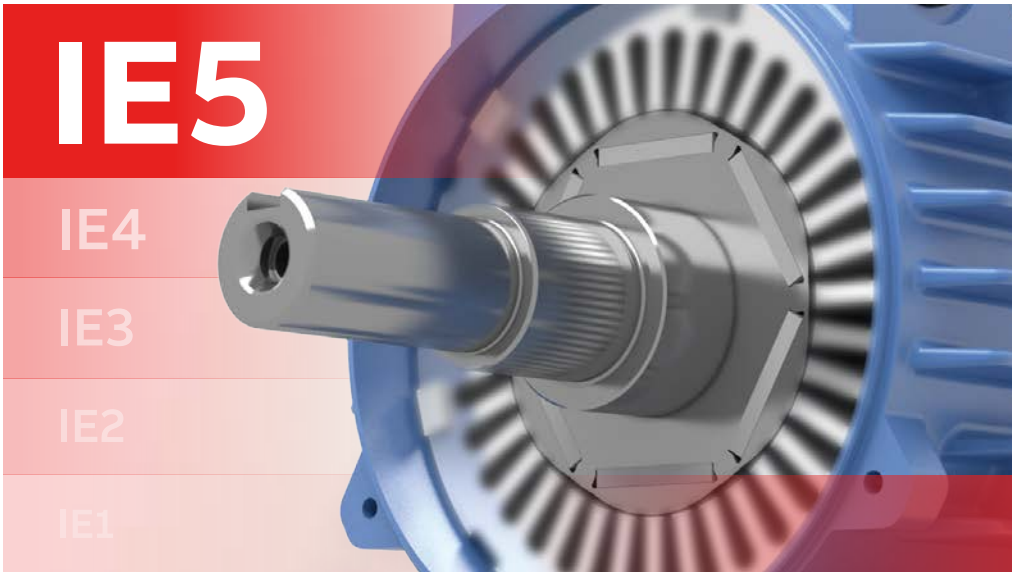
低压IE5 超高效永磁同步电机

安装，操作，维护及安全手册

Low voltage IE5 Ultra Premium Permanent magnet motors

Installation, operation, maintenance and safety manual



EU Declaration of Conformity

The products: Variable frequency drive permanent magnet synchronous motors of the series.
M2BJX 71,80,90,100,112,132,160,180,200,225,250,280,315 and 355
M3BJ 71,80,90,100,112,132,160,180,200,225,250,280,315,355,400 and 450

The Manufacturer:
ABB Shanghai Motors Co., Ltd.
No.88 Tianning Road,
Minhang(Economic & Technical Development Zone)
Shanghai 200245 P.R. of China

This declaration of conformity is issued under the sole responsibility of the manufacturer.

The products of the declaration described above are in conformity with the relevant Union harmonization legislation:

Directive 2014/35/EU
The motors are in conformity with provisions of the harmonized standards which thus comply with Principal Elements of the Safety Objectives for Electrical Equipment stated in Annex I of said directive.

Directive 2011/65/EU
Motors are in conformity with the Directive 2011/65/EU and the amending Annex II to this Directive of the Delegated Directive (EU) 2015/863 of the European Parliament and of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment. Technical documentation based on the harmonized standard EN IEC 63000:2018.

The following harmonized standards were applied in relation to which conformity is declared:
EN 60034-1:2010, EN 60034-5:2001/A1:2007, EN 60034-6:1993, EN 60034-7:1993/A1:2001, EN 60034-8:2007/A1:2014, EN 60034-9:2005/A1:2007, EN 60034-14:2004:/A1:2007

Notes:

When installing motors for converter supply applications, additional requirements must be respected regarding the motor as well as the installation, as described in installation manual delivered with converters.

The conformity of the incorporation into a finished machine according to the Directive 2006/42/EC shall be established by the commissioning party when motor is fitted to the machinery.

Signed for and on behalf of: ABB Shanghai Motors Co.,LTD.
Place and date of issue: Shanghai, China, 2022-05-01

Signed by

Name：Robert Chin
Title：MOIM Division R&D Manager

Signed by

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低压电机

安装、操作、维护和安全手册

目录 **页码**

1. 一般说明

注意!
为确保安全、正确地安装、操作和维护机器，请务必遵守以下各项说明。安装、操作或维护机器或相关设备的人员应仔细阅读这些说明。本机器只能由熟悉健康和安全要求及国家法规的合格人员安装和使用。忽视这些说明会导致所有适用的担保失效。

1.1 符合性声明

当电机安装到机器时，负责调试的一方必须确保最终产品符合欧盟机械指令 2006/42/EC 要求。

电机具有危险的带电及旋转部件，并可能有较热表面。用于运输，存储，安装，连接，调试，操作和维护的所有操作均应由熟悉人员执行（符合 EN 50110-1/DIN VDE 0105/IEC 60364）。操作不当可能会导致严重的人身伤害和财产损失。

电机作为组件使用与机械指令（MD）89/392/EEC 中定义的工业和商业安装中。在确定最终产品符合指令之前，禁止调试（遵循特定的当地安全和安装规则，例如 EN 60204）。

这些机器符合 EN 60034/DIN VDE 0530 系列标准。除非明确设计用于危险区域，否则禁止在危险区域使用。

本公司符合 CEL 038《永磁同步电动机能源源效率标识实施规则》范围的产品，已在中国能效标识网上备案，并按该规则在电机本体上标贴相应的能效标识，能效标识样式按该规则要求，能效等级及能效检测方法按 GB30253 要求，消费者可登陆中国能效标识网 https://www.energylabelrecord.com/ 查看详细备案信息。

1.2 有效性

这些说明对 ABB 以下类型的产品，在电动机与发电机操作方面，都是有效的。

系列 M2BJ*，机座尺寸 71-355。

对于用于危险区域的如防爆电动机，则有单独使用手册“安装、操作与维护手册”（防爆电动机用低压电动机 / 手册）。

由于特殊应用和 / 或设计考虑的原因，某些类型电机需要提供附加信息。

2. 搬运

2.1 收货检查

收到货后，立即对电机进行检查，查看电机外部是否存在损坏（例如，轴端、法兰面和喷漆面），如果发现损坏，请立刻通知转运代理商。

检查所有铭牌数据，特别是电压和绕组接线。所有电机的铭牌上都给出了轴承型号。

2.2 运输和存放

电机应始终在干燥（温度高于 -20°C）、无振动和无尘的室内环境中存放。在运输期间，应避免出现撞击、掉落和受潮。若出现其他情况，请联系 ABB。

应对未加防护的机器加工表面（轴端和法兰面）进行防锈处理。

建议定期用手转动电机轴，以防润滑脂渗出。

如装有抗冷凝加热器，建议最好为其接通电源，避免在电机内出现冷凝。

电机在静止时不应受到任何外部震动，以避免损坏轴承。

在运输途中，必须为装有圆柱滚子轴承和 / 或角接触轴承的电机安装锁定装置。

2.3 起吊

重量超出 25 kg 的所有 ABB 电机都配有吊环或吊环螺栓。

电机只能用主吊环或吊环螺栓起吊。当电机固定在其它设备上时，不得用主吊环或吊环螺栓起吊。

不得使用辅助设备（例如，制动器、独立冷却风扇）或接线盒的吊环来起吊电机。

由于输出功率、安装方式和辅助设备的不同，相同机座号的电机的重心可能有所变化。

不得使用损坏的吊环。在起吊电机之前，请检查吊环螺栓或做成一体的吊环是否完好无损。

起重前，必须对吊环螺栓进行紧固。如有必要，必须合适的垫片调整吊环螺栓的位置。

确保使用正确的起重设备，吊钩尺寸也必须与吊环相匹配。

注意不要损坏连接至电机的辅助设备和电缆。

2.4 机器重量

对于机座号（中心高度）相同的电机，机器总重量可能会存在差异，具体取决于输出功率、安装方式和辅助设备。

ABB 所有电机的铭牌上都注明了电机的实际重量。

3. 安装和调试

警告
在电机或从动设备上工作之前请断开电源并锁定。

当电机轴旋转时，永磁电机端子会产生感应电压。感应电压与转速成正比，即使在低速下也可能很危险。在打开接线盒和 / 或在未保护的端子上工作之前，请防止轴转动。

警告
即使机器处于静止状态，带变频器电源的电机端子也可能带电。

警告
在电源系统上工作时要当心反向电源。

3.1 概述

必须仔细检查所有铭牌数据，确保正确完成电机防护和接线。

警告
若在安装电机时，轴朝上安装，则水或液体可能沿着轴下流，用户必须考虑采取措施，防止出现此类情况。打开装运锁（若已使用）。用手转动电机轴，检查其是否能自由旋转。

配有滚柱轴承的电机：
在无径向力作用于电机轴的情况下运转电机可能会损坏滚柱轴承。

配有角接触轴承的电机：
在无正确方向轴向力作用于电机轴的情况下运转电机可能会损坏角接触轴承。

警告
对于装有角面接触轴承的电机，轴向力严禁更改方向。

铭牌上已指明轴承型号。

装有注油嘴的电机：
第一次启动电机或长期存放后启动电机时，请打入指定量的润滑脂。

有关详细信息，请参阅“6.2.2 带润滑轴承的电机”部分。

3.2 绝缘电阻检查

投入使用前或怀疑绕组受潮时，应对绝缘电阻（IR）进行测量。

警告
在电机或从动设备上工作之前，请断开电源并锁定。

绝缘电阻应用作确定绝缘系统变化的趋势指标。在新机器中，IR 通常为数千兆欧，因此跟随 IR 的变化很重要，这样才能了解绝缘系统的状况。通常，IR 不应低于 10MΩ，并且在任何情况下均不得低于 1MΩ（在 500 或 1000VDC 下测量并校正至 25°C）

警告
电机机座必须接地，在每次测量后应马上将绕组通过机座放电，以免触电。

如果未达到参考电阻值，则说明绕组已经受潮，必须在烘箱炉内烘干绕组。绕组在烘箱炉温度为 90°C 下烘 12-16 小时，然后在 105°C下烘 6-8 小时。

在加热时，如果安装了排水孔塞，则必须拔除，如果安装了隔断阀，则必须打开。加热后，必须重新塞入排水塞。即使安装了排水塞，仍建议在干燥过程中拆除端罩和接线盒盖。

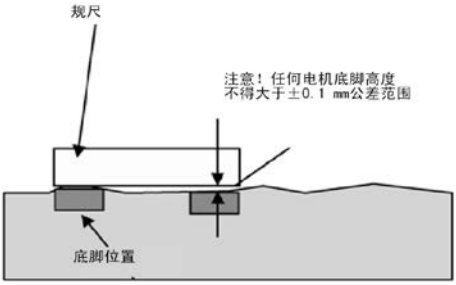
被海水打湿的绕组必须重新进行绕线。

3.3 底座

所有底座准备工作由终端用户承担。

金属底座应该涂漆，以防生锈。

底座必须平整（参见下图）、坚固、足以抵抗短路产生的冲击力。它们的设计和尺寸必须确保避免引起电机振动以及共振。



3.4 平衡和安装半联轴器和皮带轮

标准情况下，用半键来平衡电机。

当用全键平衡时，轴上贴有黄色胶带，并注明“用全键平衡”。

当进行无键平衡时，轴上贴有蓝色胶带，并注明“无键平衡”。

半联轴节或皮带轮必须用加工后的键槽来进行平衡。必须根据电机指定的平衡方法来完成平衡。

必须用合适的设备和工具来安装半联轴节和皮带轮，以免损坏轴承和密封件。

安装半联轴节或皮带轮时不要将它们敲打入位，也不要用杠杆抵住机体拆下它们。

3.5 安装和校正电机

确保电机周围的空气流通充分。可以从产品目录或网址上（参见 www.abb.com / motors & generators）的尺寸图中获得电机风罩后侧的最小自由空间要求。

