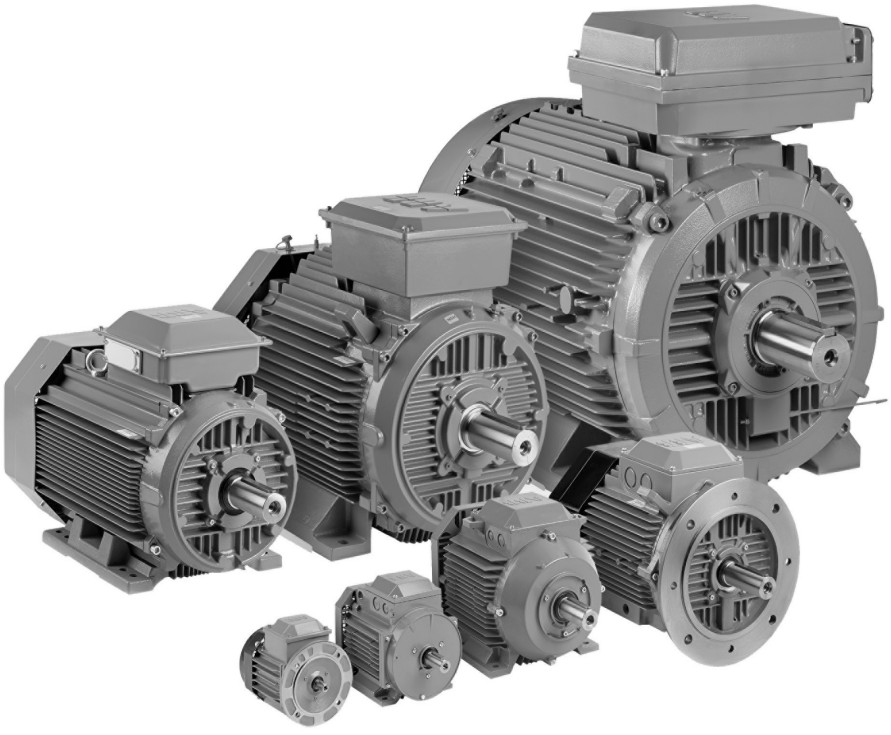
低压电机

安装，操作，维护及安全手册

Low voltage motors

Installation, operation, maintenance and safety manual



EU Declaration of Conformity

The products: 3-phase electric motors of the series

M2BAX 71, 80, 90, 100, 112, 132, 160, 180, 200, 225, 250, 280, 315 and 355

M3BP 71, 80, 90, 100, 112, 132, 160, 180, 200, 225, 250, 280, 315, 355, 400 and 450

M3AA 71, 80, 90, 100, 112, 132, 160, 180, 200, 225, 250 and 280

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 as listed 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 2009/125/EC

The motors that are marked as IE2, IE3 or IE4 are in conformity with the requirements set in the Commission Regulation (EC) No. 640/2009 and the amending Regulation (EU) No. 4/2014 until 30th of June 2021 and with the Regulation (EU) 2019/1781 and the amending Regulation (EU) 2021/341 from 1st of July 2021 and onwards.

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 60034-2-1:2014, 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 60034-12:2002/A1:2007, EN 60034-14:2004:/A1:2007 and EN 60034-30-1:2014.

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.

According to the Regulation (EU) 2019/1781 motors placed on the market before 1 July 2029 as substitutes for identical motors integrated in products placed on the market before 1 July 2021 for motors referred to in Annex I.1 (a), and before 1 July 2023 for motors referred to in Annex I.1 (b), and specifically marketed as such are exempt from the efficiency requirements.

Signed for and on behalf of: ABB Shanghai Motors Co.,LTD.
Place and date of issue: Shanghai, China, 2021-03-31

Signed by

Name: Robert Chin
Title: Global R&D Manager

Signed by

Name: Hui Luo
Title: China Local Division Manager

3GZC500930-54 C

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安装、使用产品前，请阅读使用维护说明书
Before installation and use of the product, please read the maintenance manual

Declaration of Conformity

The products: 3-phase electric motors of the series

M2BAX 71, 80, 90, 100, 112, 132, 160, 180, 200, 225, 250, 280, 315 and 355

M3BP 71, 80, 90, 100, 112, 132, 160, 180, 200, 225, 250, 280, 315, 355, 400 and 450

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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 as listed above are in conformity with the relevant **Statutory Instruments**:

UK Statutory Instruments 2012 No. 1101 'Electrical Equipment (Safety) Regulations 2016'

The motors are in conformity with provisions of the **designated** standards which thus comply with Principal Elements of the Safety Objectives for Electrical Equipment stated in **Schedule 1** of said Regulation.

UK Statutory Instruments 2021 No. 745 'The Ecodesign for Energy-Related Products and Energy Information Regulations 2021'

The motors marked as IE2, IE3 or IE4 are in conformity with the requirements set in the SI 745.

UK Statutory Instruments 2012 No. 3032 'The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012'

Motors are in conformity with the said Regulations on the restriction of the use of certain hazardous substances in electrical and electronic equipment. Technical documentation based on the standard EN IEC 63000:2018.

The following designated standards were applied in relation to which conformity is declared:

EN 60034-1:2010, EN 60034-2-1:2014, 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 60034-12:2002/A1:2007, EN 60034-14:2004:/A1:2007 and EN 60034-30-1:2014.

Notes:

Additional requirements for the motor and converter installation, cabling and grounding as described in operating manuals delivered with motors and converters shall be followed and respected

The conformity of the incorporation into a finished **machine** according to the UK Statutory Instruments 2008 No. **1597** shall be established by the commissioning party when motor is fitted to the machinery.

According to the Regulation (EU) 2019/1781 motors placed on the market before 1 July 2029 as substitutes for identical motors integrated in products placed on the market before 1 July 2021 for motors referred to in Annex I.1 (a), and before 1 July 2023 for motors referred to in Annex I.1 (b), and specifically marketed as such are exempt from the efficiency requirements.

Signed for and on behalf of: ABB Shanghai motors, CO., LTD
Place and dateof issue: Shanghai, China, 2022-05-27

Signed by _____
Name: Robert Chin
Title: Global R&D Manager

Signed by _____
Name: Hui Luo
Title: China Local Division Manager

Information for users, waste treatment facilities and marking

This document is prepared according to EU Directive 2012/19/EU (WEEE) to give end-users 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.

目录

Contents

1. 一般说明

必须遵守这些说明，以确保电机的安全和正确安装、操作和维护。任何安装、操作或维护电机或相关设备的人员都应注意。电动机的安装和使用应由 熟悉健康和安全要求以及国家法律的合格人员进行。忽略这些说明可能会使所有适用的保证失效。

1.1 符合性声明

当电机安装到机械上时，调试方必须确保最终产品符合机械指令 2006/42/EC的要求。

公司符合 CEL007《三相异步电动机能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 GB18613 要求，消费者可登陆中国能效标识网 https://www.energylabel.com.cn 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 MT*，MXMA，
系列 M1A*，M2A*/M3A*，M2B*/M3B*，M4B*，M2C*/M3C*，M2F*/M3F*，M2L*/M3L*，M2M*/M3M*，M2Q*，M2R*/M3R*，M2V*M3V*
机座尺寸 56-450。
对于用于危险区域的如防爆电动机，则有单 独的使用手册“ 防爆电动机用安装、操作与 维护手册 ”。
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。
这些说明适用于在 – 20 ° C 至+40 ° C 以下 的环境温度下安装和存放的电动机。

请注意，所讨论的电动机范围适用于整个 范围。如果要在超过这些限制的环境温度 下使用，请联系 ABB。

以下电机有附加手册：

- 辊道电机
- 水冷式电机
- 排烟电机
- 制动电机
- 高环境温度的电机
- 安装在近海平台或船舶露天甲板上的船用电动机

2. 安全注意事项

电机应由熟悉健康和安全要求以及国家法规的合格人员安装和使用。

必须按照当地法规提供预防在安装和操作现场发生事故所需的安全设备。

警告

紧急停止控制必须配备重新启动锁定装置。紧急停止后，只有新的启动命令才能生效。重新启动锁定后，将进行有意重置。

观察点：
请勿踩踏电机。
在正常操作期间，尤其是关机后，电机外壳的温度可能会很热。
在某些特殊的电动机应用中，可能需要其他说明（例如，变频器供电时）。
观察电动机的旋转部件。
通电时请勿打开接线盒。

3. 搬运

3.1 收货

收货后立即检查电动机是否有外部损坏（例如，是否损坏轴端，法兰和涂漆表面），如果发现损坏，请立即通知货运 代理。

检查所有铭牌数据，特别是电压，绕组接线（星形或三角形），类别，保护类型和温度等级。

轴承类型在所有电机的铭牌上都有规定， 最小的机座除外。对于变速驱动器应用中，请根据电机第二个铭牌上标出的频率检 查允许的最大负载能力。

3.2 运输和存放

电机应始终在干燥（温度高于-20℃）、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，以防润滑油渗出。

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。

电机在静止状态下不得承受超过 0.5 mm / s 的外部振动，以免损坏轴承。

装有圆柱滚子和/或角接触轴承的电动机在运输过程中必须装有锁定装置。

3.3 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，还必须用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。

卸下最终将电机固定到托盘的运输夹具。可从 ABB 获得特定的起吊说明。

警告

在吊装、安装或维护作业期间，应采取所有必要的安全措施，并特别注意不要让任何人承受起重荷载。

3.4 电机重量

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。

下表列出了不同机座材料的电机基本型号的最大估计重量。

除最小机座号（56 和 63）的电机外，ABB 所有电机的铭牌上都注明了电机的实际重量。

如果电动机配备了制动器和/或独立的风扇，请联系 ABB 以获得重量。

机座尺寸	铝壳重量 kg	铸铁重量 kg	制动器附加
56	4.5	–	–
63	6	–	–
71	8	13	5
80	14	20	8
90	20	30	10
100	32	40	16
112	36	50	20
132	93	90	30
160	149	130	30
180	162	190	45
200	245	275	55
225	300	360	75
250	386	405	75
280	425	800	–
315	–	1700	–
355	–	2700	–
400	–	3500	–
450	–	4500	–

4. 安装和调试

警告

在操作电机或驱动设备之前，先断开连接并锁定

4.1 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。
首次启动电动机或将电动机存储超过 6 个月后，请使用指定量的润滑脂。

有关更多详细信息，请参见“ 7.2.2 带可润滑脂轴承的电动机 ”部分。

在垂直安装且轴指向下方的情况下，电动机必须具有保护盖，以防止异物和流体掉入通风孔。

该任务也可以通过不固定在电动机上的单独的盖子来实现。在这种情况下，电机必须带有警告标签。

4.2 深沟球轴承以外的电机

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。

配备滚柱轴承的电机：

在无径向力作用于电机轴的情况下运转电动机可能会由于“ 滑动 ”而损坏滚柱轴承。

配备角接触球轴承的电机：

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

对于角接触轴承的电机，轴向力不得以任何方式改变方向。

轴承类型在铭牌上有规定。

4.3 绝缘电阻检查

在调试前、长时间停顿或存放后，可能会怀疑绕组潮湿，请测量绝缘电阻（IR）。应在断开电源电缆的情况下直接在电机端子上测量 IR，以免影响结果。

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10M Ω，并且在任何情况下均不得低于 1M Ω （在 500 或1000 VDC 下测量并校正至 25 ° C ）。

温度每升高 20 ° C，绝缘电阻值减半。第 11 章中的图 1 可用于将绝缘校正到所需温度。

警告 为避免触电风险，电机机座必须接地，每次测量后应立即将绕组对机座放电。

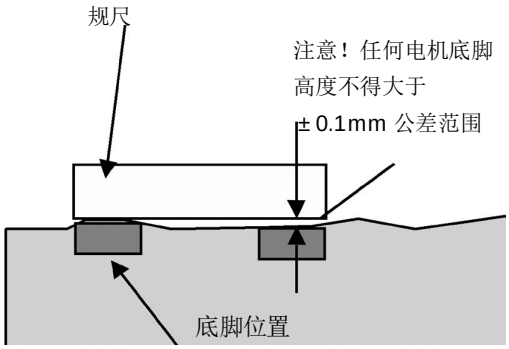
如果未达到参考电阻值，则说明绕组已经受潮，必须在烘箱炉内烘干绕组。绕组在 烘箱炉温度为 90℃下烘 12-16 小时，然后 在 105℃下烘 6-8 小时。

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。

4.4 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、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。见下图。



4.5 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。
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。

4.6 安装和校正电机

确保电机周围有足够的空间供空气流动。 建议在风扇罩和墙壁等之间留出至少 1/2 风扇罩进气口的空隙。

可以从产品目录或我们的网页上提供的尺 寸图中找到更多信息：
www.abb.com/motors&generators。

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。

半联轴器的安装精度：检查间隙 b 小于 0.05 mm，并且 a1 与 a2 之差也小于 0.05 mm。见图 2。

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。

检查电动机是否有足够的气流。
确保附近没有物体或阳光直射向电机散发 更多的热量。

对于法兰安装的电动机（例如 B5，B35，V1），请确保结构允许法兰外表面上有足够的空气流通。

4.7 径向力和皮带传动

必须根据从动设备供应商的说明张紧皮带。无论如何，不得超出相关产品目录中规定的最大皮带力 （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。

