

安装与维护手册 Installation and Maintenance Manual



SIMOTICS SD 1LE8 低压交流异步电动机

2019.03
Answers for industry.

SIEMENS



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1.0 简介

1.1 应用范围

SIMOTICS SD 1LE8系列标准电机的防护等级符合IEC60034-5标准中IP55防护等级的要求（见铭牌标注），适用于粉尘及潮湿的工作环境。如果电机安装或储存于户外，有必要增加相应的防护装置，以避免受长期强烈阳光曝晒、雨水侵蚀、以及冰雪和灰尘对电机造成的影响。

相关闭环境条件如下：

- 海拔高度 ≤1000 m
- 操作环境温度 -20 °C ~ +40 °C
- 相对湿度见下表

环境温度	相对湿度
-20 °C≤T≤20 °C	100 %
20 °C<T≤30 °C	95 %
30 °C<T≤40 °C	55 %

注：如果使用环境条件和以上不一样，请咨询西门子。

本系电机符合GB18613-2012《中小型三相异步电动机能效限定值及能效等级》标准，具体规格的能耗指标参见铭牌。

1.2 冷却方式

自冷却方式（标准配置）：冷却方式 IC411，符合 IEC/EN 60034-6 标准要求。

SIMOTICS SD 1LE8 电机为全封闭自冷却（双向风扇）型式电机，在用时时确保电机具有足够的冷却风量。如果 使用可选外部风扇，必须在安装风扇时确保合适的冷却风向。

强制冷却方式（选件）：冷却方式为 IC416，满足 IEC/EN 60034 标准要求。

电机冷却是通过一个独立的风扇（强制通风）而实现的。这种强制冷却不受机器运行状态的影响。

注意！

- 1) 确保独立风扇气流通畅，且与周围环境气流方向一致；
- 2) 独立风扇须由一个独立电源模块供电，并且确保风扇的转向与其风扇罩上附带的转向标志指示的方向一致；
- 3) 独立风扇不能通过变频器驱动；
- 4) 电机启动前，先启动独立风扇，然后启动电机；电机停机时，先关闭电机电源，待电机停止运行后断开独立风扇驱动电源。





1.3 安装结构型式




电机铭牌上标出了其安装结构型式






警告

在运输过程中，电机须通过吊环或电机结构类型指定位置进行吊装搬运。

安装型式 Mounting type	IM B3 FS315~355	IM B6 FS315	IM B7 FS315	IM B8 FS315
示意图 Diagram				
电机编号第14位号上对应的字母 Letter, position 14 th of Motor code	A	T	U	V

安装型式 Mounting type	IM V5 ¹⁾ FS315	IM V6 ²⁾ FS315	IM V1 ¹⁾ FS315~355
示意图 Diagram			
电机编号第14位号上对应的字母 Letter, position 14 th of Motor code	C	D	G

安装型式 Mounting type	IM B35 FS315~355	IM V15 ¹⁾ FS315	IM V35 ²⁾ FS315
示意图 Diagram			
电机编号第14位号上对应的字母 Letter, position 14 th of Motor code	J	W	Y

注：1) 室外使用时推荐使用护罩（选件号H00）；
2) 当户外安装时，推荐对电机轴采取防护措施，避免水直接喷射到电机轴上；

2.0 搬运及存储

在运输电机时，必须用所提供的吊环或电机结构类型指定位置进行吊装搬运。在搬运电机之前，请确保吊环安装正确且牢固，但切勿用使电机轴和风扇罩来搬运电机。另外，电机升降时必须注意避和摆摇免震动，以防造成轴 承受损。

建议所有的电机应该储存在干燥无尘的环境之下，并避免过多的震动。

若电机出厂后存储 2 年或超过 2 年，建议更换润滑油脂。

如果电机在灰尘及湿度较大环境下存储时间超过 2 年，电机的用使用寿命将会降低。对于这种情况，必要时在电机安装和启动前，对其绝缘系统进行检测，从而保证其可以正常稳定的运行（相关参考值，见 3.5）。