校正正确与否是避免轴承故障、振动和轴破损的关键所在。

使用合适的螺栓或双头螺栓将电机安装在底座上，并在底座和底脚之间放置薄垫板。

用合适的方法对准电机。

如适用，钻定位孔，然后将定位销固定就位。

半联轴节的安装精度：检查间隙 b，确保其小于 0.05 mm，a1 和 a2 之间的间隙也应小于 0.05 mm。请参阅图 3。

在紧固螺栓或双头螺栓后，请再检查一次对准情况。

不得超过产品目录中规定的轴承允许负载值。

3.6 滑轨和皮带传动

如图 2 所示，将电机固定到滑轨上。

水平放置滑轨，使其处于同一平面。

检查电机轴是否与主动轴平行。

必须根据从动设备供应商的说明张紧皮带。然而，不得超出相关产品目录中规定的最大皮带张力（即，径向轴承负载）。

警告
皮带过紧会损坏轴承，并有可能引起电机轴损坏。

3.7 带有冷凝排水塞的电机

检查排水孔和排水塞是否朝下。

电机在交付时，可密封塑料排水塞处于打开位置。在灰尘过多的环境中，应关闭所有排水孔。

3.8 电缆敷设和电气接线

标准单速电机上的接线盒通常包含六个绕组接线端子以及至少一个接地端子。

除主绕组和接地端子外，接线盒还包括用于热敏电阻、加热元件或其它辅助设备的接头。

连接所有主电缆时必须使用合适的电缆铜接头。辅助设备的电缆可连接至各自的接线板。

机器仅用于固定安装。如非特别指明，电缆入口采用公制螺纹。电缆密封管的 IP 等级必须至少与接线盒的 IP 等级相同。

未使用的电缆入口必须根据接线盒的 IP 等级用封堵件密封。

在与电缆接密封管相关的文档中指明防护等级和直径。

警告
根据电缆型号和直径，在电缆入口中使用合适的电缆密封管及其密封件。

有关适用于变速应用的电缆和接头的详细信息，请参阅第 5.5 节。

在将机器连接至电源之前，必须按当地规定进行接地。

应确保电机的防护与环境和天气条件相适应; 例如，确保水不会进入电机或接线盒内。

必须在接线盒的密封槽中正确放置密封件，以确保提供正确的 IP 防护等级。

3.8.1 启动方法及接线

标准单速电机上的接线盒通常包含六个绕组接线端子以及至少一个接地端子。但永磁同步变频电机需配置变频器，仅存在变频启动，Y 接。

必须按照接线盒或电机手册内的说明进行电源接线。

警告
本说明涵盖的电机不适用直接启动（DOL）。

铭牌上印有电压和接线说明。

3.8.2 辅助设备接线

如果电机配有热敏电阻或其它电阻式温度检测器（Pt100、热敏继电器等）和辅助设备，则建议通过合适的方法对它们进行连接和使用。可以在接线盒内找到辅助元件和连接部件的接线图。

热敏电阻的最大测量电压为 2.5V。Pt100 的最大测量电流为 5mA。使用更高的测量电压或者电流会导致读数误差或者损坏系统。

绕组温度传感器采用基本绝缘类型。当将传感器连接至控制系统时，确保提供足够的绝缘或者隔离，请参见 IEC60664。

注意事项!
确保热敏电阻电路的绝缘等级或隔离符合 IEC 60664

3.9 端子和旋转方向

当电源相序 L1、L2、L3 如图 1 所示连接到端子上后，面向电机驱动端看，轴的旋转方向为顺时针方向。

若要更改旋转方向，可交换电源电缆上的任意两根接线位置。

如果电机装有单向风扇，请确保旋转方向与电机上标示的箭头方向一致。

4. 操作

4.1 使用

除非铭牌上特别指明，否则电机设计在下列条件下使用。

- 环境温度的正常范围是 -20°C到 +40°C。
- 最高海拔高度为 1000 m。
- 根据 EN/IEC 60034-1（2004），变频器输入电压公差为 ±5%，频率公差为 ±2%。

只能在满足上述条件的应用中使用电机。电机铭牌给出了额定值和工作条件。此外，必须遵守本手册和其它相关说明与标准中的所有要求。

如果超出这些限制条件，则必须检查电机数据和结构数据。更多详细信息，请联系 ABB 。

警告
忽视任何给定的说明或设备维护可能危及安全，所以必须阻止在这种情况下使用机器。

4.2 散热

检查电机内空气流通是否充分。确保电机不受附近设备热辐射或阳光直射的影响。

对于法兰安装型电机（例如，B5、B35、V1），确保电机结构允许法兰外表面有充分的空气流通。

4.3 安全事项

电机应由熟悉健康和安全要求及国家法规的合格人员安装和使用。

必须根据当地规定提供必要的安全设备，以防安装和操作现场发生事故。

警告
不得在接线电缆或附件，如变频器、启动器、制动器、热敏电阻电缆或加热元件通电时，在电机上工作。

注意事项

1. 不要踏在电机上。

2. 在正常操作过程中，尤其在停机后，电机外壳温度可能会很高，不能触摸。

3. 在某些特殊应用场合使用电机时需要参照特殊说明（例如，使用变频器电源）。

4. 小心电机的旋转部件。

5. 在通电时不得打开接线盒。

5. 变速操作中的低压电机

5.1 一般说明

本部分提供在变频器电源中使用的电机的附加说明。

必须遵守本手册及选定变频器的相关手册中给出的说明，以确保安全和电机的可用性。

ABB 可能要求提供更多信息来确定某些电机型号是否适合在特殊应用中使用或需要做特殊的设计修改。

5.2 绕组绝缘

与正弦电源相比，变速驱动器会在电机绕组上产生更高的电压应力，因此，必须根据下列说明确定电机绕组绝缘和变频器输出侧滤波器的规格。

5.2.1 相间电压

电机端子上所允许的最大相间电压峰值与脉冲的上升时间有关。

5.2.2 其它变频器的绕组绝缘选择

必须将电压应力限制到可接受的范围内。为确保应用的安全，请联系系统供应商。在确定电机规格时，必须考虑滤波器的可能影响。

5.3 热保护

本手册中涵盖的大部分电机都在定子绕组中装有 PTC 热敏电阻。建议通过合适的方式将这些热敏电阻连接至变频器。请参阅第 3.8.2 节。

5.4 轴承电流

必须根据下列说明选择使用绝缘轴承或轴承结构、共模滤波器和合适的电缆与接地方法：

5.4.1 消除变频器的轴承电流

当使用变频器时，必须使用下列方法，避免在电机中出现有害的轴承电流：

额定功率（Pn）	预防性措施
Pn < 100kW	无需任何措施
Pn ≥ 100kW	非驱动端采用绝缘轴承
Pn ≥ 350kW	非驱动端采用绝缘轴承 和 变频器侧的共模滤波器

建议使用内孔或外孔具有氧化铝涂层或陶瓷滚动体的绝缘轴承。可使用密封剂对氧化铝涂层进行处理，防止灰尘和湿气进入多孔涂层。有关轴承绝缘的详细型号，请参见电机铭牌。未经 ABB 允许，不得更改轴承类型或绝缘方法。

5.4.2 消除所有其它变频器的轴承电流

用户负责保护电机和从动设备，防止它们受到有害轴承电流的影响。

可以参考第 5.4.1 节给出的说明，但不保证它们在所有情况下的有效性。

5.5 电缆敷设、接地和 EMC

为提供正确的接地以及确保满足现行的 EMC 要求，功率高于 30 kW 的电机必须使用屏蔽对称电缆和提供 360°连接的 EMC 接头连接。对于较小的电机，强烈建议使用对称和屏蔽电缆。按接头说明中所述，

在所有电缆入口处进行 360°接地连接。将电缆屏蔽扭绞成束，然后连接至接线盒、变频器机柜内等最近的接地端子 / 母线。

注意事项!
必须在（如，电机、变频器、可能的安全开关等）所有端点处使用提供 360°连接的正确电缆接头。

对于机座号为 IEC 225 及以上的电机，除非在一个公共的金属底座上安装，否则需要在电机机座和机器之间实现附加的电位均衡。当使用一个金属底座来实现电位均衡时，要检查此连接的高频导电性，例如通过测量部件之间的电势差。

有关变速驱动器接地和电缆敷设的更多信息，请参见手册“驱动系统的接地和电缆敷设”（编号：3AFY 61201998）。

5.6 工作速度

当速度高于电机铭牌或相关产品目录中给出的标称速度时，务必确保不超出电机允许的最高转速或整个应用的临界速度。

警告
不要超过电机的最高允许转速。请参阅相关产品手册及铭牌数据。

5.7 变速应用试运行

必须根据变频器说明和当地法规执行变速应用试运行。此外，还必须考虑应用所规定的要求和限制。

必须从电机铭牌获取变频器设置所需的所有参数。最常使用的参数为：

- 电机标称电压
- 电机标称电流
- 电机标称频率
- 电机标称转速
- 电机称功率

注意: 当信息缺失或不准确时，在确保正确设置之前，不得操作电机!

ABB 建议使用由变频器提供的所有合适防护特性来提高应用的安全性。变频器通常提供下列特性（特性的名称和可用性取决于变频器制造商和型号），例如：

- 最低转速
- 最高转速
- 加速和减速时间
- 最大电流
- 最大转矩
- 失速保护

6. 维护

当电机轴旋转时，永磁电机端子会产生感应电压。感应电压与转速成正比，即使在低速下也可能很危险。在打开接线盒和 / 或在保护的端子上工作之前，请防止轴转动。

警告
停机时，在接线盒内可能接有供加热元件或加热绕组的电压。

警告
只有熟悉相关安全要求的有资质人员才能打开和维护永磁同步电机。

警告
如果没有专用工具，不允许拆卸永磁同步电机的转子。

警告
打开或拆卸永磁同步电机或此类电机的单独转子引起的磁场可能会干扰或损坏其他电气或电磁设备和组件，例如心脏起搏器，信用卡等。

警告
必须防止松动的金属零件和废物进入永磁同步电机的内部以及与转子接触。

警告
闭合打开的永磁同步电机之前，必须从电机内部清除所有不属于电机的废物或零件。

注意!
当单独旋转永磁同步电机的转子时，请小心磁场和可能产生的感应电压，因为他可能会损坏周围的设备，例如车床或动平衡机设备。

永磁同步电机只能由 ABB 认证并授权的维修店进行维修。有关永磁同步电机服务的更多信息，请联系 ABB。

请遵循制造商的操作说明。有关更多详细信息，请参见相关产品手册或联系 ABB。

保留这些安全说明!

6.1. 常规检查

1. 定期对电机进行检查，每年至少检查一次。检查的频率取决于如环境空气湿度等当地气候条件。刚开始时可通过多次实验确定检查频率，之后严格遵守。

2. 保持电机清洁，并确保空气自然流通。如果在灰尘过多的环境中使用电机，则必须定期检查和清洁通风系统。

3. 检查轴密封件（例如，V 形环或径向密封件）的情况，必要时更换密封件。

4. 检查连接件以及安装和组装螺栓的情况。

5. 通过监听是否存在不正常的噪音、振动测量、轴承温度测量，检查润滑脂的消耗量或 SPM 轴承监视来检查轴承情况。

当即将达到计算的轴承额定寿命时，应尤其注意。当出现磨损迹象时，拆卸电机，检查部件，必要时更换部件。在更换轴承时，备用轴承的型号必须与原安装的轴承型号完全相同，必须使用质量和特性均与原始密封件相同的密封件更换轴密封件。

当使用防护等级为 IP55 的电机，且电机在交付时已插入排水塞，则建议定期打开排水塞，以确保冷凝水通路不被堵塞，可以从电机中流出。必须在电机处于静止状态、可以安全工作时执行此操作。

6.2 润滑

警告
请留意所有转动部件!

