

**VMOA 变压器油循环泵**  
**VMOA Transformer Oil Circulation Pump**



# VMOA 系列 — 真空防漏性能可靠

## 运行数据

该泵是一种离心泵，设计用于循环变压器油并与冷却设备连接。

具有两种尺寸 VMOA100 和 VMOA150 可供选择。配置 50 或 60 赫兹的三相电机。可以选择从 95 到 630 伏不同的电机电压。

## 泵的部件

电机和泵的所有运动部件均完全被电机外壳和泵外壳包住，形成一个密封装置。泵叶轮直接安装在电机轴上。泵外壳 (1) 和电机外壳 (5) 用铸铁制造，并通过螺栓连接在一起。连接处用 O 型圈密封。

定子 (6) 和线圈 (8) 直接安置在电机外壳里。支撑转子 (7) 及泵叶轮 (3) 的电机轴 (9) 由两个十字轴和滚珠轴承固定。滚珠轴承 (4) 带有缓冲弹簧，以防在转子静止而电机外壳发生震动时损坏轴承。

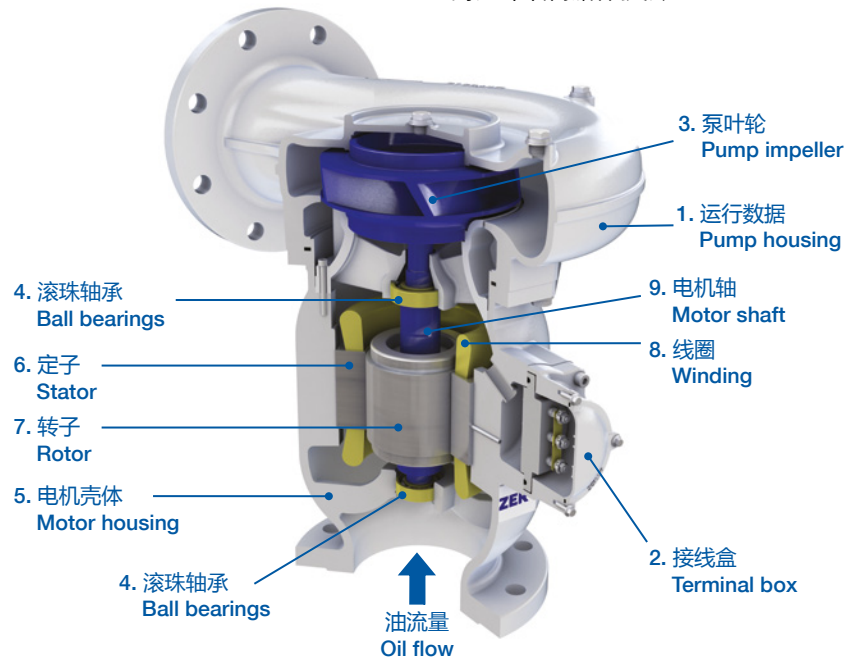
泵叶轮用轻合金制造，并且经过精细的机加工和平衡校验。泵的入口和出口连接法兰的尺寸是相同的。可选择 ISO

PN6, 10 和 ANSI 125 标准的法兰孔。送货时法兰会被遮盖住以避免在储存和运输过程中水汽在泵里面聚集。

使用的电机是符合 IEC34-1 标准的笼型感应电动机。4 极或 6 极型号的绝缘等级为 F。

接线盒的防护等级是 IP55，并为电缆接头提供一个螺丝孔。送货时用一个塑料塞子封住螺丝孔。在邻近电缆接入螺丝孔位置可以钻其他尺寸的孔。接线盒还设有一个外部的接地螺钉。

对电机和泵有从仅上底漆至完全上面漆的不同上漆方法供选择。泵内表面涂有耐油环氧树脂保护层。



## Series VMOA – Vacuumproof and Leakproof

### Design Performance

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

Two sizes VMOA 100 and VMOA 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 630V.

