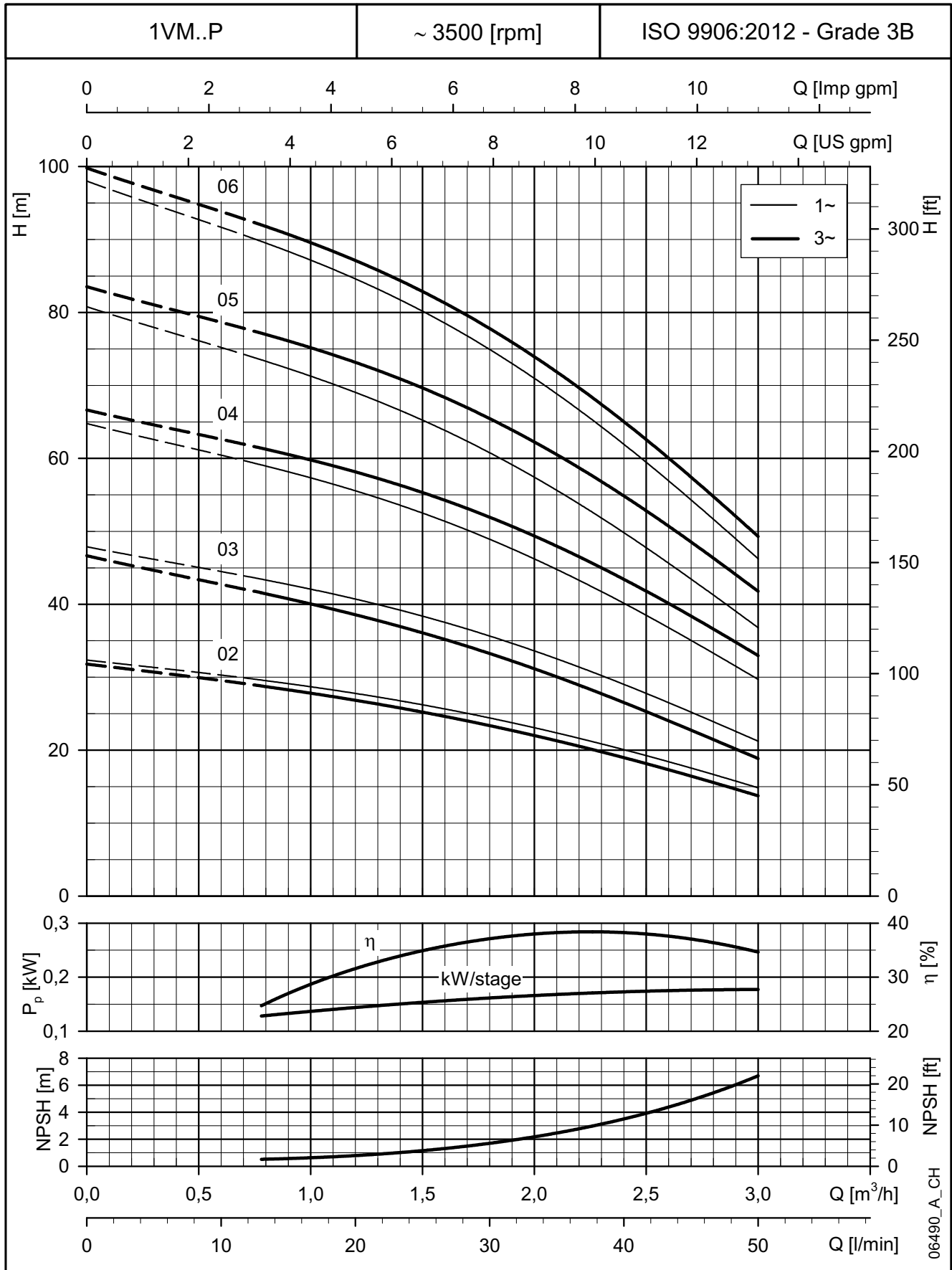
1VM02	THREE-PHASE	0,40	63	120	111	379	10	12
1VM03		0,50	63	120	111	379	10	12
1VM04		0,75	80	155	129	457	10	18
1VM05		1,1	80	155	129	477	10	19
1VM06		1,1	80	155	129	497	10	19