警告
润滑脂可能会引发皮炎和眼炎。请遵守制造商规定的所有安全预防措施。

在相关的产品目录以及所有电机（除较小机座号的电机外）的铭牌上指明轴承型号。

可靠性是轴承润滑间隔时间的关键考虑因素。
ABB 主要使用 L_1 原则（即 99% 的电机必须达到工作寿命）来进行润滑。

6.2.1 装有永久润滑轴承的机器

轴承通常采用 1Z、2Z、2RS 或同类永久润滑轴承。

按照 L_{10} 对电机进行足够润滑，可以达到如下工作时间。

在环境温度为 25°C和 40°C时，永久润滑轴承的工作时间为：

根据 L_{10} 原则的润滑间隔时间

机座号	转速	25°C时的工作时间	40°C时的工作时间
71	3000	40000	40000
71	1500/1000	40000	40000
80	3000	40000	32000
80	1500/1000	40000	40000
90	3000	40000	27000
90	1500/1000	40000	40000
100	3000	40000	34000
100	1500/1000	40000	40000
132	3000	12000	9600
132	1500	21500	17200
132	1000	24000	19200
160	3000	9000	7200
160	1500	18500	14800
160	1000	24000	19200
180	3000	8000	6400
180	1500	17500	14000
180	1000	23000	18400
200	3000	6500	5200
200	1500	16500	13200
200	1000	16000	12800

机座号	转速	25°C时的工作时间	40°C时的工作时间
225	3000	4000	3200
225	1500	11500	9200
225	1000	15000	12000
250	3000	3500	2800
250	1500	10500	8400
250	1000	14000	11200
280	3000	3200	2560
280	1500	9600	7680
280	1000	13900	11200
315	3000	3200	2560
315	1500	7600	6080
315	1000	11800	9440

这些数值对产品目录中给出的允许负载值有效。
有关应用和负载条件的信息，请参见适用的产品目录或联系 ABB。

立式电机的运行时间为以上数值的一半。

6.2.2 装有开启式可润滑轴承的电机

润滑信息铭牌和常规润滑建议如果机器装有润滑信息铭牌，请遵守给出的数据。

润滑信息铭牌给出了润滑间隔时间与安装、环境温度和转速之间的关系。

第一次使用或轴承润滑后，可能会导致温度短时升高持续 10 到 20 小时左右。

一些电机可能配有陈油收集器。请遵守设备的专门说明。

A. 手动润滑

在电机运转时润滑
- 拔除放油口塞或打开隔离阀（若已安装）。确保润滑通道已打开。
- 将指定量的润滑脂注入轴承。
- 让电机运行 1-2 小时，以将所有多余的润滑脂甩出轴承。关闭放油口塞或关闭隔离发（若已安装）。

电机停机时润滑
如果不能在电机运行时润滑轴承，则可在机器停机时进行润滑。
在这种情况下，请使用一半的润滑脂量，然后让电机全速运转几分钟。
- 停机后，将指定量的剩余油量注入轴承。
- 运转 1-2 小时后，关闭放油口塞或关闭隔离阀（若已安装）。

B. 自动润滑

如采用自动润滑，则必须永久性地卸下放油口塞或打开隔离阀（若已安装）。

ABB 建议仅使用机电系统。

如果使用自动润滑系统，所给出的每次润滑间隔时间的润滑脂量应为铭牌中数值的四倍。

6.2.3 润滑间隔时间和润滑脂量

所有型号的润滑间隔时间和润滑脂量请以电机润滑铭牌上数据为准。

根据 L_1，对装有润滑轴承的电机进行充分润滑，可达到下列工作时间。对于较高环境温度下的工作时间，请联系 ABB。L_1 值与 L_{10} 值之间的关系可用下式估算：
$L_{10}=2.7\times L_1$。

立式机器的润滑间隔时间为下表所示数值的一半。
润滑间隔时间基于环境温度 +25°C。环境温度升高会相应提高轴承温度。当温度升高 15°C时，数值减半，而当温度下降 15°C，数值增加一倍。

在变速运行中，必须在整个负载范围内测量轴承温度，若轴承温度超出 80°C，则轴承温度每上升 15°C，润滑间隔时间减半。如果电机高速运转，则还可使用高速润滑脂，请参见第 6.2.4 节。

警告
不得超出润滑脂和轴承的最高工作温度 (+110°C)。不得超出电机设计的最高转速。

6.2.4 润滑脂

警告
不同型号的润滑脂不要混合在一起。
性质不兼容的润滑脂会引起轴承损坏。

当加润滑脂时，只能使用具有以下特性的球轴承润滑脂：

- 含有锂复合基以及矿物油或 PAO 油的优质润滑油
- 40℃下的基油粘度为 100-160cST
- 稠度为 NLGI 级 1.5-3*
- 温度范围保持在 -30℃ -+120℃之间。

*）对于垂直安装的电动机或处于高温环境条件下，

如果环境温度高于 -30℃或低于 +55℃，且轴承温度低于 110℃，则上述润滑脂规范适用；其它情况请联系 ABB，咨询应采用何种润滑脂。

具有适当特性的润滑脂各大润滑脂制造商均有出售。

建议使用混合剂，但必须向润滑剂制造商索取书面保证，即在操作温度范围内混合剂不会损坏轴承或降低润滑剂的性能，这一点对 EP 混合剂来说尤其重要。

警告
不推荐在机座尺寸 280 到 450 中的高轴承温度情况下使用含有 EP 添加剂的润滑脂。

可以使用下列高性能的润滑脂：

-Esso Unirex N2 或 N3（锂复合基）
-Mobil Mobilith SHC 100（锂复合基）
-Shell Gadus S5 V 100 2（锂复合基）
-Klüber Klüberplex BEM 41-132（专用锂基）
-FAG Arcanol TEMP110（锂复合基）
-Lubcon Turmogrease L 802 EP PLUS（专用锂基）
-Total Multiplex S 2A（锂复合基）

下列润滑脂可用于高速铸铁电机，但不能与锂复合润滑脂混合使用：

-Klüber Klüber Quiet BQH 72-102 （聚脲脂基）
-Lubcon Turmo 油脂 PU703（聚脲基）

如果使用其它油脂；

请咨询制造商，了解其质量是否达到上述润滑剂的水平；使用其它油箱可能会减少润滑间隔，如果对润滑剂的相容性存在疑问，请联系当地的 ABB 营业部。

7. 售后支持

7.1 备件

订购备件时，必须指明电机序列号、完整的型号名称和产品代码，如铭牌所示。

有关更多信息，请访问网站：
www.abb.com/partsonline。

7.2 绕组重绕

应由合格的修理厂进行重绕绕组。

如需对烟道电机和其它专用电机进行重绕绕组，请事先联系 ABB 公司。

7.3 轴承

拆装轴承时必须特别小心。轴承必须用起拔器拆卸，安装时必须预热或使用专用工具。

轴承的更换方法在单独的说明书中有详细说明，该说明书可向 ABB 销售处索取。

8. 环境要求

8.1 噪音等级

在额定频率时，ABB 大多数电机的噪音等级均低于 82dB（A）

有关变频器供电时的噪音等级，请联系对应变频器厂家。

9. 故障检修

这些说明并不涉及设备的所有细节或变动，也未规定安装、操作或保养时应当满足的所有可能条件。如需了解其他信息，请联系附近的 ABB 营业部。

电动机故障检修图表（变频器相关故障请联系变频器生产商）；

必须请合格人员用合适的工具和设备进行电机维修和故障排除。

故障	产生原因	补救措施
电动机不能启动	保险丝烧断	更换保险丝，保险丝的型号和额定值应正确无误。
	过载跳闸	检查启动器中的过载并复位。
	电源不正确	查看电源是否符合电机铭牌上的说明和负荷系数。
	线路连接不正确	对照与电动机一起提供的接线图检查连接。
	绕组或控制开关断路	当开关闭合时电动机发出嗡嗡叫的声音。检查绕组接线头有无松动。确认所有控制触点是闭合的。
	机械故障	检查察看电动机与传动装置转动是否灵活。检查轴承与润滑情况。
	定子短路 定子线圈连接不良	显示保险丝烧断。电动机必须重绕。拆除端盖，定位故障。
	转子有缺陷	转子退磁
	电动机可能过载	减少负载。
电动机停转	可能发生断相	检查断相线路。
	应用错误	改变型号或尺寸。向制造商咨询。
	过载	减少负载。
	电压过低	确保维持铭牌规定的电压。检查连接情况。
	断路	保险丝烧断，检查过载继电器、定子与按钮。
电动机运行，然后逐渐停下	电源故障	检查与线路、保险丝和控制器的连接有无松动。
电动机不能到达额定性能	应用不当	咨询设备供应商正确型号是否。
	因线路电压降低而导致电机接线端子电压过低。	使用电压更高的电源或变压器终端，也可以减小负载。检查接线情况。检查导线尺寸是否正确。
	启动负载过高	检查电动机的启动负载。
	磁钢损坏或转子松动	可能需要更换转子。
	主电路开路	用测试装置定位断路位置，并进行修理。

故障	产生原因	补救措施
电动机加速时间太长且拉高电流	负载过高	减少负载。
	启动期间电压过低	检查电阻是否过高。确保电缆规格使用正确。
	转子有缺陷	更换新转子。
	施加的电压太低	校正电源。
转向错误	相序错误	对调电机或配电盘上的接线头。
电动机运行期间过热	过载	减少负载。
	机架或通风口被污垢堵塞，防碍电动机通风	疏通通风孔并检查是否有气流从电机内持续送出。
	电动机可能有一相开路	检查以确保所有导线良好连接。
	线圈接地	重绕绕组。
	终端电压不平衡	检查导线、接头与变压器有无故障。
电动机振动	电动机不对中	重新对中。
	支承不稳	加固基座。
	联轴器不平衡	重新平衡联轴器。
	传动设备不平衡	重新平衡传动设备。
	轴承缺陷	更换轴承。
	轴承未对中	修理电动机。
	平衡块移动	重新平衡电动机。
	电动机与联轴器间平衡错位（半键—全键）	重新平衡联轴器或电动机。
	多相电动机以单相运行	检查有无断路。
	轴向间隙过大	调节轴承或增加薄垫片。
刮擦噪音	风扇摩擦端盖或风罩	校正风扇安装。
	电动机在台板上松动	拧紧紧固螺栓。
运行嘈杂	气隙不均匀	检查并校正端盖连接或轴承
	转子不平衡	重新平衡转子。
轴承发热	轴弯曲或扭曲	矫正或更换轴。
	皮带拉力过大	减小皮带张力。
	皮带轮离开轴肩太远	移动皮带轮，使其更接近电动机轴承。
	皮带轮直径太小	使用较大的皮带轮。
	不对中	通过重新对中传动装置来纠正。
	油脂不足	给轴承添加适量的润滑脂。
	油脂变质或润滑脂受到污染	去除旧油脂，用煤油彻底清洗轴承并更换新油脂。
	润滑脂过量	减少油脂量，轴承内油量不应超过 1/2。
	轴承过载	检查对中，侧推力与端面推力。
	滚珠损坏或底圈凹凸不平	更换轴承，首先彻底清洁轴承座。

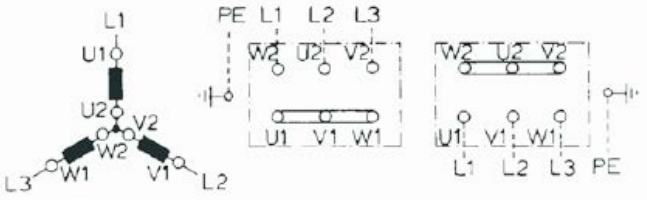


图 1 接线图

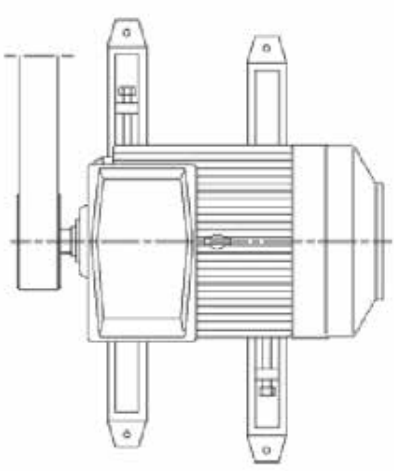


图 2 皮带传动

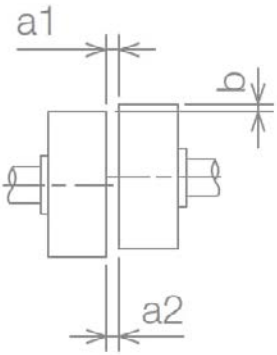


图 3 半联轴器或皮带轮的安装

注意！参见低压电机手册操作章节。

警告!
电机吊装处理不当可能会造成严重的人员伤亡或财产损失。只有具备相关资质的人员才能进行吊装及安装电机等操作。
吊装前：检查起吊设备并注意重量！表 1 显示了最大标准电机的重量。电机实际重量显示在铭牌上。

表 1

机座号 / Frame size	**重量 / Weight**
90	35kg
100	50kg
112	56kg
132	103kg
160	181kg
180	230kg
200	305kg
225	408kg
250	495kg
280	890kg
315	1700kg
355	2700kg
400	3500kg
450	4800kg

