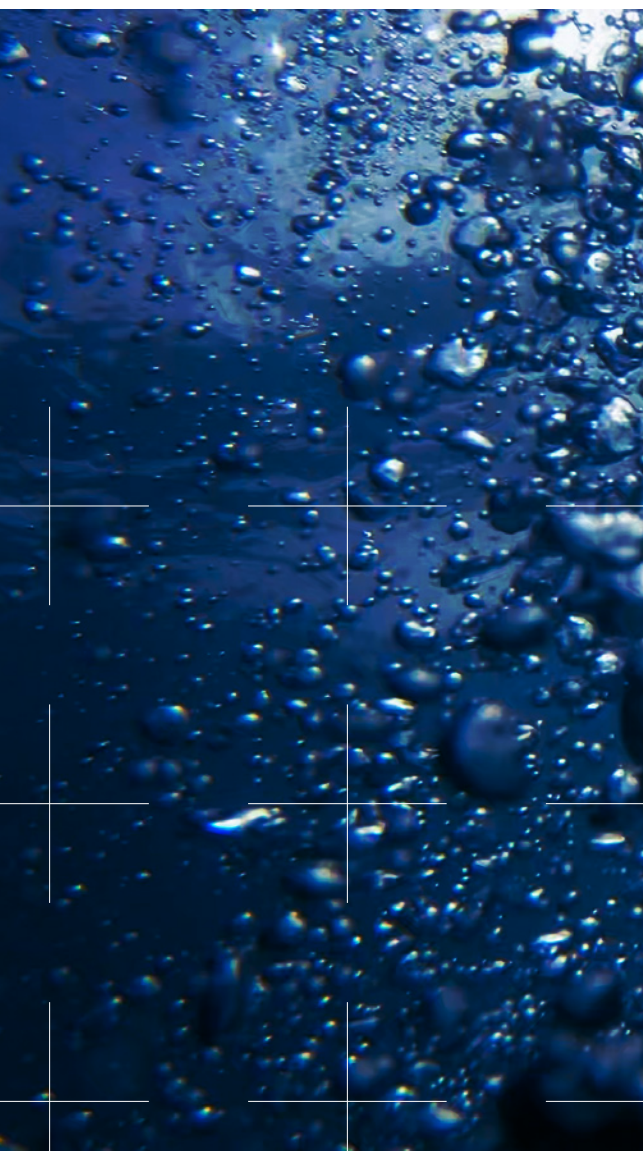


VMOA transformer oil circulation pump



Vacuumproof and leakproof design

Design performance

The pumps are of centrifugal type and are designed for circulating transformer oil in connection with cooling equipment.

Three sizes VMOA 100, 125 and 150 are available. They are provided with three-phase motors for 50 or 60 Hz. Motors can be selected for different voltage between 95 and 690V.

Pump parts

The motor and all moving parts in the pumps are completely enclosed with the motor and pump housing forming a sealed unit. The pump impeller is directly mounted on the motor shaft. The pump housing (1) and the motor housing (5) are manufactured of cast iron and joined together by bolts. The joint is sealed by an O-ring.

The stator (6) and the winding (8) are directly mounted in the motor housing. The motor shaft (9) which supports the rotor (7) as well as the pump impeller (3) is suspended in ball bearings in two spiders. The ball bearings (4) have buffer springs in order to prevent damage, when the rotor is stationary and the motor housing is subjected to vibrations.

The pump impeller is manufactured from light alloy and has been carefully machined and balanced. Flange drillings are available according to ISO PN6, 10 and ANSI 125. On delivery sealed flange covers are mounted to prevent moisture collecting in the pump during transport or storage.

The motor used is a three phase cage induction according to IEC 34-1, insulation class F in four or six pole versions.

The terminal box is splash proof IP67 and provided with a tapped hole for the cable glands. On delivery the hole is sealed by means of a plastic plug. Holes of other dimensions can be drilled adjacent to entry holes. The terminal box is provided with an earthing screw.

The motor and pump can be supplied with different painting program from only primer to completely painted with top paint. Internally the pump is protected with an oil-resistant epoxy.

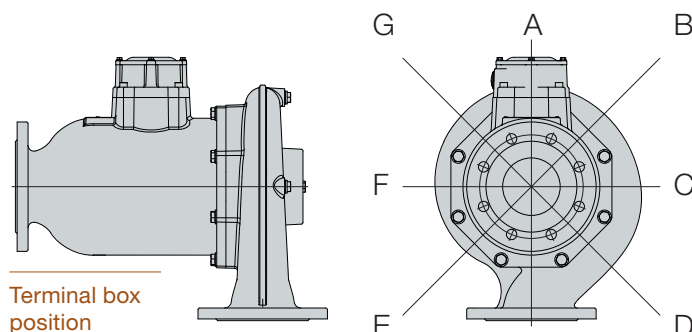
- | | |
|-----------------|---------------|
| ① Pump housing | ⑥ Stator |
| ② Terminal box | ⑦ Rotor |
| ③ Pump impeller | ⑧ Winding |
| ④ Ball bearings | ⑨ Motor shaft |
| ⑤ Motor housing | |