必要的防做表面，轴端表面等）已在工厂进行防腐蚀处理，但是在电机储存时仍需兰法（工表面加腐措施。建议经常转动一下电机轴，使轴承润滑油脂分布均匀。

3.0 调试



所有工作都必须由熟练工人进行操作。电机做任何操作工作之前，确保电机与主线及辅助电源断开。并且确保电源不被意外开启。

3.1 安装

良好的基础与正确的安装是将来电机长期可靠运行的基本条件。基础不良或者安装不当，会造成异常的电机振动和噪音。

3.1.1 基础要求

电机安装的基础可以是金属底座，也可以是混凝土结构的平台，无论是何种结构基础都应有足够的强度与刚性支撑电机。

基础的设计可以参考 DIN4024。

支撑电机的基础表面必须是平面，常用电机支撑平面的平面度：

机座号(FS)	平面度 (mm)
≤132	0.10
160	0.15
≥180	0.20

3.1.2 安装要求

由于机械部件制造公差及累积误差的存在，电机底脚安装平面与基础安装的接触平面之间，可能存在间隙。

安装时，应仔细用塞尺测量此间隙值。对于>0.05mm 的间隙，应插入合适的填隙片。填隙片的尺寸根据实际的间隙值配做。



插入合适厚度的填隙片

3.1.3 电机安装完毕后必须将吊环拧紧。当电机竖直安装且电机轴驱动端向下时，建议在非驱动端增加

防护罩，从而可以避免水及其他外部物体进入风扇罩，从而影响电机散热。

3.1.4 当电机竖直安装且驱动端轴朝上安装，建议做必要的防护措施，以防止液体沿电机轴进入电机。

3.2 接线盒

接线盒安装于电机顶部或侧面（左侧或右侧），可以作 4×90° 方向旋转，便于电缆多角度引入。

3.3 动平衡与联结

为了确保安静、无震动的运行环境，对传动联结件动（联轴器、滑轮、风扇、变速器等）须进行适当的轴向、径向校正。

电机转子动平衡方式为半键平衡。动平衡方式在电机铭牌上有标注（H表示半键平衡）。

注意！

1）

为确保无震动运行，传动联结件的动平衡方式为半键平衡；


2）

在调整传动联结件配合过程中，须考虑联结件与电机的温度环境；

3）

当电机启动前没有联结任何传动件时，电机轴上的键必须移除。

3.4 电气连接

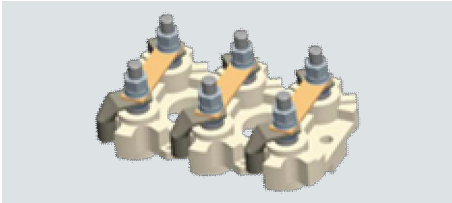


所有工作都必须由熟练工人进行操作。电机做任何操作工作之前，确保电机与主线及辅电源断开。并且，确保电源不被意外开启。

电机的接线盒内都有六个电源线接线端子和两个接地端子，电机的机壳上还有一个接地点。所有电机都适合双向转动（正转或者反转），并且通过调整其中两相电的顺序即可改变电机转向。