产品 / Product	**机座号 / Frame size**	**图号 / Picture No.**
M3BP	90-250	1
	280-450	3
M3AA	90-250	1
	280	3
M2BAX/M2BJX	90-250	1
	280-355	2

www.abb.com/motors&generators
online.abb.com/bol

Low voltage motors / Hoisting Instructions
M3BP 90-450
M3AA 90-280
M2BAX/M2BJX 90-355
3GZC503900-338 05-2022

图 1

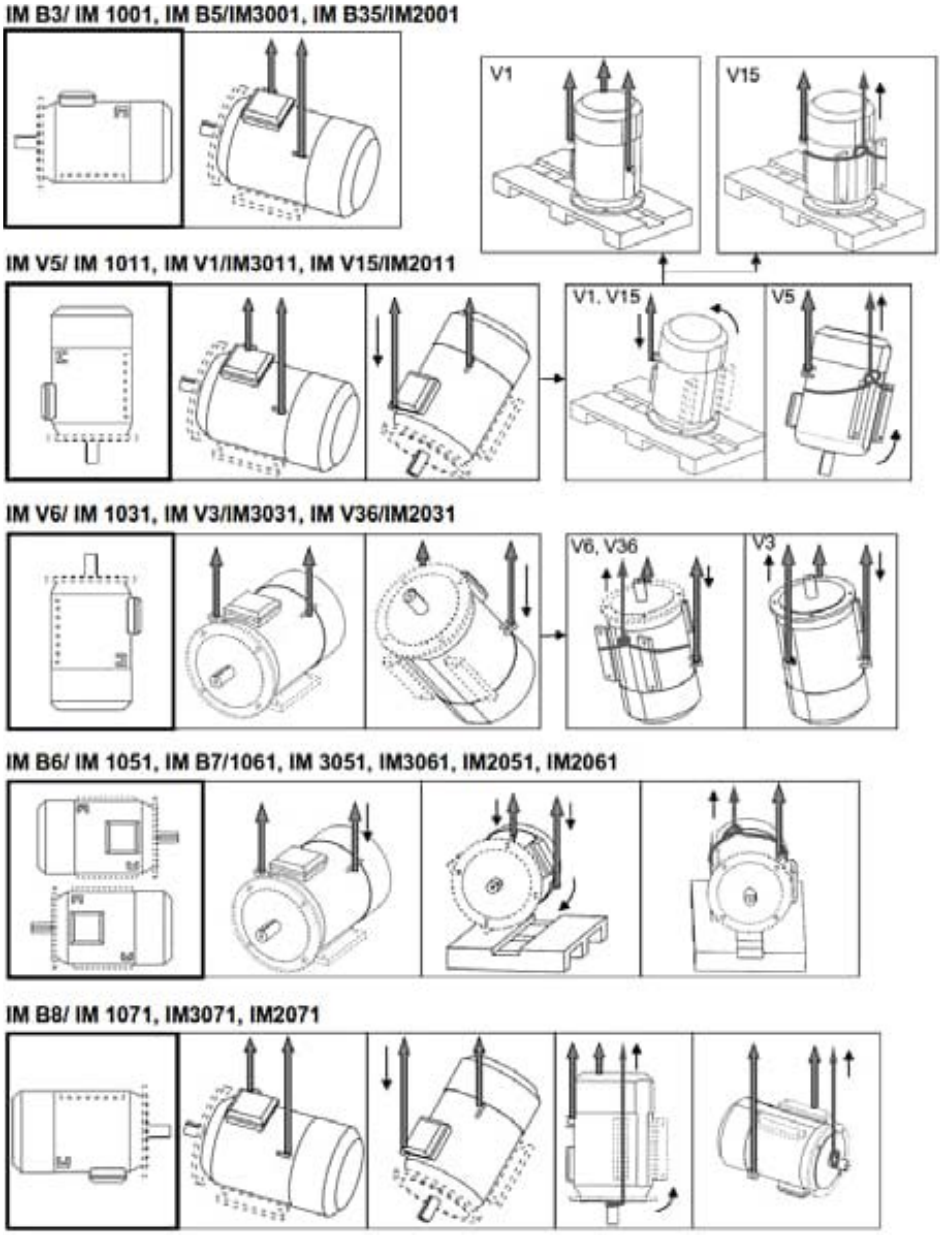
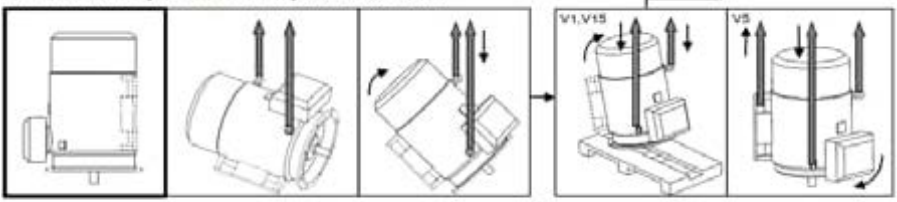

IM B3/ IM 1001, IM B5/IM3001, IM B35/IM2001
V1
V15
IM V5/ IM 1011, IM V1/IM3011, IM V15/IM2011
V1, V15
V5
IM V6/ IM 1031, IM V3/IM3031, IM V36/IM2031
V6, V36
V3
IM B6/ IM 1051, IM B7/1061, IM 3051, IM3061, IM2051, IM2061
IM B8/ IM 1071, IM3071, IM2071

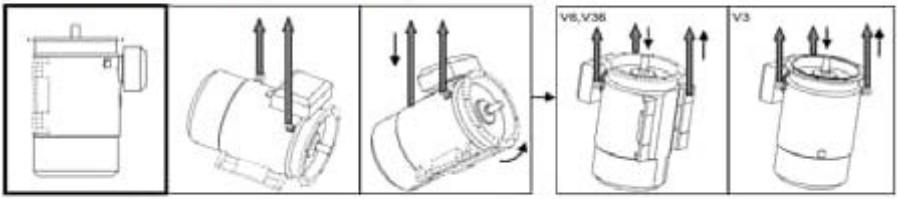
图 2

IM B3/ IM 1001, IM B5/IM3001,IM B35/IM2001

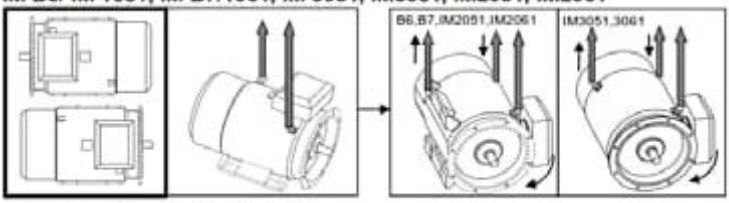
IM V5/ IM 1011, IM V1/IM3011, IM V15/IM2011



IM V6/ IM 1031, IM V3/IM3031, IM V36/IM2031



IM B6/ IM 1051, IM B7/1061, IM 3051, IM3061, IM2051, IM2061



IM B8/ IM 1071, IM3071, IM2071

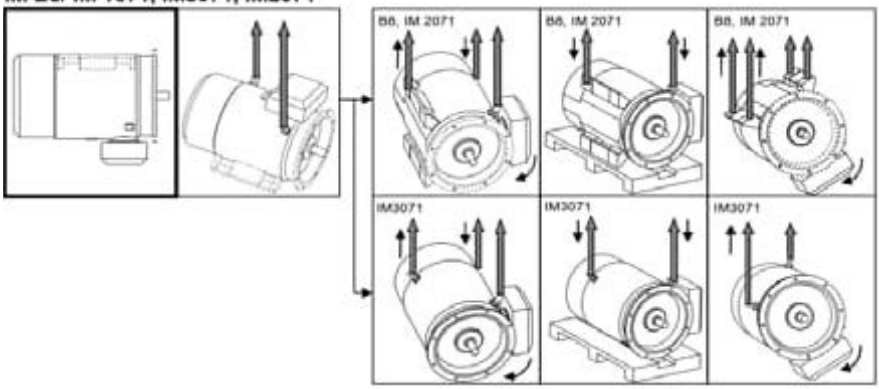
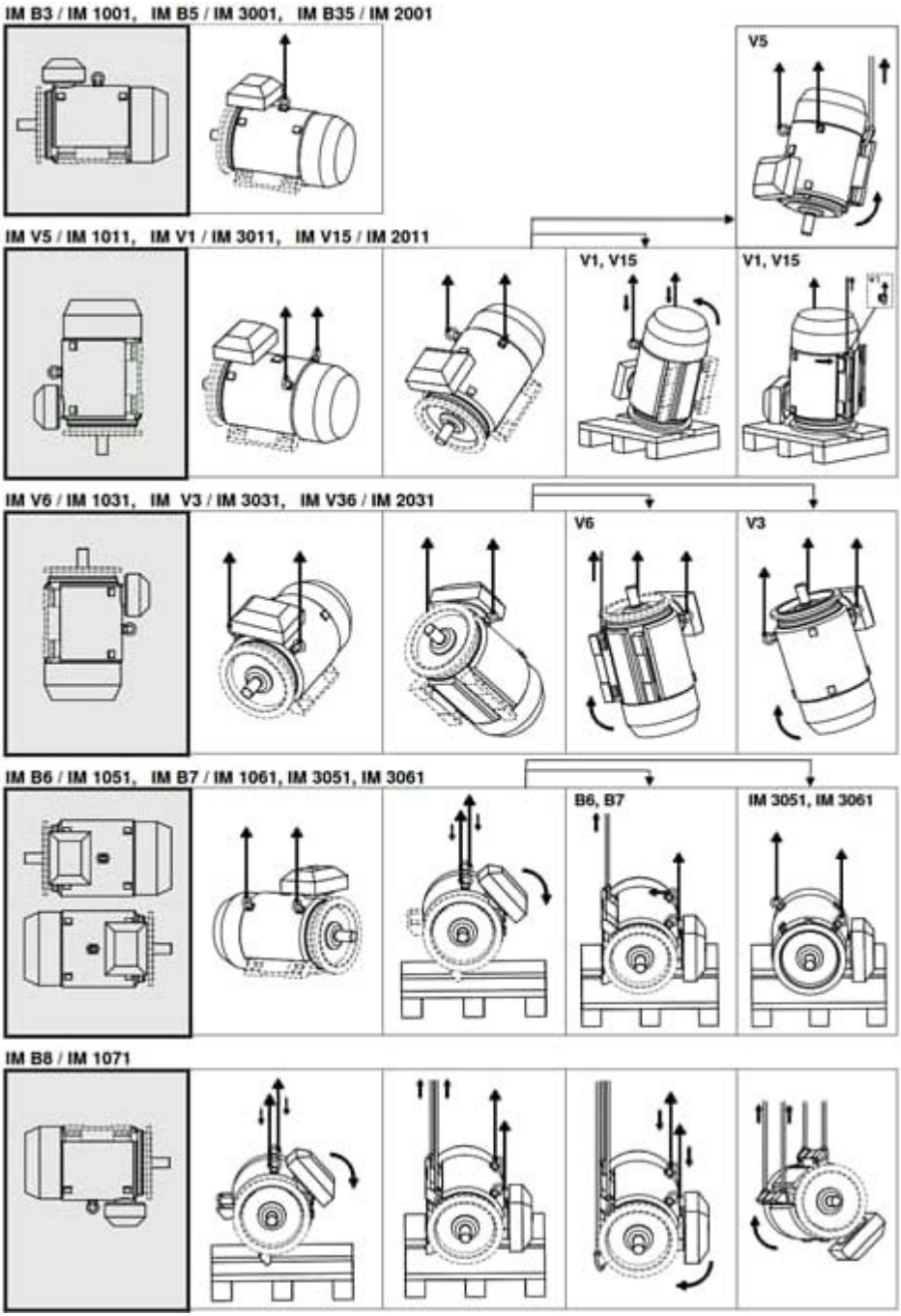


图 3


IM B3 / IM 1001, IM B5 / IM 3001, IM B35 / IM 2001
V5
IM V5 / IM 1011, IM V1 / IM 3011, IM V15 / IM 2011
V1, V15
V1, V15
IM V6 / IM 1031, IM V3 / IM 3031, IM V36 / IM 2031
V6
V3
IM B6 / IM 1051, IM B7 / IM 1061, IM 3051, IM 3061
B6, B7
IM 3051, IM 3061
IM B8 / IM 1071

Low Voltage Motors

Installation, operation, maintenance and safety manual

List of Contents **Page**

1. Introduction

NOTE!
These instructions must be followed to ensure safe and proper installation, operation and maintenance of the machine. They should be brought to the attention of anyone who installs, operates or maintains the machine or associated equipment. The machine is intended for installation and use by qualified personnel, familiar with health and safety requirements and national legislation. Ignoring these instructions may invalidate all applicable warranties.