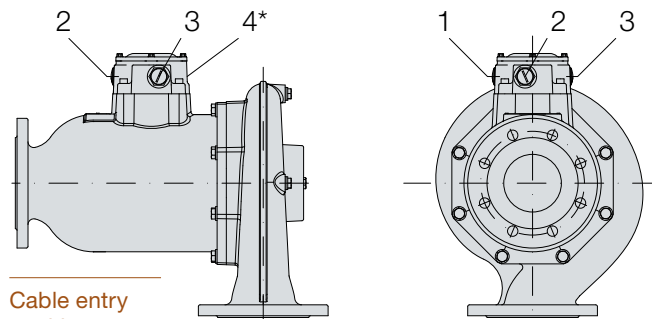
Versions

The pump casing can be rotated in relation to the motor housing if necessary. Oil filling under vacuum is recommended. Otherwise the pump circuit should be air vented before start. The terminal box can also be rotated to avoid that the insertion of cable glands is made from the top.

Following any such modification the tightness of the pump must be checked. The connection cable is to be mounted with an U-shaped bend to prevent the water from entering the terminal box through the gland.



Terminal box position



Cable entry position

* Only in combination with terminal box position A, E, F, G

Pump identification code

VMOA 100 1 60 A A A 3 C4

Pump series

Pump size (100, 150 or 125)

Number of motor poles
0=6-pole, 1 or 2=4-pole (see performance curves)

Impeller diameter code (see performance curves)

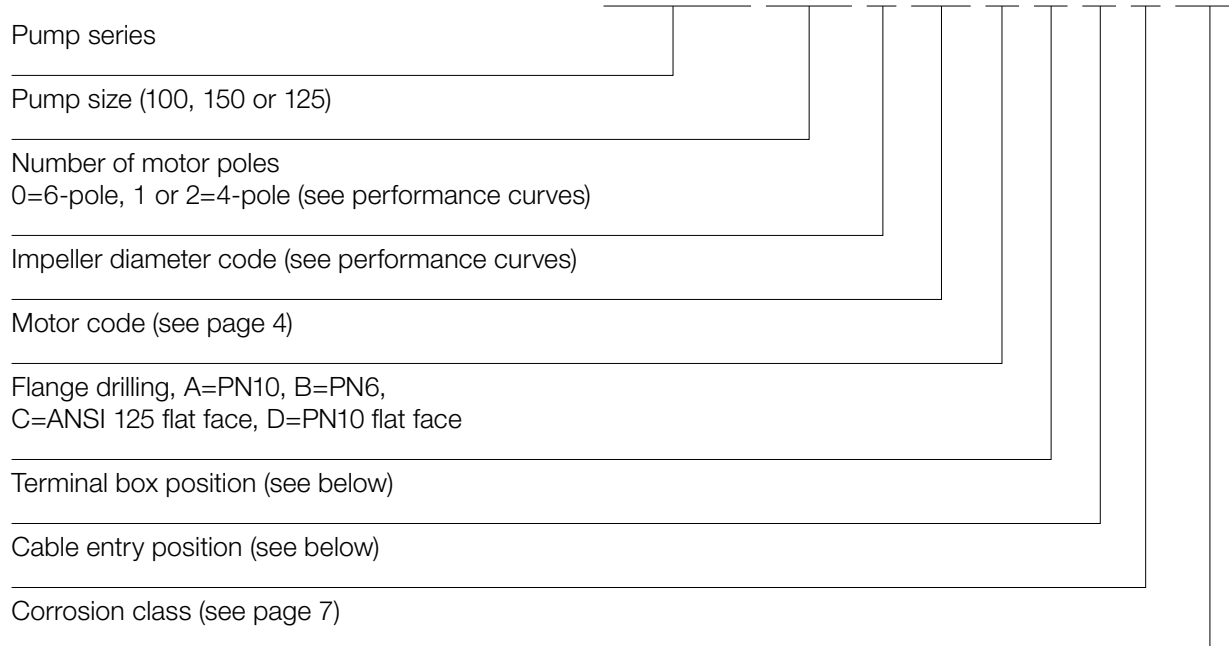
Motor code (see page 4)

Flange drilling, A=PN10, B=PN6,
C=ANSI 125 flat face, D=PN10 flat face

Terminal box position (see below)

Cable entry position (see below)

Corrosion class (see page 7)



Voltage range and overcurrent relay

The settings recommended in the table for the overcurrent relay cause tripping within max. 30 seconds both in case of stalled rotor and when a start is attempted on two phases. At these settings, the pump can be started and operated at oil temperatures down to -10°C (-14°F) with an oil viscosity corresponding to 72 mm²/s (cSt) and to

-40°C (-40°F) with an oil viscosity corresponding to 1'600 mm²/s (cSt). When checking the operation of overcurrent relay, a start should be attempted with one of the phases disconnected. However, when set for -40°C (-40°F) no tripping occurs in the event of a single phase cut-off at service, but this is of no harm to the motor.