### 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. The connection flanges have same size on inlet and discharge side of the pump. Drilling according to ISO PN6, 10 and ANSI 125 are available. On delivery the flanges are covered in order to prevent moisture collecting in the pump during transport or storage.

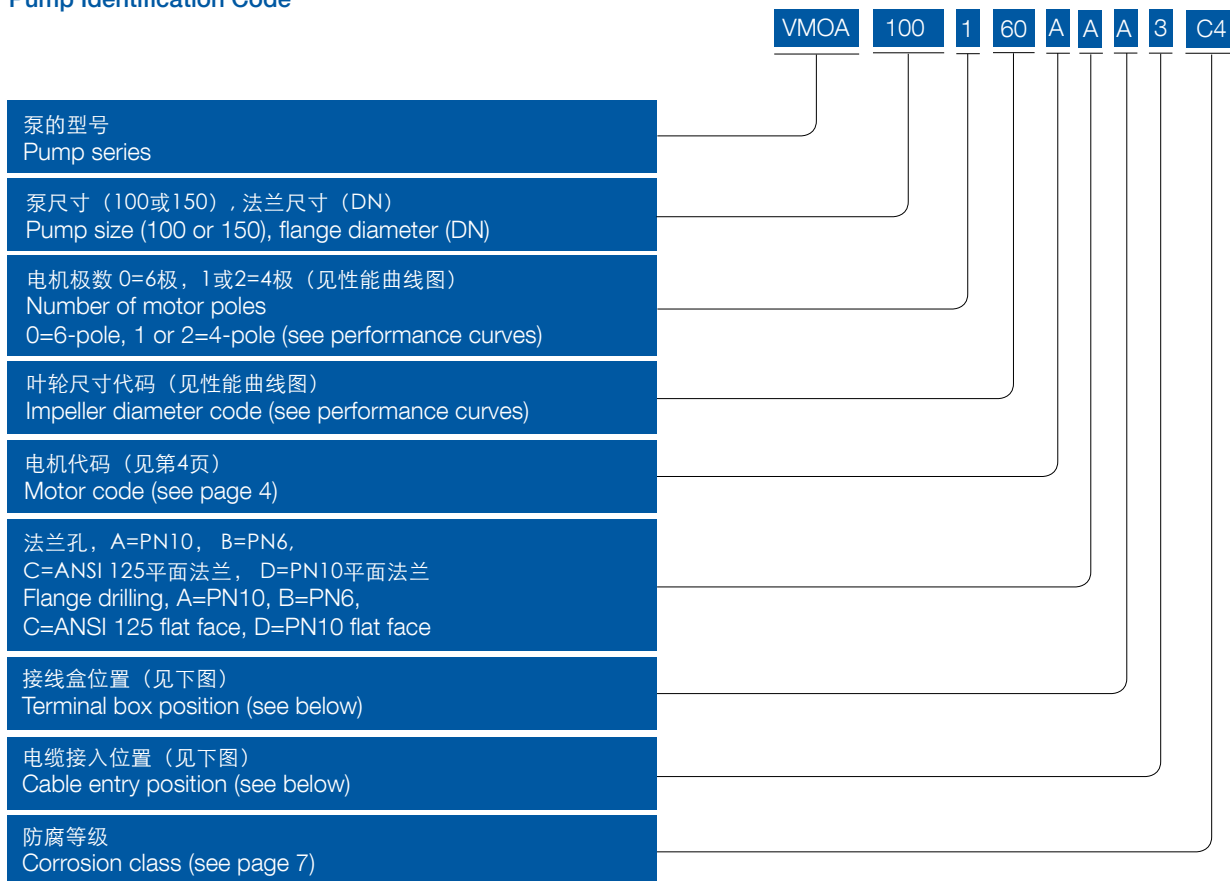
The motor used is a three phase cage induction according to IEC 34-1, insulation class F in four or six pole versions.

The terminal box is splash proof IP55 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.