1.1 Declaration of Conformity

The conformity of the end product according to Directive 2006/42/EC (Machinery) has to be established by the commissioning party when the motor is fitted to the machinery.

Electric machines have dangerous live and rotating parts and may have hot surfaces. All operations serving transport, storage, installation, connection, commissioning, operation and maintenance should be carried out by skilled personnel (in conformity with EN 50 110-1 / DIN VDE 0105 / IEC 60364). Improper handling may cause serious personal injury and damage to property.

These machines are intended for use as components for industrial and commercial installations as defined in the Machinery Directive (MD) 89/392/EEC. Commissioning is prohibited until conformity of the end product with this directive has been established (follow particular local safety and installation rules e.g. EN 60204).

These machines comply with the harmonized series of standards EN 60034 / DIN VDE 0530. Their use in hazardous areas is prohibited unless they are expressly designed for such use.

Products in consistence with the regulation of CEL 038 Permanent magnet Synchronous Motor Energy Efficiency Label in our company have been registered in the official website of China Energy Label, and CEL (China Energy Label) is stuck on the motor body per the regulation. Energy efficiency label pattern comply with the requirements of the regulation,Energy efficiency grade and energy efficiency testing mothed conform to the requirements of GB30253. For detail registration information, please visit the official website https://www.energylabelrecord.com/

1.2 Validity

The instructions are valid for the followingABB electrical machine types, in bothmotor and generator operation.

series M2BJ* in frame sizes 71-355.

There is a separate manual for e.g. Ex motors ‘Low voltage motors for hazardous areas: Installation, operation and maintenance Manual’ (Low Voltage Motors/Manual for Ex-motors).

Additional information is required for some machine types due to special application and/or design considerations.

2. Handling

2.1 Reception check

Immediately upon receipt check the motor for external damage (e.g. shaft-ends and flanges and painted surfaces) and if found, inform the forwarding agent without delay.

Check all rating plate data, especially voltage and winding connection. The type of bearing is specified on the rating plate of all motors.

2.2 Transportation and storage

The motor should always be stored indoors (above – 20 °C) , in dry, vibration free and dust free conditions.

During transportation, shocks, falls and humidity should be avoided. In other conditions, please contact ABB.

Unprotected machined surfaces (shaft-ends and flanges) should be treated against corrosion.

It is recommended that shafts are rotated periodically by hand to prevent grease migration.

Anti-condensation heaters, if fitted, are recommended to be used to avoid water condensing in the motor.

The motor must not be subject to any external vibrations at standstill so as to avoid causing damage to the bearings.

Motors fitted with cylindrical-roller and/or angular contact bearings must be fitted with locking devices during transport.

2.3 Lifting

All ABB motors above 25 kg are equipped with lifting lugs or eyebolts.

Only the main lifting lugs or eyebolts of the motor should be used for lifting the motor. They must not be used to lift the motor when it is attached to other equipment.Lifting lugs for auxiliaries (e.g. brakes, separate cooling fans) or terminal boxes must not be used for lifting the motor.

Motors with the same frame may have a different center of gravity because of different output, mounting arrangements and auxiliary equipment.

Damaged lifting lugs must not be used. Check that eyebolts or integrated lifting lugs are undamaged before lifting.

Lifting eyebolts must be tightened before lifting. If needed, the position of the eyebolt can be adjusted using suitable washers as spacers.

Ensure that proper lifting equipment is used and that the sizes of the hooks are suitable for the lifting lugs.

Care must be taken not to damage auxiliary equipment and cables connected to the motor.

2.4 Machine weight

The total machine weight can vary within the same frame size (center height) depending on different output, mounting arrangement and auxiliaries.

The actual weight of all ABB's motors is shown on the rating plate.

3. Installation and commissioning

WARNING
Disconnect and lock out before working on the motor or the driven equipment.

When the machine shaft is rotating, a permanent magnet machine induces voltage to the terminals. The induced voltage is proportional to the rotational speed, and can be hazardous even at low speeds. Prevent any rotation of the shaft before opening the terminal box and/or working at the unprotected terminals.

WARNING
The terminals of a machine with frequency converter supply may be energized even when the machine is at a standstill.

WARNING
Before of reverse-power when working at the supply system.

3.1 General

All rating plate values must be carefully checked to ensure that the motor protection and connection will be properly done.

WARNING In case of motors mounted with the shaft upwards and water or liquids are expected to go down along the shaft, the user must take in account to mount some means capable of reventing it. Remove transport locking if

employed. Turn shaft by hand to check free rotation if possible.

Motors equipped with roller bearings:
Running the motor with no radial force applied to the shaft may damage the roller bearing.

Motors equipped with angular contact bearing:
Running the motor with no axial force applied in the right direction in relation to the shaft may damage the angular contact bearing.

WARNING
For machines with angular contact bearings the axial force must not by any means change direction.

The type of bearing is specified on the rating plate.

Motors equipped with regreasing nipples:
When starting the motor for the first time, or after long storage, apply the specified quantity of grease.

For details, see section “6.2.2 Motors with regreasable bearings”.

3.2 Insulation resistance check

Measure insulation resistance (IR) before commissioning and when winding dampness is suspected.

WARNING
Disconnect and lock out before working on the motor or the driven equipment.

Insulation resistance should be used as a trend indicator to determine changes in the insulation system. In new machines the IR is usually thousands of Mohms and thus following the change of IR is important so as to know the condition of the insulation system. Typically, the IR should not be below 10MΩ and in no case below 1MΩ(measured with 500 or 1000 VDC and corrected to 25 ℃). The insulation resistance value is halved for each 20℃ increase in temperature.

WARNING
The motor frame must be grounded and the windings should be discharged against the frame immediately after each measurement to avoid risk of electrical shock.

If the reference resistance value is not attained, the winding is too damp and must be oven dried. The oven temperature should be 90° C for 12-16 hours followed by 105° C for 6-8 hours.

Drain hole plugs, if fitted, must be removed and closing valves, if fitted, must be opened during heating. After heating, make sure the plugs are refitted. Even if the drain plugs are fitted, it is recommended to disassemble the end shields and terminal box covers for the drying process.

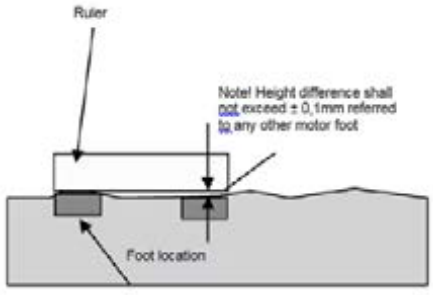
Windings drenched in seawater normally need to be rewound.

3.3 Foundation

The end user has full responsibility for preparation of the foundation.

Metal foundations should be painted to avoid corrosion.

Foundations must be even, see figure below, and sufficiently rigid to withstand possible short circuit forces.They must be designed and dimensioned to avoid the transfer of vibration to the motor and vibration caused by resonance.



3.4 Balancing and fitting coupling halves and pulleys

As standard, balancing of the motor has been carried out using half key.

When balancing with full key, the shaft is marked with YELLOW tape, with the text “Balanced with full key”.

In case of balancing without key, the shaft is marked with BLUE tape, with the text “Balanced without key”.

Coupling halves or pulleys must be balanced after machining the keyways. Balancing must be done in accordance with the balancing method specified for the motor. Coupling halves and pulleys must be fitted on the shaft by using suitable equipment and tools which do not damage the bearings and seals.

Never fit a coupling half or pulley by hammering or by removing it using a lever pressed against the body of the motor.

3.5 Mounting and alignment of the motor

Ensure that there is enough space for free airflow around the motor. Minimum requirements for free space behind the motor fan cover can be found from the product catalog or from the dimension drawings available from the web: see www.abb. com/ motors&generators.

Correct alignment is essential to avoid bearing, vibration and possible shaft failures.

Mount the motor on the foundation using the appropriate bolts or studs and place shim plates between the foundation and the feet.

Align the motor using appropriate methods.

If applicable, drill locating holes and fix the locating pins into position.

Mounting accuracy of coupling half: check that clearance b is less than 0.05 mm and that the difference a1 to a2 is also less than 0.05 mm. See Figure 3.

Re-check the alignment after final tightening of the bolts or studs.

Do not exceed permissible loading values for bearings as stated in the product catalogues.

3.6 Slide rails and belt drives

Fasten the motor to the slide rails as shown in Figure 2.

Place the slide rails horizontally on the same level. Check that the motor shaft is parallel with the drive shaft.

Belts must be tensioned according to the instructions of the supplier of the driven equipment. However, do not exceed the maximum belt forces (i.e. radial bearing loading) stated in the relevant product catalogues.

WARNING
Excessive belt tension will damage bearings and can cause shaft damage.

3.7 Machines with drain plugs for condensation

Check that drain holes and plugs face downwards.

Machines with sealable plastic drain plugs are delivered in open position. In very dusty environments, all drain holes should be closed.

3.8 Cabling and electrical connections

The terminal box on standard single speed motors normally contains six winding terminals and at least one earth terminal.

In addition to the main winding and earthing terminals, the terminal box can also contain connections for thermistors, heating elements or other auxiliary devices.

Suitable cable lugs must be used for the

connection of all main cables. Cables for auxiliaries can be connected into their terminal blocks as such.

Machines are intended for fixed installation only. If not otherwise specified, cable entry threads are metric. The IPclass of the cable gland must be at least the same as those of the terminal boxes.

Unused cable entries must be closed with blanking elements according to the IP class of the terminal box.

The degree of protection and diameter are specified in the documents relating to the cable gland.

WARNING
Use appropriate cable glands and seals in the cable entries according to the type and diameter of the cable.

Additional information on cables and glands suitable for variable speed applications can be found from chapter 5.5.

Earthing must be carried out according to local regulations before the machine is connected to the supply voltage.

Ensure that the motor protection corresponds to the environment and weather conditions; for example, make sure that water cannot enter the motor or the terminal boxes.

The seals of terminal boxes must be placed correctly in the slots provided, to ensure the correct IP class.

3.8.1 Connections and starting methods

The terminal box on standard single speed motors normally contains six winding terminals and at least one earth terminal. PM motors should be feeded by converter, VSD application, Y connection.

The supply connection must follow the instructions inside the terminal box or in the motor manual.

WARNING
Machines covered by this instruction are not suitable for direct online use (DOL).

The voltage and connection are stamped on the rating plate.

3.8.2 Connections of auxiliaries

If a motor is equipped with thermistors or other RTDs (Pt100, thermal relays, etc.) and auxiliary devices, it is recommended they be used and connected by appropriate means. Connection diagrams for auxiliary elements and connection parts can be found inside the terminal box.

Maximum measuring voltage for the thermistors is 2.5 V. Maximum measuring current for Pt100 is 5 mA. Using a higher measuring voltage or current may cause errors in readings or damage the system.

The insulations of the winding thermal sensors is of basic type. While connecting the sensors to control systems etc, ensure adequate insulation or isolation, see IEC 60664.

NOTE!
Ensure the insulation level or isolation of thermistor circuit, see IEC 60664.

3.9 Terminals and direction of rotation

The shaft rotates clockwise when viewing the shaft face at the motor drive end, and the line phase sequence - L1, L2, L3 - is connected to the terminals as shown in Figure 1.

To alter the direction of rotation, interchange any two connections on the supply cables.

If the motor has a unidirectional fan, ensure that it rotates in the same direction as the arrow marked on the motor.

4. Operation

4.1 Use

The motors are designed for the following conditions unless otherwise stated on the rating plate.

- Normal ambient temperature limits are - 20° C to +40° C.
- Maximum altitude 1000 m above sea level.
- Tolerance for converter input voltage is ±5% and for frequency ±2% according to EN/IEC 60034-1 (2004).