4.8 带有冷凝排水塞的电机

检查排水孔和塞子是否朝下。
垂直安装的电动机，排水塞可能处于水平位置。

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。

4.9 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。

电机仅用于固定安装。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。

安装时必须使用经过认证的导管集线器或电缆连接器。

电缆应采用机械方法进行保护并固定在接线盒附近，以符合 IEC / EN 60079-0 和当地安装标准的适当要求。

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。

在将电动机连接到电源之前，必须根据当地法规进行接地。

机座的接地端子必须使用电缆连接到 PE（保护性接地），如IEC 60034-1：2017 的表 20 所示：

接地导线的最小截面积

相线的横截面积，S，mm^2	相应接地导线的最小横截面积，S，mm^2
4	4
6	6
10	10
16	16
25	25
35	25
50	25
70	35
95	50
120	70
150	70
185	95
240	120
300	150
400	185

此外，电气设备外部的接地或连接设施必须有效连接横截面积至少为 4 mm^2 的导体。

网络和电动机端子之间的电缆连接，必须根据铭牌上指示的额定电流，满足国家安装标准或 IEC / EN 60204-1 标准中规定的要求。

> 当环境温度超过+50 ° C时，应使用允许工作温度至少为+90 ° C的电缆。在确定电缆尺寸时，还应考虑所有其他取决于安装条件的转换因素。

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。泄漏可能导致灰尘或水渗透，从而有可能使带电元件闪络。

4.9.1. 不同启动方式的连接

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。
这允许使用 DOL-或 Y/D-启动。

对于双速电机和特殊电机，必须按照接线 盒或电机手册内的说明进行电源接线。

铭牌上印有电压和接线说明。

直接启动（**DOL**）：
可能需要采用 Y或 D绕组连接。
例如，690 VY，400 VD表示 690 V的 Y接线和 400 V的 D接线。

星形/三角形启动（**Y/D**）：
当采用 D接线启动时，电源电压必须与电机的额定电压相等。

拆除接线板上的所有接线片。

其它启动方法和严格的启动条件：

如果采用其他启动方法，例如 S1和 S2的工作类型将使用变流器或软起动器，按照 IEC 60079-0 标准，认为该设备“在电机运行时与动力系统隔离”，并且热保护是可 选的。

4.9.2. 辅助设备连接

如果电机装了热敏电阻或其他 RTD（Pt100， 热继电器等）和辅助设备，建议通过适当的方式使用和连接。对于某些应用，必须使用热保护。可以在电动机随附的文件中找到更多详细信息。辅助元件和连接部件的连接图可在接线盒内找到。

热敏电阻的最大测量电压为 2.5V。Pt100的最大测量电流为 5 mA。使用较高的测量电压或电流可能会导致读数错误或温度检测器损坏。

热传感器的绝缘须满足基本绝缘的要求。

4.9.3. 接线盒螺栓的紧固扭矩

以下扭矩表是拧紧扭矩的通用指南。在确定拧紧扭矩时， 必须考虑电机的框架材料和表面处理。

螺纹	螺栓等级				
	4.6	5.8	8.8	10.9	12.9
	紧固扭矩 Nm				
M4	0.8	2	3	4	4.3
M5	2	4	6	9	10
M6	3	6	10	15	17
M8	8	15	23	32	50
M10	19	32	46	62	80
M12	32	55	79	101	135

4.10 端子和旋转方向

当电源相序 L1、L2、L3 如图 3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。

5. 操作

5.1 一般条件

除非铭牌上另有说明，否则电机设计用于以下条件：

- 电机只能安装在固定装置中。
- 正常环境温度范围是 – 20 ° C 至 +40 ° C。
- 最高海拔高度为1000 m。
- 电源电压和频率的变化不得超过相关标准中提到的限制。根据图 4（EN / IEC 60034-1，第 7.3 节，A 区），电源电压的容差为 ± 5%，频率的容差为 ± 2%。这两个极限值不应该同时出现。

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。

6. 变速操作中的低压电机

6.1 一般说明

本手册的这一部分提供了变频器供电使用的电机的附加说明。电机拟由一个变频器供电，而不是由一个变频器并联运行多台电机。应遵循变频器制造商给出的说明。

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。

6.2 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。

6.2.1. 选择适用于 ABB 变频器的绕组绝缘

如果是 ABB 如 AC_8_ _系列和 AC_5_ _系列带有二极管供电单元（不受控制的直流电压）的单驱动器，绕组绝缘和滤波器的选择可根据表 6.1 进行。

6.2.2 适用其他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。

6.3 热保护

本手册涵盖的大多数电动机在定子绕组中都装有 PTC 热敏电阻或其他类型的 RTD。建议将它们连接到变频器。在第 4.9.2 章中了解更多。

6.4 轴承电流

必须根据下列说明和表 6.1 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。

6.4.1 消除 ABB 变频器的轴承电流

对于 ABB 变频器，例如 AC_8_ _- 和 AC_5_ _系列，带二极管供电单元，必须 使用表 6.1 中的方法来避免电动机中有害 的轴承电流。

注意

建议使用内层具有氧化铝涂层 和/或外部钻孔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。

6.4.2 消除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 6.4.1 章给出的说明，但不保证它们在所有情况下的有效性。

表 6.1

	P_n < 100 kW	P_n ≥ **100 kW or IEC315** ≤ 机座号 ≤ **IEC355**	P_n ≥ **350 kW or IEC400** ≤ 机座号 ≤ **IEC450**
U_n ≤ 500 V	标准电机	标准电机 + 非驱动端绝缘轴承	标准电机 + 非驱动端绝缘轴承 + 共模滤波器
500V > U_n ≤ 600V	标准电机 + dU/dt –滤波器 (反应器) 或 加强绝缘	标准电机 + dU/dt –滤波器 (反应器) + 非驱动端绝缘轴承 或 加强绝缘 + 非驱动端绝缘轴承	标准电机 + 非驱动端绝缘轴承 + dU/dt –滤波器 (反应器) + 共模滤波器 或 加强绝缘 + 非驱动端绝缘轴承 + 共模滤波器
500V > U_n ≤ 600V (电缆长 > 150 m)	标准电机	标准电机 + 非驱动端绝缘轴承	标准电机 + 非驱动端绝缘轴承 + 共模滤波器
600V > U_n ≤ 690V	加强绝缘 + dU/dt –滤波器 (反应器)	加强绝缘 + dU/dt –滤波器 (反应器) + 非驱动端绝缘轴承	加强绝缘 + 非驱动端绝缘轴承 + dU/dt –滤波器 (反应器) + 共模滤波器
600V > U_n ≤ 690V (电缆长 > 150 m)	加强绝缘	加强绝缘 + 非驱动端绝缘轴承	加强绝缘 + 非驱动端绝缘轴承 + 共模滤波器

6.5 电缆铺设, 接地和 EMC

为提供正确的接地以及确保满足现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 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 280 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）。

6.6 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。

6.7 变速应用的电机

6.7.1. 一般说明

当使用 ABB 变频器时，请使用 ABB 的 DriveSize 程序来确定电机规格。可以从 ABB（www.abb.com/motors&generators） 网站下载此工具。

对于由其它变频器供电的应用，必须手动确定电机规格。有关的详细信息，请联系 ABB。

负载率曲线（或负载能力曲线）与标称电 源电压相关。在欠电压或过电压条件下工 作可能影响应用的性能。

6.7.2. 带 DTC 控制的 AC_8_ _系列变频器的电机负载率

图 5a - 5d 中给出的负载率曲线适用于带不受控直流电压和 DTC 控制的 ABB AC_8__ 系列 变频器。这些图表明电机的估计最大 连续输出转矩与电源频率的关系。输出转矩表示为电机额定转矩的百分比。这些数 值仅供参考，精确的数值可索取。

注意 不得超出电机的最大转速！

6.7.3. 带 AC_5_ _系列变频器的电机负载率

图 6a - 6d 中给出的负载率曲线适用于 ABB AC_5__系列的变频器。这些图表明电机的估计最大连续输出转矩与电源频率的关系。输出转矩表示为电机额定转矩的百分比。这些数值仅供参考，精确的数值可索取。

注意 不得超出电机的最大转速!

6.7.4 带其它电压源型变频器的电机负载率

对于直流电压不受控制且最小开关频率为 3 kHz（200…500 V）的其他转换器，可以将第 6.7.3 节中提到的尺寸说明用作指导。但是，应注意，实际的热负荷能力也可能较低。请与转换器的制造商或系统供应商联系。

注意 电机的实际热负载率可能低于参考曲线所示的数值。

6.7.5 短时过载

在断续式工作时，ABB 电机通常出现临时过载。确定此类应用规格的最简便方法就是使用 DriveSize 工具。

6.8 铭牌

在变速应用中使用的 ABB 电机不要求额外的铭牌，可以从主铭牌中找到调试变频器所需的参数。
然而，在一些特殊应用中，电机可配有适用于变速应用的附加铭牌，这些铭牌包含下列信息：

- 转速范围
- 功率范围
- 电压和电流范围
- 转矩类型（恒转矩或平方转矩）
- 变频器型号和所要求的最小切换频率

6.9 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
- 电机标称功率

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的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

7. 维护

警告

停机时，在接线盒内可能接有加热元件或直接绕组加热的电压。

7.1 常规检查

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的当地气候条件。刚开始时可通过多次实验确定检查频率，之后严格遵守。

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。

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。

检查连接件以及安装和组装螺栓的情况。

通过监听是否存在不正常的噪音、振动测量、轴承温度测量，检查润滑油的消耗量或 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 IP 55 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。

7.1.1. 备用电机

如果电动机在轮船或其他振动环境中处于待机状态较长时间，则必须采取以下措施：
必须通过系统启动每 2 周定期旋转一次轴（有报告）。如果由于某种原因无法启动，则至少必须用手转动轴，以便每周一次达到不同的位置。其他船只设备引起的振动会导致轴承点蚀，应通过定期操作/手动转动将其降至最低。

每年旋转轴时必须给轴承上油（有待报告）。如果电机的驱动端装有滚子轴承，则在旋转轴之前必须取下运输锁。运输时必须重新安装运输锁。
必须避免所有振动，以防止轴承失效。必须遵守电机使用说明书中有关调试和维护的所有说明。如果不遵守这些说明，保修将不包括绕组和轴承的损坏。

7.2 润滑

警告 请留意所有转动部件！

警告 润滑油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。

7.2.1. 装有永久润滑轴承的电机

轴承通常采用 1Z、2Z、2RS 或同类永久润滑轴承。

作为指导，根据 L1，对机座号为 250 及以下的电机进行足够润滑，可以达到如下工作时间。对于环境温度较高的工作，请联系 ABB。将 L1 值大致更改为 L10 值的信息公式：
L10=2.0 x L1。

在环境温度为 25℃和 40℃时，永久润滑轴承的工作时间为：

机座号	极数	25 ° C 时的工作温度	40 ° C 时的工作温度
56	2	52 000	33 000
56	4–8	65 000	41 000
63	2	49 000	31 000
63	4–8	63 000	40 000
71	2	67 000	42 000
71	4–8	100 000	56 000
80–90	2	100 000	65 000
80–90	4–8	100 000	96 000
100–112	2	89 000	56 000
100–112	4–8	100 000	89 000
132	2	67 000	42 000
132	4–8	100 000	77 000
160	2	60 000	38 000
160	4–8	100 000	74 000
180	2	55 000	34 000
180	4–8	100 000	70 000
200	2	41 000	25 000
200	4–8	95 000	60 000
225	2	36 000	23 000
225	4–8	88 000	56 000
250	2	31 000	20 000
250	4–8	80 000	50 000

此数据在 60Hz 及以下有效。

7.2.2 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。
- 将指定量的润滑油注入轴承。
- 让电机运行 1-2 小时，以将所有多余的润滑油甩出轴承。关闭放油口塞或关闭隔离阀（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，请使用一半的润滑油量，然后让电机全速运转几分钟。
-电机停止后，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。
如果使用中央润滑系统，则表中所列的每个润滑间隔的油脂量应乘以三。当使用较小的自动注油装置（每个电动机一个或两个滤芯）时，可以使用常规量的油脂。

如果对 2 极电机进行自动润滑，应遵守“ 润滑剂 ”一章中关于 2 极电机润滑建议的注意事项。

所用润滑脂应适合自动润滑。应检查自动润滑系统供应商和润滑脂制造商的建议。

自动润滑系统油脂量计算举例

中央润滑系统: Motor IEC M3_P 315_ 4 极，50 Hz 再润滑间隔，按表是 7600 h/55 g (驱动端) 和 7600 h/40 g (非驱动端):