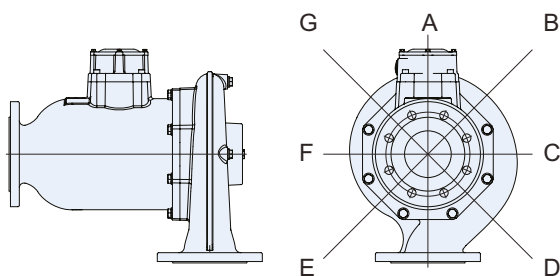
## 泵的标识代码

### Pump Identification Code



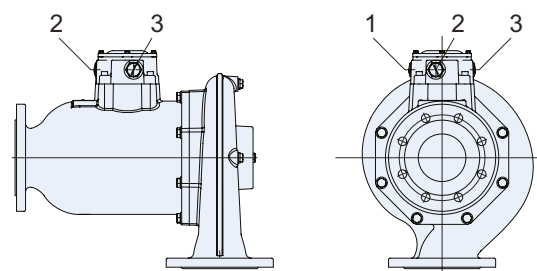
#### 接线盒位置

#### Terminal box position



#### 电缆接入位置

#### Cable entry position



#### 灵活的安装方式

若有需要, 泵体可以根据电机壳体位置来转动至合适的方位。接线盒也可以转动以避免 电缆接头在顶部交叉。在完成这些调整后一定要检查泵部件是否上紧。用一个 U 型套管固定连接电缆可以防止水从接线盒的接头位置进入。

建议在真空条件下注油。否则, 应该在启动泵之前进行排气。

#### Versions

The pump casing can be rotated in relation to the motor housing if necessary. 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 a U-shaped bend to prevent the water from entering the terminal box through the gland.

Oil filling under vacuum is recommended. Otherwise the pump circuit should be air vented before start.

## 电压范围和电流继电器

在表格中过电流继电器的推荐设定值用于万一发生转子失速以及当尝试两相启动时在最长 30 秒内触发断路器。这些设定值可以让泵在油温度低至 -10 度 (14 华氏度)、油粘度为 72 毫米<sup>2</sup>/秒, 以及在油温度低至

-40 度 (-40 华氏度)、油粘度为 1600 毫米<sup>2</sup>/秒的条件下启动和运行。当检查过电流继电器的运行时, 应该尝试脱离其中一相来启动。当设定值用于 -40 度 (-40 华氏度), 发生单相切断时不会触发断路器, 但是, 这对电机无害。

## 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 mm<sup>2</sup>/s (cSt) and to -40°C (-40°F) with an oil viscosity corre-

sponding to 1,600 mm<sup>2</sup>/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.

在正常电压和高流量下的工作电流, A  
Operating current at nominal voltage and high oil flow, A

在低至 -10°C (14°F) /-40°C (-40°F) 条件下过电流继电器的推荐设定值  
Recommended setting on overload relay down to -10°C (14°F)/down to -40°C (-40°F), A