电源连接
本系列三相异步电动机线圈可连接成星形、三角形。
对于正 确运行，允许电压偏差为±5%，频率偏差为±2%。

电缆连接示例



电机机壳外接地线



大小以及方向。矩力请参照表 1 中接线端子拧紧，矩力于接线端子的拧紧关



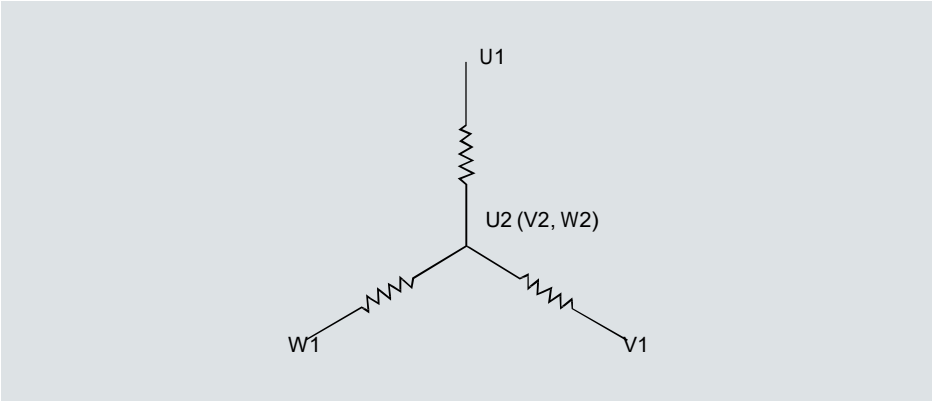
表 1

尺寸	M4	M5	M6	M8	M10	M12	M16
转距(Nm)	1.2	2.5	4.0	8.0	13	20	40

注：拧紧力矩（Nm，公差：±10%）

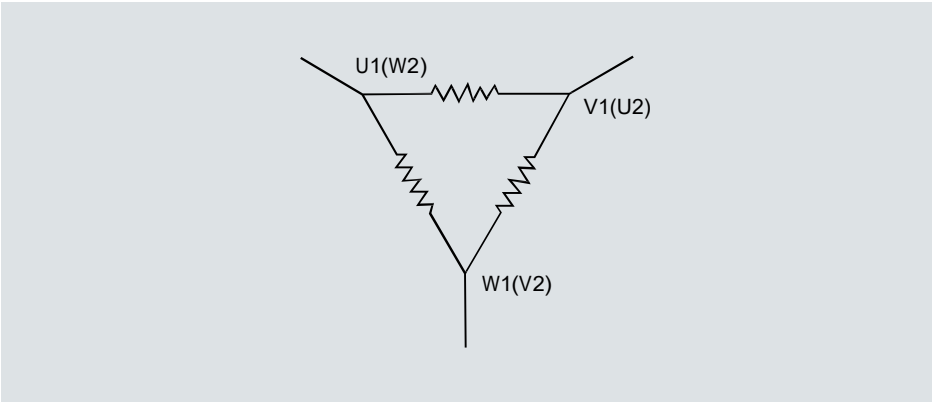
星形连接

星形连接是通过绕组接线端子 W2、U2 及 V2 相互连接，U1、V1、W1 端连接电源而实现，如下图所示



三角形连接

三角形连接是通过三相绕组的端子首尾依次相接而实现，如下图所示



注：若接线盒的辅助或主进线孔由葛兰密封，需要用标准的扳手来拧开。

绕组保护

电机有三种规格的温度传感器：（电机编号的第 15 位字母）

- PTC 热敏电阻 — 用于报警（145 °C）或跳闸保护（155 °C）
- PT100 测温电阻 — 用于测定轴承或绕组温度
- KTY84-130 — 用于绕组测温，使用温度传感器

临界电阻的测量：临界电阻的测量必须在电机运行温度的情况下对绕组施加500V直流电压。常见的绝缘电阻故障原因及处理方式主要有如下 2 种情况。

故障原因 1：可能是由于环境潮湿引起的

处理措施 1：需要将绕组进行烘干处理。

故障原因 2：电机经过长时间运行后（电机处于热态状态），最小电阻值可降低。

处理措施 2：如果 测量值低于临界电阻值，必须对电机进行更换或修改。

3.6 温度检测

温度是电机运行时的重要参考指标，得到电机各重要部位的实时温度，对掌握电机的运行状态、有效预防电机故障、保证电机可靠运行十分重要。

电机温度受冷却介质和环境温度的影响。对电机绕组温升的测量，通常是预埋测温元件（如 PT100），测温元件通过引出线连接控制系统，对电机进行测温，或者使用高精密的电阻法进行推算。如需测量电机机壳表面温度，应采用专门的仪器（如红外测温仪）进行测量，测量位置一般在电机吊环孔位置或电机中间位置。

3.7 变频器应用



在电机负载转矩不稳定时（如活塞式压缩机，负载），必然会导致非正弦电流，该电流的谐波会对系统造成影响，而产生过多干扰。

电磁兼容性

当变频器驱动电机时，电磁干扰的程度大小取决于变频器的类型（种类，IGBT 数量，干扰控制措施及制造商）、布线、距离以及应用需求。

在设计和应用阶段必须参考变频器制造商关于电磁兼容性的安装指导。



如果使用变频器驱动电机，转速超过电机额定转速时，必须考虑对电机的机械零部件及传动联结件的影响。

更多内容，请参考 IEC 60034-1。

噪声，温升和振动

电机在变频运行时，电机噪声、温升将会有所增加。

变频应用时，可能会由于转速高于额定转速，电机机械振动加大，从而使机械运转的平稳性发生变化。这样也会导致轴承和润滑脂的寿命降低。

4.0 维护



对电机进行维护操作前，电机必须对主电路以及相关的辅助电路隔离。

“5 项安全规则”（如在 DIN VDE 0105 中规定的）如下：

- 设备与电源隔离
- 采取有效措施防止再次连接
- 确认设备停止运行
- 确保电机正确接地
- 隔开相连的运动部分

以上所列的规则应一直保持到所有电机维修维护工作全面结束，并组装完成。

4.1 轴承寿命

在正常运行条件下，电机水平安装且不受任何轴向力的情况下，电机轴承寿命至少可达到**40,000** 小时；在电机承受允许径向和轴向负荷时，电机轴承寿命至少可达 **20,000** 小时。这里所说的 20,000 或 40,000 小时指的是，电机在环境温度不超过 **40 °C**，按电机铭牌上标定的数据正常运转的情况下可达到的寿命。

注意！

1) 环境温度超过 **40 °C** 后，每升高 **10 °C**，润滑脂的寿命降低一半。

2) 电机在垂直安装、外界环境非常恶劣、受外部机械振动或处于湿度比较大的环境中运行的情况下，润滑油脂的寿命以及轴承的寿命将会缩短。

3) 长期的储存会降低轴承的寿命，电机在长期储存超过 **24** 个月时，驱动端和非驱动端的轴承需要重新注油。

4) 按要求的润滑时间间隔和加注油脂量进行定期注油。



警告
电机长期变频高速运转会将降低轴承和润滑脂的寿命

4.2 润滑脂类型

润滑脂类型：UNIREX N3（Esso），合成润滑脂符合 DIN 51825-K3N 规定。

4.3 润滑脂寿命和再润滑周期

电机标准配置带注油装置，再润滑周期及加注油脂量见下表。

机座号	极数	再润滑周期（小时）	加注油脂量（克）
315	2	3000	30
	4	4000	40
	6, 8	6000	40
355	2	3000	30
	4	4000	60
	6, 8	6000	60