VMOA 100

Con- nection	Voltage range ¹⁾	Nominal voltage V	060 (6-pole)		082 (6-pole)		160 (4-pole)		182 (4-pole)		188 (4-pole)		198 (4-pole)		218 (4-pole)	
			Operating current at nominal voltage and high oil flow, A	Recommended setting on overload relay down to -10°C (14°F)/down to -40°C (-40°F), A	Operating current at nominal voltage and high oil flow, A	Recommended setting on overload relay down to -10°C (14°F)/down to -40°C (-40°F), A	Operating current at nominal voltage and high oil flow, A	Recommended setting on overload relay down to -10°C (14°F)/down to -40°C (-40°F), A	Operating current at nominal voltage and high oil flow, A	Recommended setting on overload relay down to -10°C (14°F)/down to -40°C (-40°F), A	Operating current at nominal voltage and high oil flow, A	Recommended setting on overload relay down to -10°C (14°F)/down to -40°C (-40°F), A	Operating current at nominal voltage and high oil flow, A	Recommended setting on overload relay down to -10°C (14°F)/down to -40°C (-40°F), A	Operating current at nominal voltage and high oil flow, A	Recommended setting on overload relay down to -10°C (14°F)/down to -40°C (-40°F), A
Y	111-145	127	7.1	8.0	16.2	19.5	23	25	30							
			10.6/11.7	11.7/11.7	24/45	29/45	35/45	38/45	45/45							
Y	146-190	190	5.0	5.7	11.4	13.7	16.3	18.0	21							
			7.5/8.3	8.3/8.3	17/32	21/32	24/32	27/32	32/32							
D	85-110	110	8.5	9.7	19.7	24	28	31	37							
			12.8/14.3	14.3/14.3	30/56	36/56	42/56	47/56	56/56							
Y	171-208	208	5.3	5.8	11.8	14.0	16.7	-	-							
			7.9/8.3	8.3/8.3	17.7/32	21/32	25/32	-/-	-/-							
D	100-120	110	9.0	10.0	21	24	28.6	-	-							
			13.5/14.3	14.3/14.3	32/56	36/56	43/56	-/-	-/-							
Y	321-420	400	2.4	2.6	5.3	6.0	7.0	7.5	10							
			3.6/3.9	3.9/3.9	8.1/15	9.8/15	11.5/15	13/15	15/15							
D	191-240	230	4.3	4.6	9.4	11.3	13.3	14.7	17							
			6.4/6.8	6.8/6.8	14/26	17/26	20/26	22/26	26/26							
Y	351-480	440	2.4	2.7	5.6	6.6	7.8	-	-							
			3.6/3.9	3.9/3.9	8.4/15	9.9/15	11.7/15	-/-	-/-							
D	209-280	255	4.2	4.7	9.7	11.4	13.4	-	-							
			6.3/6.8	6.8/6.8	14.6/26	17.1/26	20/26	-/-	-/-							
Y	421-550	500	1.8	2.2	4.2	5	5.9	6.5	7.5							
			2.7/3.0	3.0/3.0	6.2/11.5	7.5/11.5	8.9/11.5	9.8/11.5	11.5/11.5							
D	241-320	290	3.2	3.8	7.1	8.7	10.2	11.3	13							
			4.8/5.3	5.3/5.3	10.5/19.5	13/19.5	15.5/19.5	17/19.5	19.5/19.5							
Y	481-600	575	1.9	2.1	4.3	5.1	6	-	-							
			2.8/3.0	3.0/3.0	6.5/11.5	7.7/11.5	9.0/11.5	-/-	-/-							
D	281-350	335	3.4	3.7	7.4	8.7	10.2	-	-							
			5.1/5.3	5.3/5.3	11.1/19.5	13.1/19.5	15.5/19.5	-/-	-/-							

¹⁾ The maximum value may be exceeded by 5% continuously.

Operating current at nominal voltage and high oil flow, A

Recommended setting on overload relay down to -10°C (14°F)/down to -40°C (-40°F), A