电机代码字母 Motor code letter	频率 (赫兹) Frequency Hz	连接方式 Con- nection	电压范围 Voltage Range 1)	正常电压 Nom. Volt- age	VMOA 100 叶轮代码 Impeller Code							VMOA 150 叶轮代码 Impeller Code					
					060 (6极) (6-pole)	082 (6极) (6-pole)	160 (4极) (4-pole)	182 (4极) (4-pole)	188 (4极) (4-pole)	198 (4极) (4-pole)	218 (4极) (4-pole)	160 (4极) (4-pole)	167 (4极) (4-pole)	175 (4极) (4-pole)	182 (4极) (4-pole)	190 (4极) (4-pole)	200 (4极) (4-pole)
A	50	Y	115-140	127	7.1	8.0	16.2	19.5	23	25	30	17.4	18.1	19.2	21.0	23.4	29.0
					10.6/11.7	11.7/11.7	24/45	29/45	35/45	38/45	45/45	26/45	27/45	29/45	32/45	35/45	44/45
B	50	Y	165-200	180	5.0	5.7	11.4	13.7	16.3	18	21	12.4	12.9	13.7	15.0	16.7	20.7
					7.5/8.3	8.3/8.3	17/32	21/32	24/32	27/32	32/32	18.6/32	19.3/32	20.6/32	22.5/32	25/32	31/32
	50	D	95-115	105	8.5	9.7	19.7	24	28	31	37	20.5	21.7	23.6	26.1	29.5	39
					12.8/14.3	14.3/14.3	30/56	36/56	42/56	47/56	56/56	30.7/56	32.5/56	35.4/56	39.2/56	44.3/56	56/56
	60	Y	190-230	208	5.3	5.8	11.8	14	16.7	-	-	14.4	15.5	17.4	20	23	-
					7.9/8.3	8.3/8.3	17.7/32	21/32	25/32	-/-	-/-	21.6/32	23.3/32	26.1/32	30/32	32/32	-/-
C	60	D	110-130	120	9.0	10.0	21	24	28.6	-	-	24.9	27.4	31.6	37.2	44.7	-
					13.5/14.3	14.3/14.3	32/56	36/56	43/56	-/-	-/-	37.3/56	41.1/56	47.4/56	56/56	56/56	-/-
	50	Y	360-440	400	2.4	2.6	5.3	6.0	7.0	7.5	10	6.0	6.4	6.5	6.8	7.7	9.0
					3.6/3.9	3.9/3.9	8.1/15	9.8/15	11.5/15	13/15	15/15	9.0/15	9.6/15	9.8/15	10.2/15	11.6/15	13.5/15
	50	D	210-250	230	4.3	4.6	9.4	11.3	13.3	14.7	17	9.8	10.0	10.5	11.7	13.0	16.3
					6.4/6.8	6.8/6.8	14/26	17/26	20/26	22/26	26/26	14.7/26	15/26	15.8/26	17.6/26	19.5/26	24.4/26
D	60	Y	400-480	440	2.4	2.7	5.6	6.6	7.8	-	-	6.7	7.0	7.9	9.3	10.6	-
					3.6/3.9	3.9/3.9	8.4/15	9.9/15	11.7/15	-/-	-/-	10/15	10.5/15	11.9/15	14/15	15/15	-/-
	60	D	230-280	255	4.2	4.7	9.7	11.4	13.4	-	-	11.2	12.1	13.8	15.9	18.5	-
					6.3/6.8	6.8/6.8	14.6/26	17.1/26	20/26	-/-	-/-	16.8/26	18.1/26	21/26	24/26	26/26	-/-
	50	Y	450-550	500	1.8	2.2	4.2	5	5.9	6.5	7.5	4.5	4.8	5.3	5.6	6.0	7.0
					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	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	50	D	260-320	290	3.2	3.8	7.1	8.7	10.2	11.3	13	7.6	8.3	8.7	9.5	10.3	11.6
					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	11.4/19.5	12.4/19.5	13.0/19.5	14.2/19.5	15.5/19.5	17.4/19.5
	60	Y	520-630	575	1.9	2.1	4.3	5.1	6	-	-	5.3	5.7	6.4	7.2	8	-
					2.8/3.0	3.0/3.0	6.5/11.5	7.7/11.5	9.0/11.5	-/-	-/-	7.9/11.5	8.5/11.5	9.6/11.5	10.8/11.5	11.5/11.5	-/-
	60	D	300-360	335	3.4	3.7	7.4	8.7	10.2	-	-	9.2	9.9	11.1	12.4	14	-
					5.1/5.3	5.3/5.3	11.1/19.5	13.1/19.5	15.5/19.5	-/-	-/-	13.8/19.5	14.8/19.5	16.6/19.5	18.6/19.5	19.5/19.5	-/-

1) 可能持续地超出最大值5%。  
The maximum value may be exceeded by 5% continuously.