注意！ 如果电机垂直安装、运行时存在较大震动、有负载突变的情况或者经常变向操作，应该在比更短的时间内更换润滑脂。

4.4 再润滑



警告
在电机运行过程中或停止状态进行注油时，必须遵守当地关于安全操作的相关规定！



添加润滑油脂时，注意不能加过多的润滑油脂，否则导致轴承温度过高。
添加润滑油脂过程中，切勿将灰尘或旧的润滑油脂进入轴承中。

注意！在添加润滑脂之前，需要将注油孔中的旧润滑脂清理干净。对于废旧的润滑脂应妥善处理，以防污染环境。

建议在电机运行过程中保持工作温度时，进行添加润滑脂。
若在电机运行过程中不能添加润滑脂，推荐先注入少量润滑脂，然后旋转电机使润滑脂均匀分布，当电机停下后，将剩余的润滑脂再注入。
如果电机轴驱动端轴承或非驱动端轴承过热，建议检查轴承受损情况，如有必要，则需更换轴承或添加润滑脂。

注意！如果过热，轴承脂颜色将会变暗。

4.5 轴承更换 — 装配与拆卸

当轴承寿命终了时，电动机运行的振动及噪声将明显增大，应更换轴承。

注意！更换新轴承的规格型号应与旧轴承相符

拆下电机的必要部分，用专业的工具将滚动轴承拉出。

在安装新的轴承之前，首先按照轴承生产商提供的相关说明对轴承进行预热，然后将轴承装入转子轴。轴承更换后，旧轴封（V型环或油封）也必须更换。



警告
更换轴承时，严格禁止任何冲击和击打（列如用锤头等），以防损害轴承，造成过早损坏。

关于端盖或法兰盘上螺栓的拧紧力，请参照表 5 中螺栓的拧紧力矩大小及方向



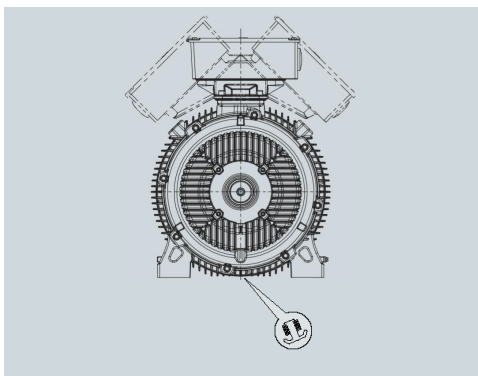
尺寸	M4	M5	M6	M8	M10	M12	M16	M20
转距(Nm)	2	3.5	6	16	28	46	110	225

注：拧紧力矩（Nm，公差：±10%）

4.6 排水孔

根据结构安装型式，可以考虑选用排水孔选项（选件号H03）。

排水孔位于电机机座上，并且排水孔在出厂时预先安装好塑料塞。



5.0 启动

预备检查

在电机第一次通电前，建议预先做一下几个方面的检查：

- 1) 确保螺栓拧紧，包括传动连结件上的螺栓；
- 2) 确保电机冷却风扇没有被卡住；
- 3) 确保轴承充分润滑；
- 4) 电源以及接线方式与铭牌一致，确保直接启动、软启动、或变频启动等数据与铭牌一致；
- 5) 确保正确接地；
- 6) 若电机配有热保护传感器或防潮加热带，确保这些器件的端子接线正确。

当电机接通电源后，检查电机的转向以及空气流通方向是否正确。电流、振动、噪声等是否正常。

REACH法规第33条的规定

该产品的一个或多个组成物品中含有高关注物质候选清单中的以下物质超过0.1%：

- CAS编号7439-92-1，铅

基于现有信息，在规范化使用的条件下，包括废弃处理，该物质不会产生风险。



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1.0 INTRODUCTION

1.1 Application scope

SIMOTICS SD 1LE8 series standard motors fulfill with protection degree IP55 according to IEC60034-5, and can be used in a dusty and damp environment. A suitable canopy cover is recommended if the motors are installed outdoors with exposure to direct sunlight, rain, snow and ice.

Please refer to the following environmental application conditions:

- Installation altitude $\leq 1000\text{m}$
- Operating temperature range $-20^{\circ}\text{C} \sim +40^{\circ}\text{C}$
- Relative humidity refer to following table

Ambient temperature	Relative Humidity
$-20^{\circ}\text{C} \leq T \leq 20^{\circ}\text{C}$	100 %
$20^{\circ}\text{C} < T \leq 30^{\circ}\text{C}$	95 %
$30^{\circ}\text{C} < T \leq 45^{\circ}\text{C}$	55 %

If the ambient conditions and site altitude is different from above, please consult with Siemens.

This series motors comply with GB18613-2012 Minimum allowable values of energy efficiency and the energy efficiency grades for small and medium three-phase asynchronous motors, the value of energy efficiency are written on rating plate.