The motor can only be used in applications it is intended for. The rated nominal values and operational conditions are shown on the motor rating plates. In addition, all requirements of this manual and other related instructions and standards must be followed.

If these limits are exceeded, motor data and construction data must be checked. Please contact ABB for further information.

WARNING
Ignoring any of given instructions or maintenance of the apparatus may jeopardize the safety and thus prevents the use of the machine.

4.2 Cooling

Check that the motor has sufficient airflow. Ensure that nonearby objects or direct sunshine radiate additional heat tothe motor.

For flange mounted motors (e.g. B5, B35, V1), make sure that the construction allows sufficient air flow on the outer surface of the flange.

4.3 Safety considerations

The machine is intended for installation and use by qualified personnel, familiar with health and safety requirements and national legislation.

Safety equipment necessary for the prevention of accidents at the installation and operating site must be provided in accordance with local regulations.

WARNING
Do not carry out work on motor, connection cables or accessories such as frequency converters,starters, brakes, thermistor cables or heating elements when voltage is applied.

Points to observe
1. Do not step on the motor.
2. The temperature of the outer casing of the motor may be too hot to touch during normal operation and especially after shut-down.
3. Some special motor applications require special instructions (e.g. using frequency converter supplies).
4. Be aware of rotating parts of the motor.
5. Do not open terminal boxes while energized.

5. Low voltage motors in variable speed operation

5.1 Introduction

This part of the manual provides additional instructions for motors used in frequency converter supply. Instructions provided in this and respective manuals of selected frequency converter must be followed to ensure safety and availability of the motor. Additional information may be required by ABB to decide on the suitability for some machine types used in special applications or with special design modifications.

5.2 Winding insulation

Variable speed drives cause higher voltage stresses than the sinusoidal supply on the winding of the motor and therefore the winding insulation of the motor as well as the filter at the converter output must be dimensioned according following instructions.

5.2.1 Phase to phase voltages

The maximum allowed phase to phase voltage

peaks at the motor terminal as a function of the rise time of the pulse.

5.2.2 Selection of winding insulation with all other converters

The voltage stresses must be limited below accepted limits. Please contact the system supplier to ensure the safety of the application. The influence of possible filters must be taken into account while dimensioning the motor.

5.3 Thermal protection

Most of the motors covered by this manual are equipped with PTC thermistors in the stator windings. It is recommended to connect those to the frequency converter by appropriate means. See also chapter 3.8.2.

5.4 Bearing currents

Insulated bearings or bearing constructions, common mode filters and suitable cabling and grounding methods must be used according to the following instructions:

5.4.1 Elimination of bearing currents with converters

In the case of frequency converter, the following methods must be used to avoid harmful bearing currents in the motors:

Pn	Preventive measures
Pn < 100kW	No actions needed
Pn ≥ 100kW	Insulated non-drive end bearing
Pn ≥ 350kW	Insulated non-drive end bearing And Common mode filter at the conveter

Insulated bearings which have aluminum oxide coated inner and/or outer bores or ceramic rolling elements, are recommended. Aluminum oxide coatings shall also be treated with a sealant to prevent dirt and humidity penetrating into the porous coating. For the exact type of bearing insulation, see the motor's rating plate.

Changing the bearing type or insulation method without ABB's permission is prohibited.

5.4.2 Elimination of bearing currents with all other converters

The user is responsible for protecting the motor and driven equipment from harmful bearing currents. Instructions described in Chapter 5.4.1 can be used as guideline, but their effectiveness cannot be guaranteed in all cases.

5.5 Cabling, grounding and EMC

To provide proper grounding and to ensure compliance with any applicable EMC requirements, motors above 30 kW shall be cabled by shielded symmetrical cables and EMC glands, i.e. cable glands providing 360° bonding.

Also for smaller motors symmetrical and shielded cables are highly recommended. Make the 360° grounding arrangement at all the cable entries as described in the instructions for the glands.Twist the cable shields into bundles and connect to the nearest ground terminal/bus bar inside the terminal box, converter cabinet, etc.

NOTE!
Proper cable glands providing 360 ° bonding must be used at all termination points, e.g. at motor, converter, possible safety switch, etc.

For motors of frame size IEC 225 and upward, additional potential equalization between the motor frame and the driven equipment is needed, unless both are mounted on a common steel base. In this case, the high frequency conductivity of the connection provided by the steel base should be checked by, for example, measuring the potential difference between the components.

More information about grounding and cabling of variable speed drives can be found in the manual "Grounding and cabling of the drive system" (Code: 3AFY 61201998).

5.6 Operating speed

For speeds higher than the nominal speed stated on the motor's rating plate or in the respective product catalogue, ensure that either the highest permissible rotational speed of the motor or the critical speed of the whole application is not exceeded.

WARNING
Do not exceed the maximum allowed speed of the machine. See product specific manuals and rating plate.

5.7 Commissioning the variable speed application

The commissioning of the variable speed application must be done according to the instructions of the frequency converter and local laws and regulations. The requirements and limitations set by the application must also be taken into account.

All parameters needed for setting the converter must be taken from the motor rating plates. The most often needed parameters are:

- Motor nominal voltage
- Motor nominal current
- Motor nominal requency
- Motor nominal speed
- Motor nominal power

Note:
In case of missing or inaccurate information, do not operate the motor before ensuring correct settings!

ABB recommends using all the suitable protective features provided by the converter to improve the safety of the application. Converters usually provide features such as (names and availability of features depend on manufacturer and model of the converter):

- Minimum speed
- Maximum speed
- Acceleration and deceleration times
- Maximum current
- Maximum Torque
- Stall protection

6. Maintenance

When the machine shaft is rotating, a permanent magnet machine induces voltage to the terminals. The induced voltage is proportional to the rotational speed, and can be hazardous even at low speeds. Prevent any rotation of the shaft before opening the terminal box and/or working at the unprotected terminals.

WARNING
Voltage may be connected at standstill inside the terminal box for heating elements or direct winding heating.

WARNING
A motor with frequency converter supply may energize even if the motor is at standstill.

WARNING
Only qualified personnel familiar with the relevant safety requirements allowed to open and maintain PM synchronous machines.

WARNING
It is not allowed to remove the rotor of a PM synchronous machine without the special tools designed for this purpose.

WARNING
Magnetic stray fields, caused by an open or disassembled PM synchronous machine or by a separate rotor of such a machine, may disturb or damage other electrical or electromagnetic equipment and components, such as cardiac pacemakers, credit cards and equivalent.

WARNING
Loose metallic parts and waste must be prevented from entering the interior of the permanent magnet synchronous machine as well as getting into contact with the rotor.

WARNING
Before closing an opened permanent magnet synchronous machine, all parts which does not belong to the machine and wastes must be removed from the interior of the machine.

Note!
Beware of magnetic stray fields and possible induced voltages when rotating the separate rotor of a permanent magnet synchronous machine as they may cause damage to surrounding equipment, for example lathes or balancing machines.

Permanent magnet synchronous machines must only be serviced by repair shops qualified and authorised by ABB. For more information concerning service of permanent magnet synchronous machines, please contact ABB.

Follow manufacturer's operating instructions. For further details see product specific manuals or contact ABB.

Preserve these safety instructions!

6.1 General inspection

1. Inspect the motor at regular intervals, at least once a year. The frequency of checks depends on, for example, the humidity level of the ambient air and on the local weather conditions. This can initially be determined experimentally and must then be strictly adhered to.

2. Keep the motor clean and ensure free ventilation airflow. If the motor is used in a dusty environment, the ventilation system must be regularly checked and cleaned.

3. Check the condition of shaft seals (e.g. V-ring or radial seal) and replace if necessary.

4. Check the condition of connections and mounting and assembly bolts.

5. Check the bearing condition by listening for any unusual noise, vibration measurement, bearing temperature, inspection of spent grease or SPM bearing monitoring. Pay special attention to bearings when their calculated rated life time is coming to an end.

When signs of wear are noticed, dismantle the motor, check the parts and replace if necessary. When bearings are changed, replacement bearings must be of the same type as those originally fitted. The shaft seals have to be replaced with seals of the same quality and characteristics as the originals when changing bearings.

In the case of the IP55 motor and when the motor has been delivered with a plug closed, it is advisable to periodically open the drain plugs in order to ensure that the way out for condensation is not blocked and allows condensation to escape from the motor. This operation must be done when the motor is at a standstill and has been made safe to work on.

6.2 Lubrication

WARNING
Beware of all rotating parts!

WARNING
Grease can cause skin irritation and eye inflammation. Follow all safety precautions specified by the manufacturer.

Bearing types are specified in the respective product catalogs and on the rating plate of all motors except smaller frame sizes.

Reliability is a vital issue for bearing lubrication intervals. ABB uses mainly the L_1-principle (i.e.

that 99% of the motors are certain to make the life time) for lubrication.

6.2.1 Machines with permanently greased bearings

Bearings are usually permanently greased bearings of 1Z, 2Z, 2RS or equivalent types.

As a guide, adequate lubrication can be achieved for the following duration, according to L_{10}.

Duty hours for permanently greased bearings at ambient temperatures of 25 and 40° C are:

Lubrication intervals according to L_{10} principle

Frame	Speed	Duty hours at 25°C	Duty hours at 40°C
71	3000	40000	40000
71	1500/1000	40000	40000
80	3000	40000	32000
80	1500/1000	40000	40000
90	3000	40000	27000
90	1500/1000	40000	40000
100	3000	40000	34000
100	1500/1000	40000	40000
132	3000	12000	9600
132	1500	21500	17200
132	1000	24000	19200
160	3000	9000	7200
160	1500	18500	14800
160	1000	24000	19200
180	3000	8000	6400
180	1500	17500	14000
180	1000	23000	18400
200	3000	6500	5200
200	1500	16500	13200
200	1000	16000	12800
225	3000	4000	3200
225	1500	11500	9200
225	1000	15000	12000
250	3000	3500	2800
250	1500	10500	8400
250	1000	14000	11200
280	3000	3200	2560
280	1500	9600	7680
280	1000	13900	11200
315	3000	3200	2560
315	1500	7600	6080
315	1000	11800	9440

These values are valid for permitted load values given in the product catalog. Depending on application and load conditions, see the applicable product catalog or contact ABB.

Operation hours for vertical motors are half of the above values.

6.2.2 Motors with regreasable bearings Lubrication information plate and general lubrication advice

If the machine is equipped with a lubrication information plate, follow the given values.

On the lubrication information plate, greasing intervals regarding mounting, ambient temperature and rotational speed are defined.

During the first start or after a bearing lubrication a temporary temperature rise may appear, approximately 10 to 20 hours.

Some motors may be equipped with a collector for old grease. Follow the special instructions given for the equipment.

A. Manual lubrication

Regreasing while the motor is running

– Remove grease outlet plug or open closing valve if fitted.
– Be sure that the lubrication channel is open
– Inject the specified amount of grease into the bearing.
– Let the motor run for 1-2 hours to ensure that all excess grease is forced out of the bearing. Close the grease outlet plug or closing valve if fitted.

Regreasing while the motor is at a standstill

If it is not possible to regrease the bearings while the motors are running, lubrication can be carried out while the machine is at a standstill.

– In this case use only half the quantity of grease and then run the motor for a few minutes at full speed.
– When the motor has stopped, apply the rest of the specified amount of grease to the bearing.
– After 1-2 running hours close the grease outlet plug or closing valve if fitted.

B. Automatic lubrication

The grease outlet plug must be removed permanently with automatic lubrication or open closing valve if fitted.

ABB recommends only the use of electromechanical systems.

The amount of grease per lubrication interval stated in the rating plate should be multiplied by four if an automatic regreasing system is used.

6.2.3 Lubrication intervals and amounts

As a guide, adequate lubrication for motors with regreasable bearings can be achieved

for the following duration, according to L_1. For duties with higher ambient temperatures please contact ABB. The formula to change the L_1 values roughly to L_{10} values: $L_{10} = 2.7 \times L1$.

Lubrication intervals for vertical machines are listed in the motor rating plate.

The lubrication intervals are based on an ambient temperature +25° C. An increase in the ambient temperature raises the temperature of the bearings correspondingly. The values should be halved for a 15 ° C increase and may be doubled for a 15° C decrease.