# 技术参数

## 额定参数

所有该型号的泵使用相同尺寸的电机。电机可用于 4 种电压范围并且可选择 4 极或 6 极型号。电机因此在大多数情况下能满足要求。

下表显示了电机的输出功率和转速，正常电压下的电流显示在前一页的表格中。直接启动时的启动电流是有效的，应该一直使用。

## 泵流量和电机输入功率

各个尺寸泵的流量和电机输入功率通过下一页的曲线图来说明。泵的流量适用于油粘度为 20 毫米<sup>2</sup>/秒 或以下，油密度为 850 千克 / 米<sup>3</sup> (54.3 磅 / 英尺<sup>3</sup>) 的条件。符合 ISO9906 标准的泵性能曲线显示在下页。工作电流随实际油流量变化而变化，当检查整套设备的运行时应该测量工作电流。当泵停止运转，流量降至 6 升 / 秒 (95 加仑每分钟) 时整台泵的压降约为 5 千帕 (0.7 磅每平方英寸)，流量降至 12 升 / 秒 (190 加仑每分钟) 时整台泵的压降约为 15 千帕 (2.2 磅每平方英寸)。

## 噪音值

泵的噪音值为 50 (加权) 分贝，在 两米 (6.6 英尺) 距离处测量出最大的噪音值为 62 (加权) 分贝。

## 50 赫兹 / Hz

电机代码字母 Motor Code Letter	极数 Number of Poles	连接方式 Rated Voltage (V)	额定电压 Connection (Y 或/or D)	额定电流 Rated Current (A)	启动电流 Starting Current (A)	额定输入功率 (千瓦) Rated Input (kW)	额定转速 (转/分钟) 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	1435
B	4	105	D	37	215	5.5	1435
B	4	180	Y	21	122	5.5	1435
C	4	230	D	17	99	5.5	1435
C	4	400	Y	10	58	5.5	1435
D	4	290	D	13	76	5.5	1435
D	4	500	Y	7.5	44	5.5	1435

## 60 赫兹 / Hz

电机代码字母 Motor Code Letter	极数 Number of Poles	连接方式 Rated Voltage (V)	额定电压 Connection (Y 或/or D)	额定电流 Rated Current (A)	启动电流 Starting Current (A)	额定输入功率 (千瓦) Rated Input (kW(Hp))	额定转速 (转/分钟) Rated Speed (rpm)
B	6	120	D	9.5	62	1.3/1.7	1170
B	6	208	Y	5.5	36	1.3/1.7	1170
C	6	255	D	4.5	29	1.3/1.7	1170
C	6	440	Y	2.6	17	1.3/1.7	1170
D	6	335	D	3.5	23	1.3/1.7	1170
D	6	575	Y	2.0	13	1.3/1.7	1170
B	4	120	D	37	215	6.3/8.4	1725
B	4	208	Y	21	122	6.3/8.4	1725
C	4	255	D	17	99	6.3/8.4	1725
C	4	440	Y	10	58	6.3/8.4	1725
D	4	335	D	13	76	6.3/8.4	1725
D	4	575	Y	7.5	44	6.3/8.4	1725

# 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.

## 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 mm<sup>2</sup>/s or less and an oil density of 870 kg/m<sup>3</sup> (54.3 lb/ft<sup>3</sup>). 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 ap-