VMOA 150

Con- nection	Voltage range ¹⁾	Nominal voltage V	160 (4-pole)	167 (4-pole)	175 (4-pole)	182 (4-pole)	190 (4-pole)	200 (4-pole)
Y	111-145	127	17.4	18.1	19.2	21.0	23.4	29.0
			26/45	27/45	29/45	32/45	35/45	44/45
Y	146-190	190	12.4	12.9	13.7	15.0	16.7	20.7
			18.6/32	19.3/32	20.6/32	22.5/32	25/32	31/32
D	85-110	110	20.5	21.7	23.6	26.1	29.5	39
			30.7/56	32.5/56	35.4/56	39.2/56	44.3/56	56/56
Y	171-208	208	14.4	15.5	17.4	20	23	-
			21.6/32	23.3/32	26./32	30/32	32/32	-/-
D	100-120	110	24.9	27.4	31.6	37.2	44.7	-
			37.3/56	41.1/56	47.4/56	56/56	56/56	-/-
Y	321-420	400	6.0	6.4	6.5	6.8	7.7	9.0
			9/15	9.6/15	9.8/15	10.2/15	11.6/15	13.5/15
D	191-240	230	9.8	10.0	10.5	11.7	13.0	16.3
			14.7/26	15/26	15.8/26	17.6/26	19.5/26	24.4/55
Y	351-480	440	6.7	7.0	7.9	9.3	10.6	-
			10/15	10.5/15	11.9/15	14/15	15/15	-/-
D	209-280	255	11.2	12.1	13.8	15.9	18.5	-
			16.8/26	18.1/26	21/26	24/26	26/26	-/-
Y	421-550	500	4.5	4.8	5.3	5.6	6.0	7.0
			6.7/11.5	7.2/11.5	7.9/11.5	8.4/11.5	9.0/11.5	10.5/11.5
D	241-320	290	7.6	8.3	8.7	9.5	10.3	11.6
			11.4/19.5	12.4/19.5	13.0/19.5	14.2/19.5	15.5/19.5	17.4/19.5
Y	481-600	575	5.3	5.7	6.4	7.2	8	-
			7.9/11.5	8.5/11.5	9.6/11.5	10.8/11.5	11.5/11.5	-/-
D	281-350	335	9.2	9.9	11.1	12.4	14	-
			13.8/19.5	14.8/19.5	16.6/19.5	18.6/19.5	19.5/19.5	-/-

¹⁾ The maximum value may be exceeded by 5% continuously.

VMOA 125

Con- nection	Voltage range ¹⁾	Nominal voltage V	190 (4-pole)	200 (4-pole)	210 (4-pole)	220 (4-pole)	230 (4-pole)	240 (4-pole)
Y	321-420	400	9.0	10.5	12	14	16	19
			13.5/34	16/34	18/34	21/34	23/34	23/34
D	191-240	230	16	18	20	24	27	30
			24/55	27/55	30/55	36/55	37/55	37/55
Y	351-480	440	12	14	17	20	23	-
			18/36	21/36	25.5/36	30/36	34.5/36	-/-
D	209-280	255	20	24	29	34	40	-
			30/60	36/60	43.5/60	51/60	60/60	-/-

¹⁾ The maximum value may be exceeded by 5% continuously.

Operating current at nominal voltage and high oil flow, A

Recommended setting on overload relay down to -10°C (14°F)/down to -40°C (-40°F), A

Technical data

Rated data

The same size of motors is used for all pumps. However, the motors are wound for four alternative voltage ranges and are available in 4- and 6-pole version. In most cases the motor is therefore overrated.

The data in the table below refer to the motor's input, speed and current at the nominal voltage specified in the table on previous page. The starting current is valid at direct-on-line starting, which always should be used.

50 Hz

Motor code letter	Number of poles	Rated voltage (V)	Connection (Y or D)	Rated current (A)	Starting current (A)	Rated input (kW)	Rated speed (rpm)
A	6	127	Y	7.8	51	1.1	985
B	6	105	D	9.5	62	1.1	985
B	6	180	Y	5.5	36	1.1	985
C	6	230	D	4.5	29	1.1	985
C	6	400	Y	2.6	17	1.1	985
D	6	290	D	3.5	23	1.1	985
D	6	500	Y	2.0	13	1.1	985
A	4	127	Y	30	174	5.5	1'435
B	4	105	D	37	215	5.5	1'435
B	4	180	Y	21	122	5.5	1'435
C	4	230	D	17	99	5.5	1'435
C	4	400	Y	10	58	5.5	1'435
D	4	290	D	13	76	5.5	1'435
D	4	500	Y	7.5	44	5.5	1'435
C	4	230	D	27	174	11	1'470
C	4	400	Y	16	144	11	1'470

60 Hz

Motor code letter	Number of poles	Rated voltage (V)	Connection (Y or D)	Rated current (A)	Starting current (A)	Rated input (kW/Hp)	Rated speed (rpm)
B	6	120	D	9.5	62	1.3/1.7	1'170
B	6	208	Y	5.5	36	1.3/1.7	1'170
C	6	255	D	4.5	29	1.3/1.7	1'170
C	6	440	Y	2.6	17	1.3/1.7	1'170
D	6	335	D	3.5	23	1.3/1.7	1'170
D	6	575	Y	2.0	13	1.3/1.7	1'170
B	4	120	D	37	215	6.3/8.4	1'725
B	4	208	Y	21	122	6.3/8.4	1'725
C	4	255	D	17	99	6.3/8.4	1'725
C	4	440	Y	10	58	6.3/8.4	1'725
D	4	335	D	13	76	6.3/8.4	1'725
D	4	575	Y	7.5	44	6.3/8.4	1'725
C	4	255	D	35	173	13/17.4	1'760
C	4	440	Y	22	158	13/17.4	1'760