1vm-2p60\_a\_td



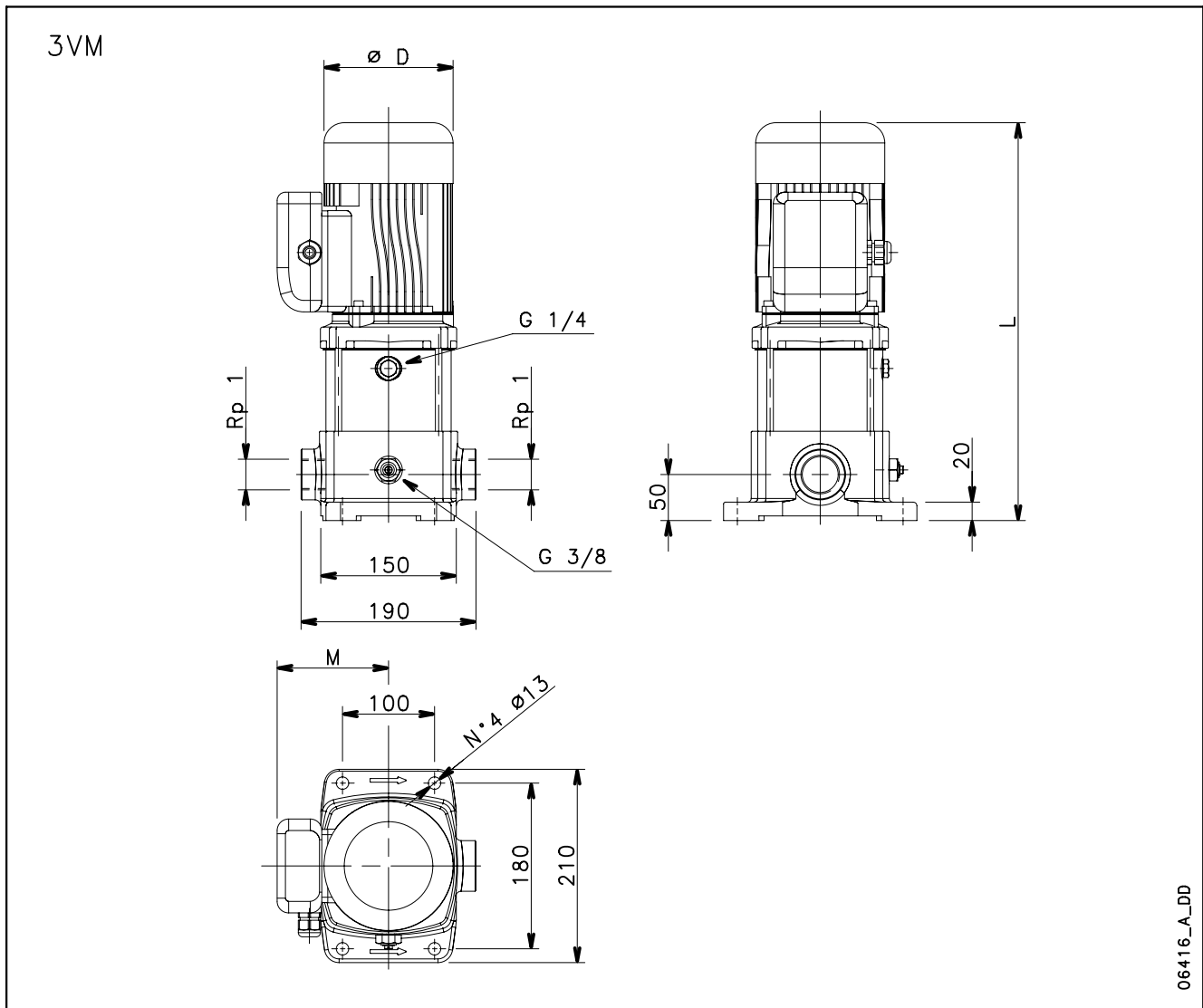
### 1VM..P SERIES

### OPERATING CHARACTERISTICS AT 60 Hz, 2 POLES



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

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



06416\_A\_DD