proximately 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

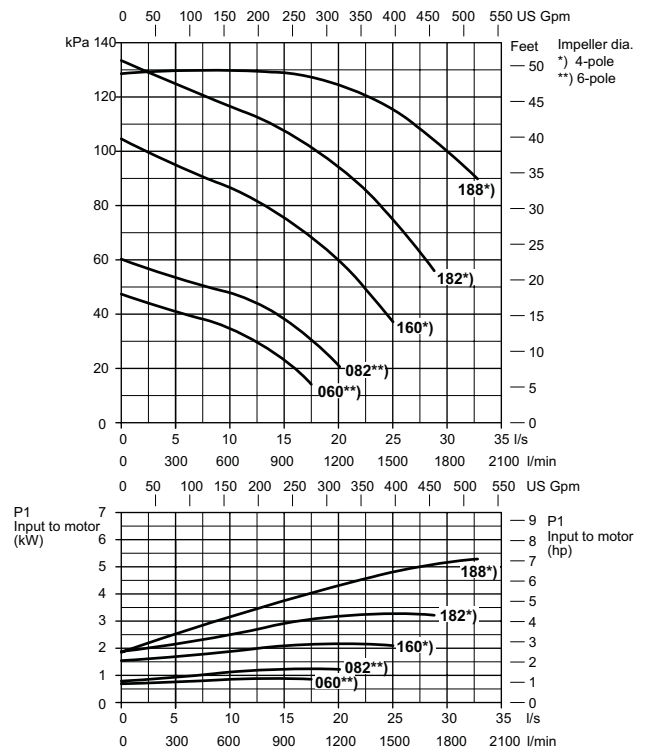
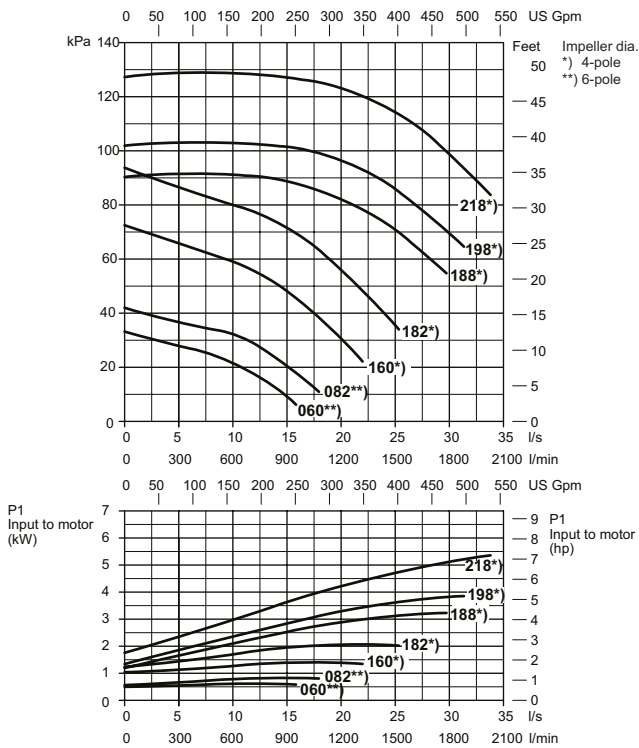
The sound pressure level of the pump is 50 dB(A), measured at a distance of 2 m (6.6 ft) maximal and the sound power level is 62 dB(A).