Pump capacity and motor input

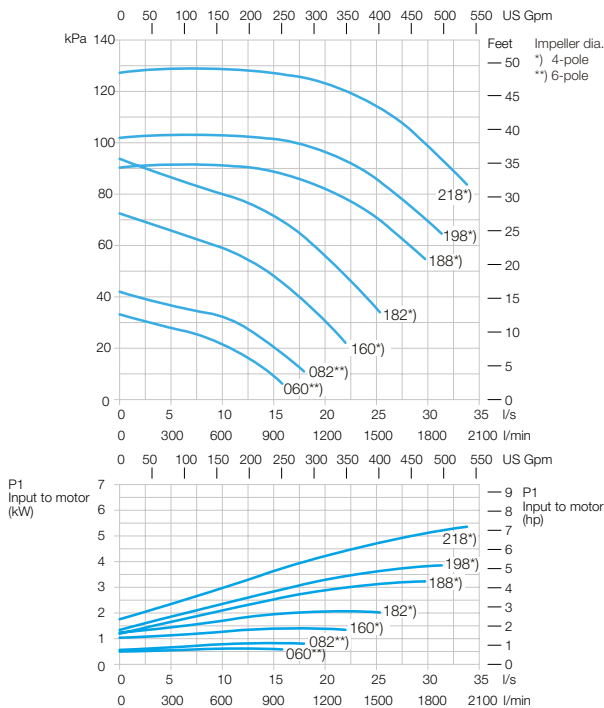
The pump capacity and the motor input for respective size of pump are illustrated by the curves on the next page. The pump capacities apply for an oil viscosity of 20 mm²/s or less and an oil density of 880 kg/m³ (54.9 lb/ft³). Pump performance curves according to ISO 9906 are shown on the following page. The operating current depends on the actual oil flow in the circuit and should be measured when checking the operation of the complete equipment. The pressure drop over a pump at standstill is approximately 5 kPa (0.7 psi) at 6 l/s (95 gpm) and 15 kPa (2.2 psi) at 12 l/s (190 gpm).

Sound level

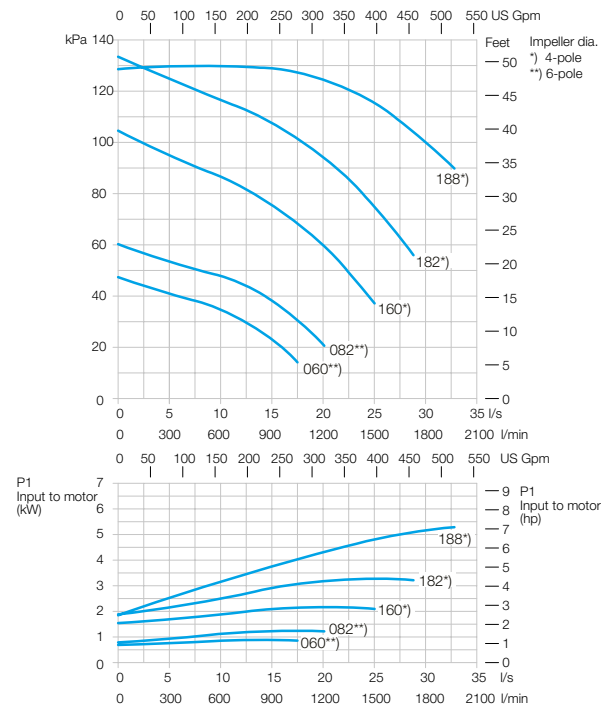
The sound pressure level of the pump is 50 dB(A), measured at a distance of 2 m (6.6 ft) maximal and the sound power level is 62 dB(A).