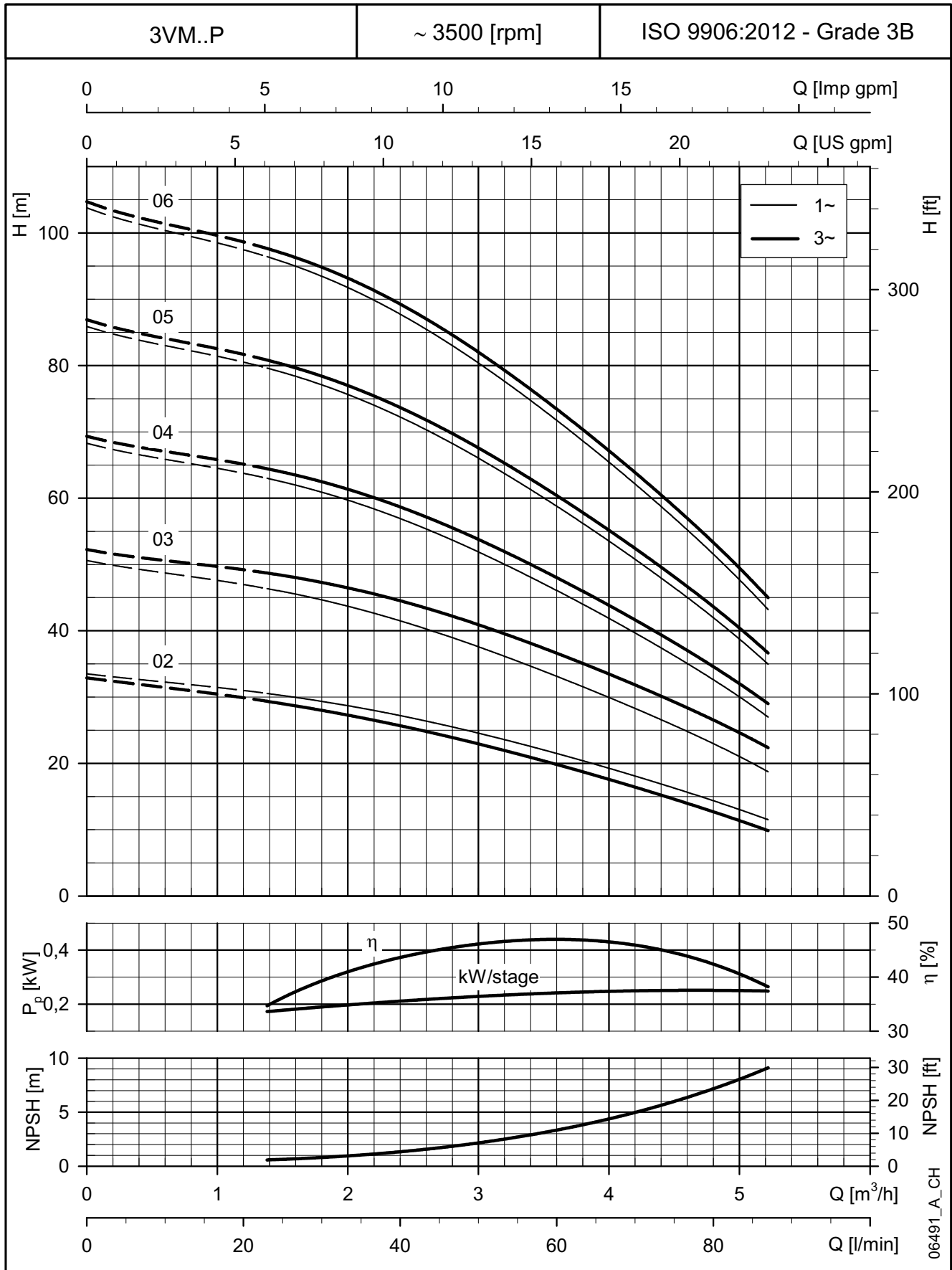
PUMP TYPE	VERSION	MOTOR		DIMENSIONS (mm)			PN bar	WEIGHT kg
		kW	SIZE	D	M	L		
3VM02	SINGLE-PHASE	0,50	63	120	111	379	10	12
3VM03		0,75	71	140	121	393	10	14
3VM04		1,1	80	155	137	457	10	19
3VM05		1,5	80	155	137	477	10	20
3VM06		2,2	90	174	159	553	10	28