(DE) RLI = 55 g/7600 h*3*24 = 0,52 g/天

(NDE) RLI = 40 g/7600 h*3*24 = 0,38 g/天

单个自动润滑单元（墨盒）的润滑脂量计算示例

(DE) RLI = 55 g/7600 h*24 = 0,17 g/天

(NDE) RLI = 40 g/7600 h*24 = 0,13 g/天

RLI = 再润滑间隔，DE=驱动端， NDE=非驱动端。

7.2.3. 润滑间隔时间和润滑油量

立式电动机的润滑间隔为下表中所示值的一半。

作为指导，根据 L1，可在以下时间内实现充分润滑。对于环境温度较高的工作，请联系 ABB。将 L1 值大致更改为 L10 值的信息公式为 L10=2.0 x L1，采用手动润滑。

润滑间隔是基于 80 °C 的轴承工作温度（环境温度 +25 °C ）。

润滑间隔是基于 80 °C 的轴承工作温度（环境温度 +25 °C ）。

更高速度的操作，例如在变频器应用中，或者在重载下降低速度，将需要较短的润滑间隔。

不得超出润滑油和轴承的最高工作温度（+110℃）。

警告 不得超出电机设计的最高转速。

机座号	润滑油量 g/轴承	kW	3600 r/min	3000 r/min	kW	1800 r/min	1500 r/min	kW	1000 r/min	kW	500-900 r/min
球轴承, 工作期内润滑间隔											
112	10	all	10 000	13 000	all	18 000	21 000	all	2 5 000	all	28 000
132	15	all	9 000	11 000	all	17 000	19 000	all	23 000	all	26 500
160	25	≤ 18,5	9 000	12000	≤ 15	18 000	21 500	≤ 11	24 000	all	24 000
160	25	> 18,5	7 500	1 0000	> 15	15 000	18 000	> 11	22 500	all	24 000
180	30	≤ 22	7 000	9 000	≤ 22	15 500	18 500	≤ 15	24 000	all	24 000
180	30	> 22	6 000	8 500	> 22	14 000	17 000	> 15	21 000	all	24 000
200	40	≤ 37	5 500	8 000	≤ 30	14 500	17 500	≤ 22	23 000	all	24 000
200	40	> 37	3 000	5 500	> 30	10 000	12 000	> 22	16 000	all	20 000
225	50	≤ 45	4 000	6 500	≤ 45	13 000	16 500	≤ 30	22 000	all	24 000
225	50	> 45	1 500	2 500	> 45	5 000	6 000	> 30	8 000	all	10 000
250	60	≤ 55	2 500	4 000	≤ 55	9 000	11 500	≤ 37	15 000	all	18 000
250	60	> 55	1 000	1 500	> 55	3 500	4 500	> 37	6 000	all	7 000
280	60	all	2 000	3 500	–	–	–	–	–	–	–
280	60	–	–	–	all	8 000	10 500	all	14 000	all	17 000
280	35	all	1 900	3 200		–	–		–		–
280	40		–	–	all	7 800	9 600	all	13 900	all	15 000
315	35	all	1 900	3 200		–	–		–		–
315	55		–		all	5 900	7 600	all	11 800	all	12 900
355	35	all	1 900	3 200		–	–		–		–
355	70		–		all	4 000	5 600	all	9 600	all	10 700
400	40	all	1 500	2 700		–	–		–		–
400	85		–	–	all	3 200	4 700	all	8 600	all	9 700
450	40	all	1 500	2 700		–	–		–		–
450	95		–	–	all	2 500	3 900	all	7 700	all	8 700
滚柱轴承, 工作期内润滑间隔											
160	25	≤ 18,5	4 500	6 000	≤ 15	9 000	10 500	≤ 11	12 000	all	12 000
160	25	> 18,5	3 500	5 000	> 15	7 500	9 000	> 11	11 000	all	12 000
180	30	≤ 22	3 500	4 500	≤ 22	7 500	9 000	≤ 15	12 000	all	12 000
180	30	> 22	3 000	4 000	> 22	7 000	8 500	> 15	10 500	all	12 000
200	40	≤ 37	2 750	4 000	≤ 30	7 000	8 500	≤ 22	11 500	all	12 000
200	40	> 37	1 500	2 500	> 30	5 000	6 000	> 22	8 000	all	10 000
225	50	≤ 45	2 000	3 000	≤ 45	6 500	8 000	≤ 30	11 000	all	12 000
225	50	> 45	750	1 250	> 45	2 500	3 000	> 30	4 000	all	5 000
250	60	≤ 55	1 000	2 000	≤ 55	4 500	5 500	≤ 37	7 500	all	9 000
250	60	> 55	500	750	> 55	1 500	2 000	> 37	3 000	all	3 500
280[1)]	60	all	1 000	1 750	–	–	–	–	–	–	–
280[1)]	70	–	–	–	all	4 000	5 250	all	7 000	all	8 500
280	35	all	900	1 600		–	–		–		–
280	40		–	–	all	4 000	5 300	all	7 000	all	8 500
315	35	all	900	1 600		–	–		–		–
315	55				all	2 900	3 800	all	5 900	all	6 500
355	35	all	900	1 600		–	–		–		–
355	70				all	2 000	2 800	all	4 800	all	5 400
400	40	all	–	1 300		–	–		–		–
400	85		–	–	all	1 600	2 400	all	4 300	all	4 800
450	40	all	–	1 300		–	–		–		–
450	95		–	–	all	1 300	2 000	all	3 800	all	4 400[1)]

1) M3AA

7.2.4. 润滑油

警告

不同型号的润滑油不要混合在一起。
性质不兼容的润滑油会引起轴承损坏。

当加润滑油时，只能使用具有以下特性的球轴承润滑油：

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

*） 对于垂直安装的电动机或处于高温环境条件下，建议以较高值为准。

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

具有适当特性的润滑油各大润滑油制造商均有出售。

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

通常，不建议使用包含 EP 添加剂的润滑剂。在某些情况下，轴承可能会造成伤害，因此必须与润滑剂供应商一起对其使用情况逐一评估。

可以使用下列高性能的润滑油：

- Mobil Unirex N2 or 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 Multis Complex S2 A (锂复合基)

对于高速2极电机应始终使 用高速润滑油，因为它们的速度系数高于 480,000（以 Dm ×n 计算，其中 Dm = 轴承平均直径，mm；n=转速，r/min）。

下列润滑油可用于高速铸铁电机，但不能与锂复合润滑油混合使用：

- 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；如果对润滑剂的相容性存在疑问，请联系当地的 ABB 营业部。

8.售后支持

8.1 备件

除非另有说明，否则零件必须是原配零件或 ABB 认可的零件。

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。

8.2 拆卸、重装和绕组重绕

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。

8.3 轴承

拆装轴承时必须特别小心。轴承必须用提拔器拆卸，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。

必须遵守电机上的所有指示，例如标签。不得更改铭牌上指示的轴承型号。

除非制造商明确批准，否则由最终用户进行的任何修理均免除制造商的责任。

9. 环境要求

在 50 Hz 时，ABB 大多数电机的声压级噪音均低于 82 dB（A）（ ± 3dB）。

可以在相关产品目录中找到特定机器的数据。在 60 Hz 正弦电源下，其数值比产品目录中 50 Hz 时的数值大约高 3 dB（A）。

有关变频器供电时的声压级噪音，请联系 ABB。

当需要报废或回收电动机时，必须遵循适当的方法，当地法规和法律。

10. 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。

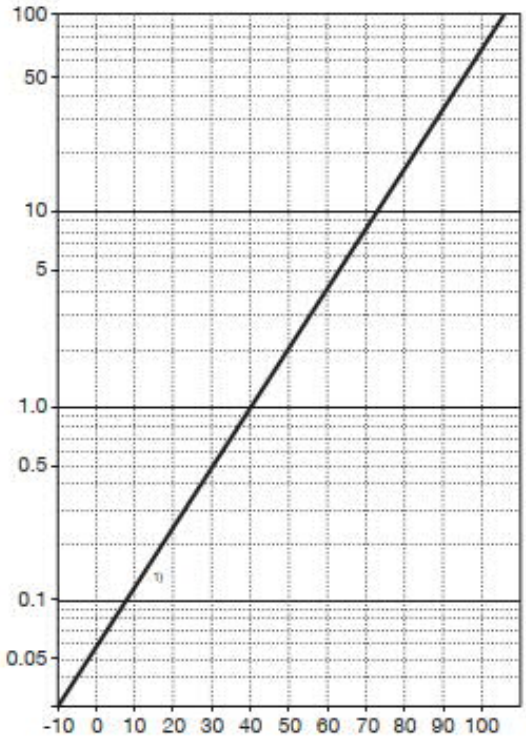
电动机故障检修图表

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因素。
	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	联系 ABB 或 确保已断开电源并已接地以完成工作，断开电缆并测量绝缘电阻。
	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。
	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。
电动机不能到达转速	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	检查电机的启动是否处于“ 空载 ”状态。
	转子断条或转子松动	检查端环附近有无裂缝。可能需要更换转子，因为维修通常只能暂时解决问题。
	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。
	鼠笼式转子有缺陷	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。
	机座或通风口被污垢堵塞,防碍了电动机通风	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。
	轴端余隙过大。	调节轴承或增加薄垫片。
刮擦噪音	风扇摩擦端罩或风扇盖	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	检查并校正支架连接或轴承。
	转子不平衡	重新平衡转子。
球轴承发热	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油。
	油脂变质或润滑油受到污染	去除旧油脂，用煤油彻底清洗轴承并更换新油脂。
	润滑油过量	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。

11. 图表



说明：
X 轴：绕组温度，摄氏度
Y 轴：绝缘电阻温度
系数，ktc
1）为了将观察到的绝缘电阻 Ri 校正到 40 ° C，将其乘以温度系数 ktc。 Ri 40 ° C = Ri x

图 1.该图说明了绝缘电阻与温度的关系以及如何在 40 ° C 的温度下校正测得的绝缘电阻。

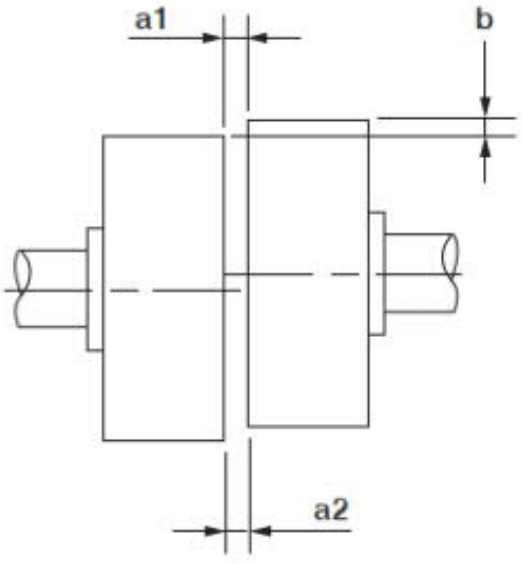
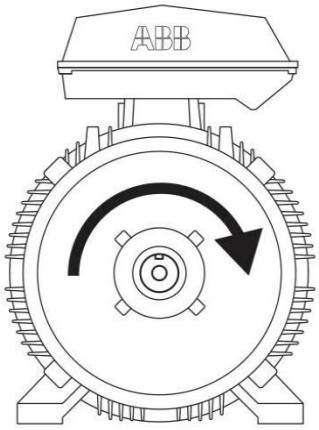


图 2.半联轴器或皮带轮的安装



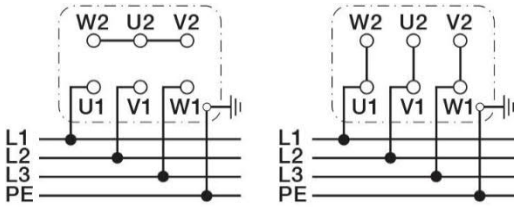


图 3.主电源端子的连接

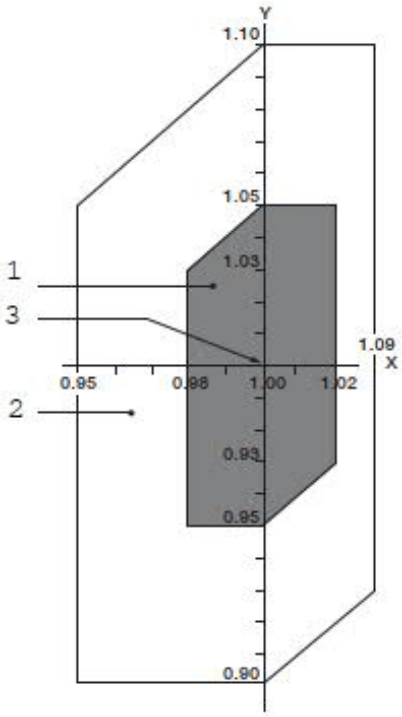


图 4. A 区和 B 区的电压和频率偏差

说明:

X 轴　　频率标幺值 .