# 技术参数 / Performance Ranges

VMOA 100

50 赫兹 / Hz

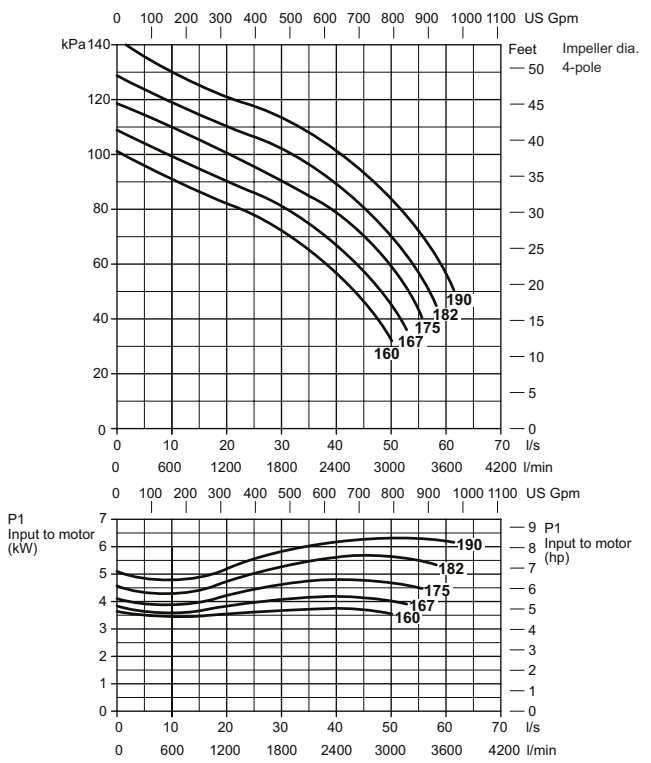
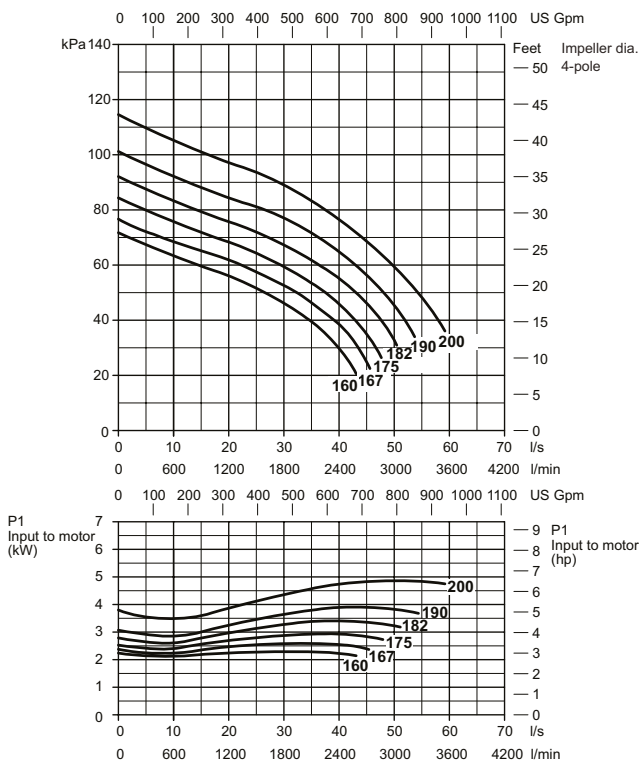
60 赫兹 / Hz



VMOA 150

50 赫兹 / Hz

60 赫兹 / Hz





## 安装

泵由法兰支撑并且可以在任何位置运行。泵与冷却器的入口连接以防入口处压力不足。

在完成安装以后必须检查泵的旋转方向。如果在接线盒中标识为 S1, S2 和 S3 的接线端子以相位序列连接, 则旋转方向将是正确的 (从入口侧观察顺时针方向)。当泵内充满油时只听到柔和的嗡嗡声, 那么泵的旋转方向应该是正确的。如果叶轮旋转方向错误, 则产生一种更响的嘎嘎声。电机被设计成直接启动。避免在阀门关闭的情况下启动和运转泵。

## 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.

## 上漆

除了进行补漆、检查电缆连接以及检查确定没有出现漏油之外, 不需要对泵进行其它特别的维护。

有不同的上漆方式供选择: 仅上底漆 (PK) 或根据 ISO12944-5 标准。防腐等级 C4 (C4)。防腐等级 C5 (C5)。标准配置颜色为 NCS1700/RAL 7047 (浅灰色)。所有已上漆的连接部件如果在安装时其油漆层受到损坏则一定要进行补漆以符合防腐等级的要求。

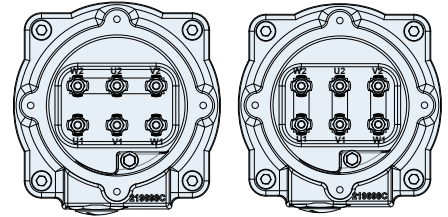
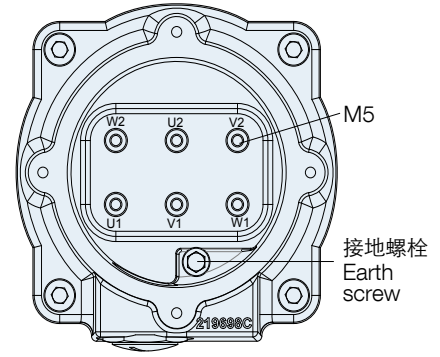
## Painting

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.