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

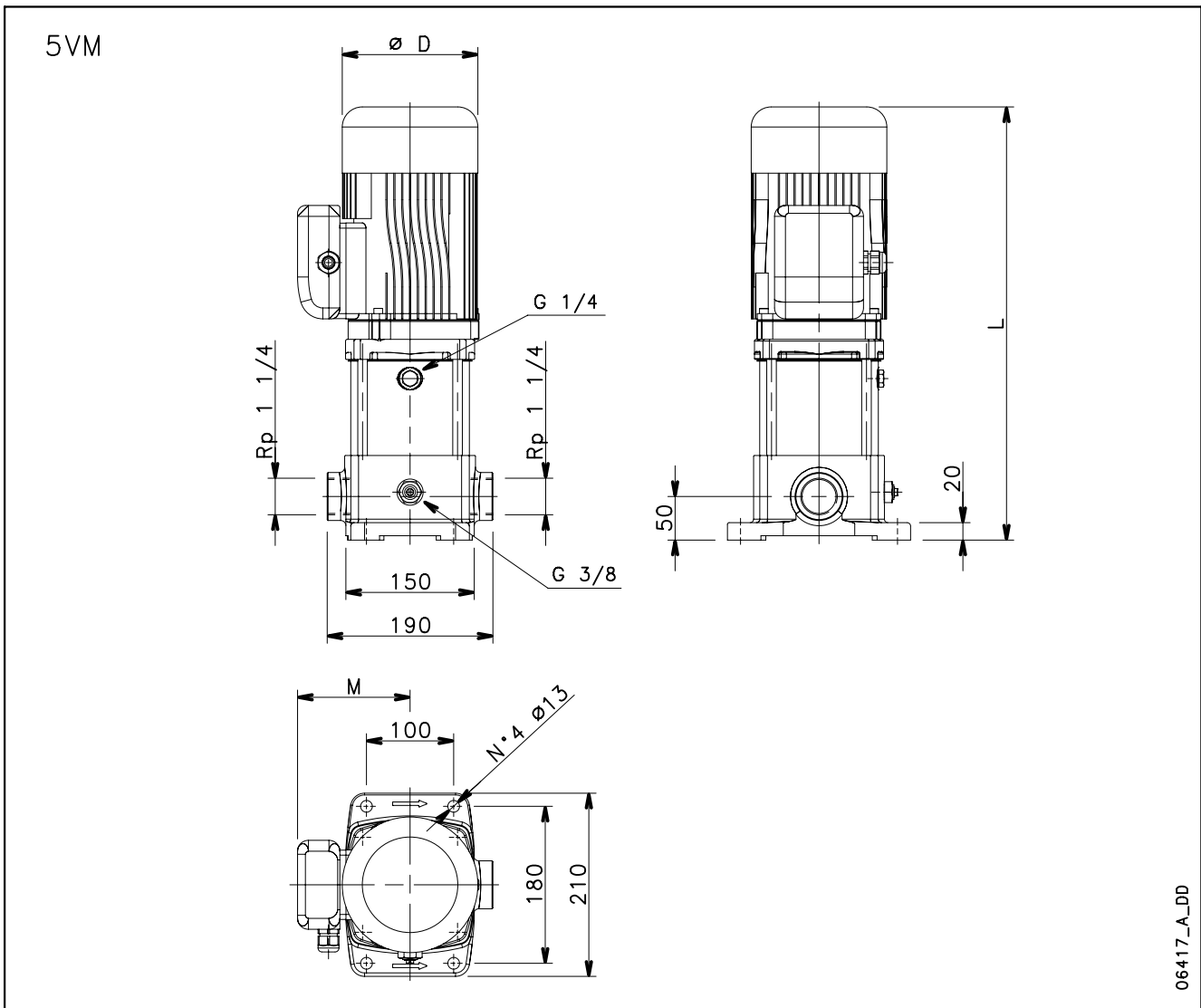
### 3VM..P SERIES

### OPERATING CHARACTERISTICS AT 60 Hz, 2 POLES



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

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



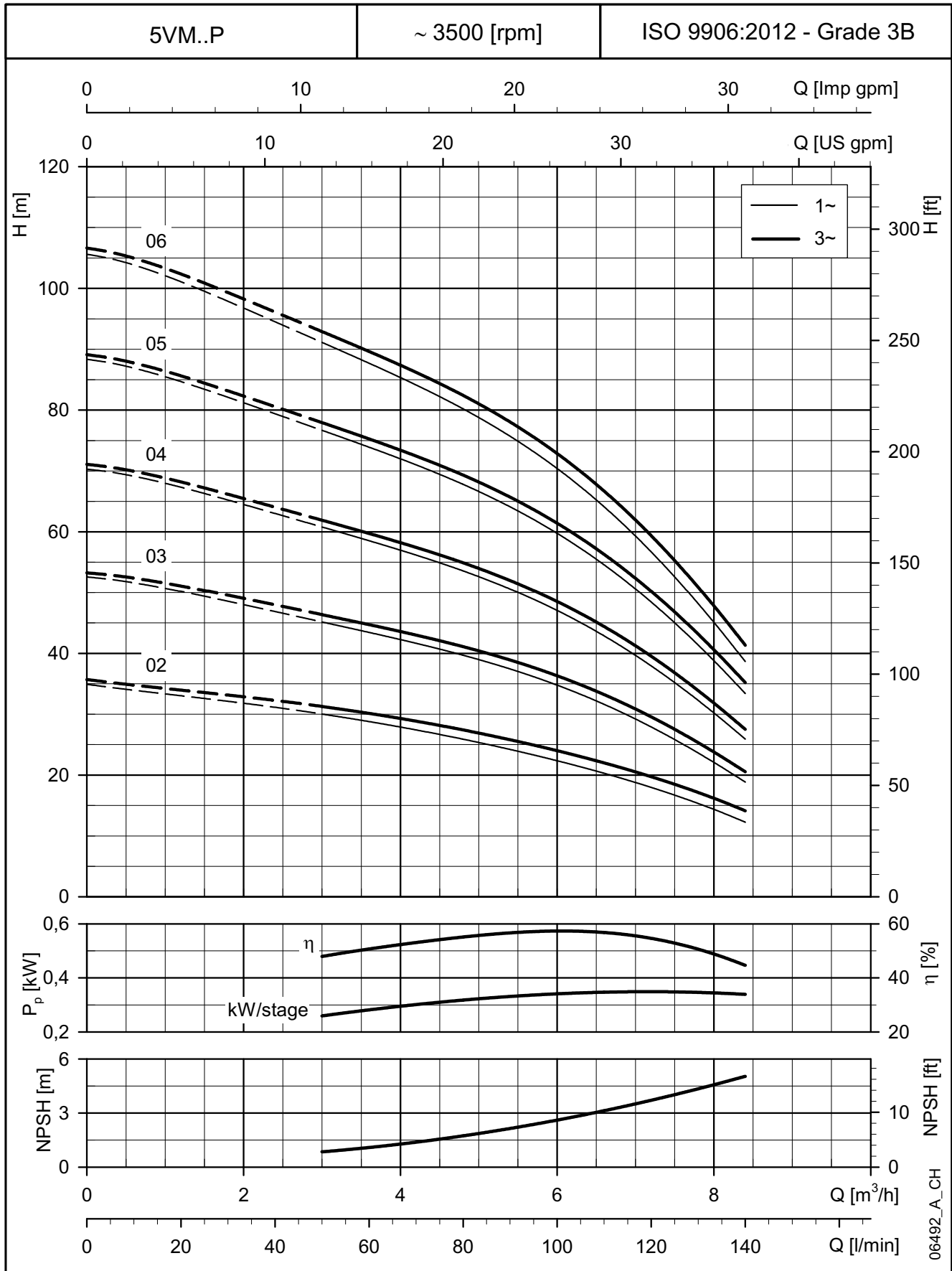
PUMP TYPE	VERSION	MOTOR		DIMENSIONS (mm)			PN bar	WEIGHT kg
		kW	SIZE	D	M	L		
5VM02	SINGLE-PHASE	0,75	71	140	121	393	10	14
5VM03		1,1	80	155	137	437	10	18
5VM04		1,5	80	155	137	457	10	20
5VM05		2,2	90	174	159	533	10	28
5VM06		2,2	90	174	174	159	553	10