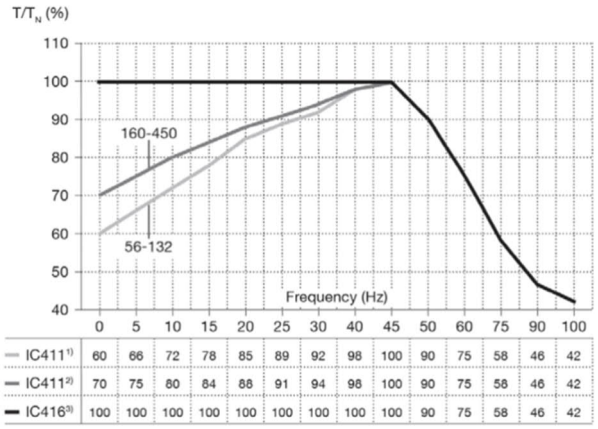
Y 轴　　电压标幺值

1. 区域 A

2. 区域 B (区域 A 外)

3. 定额点

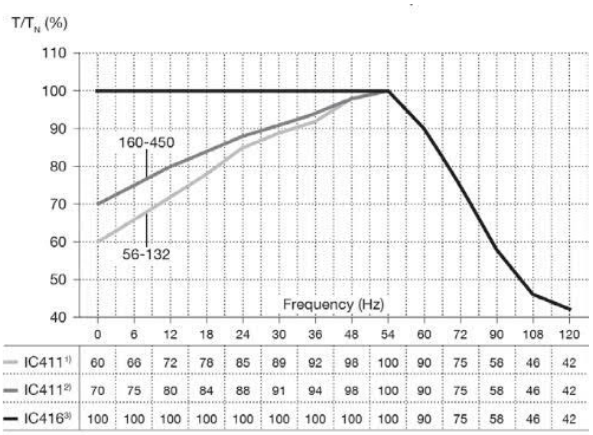
带 DTC 控制的变频器电机的负载能力曲线指导



Frequency (Hz)	0	5	10	15	20	25	30	40	45	50	60	75	90	100
IC411[1]	60	66	72	78	85	89	92	98	100	90	75	58	46	42
IC411[2]	70	75	80	84	88	91	94	98	100	90	75	58	46	42
IC416[3]	100	100	100	100	100	100	100	100	100	90	75	58	46	42

[1] Self ventilated, IEC frame sizes 56-132
[2] Self ventilated, IEC frame sizes 160-450
[3] Separate motor cooling (force ventilated)

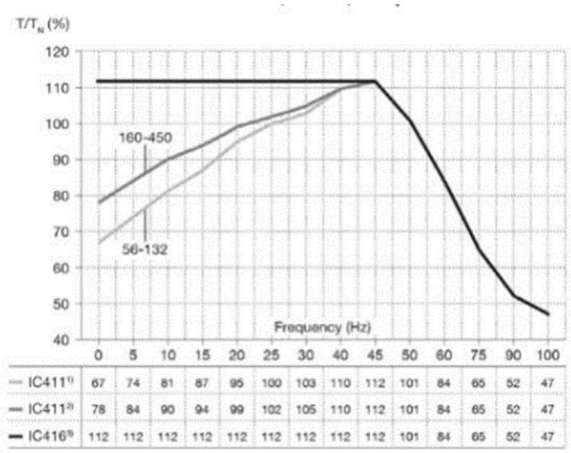
图 5a.带 DTC 控制的变频器，50 Hz，温升 B



Frequency (Hz)	0	6	12	18	24	30	36	48	54	60	72	90	108	120
IC411[1]	60	66	72	78	85	89	92	98	100	90	75	58	46	42
IC411[2]	70	75	80	84	88	91	94	98	100	90	75	58	46	42
IC416[3]	100	100	100	100	100	100	100	100	100	90	75	58	46	42

[1] Self ventilated, IEC frame sizes 56-132
[2] Self ventilated, IEC frame sizes 160-450
[3] Separate motor cooling (force ventilated)

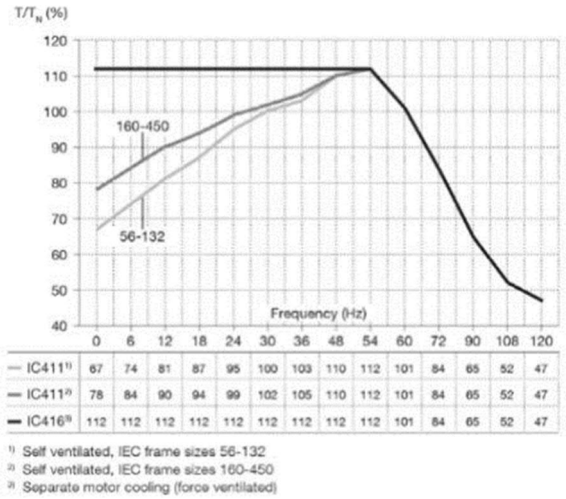
图 5b.带 DTC 控制的变频器，60 Hz，温升 B



Frequency (Hz)	0	5	10	15	20	25	30	40	45	50	60	75	90	100
IC411[1]	67	74	81	87	95	100	103	110	112	101	84	65	52	47
IC411[2]	78	84	90	94	99	102	105	110	112	101	84	65	52	47
IC416[3]	112	112	112	112	112	112	112	112	112	101	84	65	52	47

[1] Self ventilated, IEC frame sizes 56-132
[2] Self ventilated, IEC frame sizes 160-450
[3] Separate motor cooling (force ventilated)

图 5c.带 DTC 控制的变频器，50 Hz，温升 F



Frequency (Hz)	0	6	12	18	24	30	36	48	54	60	72	90	108	120
IC411[1]	67	74	81	87	95	100	103	110	112	101	84	65	52	47
IC411[2]	78	84	90	94	99	102	105	110	112	101	84	65	52	47
IC416[3]	112	112	112	112	112	112	112	112	112	101	84	65	52	47

[1] Self ventilated, IEC frame sizes 56-132
[2] Self ventilated, IEC frame sizes 160-450
[3] Separate motor cooling (force ventilated)

图 5d. 带 DTC 控制的变频器，60 Hz，温升 F

其他电压源 PWM 型电机的负载曲线指导

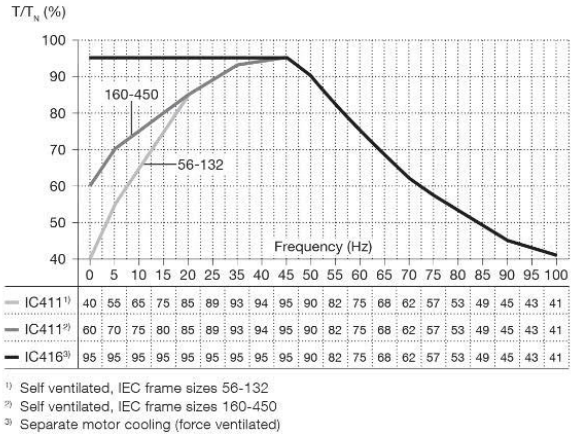


图 6a. 其他电压源 PWM 型变频器，50 Hz，温升 B

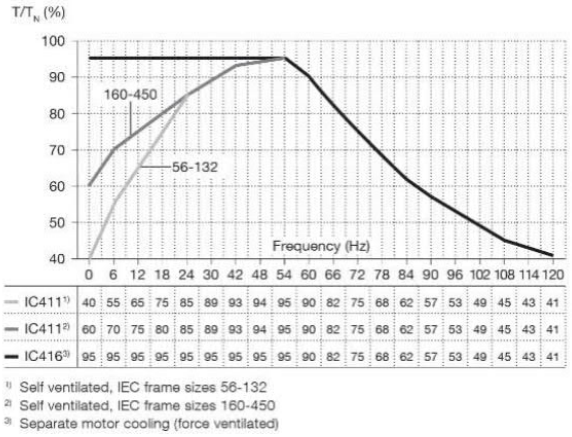


图 6b. 其他电压源 PWM 型变频器，60 Hz，温升 B

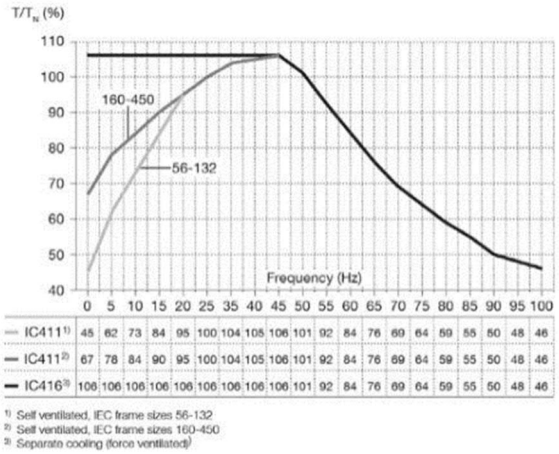


图 6c. 其他电压源 PWM 型变频器，50 Hz，温升 F

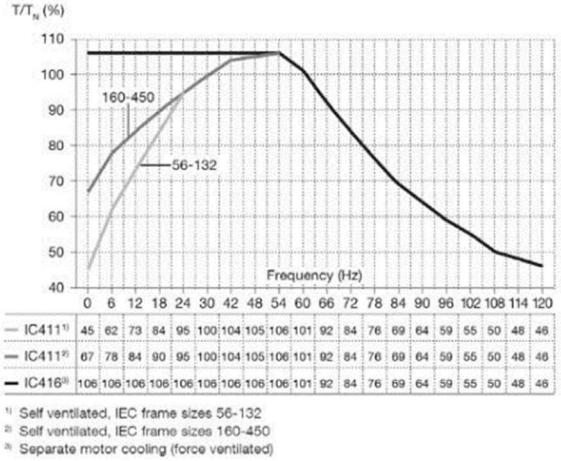


图 6c. 其他电压源 PWM 型变频器，60 Hz，温升 F

12. 吊装指导手册

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	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 90-355
3GZC503900-338 04-2016