## 接线端

## Terminals

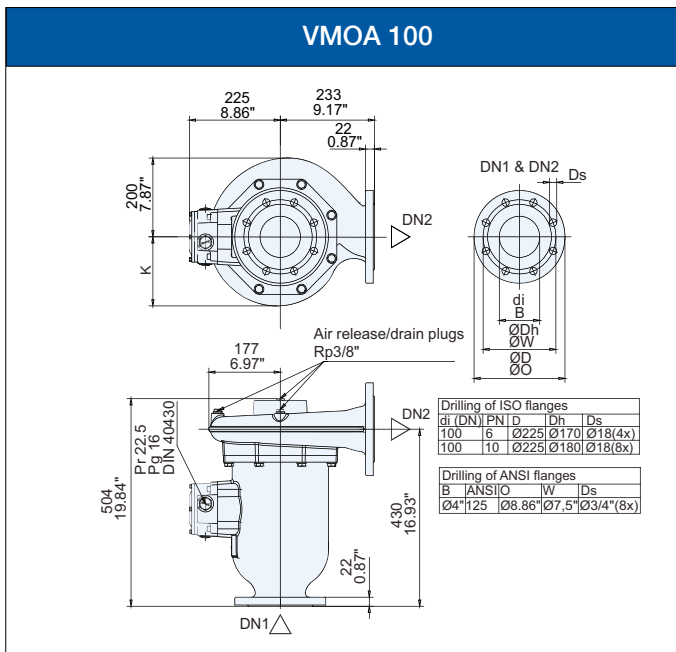


Y型连接方式  
Y-connected

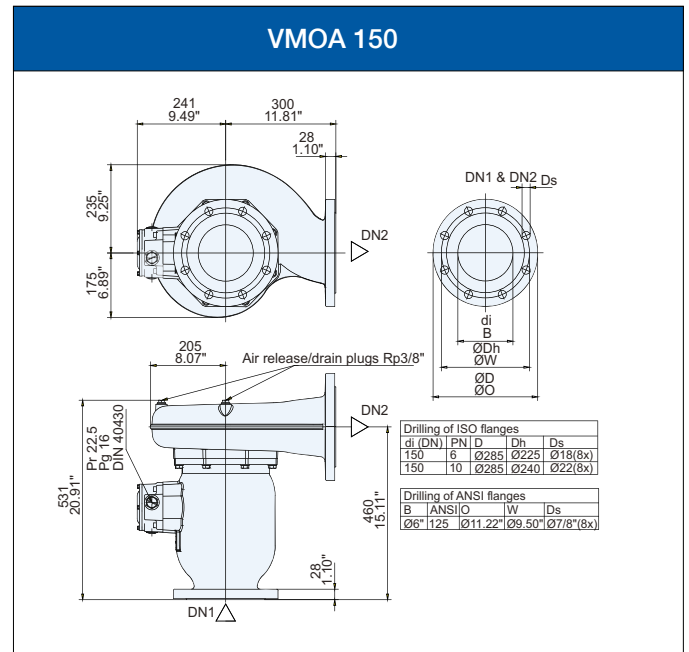
D型连接方式  
D-connected

泵尺寸 Pump size	尺寸K值 (毫米) Dimension K (mm/Inch)	重量 (千克) Weight (kg/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	185/7.28"	100/220
VMOA 150-XXX	185/7.28"	120/265

## 尺寸图 Dimension prints



接线盒的标准安装方式  
Terminal box shown as mounted on the standard version.



接线盒的标准安装方式  
Terminal box shown as mounted on the standard version.

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