In variable speed operation, it is necessary to measure the bearing temperature for the whole duty range and if exceeds 80° C, the lubrication intervals should be halved for a 15° C increase in bearing temperature. If the motor is operated at high speeds, it is also possible to utilize so called high speed greases, see chapter 6.2.4.

WARNING
The maximum operating temperature of the grease and bearings, +110 °C , must not be exceeded. The designed maximum speed of the motor must not be exceeded.

6.2.4 Lubricants

WARNING
Do not mix different types of grease. Incompatible lubricants may cause bearing damage.

When regreasing, use only special ball bearing grease with the following properties:

– good quality grease with lithium complex soap and withmineral-orPAO-oil
– base oil viscosity 100-160 cST at 40° C
– consistency NLGI grade 1.5 - 3 *)
– temperature range -30°C - +120°C , continuously.

*) For vertical mounted motors or in hot conditions a stiffer end of scale is recommended.

The above mentioned grease specification is valid if the ambient temperature is above -30° C or below +55° C, and the bearing temperature is below 110 ° C; otherwise consult ABB regarding suitable grease.

Grease with the correct properties is available from all the major lubricant manufacturers.

Admixtures are recommended, but a written guarantee must be obtained from the lubricant maufacturer, especially concerning EP admixtures, that admixtures do not damage bearings or the properties of lubricants at the operating temperature rage.

WARNING
Lubricants containing EP admixtures are not recommended in high bearing temperatures in frame sizes 280 to 450.

The following high performance greases can be used:

- Esso Unirex N2 or N3 (lithium complex base)
- Mobil Mobilith SHC 100 (lithium complex base)
- Shell Gadus S5 V 100 2 (lithium complex base)
- Klüber Klüberplex BEM 41-132 (special lithium base)
- FAG Arcanol TEMP110 (lithium complex base)
- Lubcon Turmogrease L 802 EP PLUS (special lithium base)
- Total Multiplex S 2 A (lithium complex base)

The following greases can be used for high speed cast iron motors but not mixed with lithium complex greases:

- Klüber Klüber Quiet BQH 72-102 (polyurea base)
- Lubcon Turmogrease PU703 (polyurea base)

If other lubricants are used;

Check with the manufacturer that the qualities correspond to those of the above mentioned lubricants. The lubrication interval are based on the listed high performance greases above. Using other greases can reduce the interval.If the compatibility of the lubricant is uncertain, contact ABB.

7. After Sales Support

7.1 Spare parts

When ordering spare parts, the motor serial number, full type designation and product code, as stated on the rating plate, must be specified.

For more information, please visit our website WWW.abb.com/partsonline.

7.2 Rewinding

Rewinding should always be carried out by qualified repair shops.

Smoke extraction and other special motors should not be rewound without first contactiong ABB.

7.3 Bearings

Special care should be taken with the bearings. These must be removed using pullers and fitted by heating or using special tools for the purpose.

Bearing replacement is described in detail in a separate instruction leaflet available from the ABB Sales Office.

8. Environmental requirements

8.1 Noise levels

Most of ABB's motors have a sound pressure level not exceeding 82 dB(A) at rating frequency.

For sound pressure levels at frequency converter supply, please contact converter supplier.

9. Troubleshooting

These instructions do not cover all details or variations in equipment nor provide for every possible condition to be met in connection with installation, operation or maintenance. Should additional information required, please contact the nearest ABB Sales Office.

Motor troubleshooting chart (Troubleshooting for the converter please contact with the converter supplier.)

Your motor service and any troubleshooting must be handled by qualified persons who have proper tools and equipment.

	CAUSE	**WHAT TO DO**
Motor fails to start	Blown fuses	Replace fuses with proper type and rating.
	Overload trips	Check and reset overload in starter.
	Improper power supply	Check to see that power supplied agrees with motor rating plate and load factor.
	Improper line connections	Check connections against diagram supplied with motor.
	Open circuit in winding or control switch	Indicated by humming sound when switch is closed. Check for loose wiring connections. Also ensure that all control contacts are closing.
	Mechanical failure	Check to see if motor and drive turn freely. Check bearings and lubrication.
	Short circuited stator Poor stator coil connection	Indicated by blown fuses. Motor must be rewound. Remove end shields, locate fault.
	Rotor defective	Rotor demagnetization.
	Motor may be overloaded	Reduce load.
Motor stalls	One phase may be open	Check lines for open phase.
	Wrong application	Change type or size. Consult equipment supplier.
	Overload	Reduce load.
	Low voltage	Ensure the rating plate voltage is maintained. Check connection.
	Open circuit	Fuses blown, check overload relay, stator and push buttons.
Motor runs and then dies down	Power failure	Check for loose connections to line, to fuses and to control.
Motor does not meet the rating performance	Not applied properly	Consult equipment supplier for proper type.
	Voltage too low at motor terminals because of line drop	Use higher voltage or transformer terminals or reduce load. Check connections. Check conductors for proper size.
	Starting load too high	Check the start load of the motor.
	Broken rotor bars or loose rotor	Replace with new rotor.
	Open primary circuit	Locate fault with testing device and repair.

	CAUSE	WHAT TO DO
Motor takes too long to accelerate and/ or draws high current	Excessive load	Reduce load.
	Low voltage during start	Check for high resistance. Make sure that adequate cable size is used.
	Defective squirrel cage rotor	Replace with new rotor.
	Applied voltage too low	Correct power supply.
Wrong rotation direction	Wrong sequence of phases	Reverse connections at motor or at switchboard.
Motor overheats while running	Overload	Reduce load.
	Frame or ventilation openings may be full of dirt and prevent proper ventilation of motor	Open vent holes and check for a continuous stream of air from the motor.
	Motor may have one phase open	Check to make sure that all leads are well connected.
	Grounded coil	Motor must be rewound
	Unbalanced terminal voltage	Check for faulty leads, connections and transformers.
Motor vibrates	Motor misaligned	Realign.
	Weak support	Strengthen base.
	Coupling out of balance	Balance coupling.
	Driven equipment unbalanced	Rebalance driven equipment.
	Defective bearings	Replace bearings.
	Bearings not in line	Repair motor.
	Balancing weights shifted	Rebalance motor.
	Contradiction between balancing of rotor and coupling (half key-full key)	Rebalance coupling or motor.
	Polyphase motor running single phase	Check for open circuit.
	Excessive end play	Adjust bearing or add shim.
Scraping noise	Fan rubbing end shield or fan cover	Correct fan mounting.
	Loose on bedplate	Tighten holding bolts.
Noisy operation	Air gap not uniform	Check and correct end shield fits or bearing fits.
	Rotor unbalance	Rebalance rotor.
Hot bearings	Bent or sprung shaft	Straighten or replace shaft.
	Excessive belt pull	Decrease belt tension.
	Pulleys too far away from shaft shoulder	Move pulley closer to motor bearing.
	Pulley diameter too small	Use larger pulleys.
	Misalignment	Correct by realignment of the drive.
	Insufficient grease	Maintain proper quality and amount of grease in bearing.
	Deterioration of grease or lubricant contaminated	Remove old grease, wash bearings thoroughly in kerosene and replace with new grease.
	Excess lubricant	Reduce quantity of grease, bearing should not be more than half full.
	Overloaded bearing	Check alignment, side and end thrust.
	Broken ball or rough races	Replace bearing, clean housing thoroughly first.

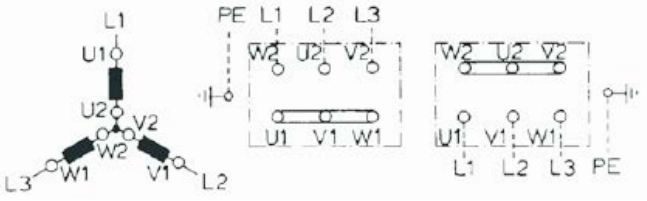


Figure 1. Connection diagram

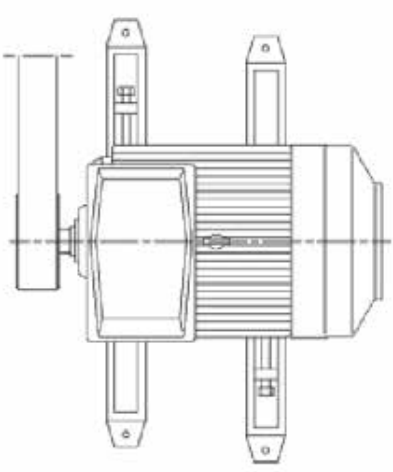


Figure 2. Belt drive

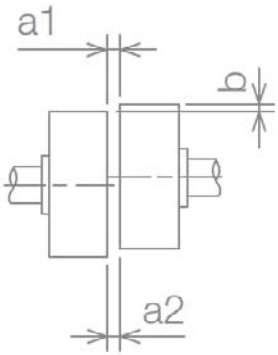


Figure 3. Mounting of half-coupling or pulley

Additional manual for Hoisting Instructions

Note! See also manual ofr Low Voltage Motors chapter Handing.

WARNING !
Improper handling and lifting of motor may cause death, serious injury or property damage. Only skilled personnel shall be used for lifting and installing the motor.
Before lifting: Check lifting devices and note weight! Table 1. shows the maximum standard motor weights. The actual weight is stated on the rating plate of the motor.

Table 1

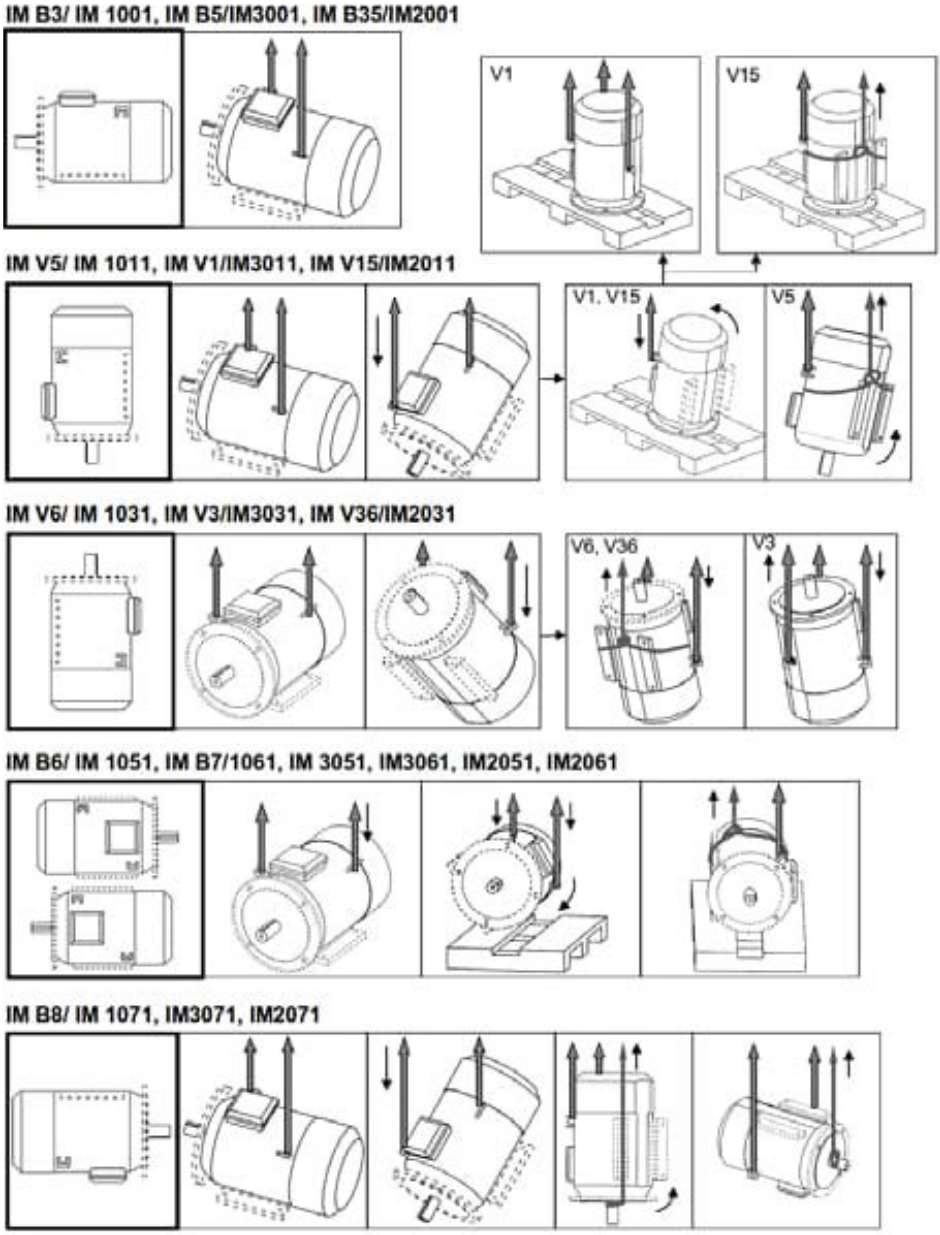
Frame size	Weight
90	35kg
100	50kg
112	56kg
132	103kg
160	181kg
180	230kg
200	305kg
225	408kg
250	495kg
280	890kg
315	1700kg
355	2700kg
400	3500kg
450	4800kg