Performance ranges

VMOA 100 50 Hz

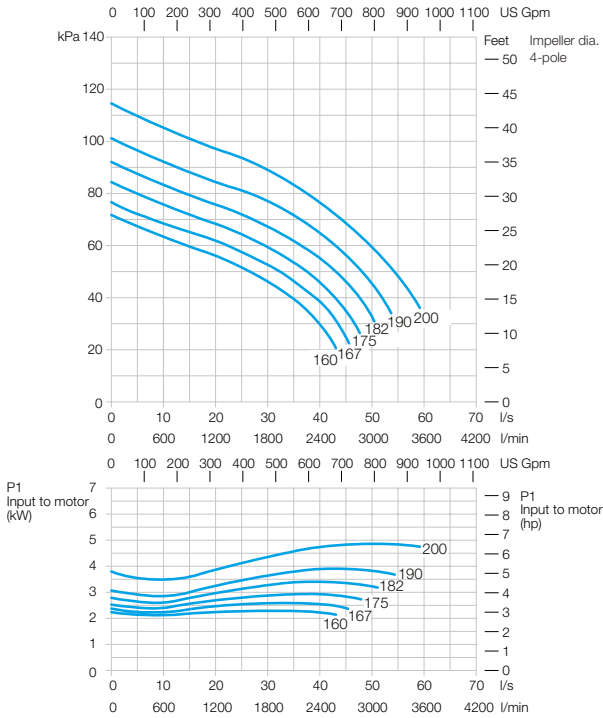


VMOA 100 60 Hz

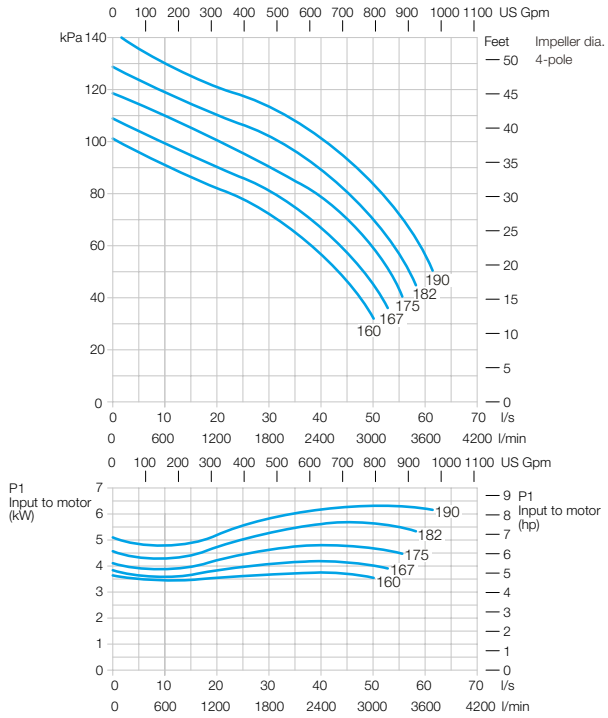


Performance ranges

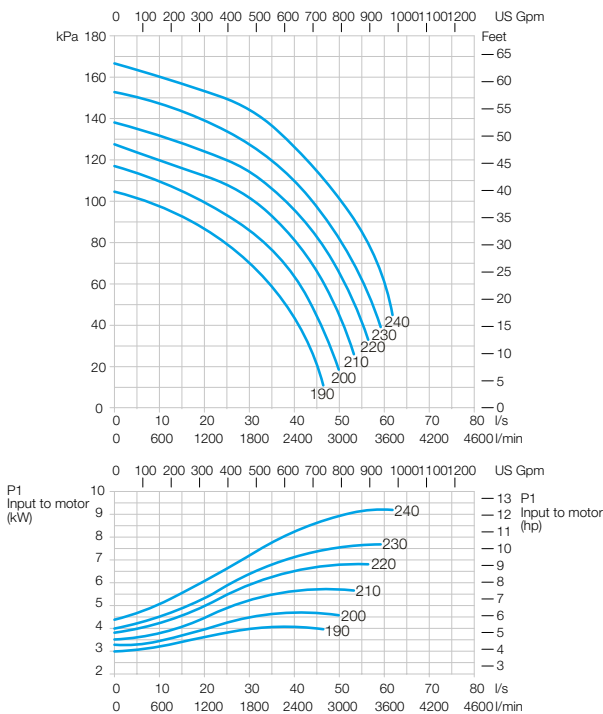
VMOA 150 50 Hz



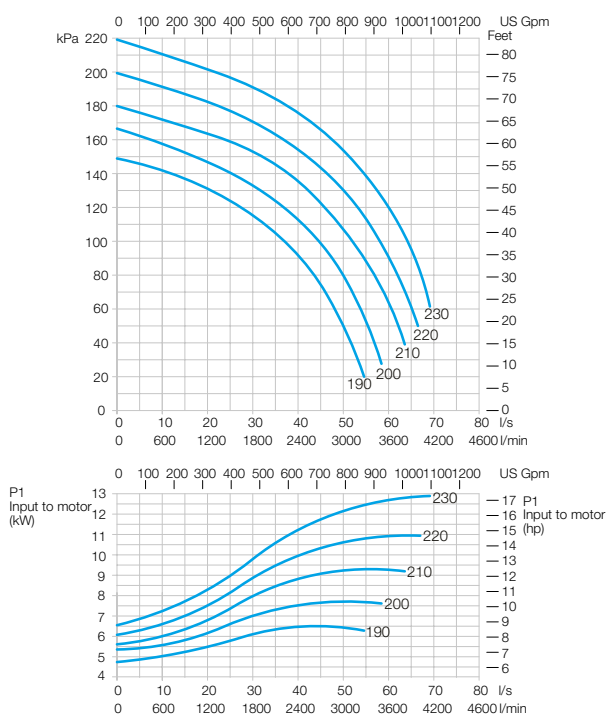
VMOA 150 60 Hz



VMOA 125 50 Hz



VMOA 125 60 Hz



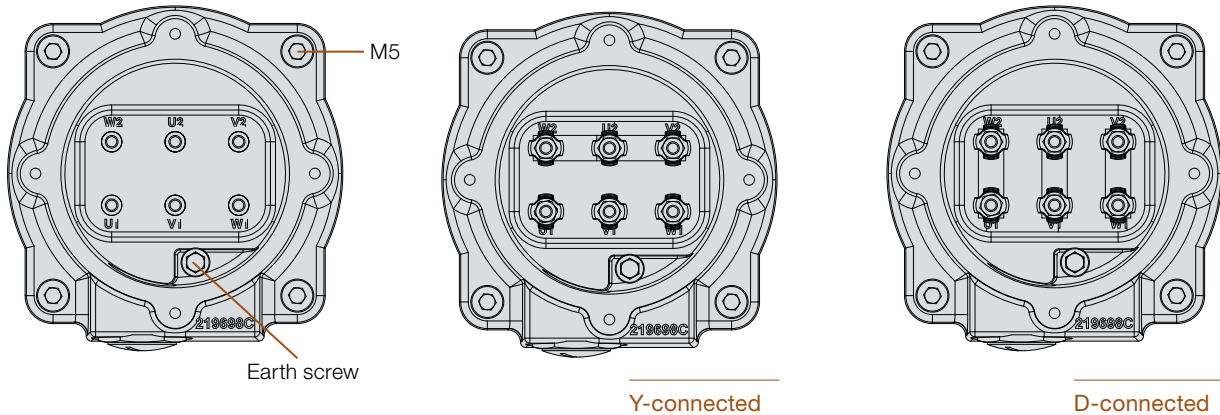
Installation

The pumps are supported by their flanges and can work in any position. They shall be connected to the inlet side of coolers in order to prevent underpressure at the inlet.

After installation the direction of rotation of the pump must be checked. The direction will be correct (i.e clockwise seen from the inlet side) if the

terminals in terminal box marked U1 V1 W1 (older marking S1, S2 and S3) are connected in phase sequence. When the pump is