1.2 Cooling method

Self-ventilation (standard): Type of cooling IC411 in accordance with IEC / EN 60034-6

SIMOTICS SD 1LE8 motors are totally enclosed and self-ventilated (TEFC) by a bi-directional fan mounted on the NDE of the rotor shaft. Care must be taken to ensure adequate clearance for maximum air flow and cooling. If the optional external fan is used, the correct direction of air flow must be taken into consideration for proper cooling.

Forced ventilation (option): Type of cooling IC416 is in accordance with IEC / EN 60034.

In this case the motor is cooled by a separately driven fan (forced ventilation), and it is not impacted by the status of the motor.

- Notice!**
- 1) Ensure the air flow of the separately driven fan smooth, and consistent with external air flow;
 - 2) The separately driven fan is powered by an independent module. And it must be ensured that the rotation direction of the separately driven fan is consistent with the mark shown on fan cowl;
 - 3) The separately driven fan can not be powered through converter;
 - 4) It must be ensured that the machine is not operated without starting the external fan, and stopped before external fan stop.





1.3 Types of construction/method of installation




The type of construction of the machine is stated on the rating plate.




Warning



During transport, machines may only be hoisted in a position corresponding to their basic type of construction.

安装型式 Mounting type	IM B3 FS315~355	IM B6 FS315	IM B7 FS315	IM B8 FS315
示意图 Diagram				
电机编号第14位号上对应的字母 Letter, position 14 th of Motor code	A	T	U	V

安装型式 Mounting type	IM V5 ¹⁾ FS315	IM V6 ²⁾ FS315	IM V1 ¹⁾ FS315~355
示意图 Diagram			
电机编号第14位号上对应的字母 Letter, position 14 th of Motor code	C	D	G

安装型式 Mounting type	IM B35 FS315~355	IM V15 ¹⁾ FS315	IM V35 ²⁾ FS315
示意图 Diagram			
电机编号第14位号上对应的字母 Letter, position 14 th of Motor code	J	W	Y

Note: 1) At outdoor application, the using of protective cover (option code H00) is recommended;

2) At out door application the protection of shaft again jet-water is recommended;

2.0 HANDLING AND STORAGE

When lifting the motors, always use the lifting eyes provided or machines may only be hoisted in a position corresponding to their basic type of construction. Prior to lifting the motor make sure that the lifting eyes are installed correctly and tightened. Never lift a motor using the rotor shaft and fan cowl. In addition care must be taken during lifting and lowering of the motor to avoid any shocks or vibrations which can result in bearing damages.

It is recommended that all motor be stored in a dry, dust free environment and free of excessive vibrations.

After 2 years of storage, recommend to replace the grease in bearings.

The service life of the motor can be considerably reduced if the storage period extends beyond 2 years in environments with high moisture and dirt. If necessary, the insulation resistance of the winding could be measured determine the health of the motor prior to installation and start-up, (see Section 3.5. for reference values).

Machined surfaces (flange, DE rotor shaft) are treated at the factory with an anti corrosive agent to prevent rusting. However these surfaces should be retreated during storage as deemed necessary. It is recommended that the motor shaft is rotated by hand on a frequent basis to ensure even grease distribution.

3.0 INSTALLATION AND COMMISSIONING



All work must be carried out by a skilled worker. Before starting any work, be sure to isolate the machine from the main and auxiliary power supply as applicable. Mains must be secured against accidental switch on.

3.1 Installation

A fine foundation and exact installation is regarded as a basic requirement for coming long-time reliable working. Inappropriate foundation or installation may cause abnormal motor vibration and noise.

3.1.1 Foundation requirement

The foundation of installation can be a metal base or a platform of concrete structure, whatever structure the foundation has, the foundation must have enough strength and rigidity in order to support motors.

The design of foundation can refer to DIN 4024.

The supporting surface of the foundation must be flat, flatness of the supporting surfaces for conventional motors:

Frame size(FS)	Flatness (mm)
≤132	0.10
160	0.15
≥180	0.20

3.1.2 Installation requirement

Because of the manufacture tolerance and cumulate errors existing in mechanical parts, clearance may exist between the motor feet plane and the foundation support surface.

When install motors, the clearance size must be measured carefully by feeler gauge. For clearance which $>0.05\text{mm}$, shim with proper thickness should be inserted. The size of shim is according to the actual value of clearance.



Insert a shim with proper thickness

3.1.3 Lifting eyes are screwed in place and must be tightened. If the motor is installed vertically with the DE shaft facing downwards, a protective canopy is recommended to cover the fan cowling. This canopy is necessary to prevent the ingress of water and foreign objects that may inhibit proper fan operation.

3.1.4 If the DE shaft is facing upwards, a protective canopy and / or suitable protective measures are recommended to be taken to prevent liquids from entering the motor windings via the shaft.