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	174	134	553	10

5vm-2p60\_a\_td

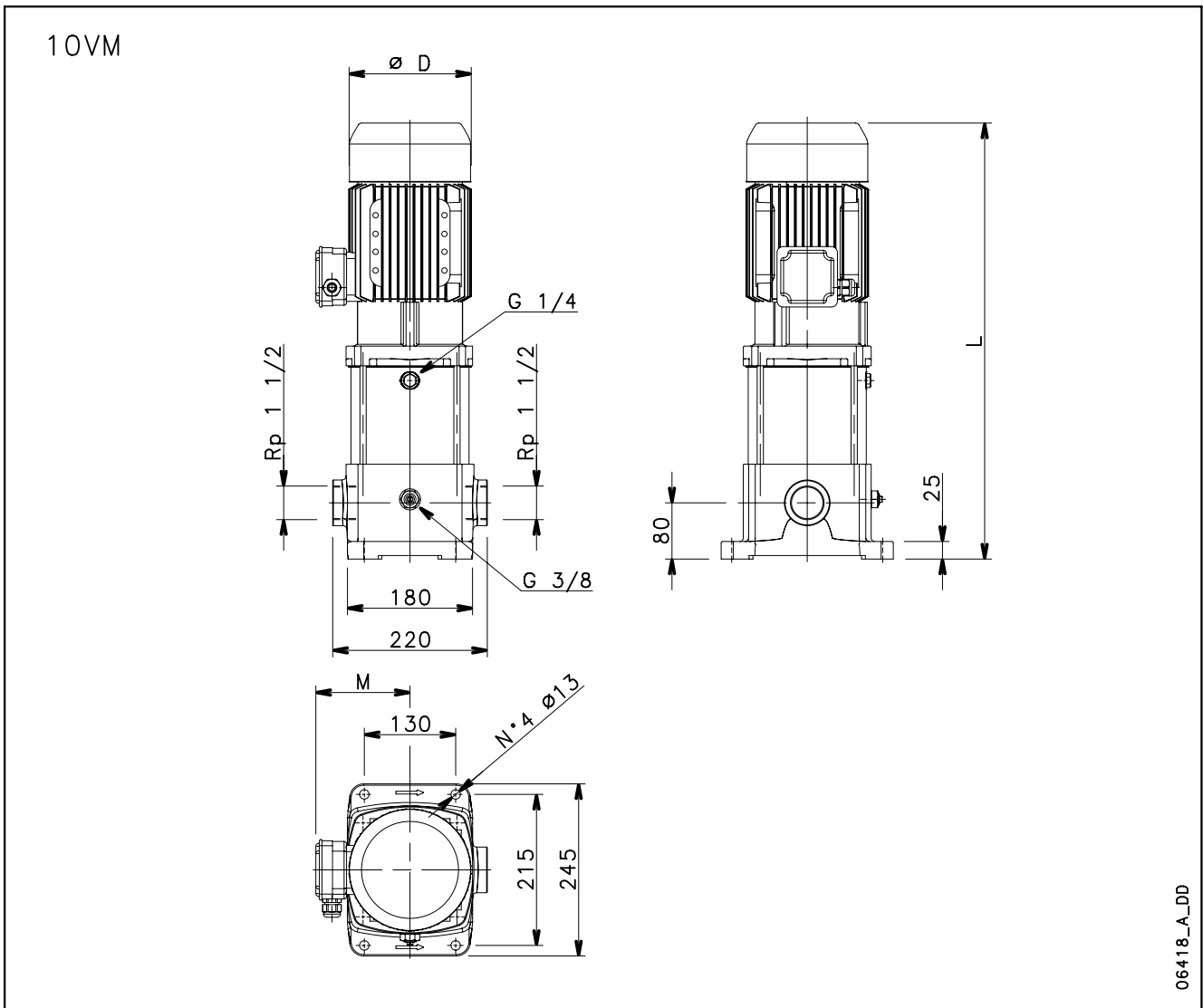
**5VM..P SERIES**

**OPERATING CHARACTERISTICS AT 60 Hz, 2 POLES**



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

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



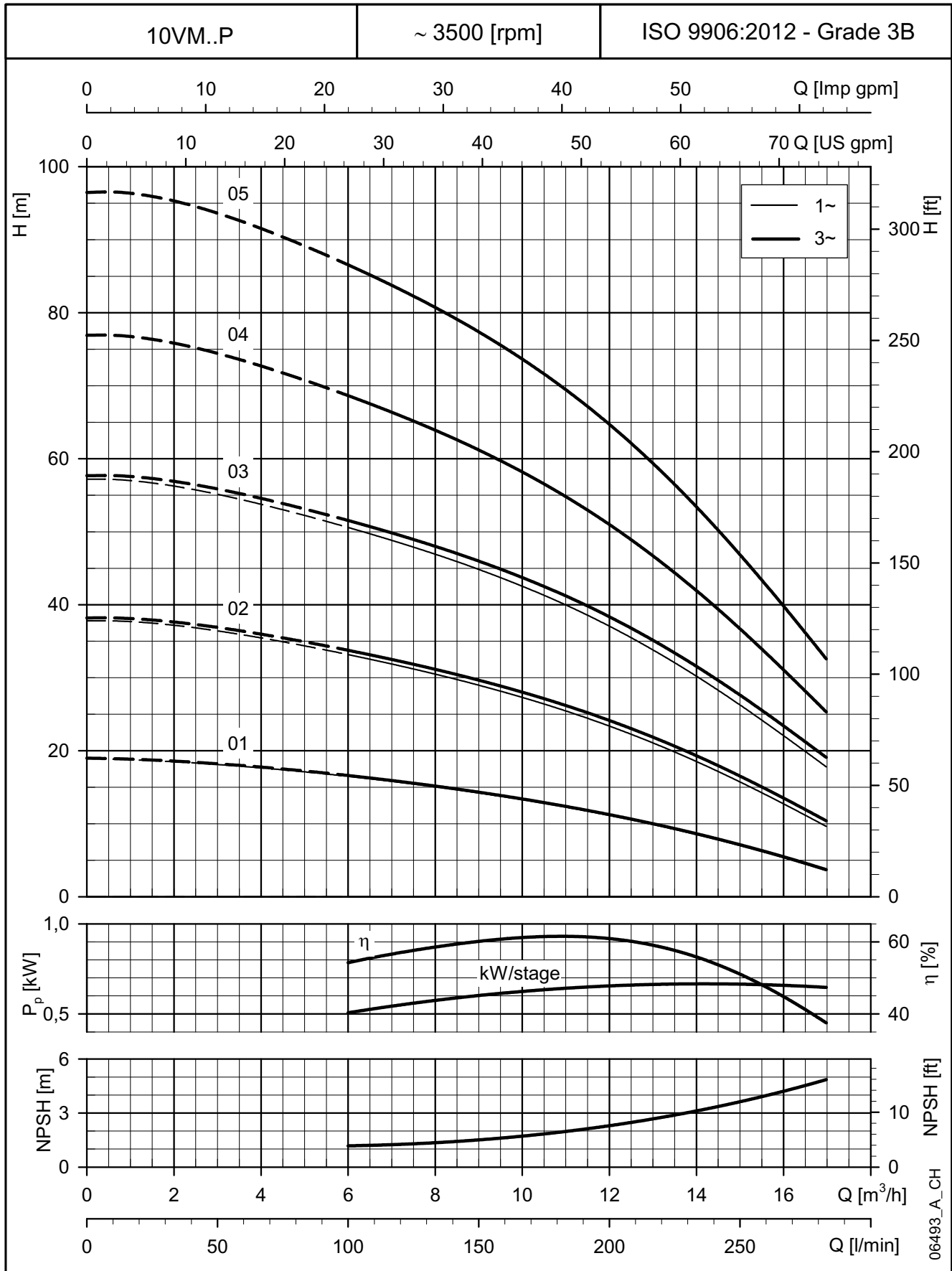
PUMP TYPE	VERSION	MOTOR		DIMENSIONS (mm)			PN bar	WEIGHT kg
		kW	SIZE	D	M	L		
10VM01	SINGLE-PHASE	1,1	80	155	137	501	10	23
10VM02		1,5	80	155	137	501	10	24
10VM03		2,2	90	174	159	589	10	33

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

**10VM..P SERIES**

**OPERATING CHARACTERISTICS AT 60 Hz, 2 POLES**



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







# 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 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: 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.

# 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 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  $\gamma = 1 \text{ kg/dm}^3$

Flow rate required: 25 m<sup>3</sup>/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<sup>3</sup>/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  $\rho$  DENSITY OF WATER TABLE**

t °C	T K	$p_s$ bar	$\rho$ kg/dm <sup>3</sup>	t °C	T K	$p_s$ bar	$\rho$ kg/dm <sup>3</sup>	t °C	T K	$p_s$ bar	$\rho$ kg/dm <sup>3</sup>
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				