图 1

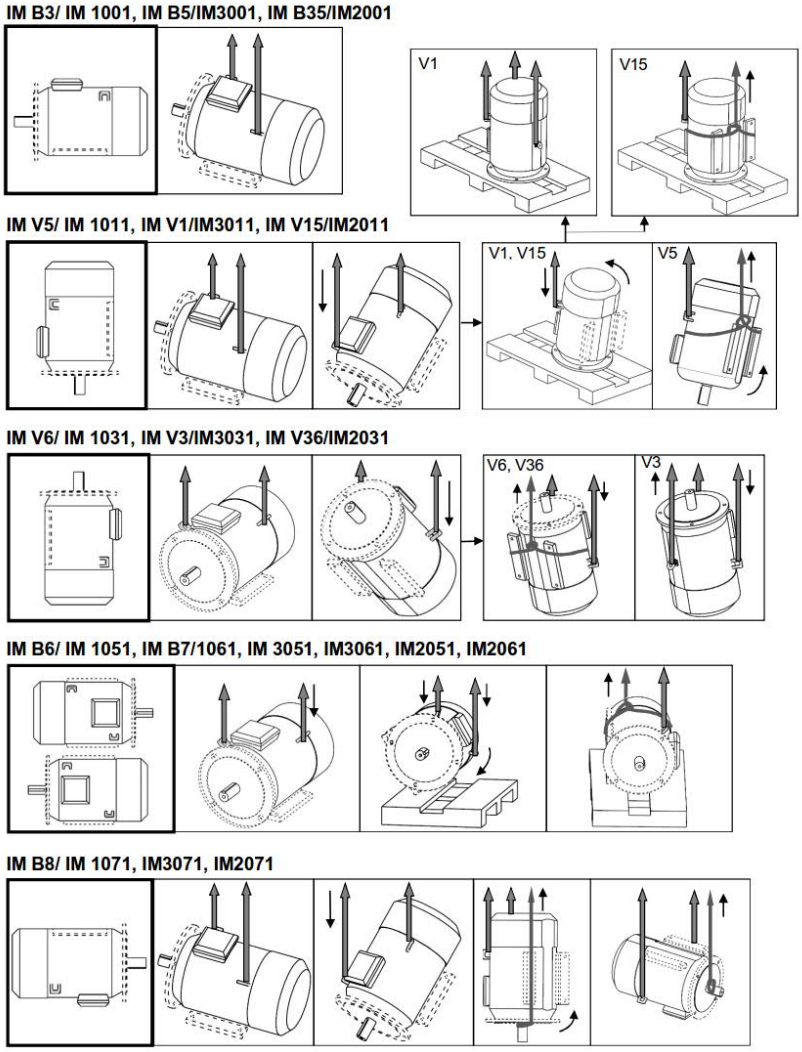


图 2

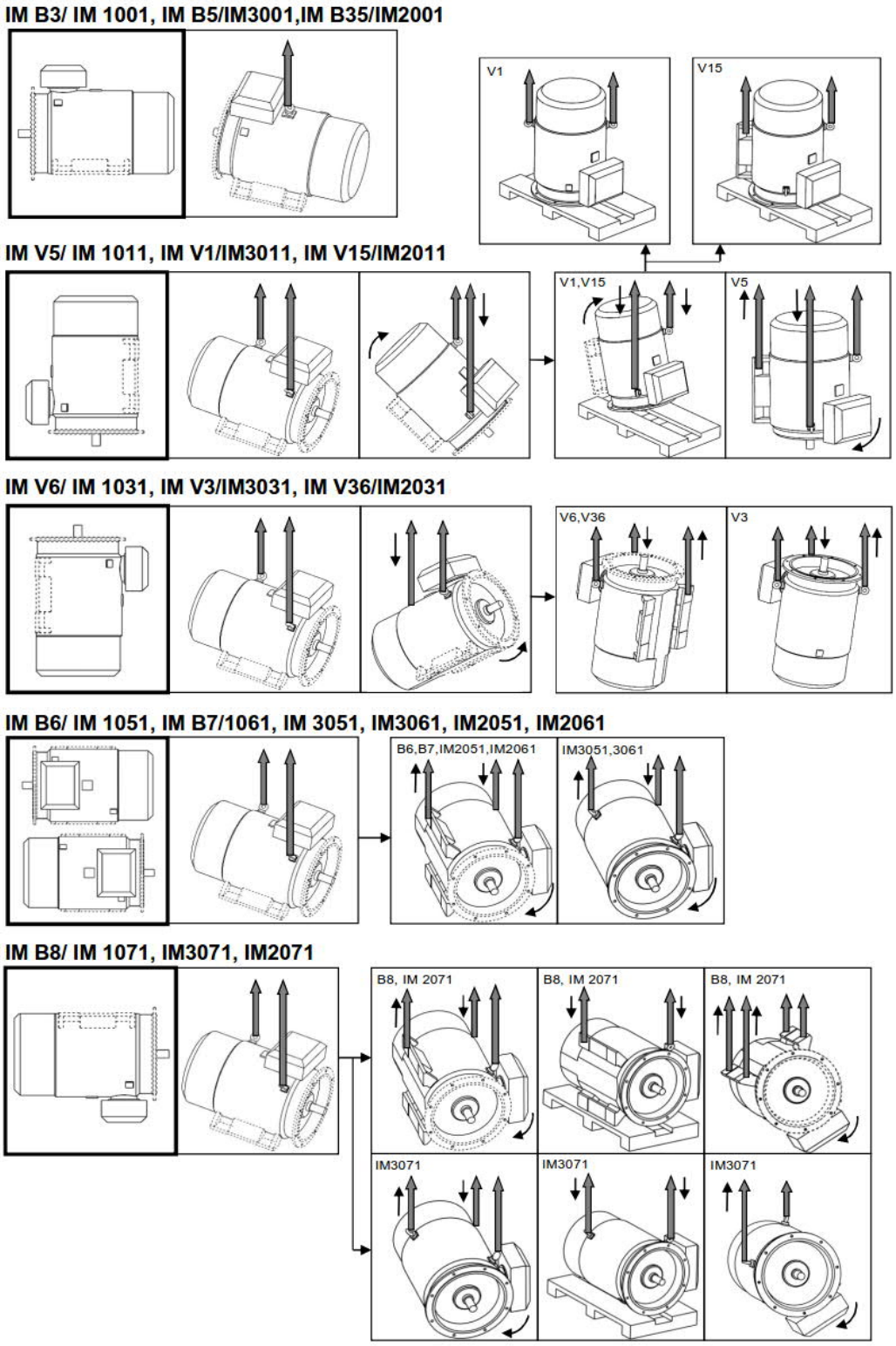
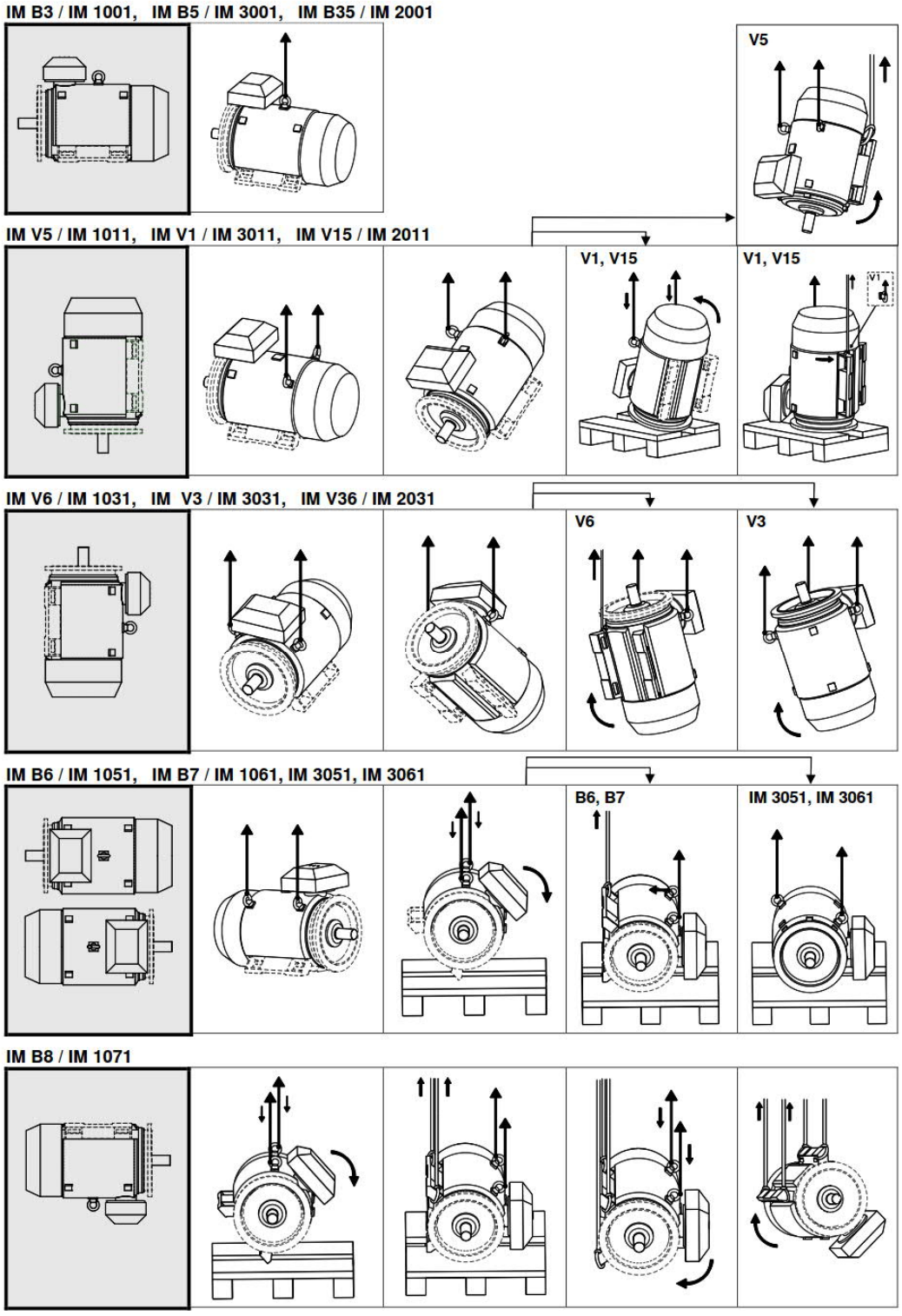

IM B3/ IM 1001, IM B5/IM3001,IM B35/IM2001
V1
V15
IM V5/ IM 1011, IM V1/IM3011, IM V15/IM2011
V1,V15
V5
IM V6/ IM 1031, IM V3/IM3031, IM V36/IM2031
V6,V36
V3
IM B6/ IM 1051, IM B7/1061, IM 3051, IM3061, IM2051, IM2061
B6,B7,IM2051,IM2061
IM3051,3061
IM B8/ IM 1071, IM3071, IM2071
B8, IM 2071
B8, IM 2071
B8, IM 2071
IM3071
IM3071
IM3071

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
V1
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

1. Introduction

THESE INSTRUCTIONS MUST BE FOLLOWED TO ENSURE SAFE AND PROPER INSTALLATION, OPERATION AND MAINTENANCE OF THE MOTOR. THEY SHOULD BE BROUGHT TO THE ATTENTION OF ANYONE WHO INSTALLS, OPERATES OR MAINTAINS THE MOTOR OR ASSOCIATED EQUIPMENT. THE MOTOR 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.

Products in consistence with the regulation of Three-Phase Asynchronous 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 GB18613. For detail registration information, please visit the official website www.energylabel.gov.com.

1.2 Validity

These instructions are valid for the following ABB electrical machine types, in both motor and generator operation:

series MT*, MXMA,
series M1A*, M2A*/M3A*, M2B*/M3B*, M4B*, M2C*/M3C*, M2F*/M3F*, M2L*/M3L*, M2M*/M3M*, M2Q*, M2R*/M3R*, M2V*/M3V*
in frame sizes 56 - 450.

There is a separate manual for e.g. Ex motors ‘Low voltage motors for explosive atmospheres: Installation, operation and maintenance and safety manual (3GZF500730-47)

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

These instructions are valid for motors installed and stored at ambient temperatures above –20 °C and below +40 °C. Note that the motor range in question is suitable for this whole range. For use in ambient temperatures exceeding these limits, please contact ABB.

Additional manual is available for the following motors:

- roller table motors
- water cooled motors
- smoke extraction motors
- brake motors
- motors for high ambient temperatures
- motors in marine applications for mounting on open deck
- of ships or offshore units

2. Safety considerations

The motor 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	EMERGENCY STOP CONTROLS MUST BE EQUIPPED WITH RESTART LOCKOUTS. AFTER EMERGENCY STOP A NEW START COMMAND CAN TAKE EFFECT ONLY AFTER THE RESTART LOCKOUT HAS BEEN INTENTIONALLY RESET.

Points to be observed
Do not step on the motor.

The temperature of the outer casing of the motor may be hot to the touch during normal operation and especially after shut-down.

Some special motor applications may require additional instructions (e.g., when supplied with a frequency converter).

Observe rotating parts of the motor.
Do not open terminal boxes while energized.

3. Handling

3.1 Reception

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

Check all rating plate data, especially voltage, winding connections (star or delta), category, type of protection and temperature class. The type of bearing is specified on the rating plate of all motors except the smallest frame sizes. In the case of a variable speed drive application, check the maximum loadability allowed according to the frequency stamped on the motor's second rating plate.

3.2 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 energized to avoid water condensing in the motor.

The motor must not be subject to any external vibrations exceeding 0.5 mm/s 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.

3.3 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. Because of different output, mounting arrangements and auxiliary equipment, motors with the same frame may have a different center of gravity.

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.

Remove eventual transport jigs fixing the motor to the pallet.

Specific lifting instructions are available from ABB.

WARNING

DURING LIFTING, MOUNTING OR MAINTENANCE WORK, ALL NECESSARY SAFETY CONSIDERATIONS SHALL BE IN PLACE AND SPECIAL ATTENTION TO BE TAKEN THAT NOBODY WILL BE SUBJECT TO LIFTED LOAD.

3.4 Motor weight

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

The following table shows estimated maximum weights for machines in their basic versions as a function of frame material.

The actual weight of all ABB's motors, except the smallest frame sizes (56 and 63), is shown on the rating plate.

If the motor is equipped with a brake and/or separate fan, contact ABB for the weight.

Frame	Aluminum	Cast iron	Add. for brake
Size	Weight kg	Weight kg	
56	4.5	–	–
63	6	–	–
71	8	13	5
80	14	20	8
90	20	30	10
100	32	40	16
112	36	50	20
132	93	90	30
160	149	130	30
180	162	190	45
200	245	275	55
225	300	360	75
250	386	405	75
280	425	800	–
315	–	1700	–
355	–	2700	–
400	–	3500	–
450	–	4500	–

4. Installation and commissioning

WARNING

DISCONNECT AND LOCK OUT BEFORE WORKING ON THE MOTOR OR THE DRIVEN EQUIPMENT.

4.1 General

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

When starting the motor for the first time or after it has been in storage more than 6 months, apply the specified quantity of grease.

See section “7.2.2 Motors with re-greasable bearings” for more details.

When fitted in a vertical position with the shaft pointing downwards, the motor must have a protective cover to prevent foreign objects and fluid from falling into the ventilation openings. This task can also be achieved by a separate cover not fixed to the motor. In this case, the motor must have a warning label.

4.2 Motors with other than deep groove ball bearings

Remove transport locking if employed. Turn the shaft of the motor by hand to check free rotation, if possible.

Motors equipped with cylindrical roller bearings:
Running the motor with no radial force applied to the shaft may damage the roller bearing due to “sliding”,

Motors equipped with angular contact ball 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 MOTORS WITH ANGULAR CONTACT BEARINGS THE AXIAL FORCE MUST NOT BY ANY MEANS CHANGE DIRECTION.

The type of bearing is specified on the rating plate.

4.3 Insulation resistance check

Measure insulation resistance (IR) before commissioning, after long periods of standstill or storage when winding dampness may be suspected. IR shall be measured directly on the motor terminals with the supply cables disconnected in order to avoid them affecting the result.