3.2 Terminal box

Terminal box is either top or side mounted (LHS or RHS) on the motor and can be rotated 4 times by 90° thus allowing for multiple cable entry possibilities.

3.3 Balancing and coupling of transmission elements

To ensure a quiet and vibration free operation, proper axial and radial alignment of a balanced transmission element (coupling, pulleys, fans, gear box, etc.) is essential.

As standard, rotors are dynamically balanced using a half feather key as indicated on the name plate (H=Half Key).

- Notice!**
- 1) The transmission and coupling elements are required to be half-key balanced to ensure a vibration free operation.
 - 2) Coupling and motor temperature considerations must be taken into account during alignment of the transmission.
 - 3) Key must be removed from the motor shaft prior to starting if no transmission is coupled.

3.4 Electrical connection



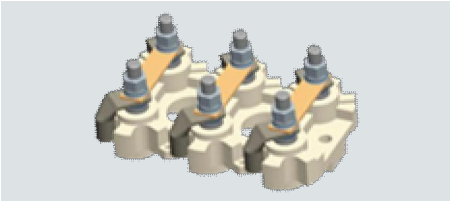
All work must be carried out by skilled worker. Before starting any work, be sure to isolate the machine from the main and auxiliary power supply as applicable. Mains must be secured against accidental switch on.

There are six power supply terminals and two earthing positions located in the terminal box. There is an earthing point located on the base of the frame. All motors are suitable for bi-directional rotation (CW or CCW). Rotation direction can be changed by exchanging any two phases.

Mains Power Connection

Windings of standard three-phase single speed motors can be connected either in star or delta connection. Voltage and frequency deviations of $\pm 5\%$ VAC and $\pm 2\%$ Hz respectively of the rated voltage and frequency values are acceptable for proper operation.

Cable Connection Examples



External Earthing



Please refer to Table 1 for tightening torque and direction for electrical terminal lugs.

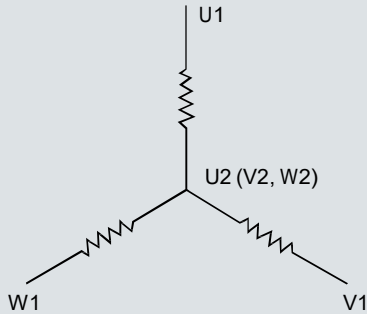


Table 1

Size	M4	M5	M6	M8	M10	M12	M16
Torque(Nm)	1.2	2.5	4.0	8.0	13	20	40

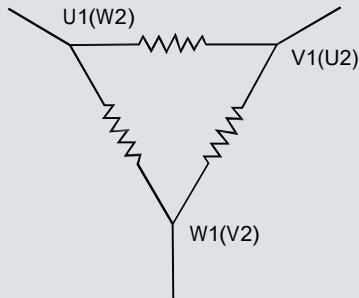
Star connection

A star connection is obtained by connecting W2, U2, V2 terminals to each other and the U1, V1, W1 terminals to the mains.



Delta connection

A delta connection is obtained by connecting the end of a phase to the beginning of the next phase.



Note: If the auxiliary or mains cable entries on the terminal box is sealed with gland plugs, a flat (standard) screw driver is required for removal.

Winding Protection

Motors have three types of electrical protection sensors:

- PTC - used for temperature alarming (145 °C) or tripping function (155 °C)
- PT100 - used for monitoring temperature of bearing or stator windings.
- KTY84-130 - used for motor temperature detection with temperature sensor

Notice! The PTC, PT100 and KTY84-130 require connection to an external control unit.
When PT100s are used for bearing temperature monitoring, the alarming and tripping values are independent of those of the winding class Option code: Q5A .

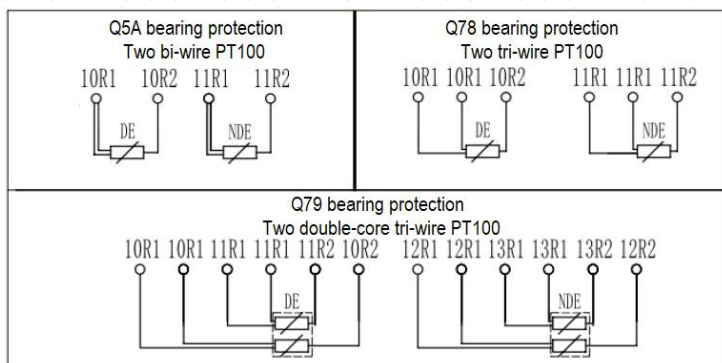
Auxiliary terminal Connection

If the motors are configured with winding protection PTC, PT100, KTY84-130 and space heating, the auxiliary terminal connection is shown in Table 2.