filled with oil and the direction of rotation is correct only a soft humming noise can be heard. If the impeller is rotating in the wrong direction, a much louder, rattling noise will occur. The motor is designed for direct start. Avoid to start and drive the pumps with closed valves.

Terminals



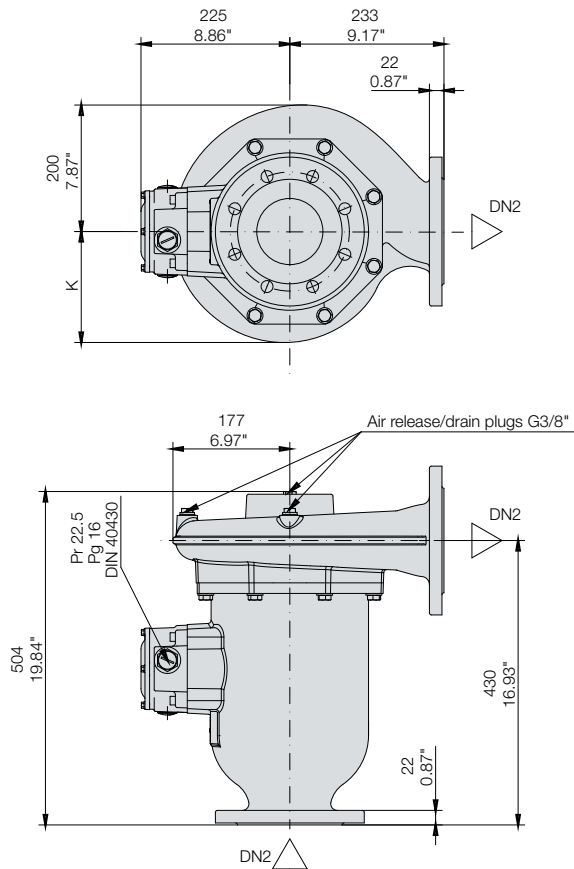
Painting

The pumps require no special maintenance other than touch-up painting, checking of cable connections and a check to ascertain that no oil leaks exists.

- The pumps are delivered in different painting versions.
- Primer only (PK) or according to ISO 12944-5.
- Corrosion class C4 (C4).
- Corrosion class C5 (C5).
- The standard colour is NCS 1700/RAL 7047 (light grey).
- All paint joints broken during mounting must be touch up painted to fulfill the corrosion class.