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 10 MΩ and in no case below 1 MΩ (measured with 500 or 1000 VDC and corrected to 25 °C). The insulation resistance value is halved for each 20 °C increase in temperature.

Figure 1, in chapter 11, can be used for the insulation correction to the desired temperature.

WARNING	TO AVOID RISK OF ELECTRICAL SHOCK, THE MOTOR FRAME MUST BE GROUNDED AND THE WINDINGS SHOULD BE DISCHARGED AGAINST THE FRAME IMMEDIATELY AFTER EACH MEASUREMENT.

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.

If fitted drain hole plugs must be removed and closing valves 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.

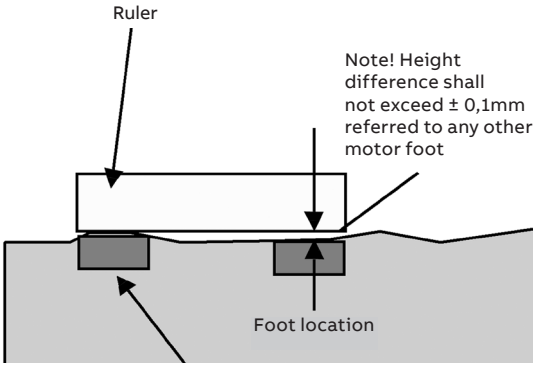
4.4 Foundations

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

Metal foundations should be painted to avoid corrosion.

Foundations must be even 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. See figure below.



4.5 Balancing and fitting coupling halves and pulleys

As standard, balancing of the motor has been carried out using half 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 removing it by using a lever pressed against the body of the motor.

4.6 Mounting and alignment of the motor

Ensure that there is enough space for free airflow around the motor. It is recommended to have a clearance between the fan cover and the wall etc. of at least ½ of the air intake of the fan cover. Additional information may be found from the product catalog or from the dimension drawings available on our web pages: 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 2.

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 catalogs.

Check that the motor has sufficient airflow. Ensure that no nearby objects or direct sunshine radiate additional heat to the 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.

4.7 Radial forces and belt drives

Belts must be tightened 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 catalogs.

WARNING

EXCESSIVE BELT TENSION WILL DAMAGE BEARINGS AND CAN CAUSE SHAFT DAMAGE.

4.8 Motors with drain plugs for condensation

Check that drain holes and plugs face downwards. In vertical position mounted motors, the drain plugs may be in horizontal position.

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

4.9 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.

Motors are intended for fixed installation only. Unless otherwise specified, cable entry threads are metric. The IP class of the cable gland must be at least the same as those of the terminal boxes.

Certified conduit hub or cable connector has to be used at the time of installation.

CABLES SHOULD BE MECHANICALLY PROTECTED AND CLAMPED CLOSE TO THE TERMINAL BOX TO FULFILL THE APPROPRIATE REQUIREMENTS OF IEC/EN 60079-0 AND LOCAL INSTALLATION STANDARDS.

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.

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

The earth terminal on the frame has to be connected to PE (protective earth) with a cable as shown in Table 20 of IEC 60034-1:2017:

Minimum cross-sectional area for protective conductors

Cross-sectional area of phase conductors of the installation, S, mm²	Minimum cross-sectional area of the corresponding protective conductor, S, mm²
4	4
6	6
10	10
16	16
25	25
35	25
50	25
70	35
95	50
120	70
150	70
185	95
240	120
300	150
400	185

In addition, earthing or bonding connection facilities on the outside of electrical apparatus must provide effective connection of a conductor with a cross-sectional area of at least 4 mm2.

The cable connection between the network and motor terminals must meet the requirements stated in the national standards for installation or in the standard IEC/EN 60204-1 according to the rated current indicated on the rating plate.

NOTE

WHEN THE AMBIENT TEMPERATURE EXCEEDS +50 °C, CABLES HAVING PERMISSIBLE OPERATING TEMPERATURE OF +90 °C AS MINIMUM SHALL BE USED. ALSO ALL OTHER CONVERSION FACTORS DEPENDING ON THE INSTALLATION CONDITIONS SHALL BE TAKEN INTO ACCOUNT WHILE SIZING THE CABLES.

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. A leak could lead to penetration of dust or water, creating a risk of flashover to live elements.

4.9.1. Connections for different starting methods

The terminal box on standard single speed motors normally contains six winding terminals and at least one earth terminal. This enables the use of DOL- or Y/D –starting.

For two-speed and special motors, the supply connection must follow the instructions inside the terminal box or in the motor manual.

The voltage and connection are stamped on the rating plate.

Direct-on-line starting (DOL):
Y or D winding connections may be used. For example, 690 VY, 400 VD indicates Y-connection for 690 V and D-connection for 400 V.

Star/Delta (Wye/Delta) starting (Y/D):
The supply voltage must be equal to the rated voltage of the motor when using a D-connection. Remove all connection links from the terminal block.

Other starting methods and severe starting conditions:
In cases where other starting methods e.g. converter or soft starter will be used in the duty types of S1 and S2, it is considered that the device is “isolated from the power system when the electrical machine is running” as in the standard IEC 60079-0 and thermal protection is optional.

4.9.2. 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. For certain applications, it is mandatory to use thermal protection. More detailed information can be found in the documents delivered with the motor. Connection diagrams for auxiliary elements and connection parts can be found inside the terminal box.

The maximum measuring voltage for the thermistors is 2.5 V. The maximum measuring current for Pt100 is 5 mA. Using a higher measuring voltage or current may cause errors in readings or a damaged temperature detector.

The insulation of thermal sensors fulfills the requirements of basic insulation.

4.9.3. ConnectionsTightening torque of terminal box bolts

The following torque table is a generic guideline for tightening torques. The motor's frame material and surface treatment must be taken into account when determining the tightening torque.

Thread	Bolt grade				
	4.6	5.8	8.8	10.9	12.9
	Tightening torque Nm				
M4	0.8	2	3	4	4.3
M5	2	4	6	9	10
M6	3	6	10	15	17
M8	8	15	23	32	50
M10	19	32	46	62	80
M12	32	55	79	101	135

4.10 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 3.

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.

5. Operation

5.1 General

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

- Motors are to be installed in fixed installations only.
- Normal ambient temperature range is from –20 °C to +40 °C.
- Maximum altitude is 1000 m above sea level.
- The variation of the supply voltage and frequency may not exceed the limits mentioned in relevant standards. Tolerance for supply voltage is ±5 %, and for frequency ±2 % according to the figure 4 (EN / IEC 60034-1, paragraph 7.3, Zone A). Both extreme values are not supposed to occur at the same time.

The motor can only be used in applications for which it is intended. The rated nominal values and operation 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 INSTRUCTIONS OR MAINTENANCE OF THE APPARATUS MAY JEOPARDIZE SAFETY AND THUS PREVENT THE USE OF THE MOTOR.

6. Low voltage motors in variable speed operation

6.1 Introduction

This part of the manual provides additional instructions for motors used in frequency converter supplies. The motor is intended to operate from a single frequency converter supply and not motors running in parallel from one frequency converter. Instructions given by the converter manufacturer shall be followed.

Additional information may be required by ABB to decide on the suitability for some motor types used in special applications or with special design modifications.

6.2 Winding insulation

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

6.2.1. Selection of winding insulation for ABB converters

In the case of ABB e.g. AC_8_ _-series and AC_5_ _-series single drives with a diode supply unit (uncontrolled DC voltage), the selection of winding insulation and filters can be made according to table 6.1.

6.2.2 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.

6.3 Thermal protection

Most of the motors covered by this manual are equipped with PTC thermistors or other type of RTD's in the stator windings. It is recommended to connect those to the frequency converter. Read more in chapter 4.9.2.

6.4 Bearing currents

Insulated bearings or bearing constructions, common mode filters and suitable cabling and grounding methods must be used according to the following instructions and using table 6.1.

6.4.1 Elimination of bearing currents with ABB converters

In case of ABB frequency converter e.g. AC_8_ _- and AC_5_ _-series with a diode supply unit, the methods according to table 6.1 must be used to avoid harmful bearing currents in motors.

NOTE

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.

6.4.2 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 6.4.1 can be used as guideline, but their effectiveness cannot be guaranteed in all cases.

	P_N < 100 kW	**P_N ≥ 100 kW or IEC315 ≤ Frame size ≤ IEC355**	**P_N ≥ 350 kW or IEC400 ≤ Frame size ≤ IEC450**
U_N ≤ 500 V	Standard motor	Standard motor + Insulated N-bearing	Standard motor + Insulated N-bearing + Common mode filter
500V > U_N ≤ 600V	Standard motor + dU/dt –filter (reactor) OR Reinforced insulation	Standard motor + dU/dt –filter (reactor) + Insulated N-bearing OR Reinforced insulation + Insulated N-bearing	Standard motor + Insulated N-bearing + dU/dt –filter (reactor) + Common mode filter OR Reinforced insulation + Insulated N-bearing + Common mode filter
500V > U_N ≤ 600V (cable length > 150 m)	Standard motor	Standard motor + Insulated N-bearing	Standard motor + Insulated N-bearing + Common mode filter
600V > U_N ≤ 690V	Reinforced insulation + dU/dt –filter (reactor)	Reinforced insulation + dU/dt –filter (reactor) + Insulated N-bearing	Reinforced insulation + Insulated N-bearing + dU/dt –filter (reactor) + Common mode filter
600V > U_N ≤ 690V (cable length > 150 m)	Reinforced insulation	Reinforced insulation + Insulated N-bearing	Reinforced insulation + Insulated N-bearing + Common mode filter

6.5 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.

Symmetrical and shielded cables are highly recommended also for smaller motors. 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 SUCH AS MOTOR, CONVERTER, POSSIBLE SAFETY SWITCH, ETC.

For motors of frame size IEC 280 and above, 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).

6.6 Operating speed

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

6.7 Motors in variable speed applications

6.7.1. General

With ABB's frequency converters, the motors can be dimensioned by using ABB's DriveSize dimensioning program. The tool is downloadable from the ABB website (www.abb.com/motors&generators).

For application supplied by other converters, the motors must be dimensioned manually. For more information, please contact ABB.

The loadability curves (or load capacity curves) are based on nominal supply voltage. Operation in under or over voltage conditions may influence on the performance of the application.

6.7.2. Motor loadability with AC_8_ _ – series of converters with DTC control

The loadability curves presented in Figures 5a – 5d are valid for ABB AC_8_ _-series converters with uncontrolled DC-voltage and DTC-control. The figures show the approximate maximum continuous output torque of the motors as a function of supply frequency. The output torque is given as a percentage of the nominal torque of the motor. The values are indicative and exact values are available on request.

NOTE

THE MAXIMUM SPEED OF THE MOTOR AND APPLICATION MAY NOT BE EXCEEDED!

6.7.3. Motor loadability with AC_5_ _ – series of converter

The loadability curves presented in Figures 6a – 6d are valid for AC_5_ _ -series converters. The figures show the approximate maximum continuous output torque of the motors as a function of supply frequency. The output torque is given as a percentage of the nominal torque of the motor. The values are indicative and exact values are available on request.

NOTE

THE MAXIMUM SPEED OF THE MOTOR AND APPLICATION MAY NOT BE EXCEEDED!

6.7.4 Motor loadability with other voltage source PWM-type converters

For other converters, with uncontrolled DC voltage and minimum switching frequency of 3 kHz (200…500 V), the dimensioning instructions as mentioned in chapter 6.7.3 can be used as guidelines. However, it shall be noted that the actual thermal loadability can also be lower. Please contact the manufacturer of the converter or the system supplier.

NOTE

THE ACTUAL THERMAL LOADABILITY OF A MOTOR MAY BE LOWER THAN SHOWN BY GUIDELINE CURVES.

6.7.5 Short time overloads

ABB motors can usually be temporarily overloaded as well as used in intermittent duties. The most convenient method to dimension such applications is to use the DriveSize tool.

6.8 Rating plates

The usage of ABB's motors in variable speed applications do not usually require additional rating plates. The parameters required for commissioning the converter can be found from the main rating plate. In some special applications, however, the motors can be equipped with additional rating plates for variable speed applications. Those include the following information:

- speed range
- power range
- voltage and current range
- type of torque (constant or quadratic)
- and converter type and required minimum switching frequency.

6.9 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:

- nominal voltage
- nominal current
- nominal frequency
- nominal speed
- 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

7. Maintenance

WARNING

VOLTAGE MAY BE CONNECTED AT STANDSTILL INSIDE THE TERMINAL BOX FOR HEATING ELEMENTS OR DIRECT WINDING HEATING.

7.1 General inspection

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.

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.

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

Check the condition of connections and mounting and assembly bolts.

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 IP 55 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.

7.1.1. Standby motors

IIf the motor is in standby for a longer period of time on a ship or in other vibrating environment the following measures have to be taken:

The shaft must be rotated regularly every 2 weeks (to be reported) by means of starting up of the system. In case a start-up is not possible, for any reason, at least the shaft has to be turned by hand in order to achieve a different position once a week. Vibrations caused by other vessel's equipment will cause bearing pitting which should be minimized by regular operation/hand turning.