Table 2 Motor winding protection

One set of PTC		Two sets of PTC				One KTY84-130 sensor		Two KTY84-130 sensor				Three bi-wire PT100			
15th digit is B		15th digit is C				15th digit is F		15th digit is G				15th digit is H			
2TP1	2TP2	1TP1	1TP2	2TP1	2TP2	+1R1	-1R2	+1R1	-1R2	+2R1	-2R2	1R1	1R2	2R1	2R2
												3R1	3R2		

Six bi-wire PT100						Three tri-wire PT100						Six tri-wire PT100											
15th digit is J						15th digit is Q						15th digit is R											
1R1	1R2	2R1	2R2	3R1	3R2	4R1	4R2	5R1	5R2	6R1	6R2	1R1	1R2	2R1	2R2	3R1	3R2	1R1	1R2	2R1	2R2	3R1	3R2
												4R1	4R2	5R1	5R2	6R1	6R2						



Motors which are exposed to a wide temperature fluctuation environment are susceptible to condensation formation, hence it is strongly recommended to add a anti-condensation heater (Option code: Q04). The terminals for DE and NDE heaters are 1HE1-1HE2, and 2HE1-2HE2.



Warning

The space heater must never be energized during motor operation.

3.5 Insulation resistance inspection

After extended periods of storage or standstill (6 months or longer), it is recommended to measure the insulation resistance between phases and phase to ground prior to applying power at start-up.



Warning

During and shortly after the resistance measurement, the motor terminals are hazardous with a residual voltage charge. Avoid touching the terminals.

Insulation resistance

The minimum insulation resistance between new, cleaned or repaired windings with reference to ground is 10 MΩ.

The critical insulation resistance (Recruit) is calculated by multiplying the rated voltage, e.g. 0.69 kV AC, with the constant factor (0.5MΩ / kV):

$$\text{Recruit} = 0.69 \text{ kV} \times 0.5 \text{ M}\Omega/\text{kV} = 0.345 \text{ M}\Omega$$

Measurement

The minimum insulation resistance between the windings and ground measurement is taken at 500 V DC and at a winding temperature of 25 °C ± 15 °C.

The measurement of the critical insulation resistance: it should be measured with 500 V DC with the winding at operating temperature.

Normal failure and corrective measures on insulation resistance

Cause: Might be due to high humidity. Correction: Windings must be dried.

Cause: After extended periods of operation, the minimum insulation resistance may decrease. However as long as the measured value is not less than the Recruit values the motor will continue to operate.

Correction: If the measured value is less than the Recruit value then the motor must be replaced or repaired.

3.6 Temperature measurement

Temperature is an important reference index of motor running, the important parts for motor real-time temperature, the operation state, effective prevention of master motor fault, to ensure reliable operation is very important.

The motor temperature is influenced by cooling medium and environmental temperature. Measurement of motor winding temperature rise, usually embedded temperature measuring device (such as PT100), temperature measuring element through the lead wire connection control system, the motor temperature, or using the high precision of resistance method is founded. For measuring surface temperature of motor, should use special instruments such as infrared thermometer to measure, measure position generally in the middle position of the motor or eyebolt position.



Warning

when Motor is running, the surface temperature will gradually rise,

Please do not directly touch by hand, in order to avoid scald.

3.7 Converter application



In applications when motor torque is variable (piston-type compressor, load for example), the inevitable result is a non-sinusoidal motor current, whose harmonics can lead to excessive system perturbation or excessive electromagnetic interference.

Electromagnetic compatibility

In application where the motor is driven by a drive, the degree of electrical interference depends on the type of used drive (type, number of IGBTs, interference suppression measures, and manufacturer), cabling, distance and application requirements.

The installation guidelines of the drive manufacturer with regards to electromagnetic compatibility must be considered at all times during the design and implementation phases.



If the motor is driven by a drive and the operating speed exceeds synchronous speed then considerations must be given to the mechanical components and transmission coupling.

Please refer to IEC 60034-1 for further details.

Noise, Temperature and Vibration

When motor are used with converter fed operation, the noise and temperature rise will be a little worse than standard motor with rated speed.

Due to increased speeds above the rated speed, vibration of motor will increase. Therefore the mechanical smooth running is changed, and lifetime of grease and bearing will be reduced.

4.0 MAINTAINANCE



Before starting any service and maintenance work on the motor the motor must be properly isolated from the mains and auxiliary power.

The usual "5 safety rules" (as set forth in DIN VDE 0105) are:

- Isolate the equipment
- Take effective measures to prevent reconnection
- Verify equipment is dead
- Ensure Earthing correctly
- Cover or fence off adjacent live parts

These precautions listed above should remain in force until all maintenance work is finished and the motor has been fully assembled.

4.1 Bearing lifetime

The average bearing lifetime for motors with sealed or open bearing at the DE & NDE varies between 20,000 and 40,000 hours for horizontal mounted motors without additional axial loading. This 20,000 or 40,000 hours of operation applies to 2, 4, 6 pole motors when operated at an ambient 40°C based on rating plate data. For every 10K temperature rise above 40°C, the grease lifetime is reduced by one half.