Product	Frame size	Picture No.
M3BP	90-250	1
	280-450	3
M3AA	90-250	1
	280	3
M2BAX/M2BJX	90-250	1
	280-355	2

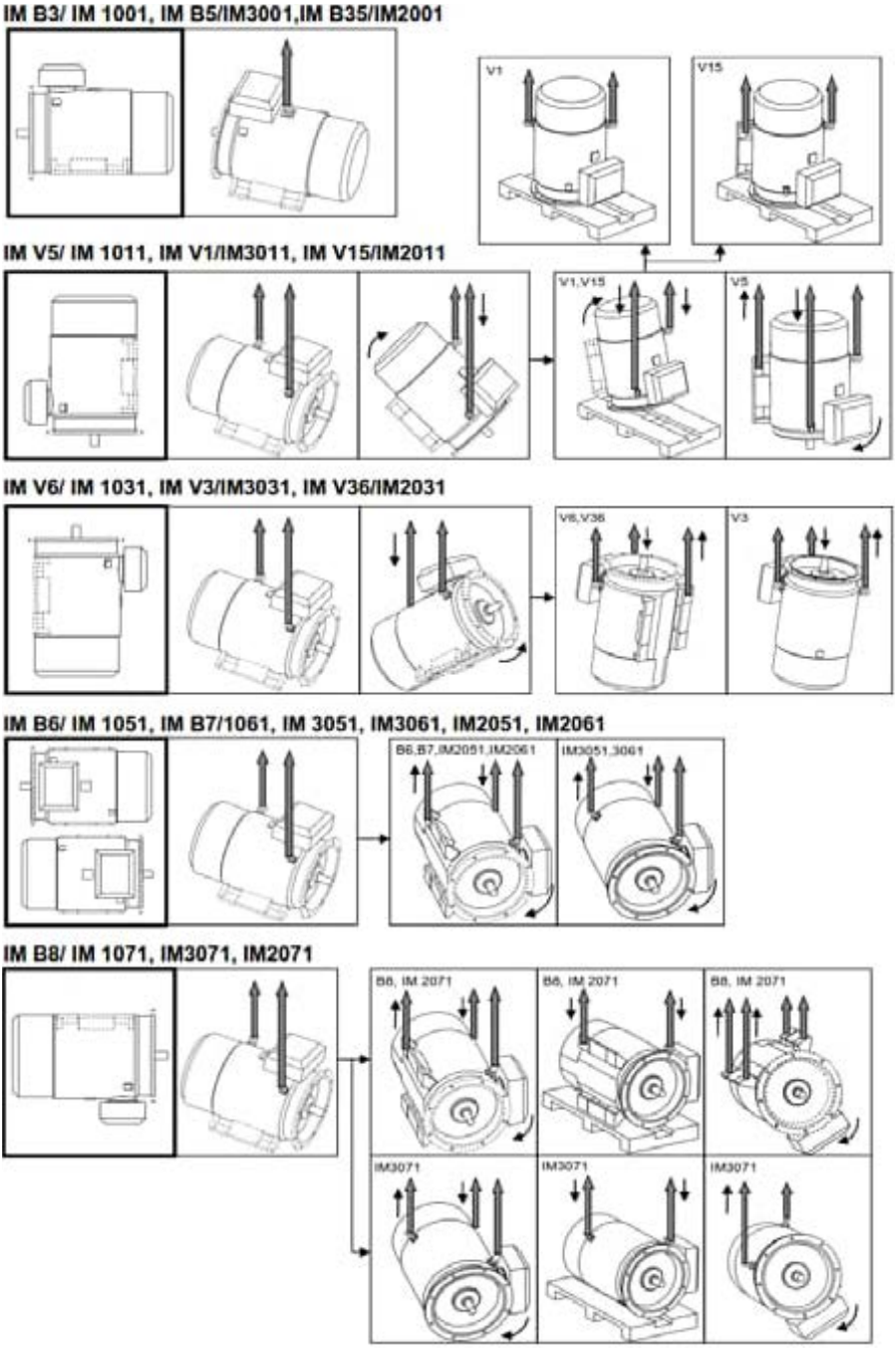
www.abb.com/motors&generators
online.abb.com/bol

Low voltage motors / Hoisting Instructions
M3BP 90-450
M3AA 90-280
M2BAX/M2BJX 90-355
3GZC503900-338 05-2022

Picture 1.


IM B3/ IM 1001, IM B5/IM3001, IM B35/IM2001
V1
V15
IM V5/ IM 1011, IM V1/IM3011, IM V15/IM2011
V1, V15
V5
IM V6/ IM 1031, IM V3/IM3031, IM V36/IM2031
V6, V36
V3
IM B6/ IM 1051, IM B7/1061, IM 3051, IM3061, IM2051, IM2061
IM B8/ IM 1071, IM3071, IM2071

Picture 2.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V15
IM V5/ IM 1011, IM V1/IM3011, IM V15/IM2011
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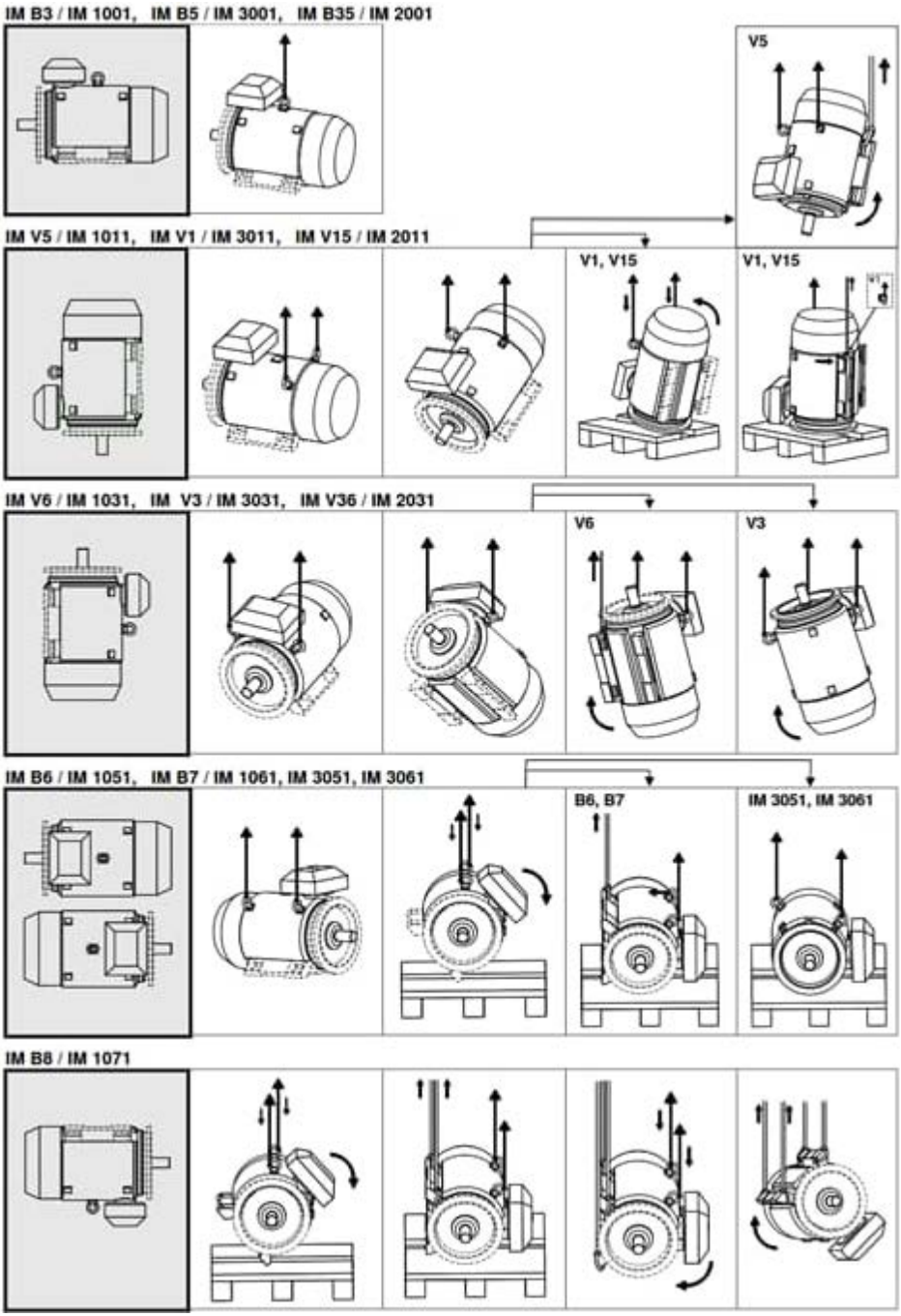
V5
IM V6/ IM 1031, IM V3/IM3031, IM V36/IM2031
V6,V36
V3
IM B6/ IM 1051, IM B7/1061, IM 3051, IM3061, IM2051, IM2061
B6,B7,IM2051,IM2061
IM3051,3061
IM B8/ IM 1071, IM3071, IM2071
B8, IM 2071
B8, IM 2071
B8, IM 2071
IM3071
IM3071
IM3071

Picture 3.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V5
IM V5 / IM 1011, IM V1 / IM 3011, IM V15 / IM 2011
V1, V15
V1, V15
IM V6 / IM 1031, IM V3 / IM 3031, IM V36 / IM 2031
V6
V3
IM B6 / IM 1051, IM B7 / IM 1061, IM 3051, IM 3061
B6, B7
IM 3051, IM 3061
IM B8 / IM 1071

Appendix A

Information for users, waste treatment facilities and marking

This document is prepared according to EU Directive 2012/19/EU (WEEE) to give endusers the necessary information on how to 'treat and dispose of EEE (Electrical and Electronic Equipment) waste after it has been removed from service and is to be recycled.

Marking of the products

Products that are marked with the crossed-out wheeled bin symbol as below and/or the symbol is included in its documentation shall be handled in the following way:

For private households

The crossed-out wheeled bin symbol on the product(s) and / or accompanying documents means that used electrical and electronic equipment (WEEE) should not be mixed with general household waste. For proper treatment, recovery and recycling, please take this product(s) to designated collection points where it will be accepted free of charge.

Alternatively, in some countries, you may be able to return your products to your local retailer upon purchase of an equivalent new product.

Disposing of this product correctly will help save valuable resources and prevent any potential negative effects on human health and the environment, which might otherwise arise from inappropriate waste handling.

Please contact your local authority for further details of your nearest designated collection point. Depending on your national legislation, incorrect disposal of this waste may incur a penalty in your country.

For professional users in the European Union

The crossed-out wheeled bin symbol on the product(s) and / or accompanying documents means that used electrical and electronic equipment (WEEE) should not be mixed with general household waste, If you wish to dispose of electrical and electronic equipment (EEE), please contact your dealer or supplier for further information.

Disposing of this product correctly will help save valuable resources and prevent any potential negative effects on human health and the environment, which could otherwise arise from inappropriate waste handling.

For disposal in countries outside the European Union

The crossed-out wheeled bin symbol is only valid in the European Union (EU) and means that used electrical and electronic equipment (WEEE) should not be mixed with general household waste, If you wish to dispose of this product, please contact your local authorities or dealer for the correct method of disposal.

Disposing of this product correctly will help save valuable resources and prevent any potential negative effects on human health and the environment, which could otherwise arise from inappropriate waste handling.

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