The bearing must be greased while rotating the shaft every year (to be reported). If the motor has been provided with roller bearing at the driven end, the transport lock must be removed before rotating the shaft. The transport locking must be remounted in case of transportation.

3All vibrations must be avoided to prevent a bearing from failing. All instructions in the motor instruction manual for commissioning and maintenance have to be followed. The warranty will not cover the winding and bearing damages if these instructions have not been followed.

7.2 Lubrication

 WARNING	BEWARE OF ALL ROTATING PARTS.
 WARNING	GREASE CAN CAUSE SKIN IRRITATION AND EYE INFLAMMATION. FOLLOW ALL SAFETY PRECAUTIONS SPECIFIED BY THE MANUFACTURER OF THE GREASE.

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 L1 -principle (i.e. that 99 % of the motors are certain to make the life time) for lubrication.

7.2.1. Motors with permanently greased bearings

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

As a guide, adequate lubrication for sizes up to 250 can be achieved for the following duration, according to L_1. For duties with higher ambient temperatures, please contact ABB. The informative formula to change the L_1 values roughly to L_{10} values: $L_{10} = 2.0 \times L_1$.

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

Frame size	Poles	Duty hours at 25 °C	Duty hours at 40 °C
56	2	52 000	33 000
56	4–8	65 000	41 000
63	2	49 000	31 000
63	4–8	63 000	40 000
71	2	67 000	42 000
71	4–8	100 000	56 000
80–90	2	100 000	65 000
80–90	4–8	100 000	96 000
100–112	2	89 000	56 000
100–112	4–8	100 000	89 000
132	2	67 000	42 000
132	4–8	100 000	77 000
160	2	60 000	38 000
160	4–8	100 000	74 000
180	2	55 000	34 000
180	4–8	100 000	70 000
200	2	41 000	25 000
200	4–8	95 000	60 000
225	2	36 000	23 000
225	4–8	88 000	56 000
250	2	31 000	20 000
250	4–8	80 000	50 000

This data is valid up to 60 Hz.

7.2.2. Motors with regreasable bearings

Lubrication information plate and general lubrication advice

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

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

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 re-grease the bearings while the motors are running, lubrication can be carried out while the motor is at a standstill.
- In this case, use only half the amount 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 table should be multiplied by three if a central lubrication system is used. When using a smaller automatic re-grease unit (one or two cartridges per motor) the normal amount of grease can be used.

When 2-pole motors are automatically re-greased, the note concerning lubricant recommendations for 2-pole motors in the Lubricants chapter should be followed.

The used grease should be suitable for automatic lubrication. The automatic lubrication system deliverer and the grease manufacturer's recommendations should check.

Calculation example of amount of grease for automatic lubrication system
Central lubrication system: Motor IEC M3_P 315_ 4-pole in 50 Hz network, re-lubrication interval according to Table is 7600 h/55 g (DE) and 7600 h/40 g (NDE):
(DE) RLI = 55 g/7600 h*3*24 = 0,52 g/day
(NDE) RLI = 40 g/7600 h*3*24 = 0,38 g/day

Calculation example of amount of grease for single automation lubrication unit (cartridge)
(DE) RLI = 55 g/7600 h*24 = 0,17 g/day
(NDE) RLI = 40 g/7600 h*24 = 0,13 g/day
RLI = Re-lubrication interval, DE = Drive end, NDE = Non drive end

7.2.3. Lubrication intervals and amounts

Lubrication intervals for vertical motors are half of the values shown in the table below.

As a guide, adequate lubrication can be achieved for the following duration, according to L_1. For duties with higher ambient temperatures please contact ABB. The informative formula to change the L_1 values roughly to L_{10} values is $L_{10} = 2.0 \times L_1$, with manual lubrication.

The lubrication intervals are based on a bearing operating temperature of 80 °C (ambient temperature +25 °C).

NOTE

THE LUBRICATION INTERVALS ARE BASED ON A BEARING OPERATING TEMPERATURE OF 80 °C (AMBIENT TEMPERATURE +25 °C).

Higher speed operation, e.g. in frequency converter applications, or lower speed with heavy load will require shorter lubrication intervals.

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.

Frame size	Amount of grease g/bearing	kW	3600 r/min	3000 r/min	kW	1800 r/min	1500 r/min	kW	1000 r/min	kW	500-900 r/min
Ball bearings, lubrication intervals in duty hours											
112	10	all	10 000	13 000	all	18 000	21 000	all	2 5 000	all	28 000
132	15	all	9 000	11 000	all	17 000	19 000	all	23 000	all	26 500
160	25	≤ 18,5	9 000	12000	≤ 15	18 000	21 500	≤ 11	24 000	all	24 000
160	25	> 18,5	7 500	1 0000	> 15	15 000	18 000	> 11	22 500	all	24 000
180	30	≤ 22	7 000	9 000	≤ 22	15 500	18 500	≤ 15	24 000	all	24 000
180	30	> 22	6 000	8 500	> 22	14 000	17 000	> 15	21 000	all	24 000
200	40	≤ 37	5 500	8 000	≤ 30	14 500	17 500	≤ 22	23 000	all	24 000
200	40	> 37	3 000	5 500	> 30	10 000	12 000	> 22	16 000	all	20 000
225	50	≤ 45	4 000	6 500	≤ 45	13 000	16 500	≤ 30	22 000	all	24 000
225	50	> 45	1 500	2 500	> 45	5 000	6 000	> 30	8 000	all	10 000
250	60	≤ 55	2 500	4 000	≤ 55	9 000	11 500	≤ 37	15 000	all	18 000
250	60	> 55	1 000	1 500	> 55	3 500	4 500	> 37	6 000	all	7 000
280[1)]	60	all	2 000	3 500	–	–	–	–	–	–	–
280[1)]	60	–	–	–	all	8 000	10 500	all	14 000	all	17 000
280	35	all	1 900	3 200		–	–		–		–
280	40		–	–	all	7 800	9 600	all	13 900	all	15 000
315	35	all	1 900	3 200		–	–		–		–
315	55		–	-	all	5 900	7 600	all	11 800	all	12 900
355	35	all	1 900	3 200		–	–		–		–
355	70		–	-	all	4 000	5 600	all	9 600	all	10 700
400	40	all	1 500	2 700		–	–		–		–
400	85		–	–	all	3 200	4 700	all	8 600	all	9 700
450	40	all	1 500	2 700		–	–		–		–
450	95		–	–	all	2 500	3 900	all	7 700	all	8 700
Roller bearings, lubrication intervals in duty hours											
160	25	≤ 18,5	4 500	6 000	≤ 15	9 000	10 500	≤ 11	12 000	all	12 000
160	25	> 18,5	3 500	5 000	> 15	7 500	9 000	> 11	11 000	all	12 000
180	30	≤ 22	3 500	4 500	≤ 22	7 500	9 000	≤ 15	12 000	all	12 000
180	30	> 22	3 000	4 000	> 22	7 000	8 500	> 15	10 500	all	12 000
200	40	≤ 37	2 750	4 000	≤ 30	7 000	8 500	≤ 22	11 500	all	12 000
200	40	> 37	1 500	2 500	> 30	5 000	6 000	> 22	8 000	all	10 000
225	50	≤ 45	2 000	3 000	≤ 45	6 500	8 000	≤ 30	11 000	all	12 000
225	50	> 45	750	1 250	> 45	2 500	3 000	> 30	4 000	all	5 000
250	60	≤ 55	1 000	2 000	≤ 55	4 500	5 500	≤ 37	7 500	all	9 000
250	60	> 55	500	750	> 55	1 500	2 000	> 37	3 000	all	3 500
280[1)]	60	all	1 000	1 750	–	–	–	–	–	–	–
280[1)]	70	–	–	–	all	4 000	5 250	all	7 000	all	8 500
280	35	all	900	1 600		–	–		–		–
280	40		–	–	all	4 000	5 300	all	7 000	all	8 500
315	35	all	900	1 600		–	–		–		–
315	55		-	-	all	2 900	3 800	all	5 900	all	6 500
355	35	all	900	1 600		–	–		–		–
355	70		-	-	all	2 000	2 800	all	4 800	all	5 400
400	40	all	–	1 300		–	–		–		–
400	85		–	–	all	1 600	2 400	all	4 300	all	4 800
450	40	all	–	1 300		–	–		–		–
450	95		–	–	all	1 300	2 000	all	3 800	all	4 400

[1)] M3AA

7.2.4. 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 with mineral- or PAO-oil
- base oil viscosity 100-160 cST at 40 °C
- consistency NLGI grade 1.5 - 3 *)
- temperature range –30 °C - +120 °C, continuously

*) A stiffer end of scale is recommended for vertically mounted motors or in hot conditions.

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


WARNING

IN GENERAL, LUBRICANTS CONTAINING EP ADMIXTURES ARE NOT RECOMMENDED. IN SOME CASES IT CAN CAUSE HARM IN THE BEARING, THEREFORE ITS USE HAS TO BE EVALUATED CASE BY CASE TOGETHER WITH LUBRICANT SUPPLIERS.

The following high performance greases can be used:

- Mobil 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 Multis Complex S2 A (lithium complex base)


NOTE

ALWAYS USE HIGH SPEED GREASE FOR HIGH SPEED 2-POLE MOTORS WHERE THE SPEED FACTOR IS HIGHER THAN 480,000 (CALCULATED AS DM X N WHERE DM = AVERAGE BEARING DIAMETER, MM; N = ROTATIONAL SPEED, R/MIN).

- 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 intervals are based

8. After sales support

8.1 Spare parts

Unless otherwise stated, spare parts must be original parts or approved by ABB.

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

8.2 Dismantling, re-assembly and rewinding

Rewinding should always be carried out by qualified repair shops.

Smoke venting and other special motors should not be rewound without first contacting ABB.

8.3 Bearings

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

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

Any directions placed on the motor, such as labels, must be followed. The bearing types indicated on the rating plate must not be changed.

NOTE	ANY REPAIR BY THE END USER, UNLESS EXPRESSLY APPROVED BY THE MANUFACTURER, RELEASES THE MANUFACTURER FROM RESPONSIBILITY TO CONFORMITY.

9. Environmental requirements

Most of ABB's motors have a sound pressure level not exceeding 82 dB (A) (± 3 dB) at 50 Hz.

Values for specific motors can be found in the relevant product catalogs. At 60 Hz sinusoidal supply, the values are approximately 3 dB(A) higher compared to 50 Hz values stated in the product catalogs.

For sound pressure levels at frequency converter supplies, please contact ABB.

When motor(s) need to be scrapped or recycled, appropriate means, local regulations and laws must be followed.

10. Troubleshooting

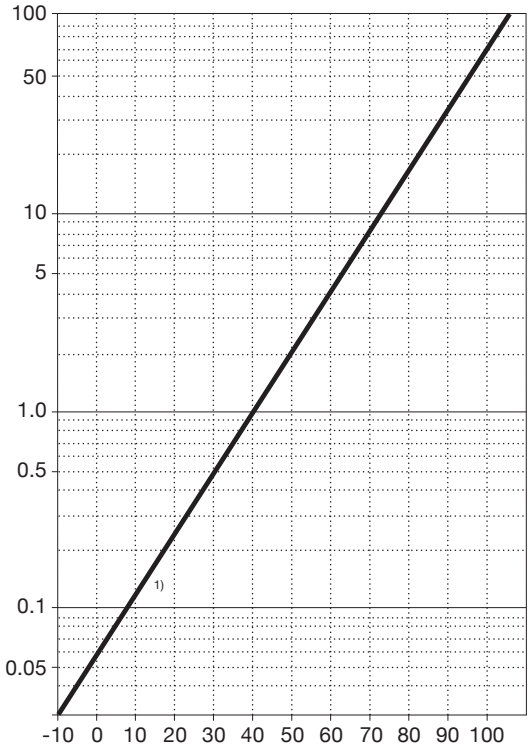
These instructions do not cover all details or variations in equipment nor provide information for every possible condition to be met in connection with installation, operation or maintenance. Should additional information be required, please contact the nearest ABB Sales Office.