- Notice !** 1) Extended storage periods, excessive vibrations and high humidity levels will reduce the useful life of the DE & NDE bearing and bearing grease.
- 2) Long time storage will reduce bearing grease lifetime. If motor has in storage for over 24 month, it is recommended to replace bearing grease.
- 3) Bearings must be re-greased according to required intervals and re-greasing quantity.



Warning

Operating a motor above synchronous speeds for extended periods of time will reduce the bearing grease lifetime.

4.2 Grease type

Type of grease: UNIREX N3 (Esso); Conforms to DIN 51825-K3N.

4.3 Grease lifetime and regreasing intervals

The standard motors are equipped with re-greasing device. Please refer to re-greasing intervals and grease quantity as following table.

Frame size	Poles	Re-greasing interval (h)	Re-greasing quantity (g)
315	2	3000	30
	4	4000	40
	6, 8	6000	40
355	2	3000	30
	4	4000	60
	6, 8	6000	60

Exception ! In applications where the motor is installed vertically or operating with heavy vibration, sudden load changes, frequent reversing operation, etc., the grease should be changed at considerably more frequent intervals than the operating hours stated.

4.4 Re-greasing procedure



Warning

All local safety regulations must be considered when re-greasing the motor in operation or at a standstill.



Care must be taken not to over grease the bearings as this can result in increased bearing temperatures.
Dust and old grease must be prevented from entering the motor bearings during the re-greasing cycles.

Notice ! The re-greasing nipple should be cleaned of old grease and dust prior to attaching the re-greasing device. For the waste grease should be properly handled to prevent environmental pollution.

It is recommended that the DE and NDE bearings should be re-greased while the motor is in operating and at operating temperature.

If it is not possible to re-grease the motor during operation, then it recommended that a partial amount of the grease is injected and then the motor energized and rotated for a few revolutions to allow for grease dispersion. After coming to a complete stop the remaining grease should be added.

If a DE or NDE bearing have experienced overheating, it is recommended that the bearing should be inspected for heat damage and replaced or re-greased as necessary.

Notice! Bearing grease will appear dark in color if overheating was experienced.


4.5 Bearing replacement – assembly and disassembly

As bearings near the end of their useful lifespan, the vibration and noise levels of the motor will increase considerably. Then the bearing must be replaced.

Notice! Worn or damaged bearings must be replaced with an equivalent bearing matching the original specifications.

When replacing the bearing, dismantle the necessary parts and use a suitable bearing extraction tool to remove the damaged or worn bearing.

Before installing the new bearing, pre-heat the bearing as per the manufacture instruction prior to pressing it onto the rotor shaft. Shaft sealing rings (V Ring or Oil Seal) must be replaced with new ones after bearing replacement.



Warning

Any impacts or hits (such as with a hammer etc.) is strictly forbidden as this will damage the bearing and result in premature failure.

Please refer to tightening torques for the end flange bolts.



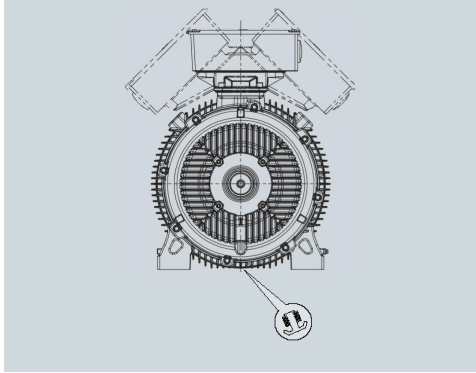
Size	M4	M5	M6	M8	M10	M12	M16	M20
Torque (Nm)	2	3.5	6	16	28	46	110	225

Note: Tightening Torque (Nm, Tolerance: ±10%)

4.6 Condensation drain plug

Based on the motor's construction and mounting type, please consider to select the drainage hole option (option code H03).

Drainage hole is on motor's frame, and it is closed by a plastic plug when delivered.



5.0 START UP

Preliminary Inspection

Before applying power to the motor for the first time, it is recommended to check:

- 1) All retaining bolts are tightened including transmission coupling and alignment
- 2) Motor cooling fan unobstructed
- 3) Bearings are adequately regreased
- 4) Main supply voltage and connection method is according to rating plate.

Operation of DOL, Soft start, and VSD are set according to parameters on rating plate.

- 5) Proper connection of earthing (grounding)
- 6) Connections of sensors' and heaters' terminals, if have.

After motor is powered on, check motor's rotation direction and air flow. Check whether the current, vibration, and noise is normal.

Information according to Article 33 of the REACH regulation

This product contains one or several subproducts in which the following substance – belonging to the "list of candidates" – exists in a concentration exceeding 0.1 percent by weight.

- CAS No. 7439-92-1, lead

Based on the currently available information, we assume that this substance does not represent any risk when correctly used, including its disposal.

西门子（中国）有限公司
工业业务领域
驱动技术集团

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