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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 <sup>3</sup> /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		
	</																			

## 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

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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 <sup>3</sup> /h	Cubic feet per hour ft <sup>3</sup> /h	Cubic feet per minute ft <sup>3</sup> /min	Imp. gal. per minute Imp. gal./min	US gal. per minute Us gal./min
<b>1,000</b>	0,0600	2,1189	0,0353	0,2200	0,2642
16,6667	<b>1,000</b>	35,3147	0,5886	3,6662	4,4029
0,4719	0,0283	<b>1,000</b>	0,0167	0,1038	0,1247
28,3168	1,6990	60,0000	<b>1,000</b>	6,2288	7,4805
4,5461	0,2728	9,6326	0,1605	<b>1,000</b>	1,2009
3,7854	0,2271	8,0208	0,1337	0,8327	<b>1,000</b>

## PRESSURE AND HEAD

Newton per square metre N/m <sup>2</sup>	kilo Pascal kPa	bar bar	Pound force per square inch psi	metre of water m H <sub>2</sub> O	millimetre of mercury mm Hg
<b>1,000</b>	0,0010	1 x 10 <sup>-5</sup>	1.45 x 10 <sup>-4</sup>	1.02 x 10 <sup>-4</sup>	0,0075
1000,0000	<b>1,000</b>	0,0100	0,1450	0,1020	7,5006
1 x 10 <sup>5</sup>	100,0000	<b>1,000</b>	14,5038	10,1972	750,0638
6894,7570	6,8948	0,0689	<b>1,000</b>	0,7031	51,7151
9806,6500	9,8067	0,0981	1,4223	<b>1,000</b>	73,5561
133,3220	0,1333	0,0013	0,0193	0,0136	<b>1,000</b>