Pump dimensions

Pump size	Dimension K mm	Dimension K inch	Weight kg	Weight lb
VMOA 100-060	155	6.10"	95	210
VMOA 100-082	155	6.10"	95	210
VMOA 100-160	155	6.10"	95	210
VMOA 100-182	155	6.10"	95	210
VMOA 100-188	185	7.28"	100	220
VMOA 100-198	185	7.28"	100	220
VMOA 100-218	158	7.28"	100	220
VMOA 150-XXX	-	-	120	265
VMOA 125-XXX	-	-	155	342



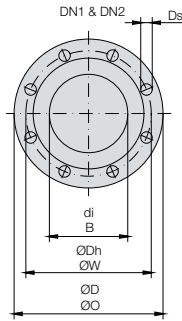
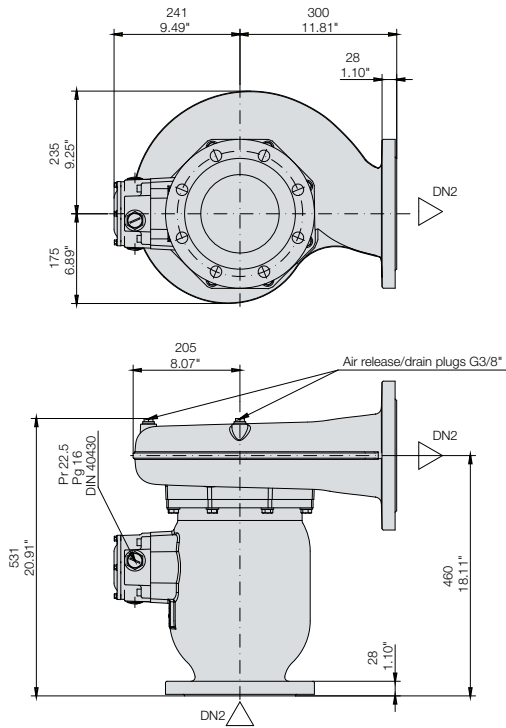
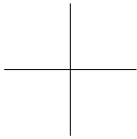
VMOA 100

Drilling of ISO flanges

di (DN)	PN	D	Dh	Ds
100	6	ø225	ø170	ø18(4x)
100	10	ø225	ø180	ø18(8x)

Drilling of ANSI flanges

B	ANSI	O	W	Ds
ø4"	125	ø8.86"	ø7.5"	ø3/4"(8x)



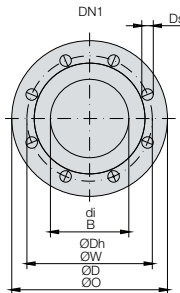
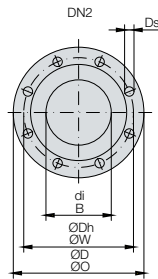
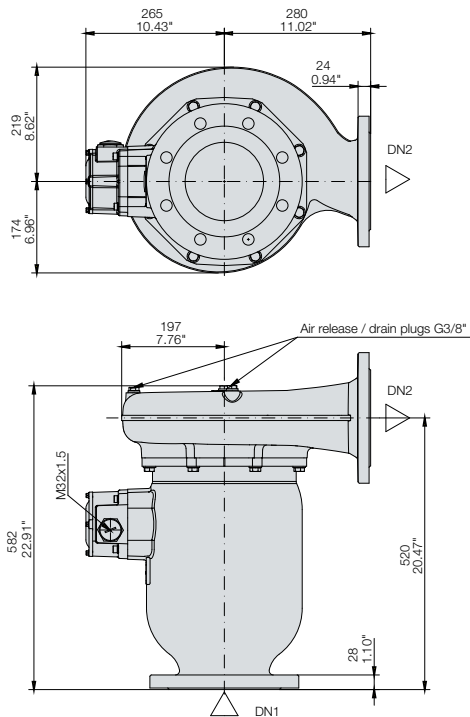
VMOA 150

Drilling of ISO flanges

	di	PN	D	Dh	Ds
DN1	150	6	ø285	ø225	ø18(8x)
	150	10	ø285	ø240	ø22(8x)
DN2	125	6	ø250	ø200	ø18(8x)
	125	10	ø250	ø210	ø18(8x)

Drilling of ANSI flanges

	B	ANSI	O	W	Ds
DN1	ø6"	125	ø11.22"	ø9.50"	ø7/8"(8x)
DN2	ø5"	125	ø11.22"	ø8.50"	ø7/8"(8x)



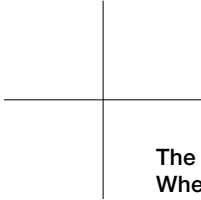
VMOA 125

Drilling of ISO flanges

di (DN)	PN	D	Dh	Ds
150	6	ø285	ø225	ø18(8x)
150	10	ø285	ø240	ø22(8x)

Drilling of ANSI flanges

B	ANSI	O	W	Ds
ø6"	125	ø11.22"	ø9.50"	ø7/8"(8x)



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The Flow Equipment division specializes in pumping solutions specifically engineered for the processes of our customers. We provide pumps, agitators, compressors, grinders, screens and filters developed through intensive research and development in fluid dynamics and advanced materials. We are a market leader in pumping solutions for water, oil and gas, power, chemicals and most industrial segments.

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