## LENGTH

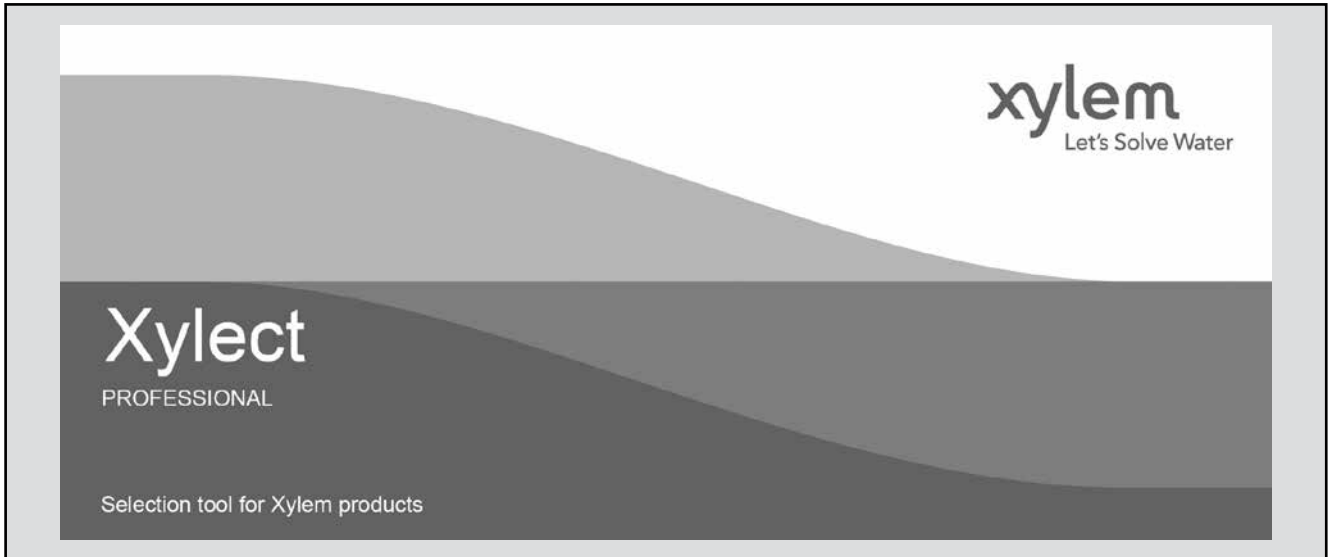
millimetre mm	centimetre cm	metre m	inch in	foot ft	yard yd
<b>1,000</b>	0,1000	0,0010	0,0394	0,0033	0,0011
10,0000	<b>1,000</b>	0,0100	0,3937	0,0328	0,0109
1000,0000	100,0000	<b>1,000</b>	39,3701	3,2808	1,0936
25,4000	2,5400	0,0254	<b>1,000</b>	0,0833	0,0278
304,8000	30,4800	0,3048	12,0000	<b>1,000</b>	0,3333
914,4000	91,4400	0,9144	36,0000	3,0000	<b>1,000</b>

## VOLUME

cubic metre m <sup>3</sup>	litre litro	millilitre ml	imp. Gallon imp. gal.	US gallon US gal.	cubic foot ft <sup>3</sup>
<b>1,000</b>	1000,0000	1 x 10 <sup>6</sup>	219,9694	264,1720	35,3147
0,0010	<b>1,000</b>	1000,0000	0,2200	0,2642	0,0353
1 x 10 <sup>-6</sup>	0,0010	<b>1,000</b>	2.2 x 10 <sup>-4</sup>	2.642 x 10 <sup>-4</sup>	3.53 x 10 <sup>-5</sup>
0,0045	4,5461	4546,0870	<b>1,000</b>	1,2009	0,1605
0,0038	3,7854	3785,4120	0,8327	<b>1,000</b>	0,1337
0,0283	28,3168	28316,8466	6,2288	7,4805	<b>1,000</b>

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.

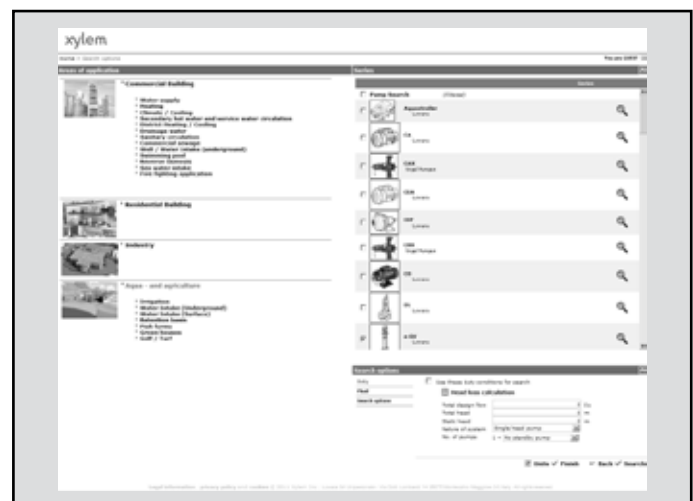
The possibility to search by applications and the detailed information output given makes it easy to make the optimal selection without having detailed knowledge about the Lowara and Vogel products.

The search can be made by:

- Application
- Product type
- Duty point

Xylect™ gives a detailed output:

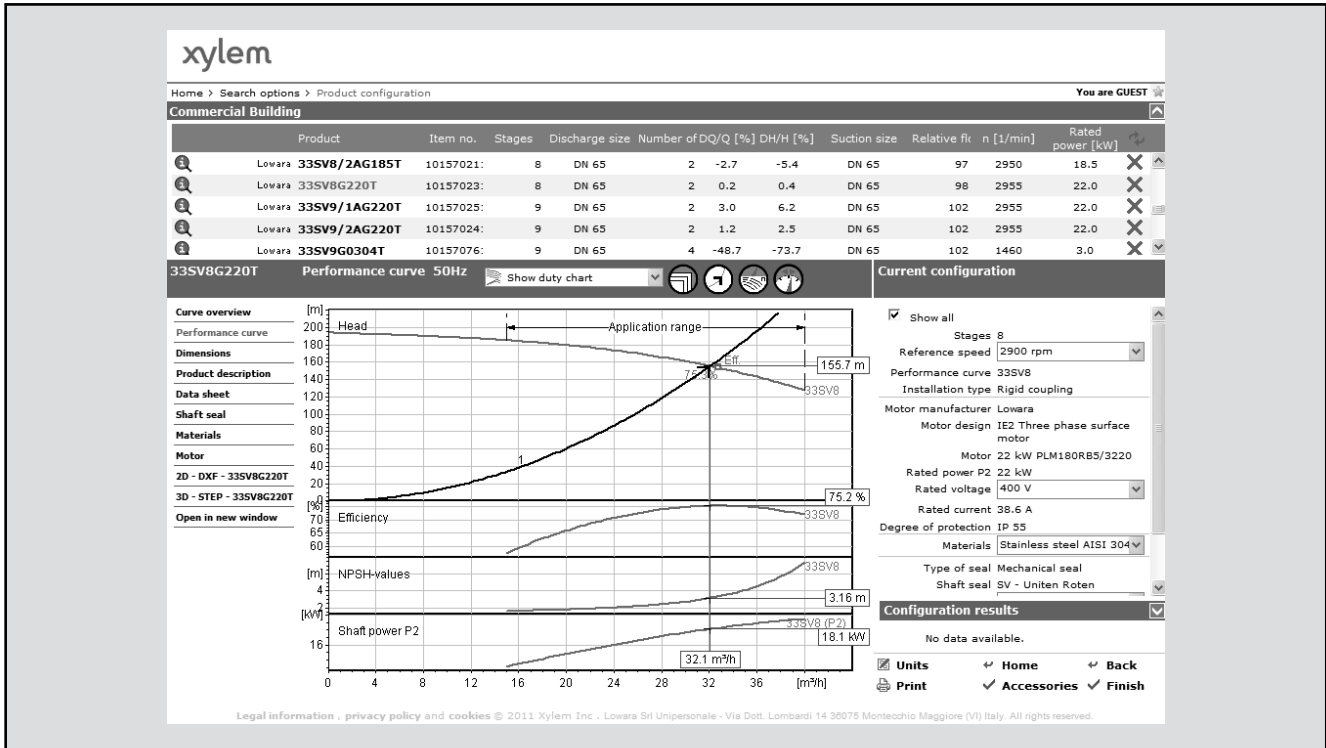
- List with search results
- Performance curves (flow, head, power, efficiency, NPSH)
- Motor data
- Dimensional drawings
- Options
- Data sheet printouts
- Document downloads incl dxf files



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

## FURTHER PRODUCT SELECTION AND DOCUMENTATION

### Xylect™



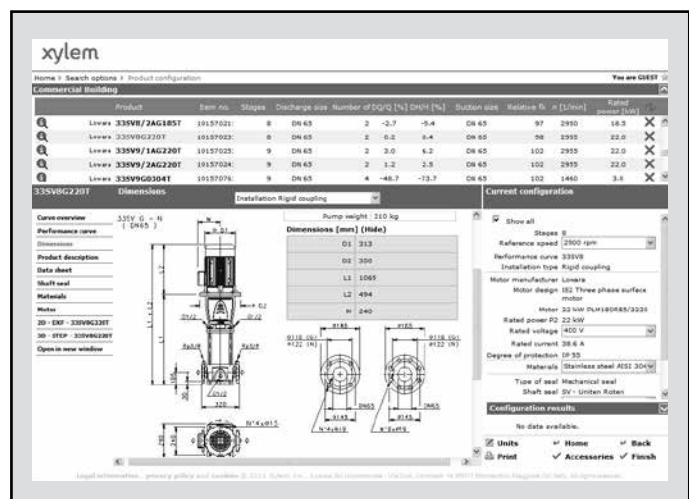
The detailed output makes it easy to select the optimal pump from the given alternatives.

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 has a My Xylect space, where all projects are saved.

For more information about Xylect™ please contact our sales network or visit [www.xylect.com](http://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.

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