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

TROUBLE	CAUSE	WHAT TO DO
Motor fails to start	Blown fuses	Replace the fuses with proper type and rating.
	Overload trip	Check and reset the overload in the starter.
	Improper power supply	Check to see that thre power supplied agrees with ther motor rating plate and load factor.
	Improper line connections	Check connections against the diagram supplied with motor.
	Open circuit in winding or control switch	Indicated by humming sound when switch is closed. Check for loose wiring connections and ensure that all control contacts are closing.
	Mechanical failure	Check to see if the motor and drive turn freely. Check the bearings and lubrication.
	Short circuited stator	Contact ABB or Ensure that the supply is disconnected and grounding for work done, disconnect the cables and measure the insulation resistance.
	Poor stator coil connection	Indicated by blown fuses. Motor must be rewound. Remove end shields and locate fault.
	Motor may be overloaded	Reduce load.
Motor stalls	One phase may be open	Check lines for open phase.
	Wrong application	Change the type or size. Consult the equipment supplier.
	Overload	Reduce the load.
	Low voltage	Ensure the rating plate voltage is maintained. Check the connection.
	Open circuit	Fuses blown. Check the overload relay, stator and push buttons.
Motor runs and then dies down	Power failure	Check for loose connections to the line, fuses and control.
Motor does not accelerate up to nominal speed	Not applied properly	Consult the equipment supplier for the proper type.
	Voltage too low at motor terminals because of line drop	Use a higher voltage or transformer terminals or reduce the load. Check connections. Check the conductors for proper size.
	Starting load too high	Check the motor's starts against "no load".
	Broken rotor bars or loose rotor	Look for cracks near the rings. A new rotor may be required as repairs are usually temporary.
	Open primary circuit	Locate the fault with a testing device and repair it.

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

11. Figures



Key:

X-axis: Winding temperature, Celsius Degrees

Y-axis: Insulation Resistance Temperature Coefficient, ktc

1) To correct observed insulation resistance, R_i, to 40 °C multiply it by the temperature coefficient k_{tc}. $R_{i\,40\,°C} = R_i$ x

Figure 1. Diagram illustrating the insulation resistance dependence from the temperature and how to correct the measured insulation resistance to the temperature of 40 °C.

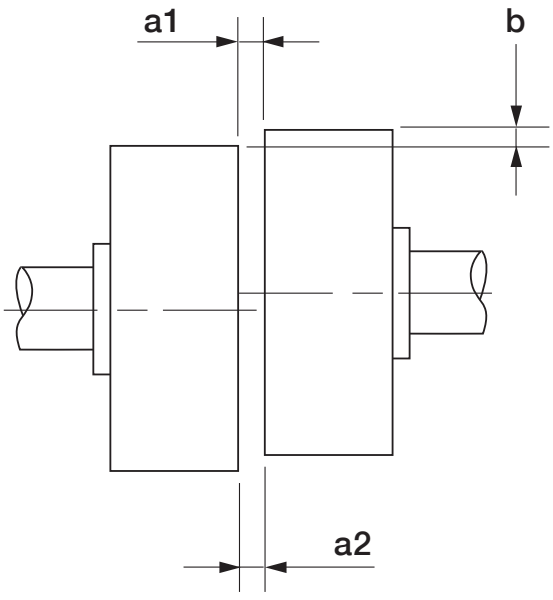


Figure 2. Mounting of half-coupling or pulley

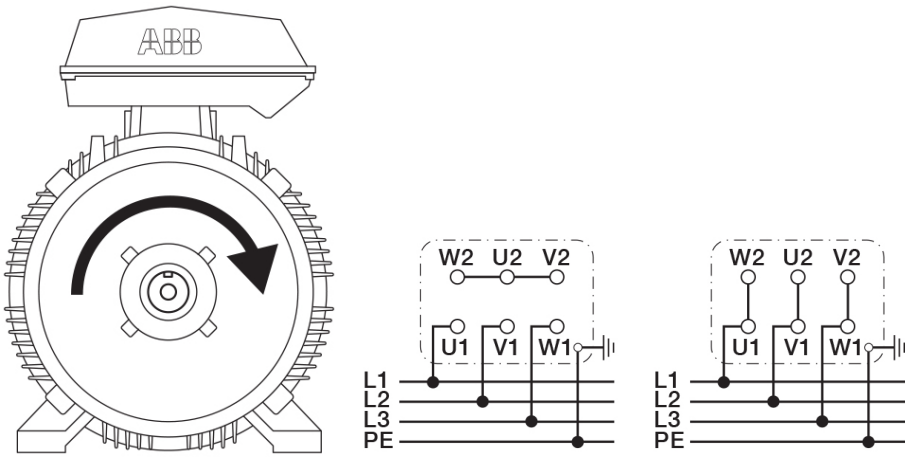
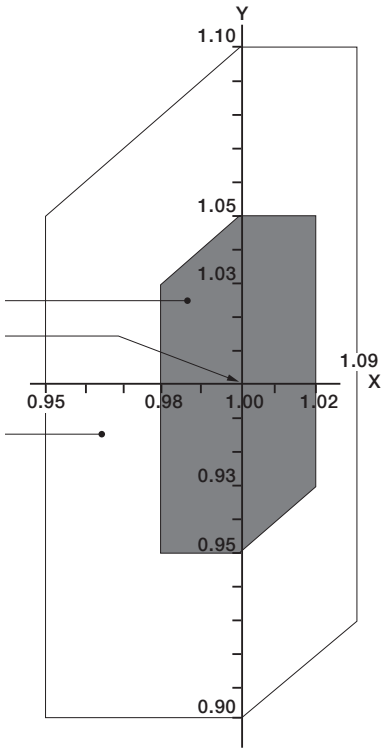


Figure 3. Connection of terminals for main supply



Key:

X axis frequency p.u.

Y axis voltage p.u.

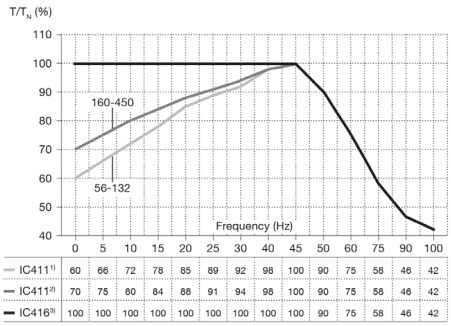
1. zone A

2. zone B (outside zone A)

3. rating point

Figure 4. Voltage and frequency deviation in zones A and B

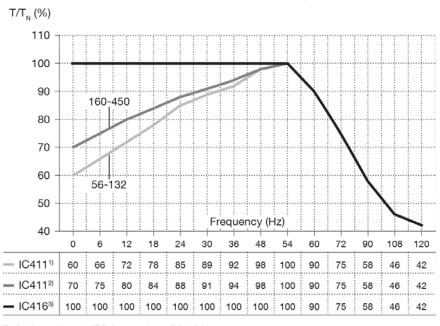
Guideline loadability curves with converters with DTC control



Frequency (Hz)	0	5	10	15	20	25	30	40	45	50	60	75	90	100
IC411[1]	60	66	72	78	85	89	92	98	100	90	75	58	46	42
IC411[2]	70	75	80	84	88	91	94	98	100	90	75	58	46	42
IC416[3]	100	100	100	100	100	100	100	100	100	90	75	58	46	42

[1] Self ventilated, IEC frame sizes 56-132
[2] Self ventilated, IEC frame sizes 160-450
[3] Separate motor cooling (force ventilated)

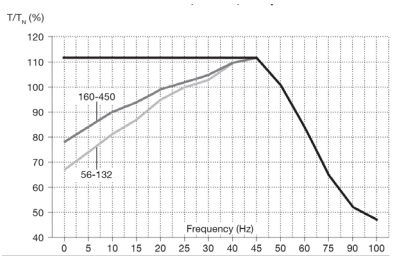
Figure 5a. Conventer with DTC control, 50 Hz, temperature rise B



Frequency (Hz)	0	6	12	18	24	30	36	48	54	60	72	90	108	120
IC411[1]	60	66	72	78	85	89	92	98	100	90	75	58	46	42
IC411[2]	70	75	80	84	88	91	94	98	100	90	75	58	46	42
IC416[3]	100	100	100	100	100	100	100	100	100	90	75	58	46	42

[1] Self ventilated, IEC frame sizes 56-132
[2] Self ventilated, IEC frame sizes 160-450
[3] Separate motor cooling (force ventilated)

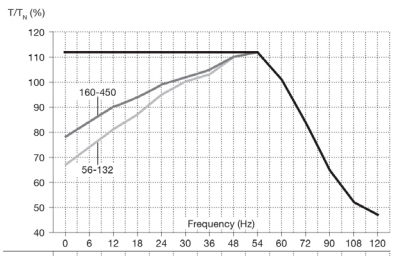
Figure 5b. Conventer with DTC control, 60 Hz, temperature rise B



Frequency (Hz)	0	5	10	15	20	25	30	40	45	50	60	75	90	100
IC411[1]	67	74	81	87	95	100	103	110	112	101	84	65	52	47
IC411[2]	78	84	90	94	99	102	105	110	112	101	84	65	52	47
IC416[3]	112	112	112	112	112	112	112	112	112	101	84	65	52	47

[1] Self ventilated, IEC frame sizes 56-132
[2] Self ventilated, IEC frame sizes 160-450
[3] Separate motor cooling (force ventilated)

Figure 5c. Conventer with DTC control, 50 Hz, temperature rise F

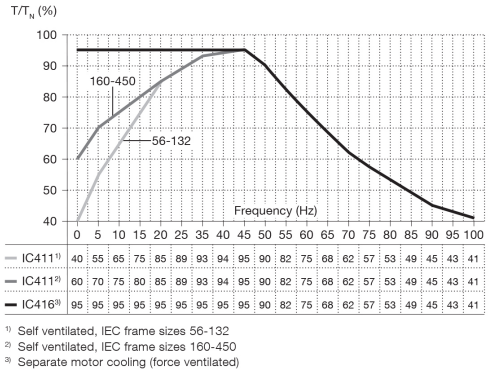


Frequency (Hz)	0	6	12	18	24	30	36	48	54	60	72	90	108	120
IC411[1]	67	74	81	87	95	100	103	110	112	101	84	65	52	47
IC411[2]	78	84	90	94	99	102	105	110	112	101	84	65	52	47
IC416[3]	112	112	112	112	112	112	112	112	112	101	84	65	52	47

[1] Self ventilated, IEC frame sizes 56-132
[2] Self ventilated, IEC frame sizes 160-450
[3] Separate motor cooling (force ventilated)

Figure 5d. Conventer with DTC control, 60 Hz, temperature rise F

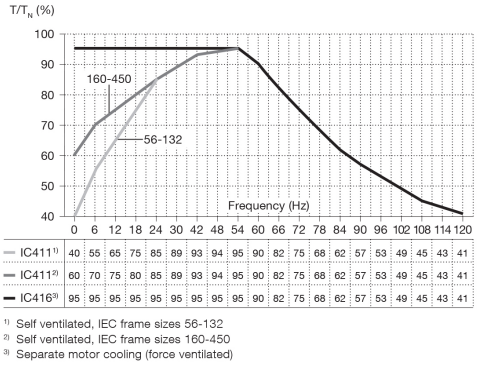
Guideline loadability curves with other voltage source PWM type



0	5	10	15	20	25	35	40	45	50	55	60	65	70	75	80	85	90	95	100	
IC411[1]	40	55	65	75	85	89	93	94	95	90	82	75	68	62	57	53	49	45	43	41
IC411[2]	60	70	75	80	85	89	93	94	95	90	82	75	68	62	57	53	49	45	43	41
IC416[3]	95	95	95	95	95	95	95	95	95	90	82	75	68	62	57	53	49	45	43	41

[1] Self ventilated, IEC frame sizes 56-132
[2] Self ventilated, IEC frame sizes 160-450
[3] Separate motor cooling (force ventilated)

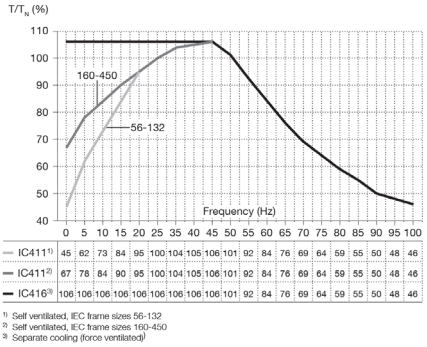
Figure 6a. Other voltage source PWM type converter, 50 Hz, temperature rise B



0	6	12	18	24	30	42	48	54	60	66	72	78	84	90	96	102	108	114	120	
IC411[1]	40	55	65	75	85	89	93	94	95	90	82	75	68	62	57	53	49	45	43	41
IC411[2]	60	70	75	80	85	89	93	94	95	90	82	75	68	62	57	53	49	45	43	41
IC416[3]	95	95	95	95	95	95	95	95	95	90	82	75	68	62	57	53	49	45	43	41

[1] Self ventilated, IEC frame sizes 56-132
[2] Self ventilated, IEC frame sizes 160-450
[3] Separate motor cooling (force ventilated)

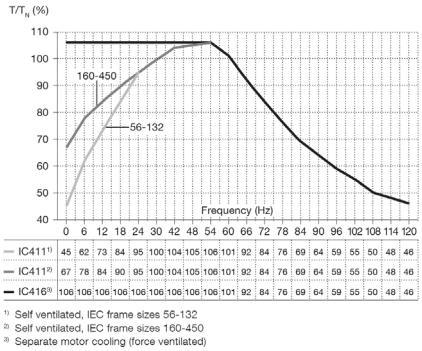
Figure 6b. Other voltage source PWM type converter, 60 Hz, temperature rise B



0	5	10	15	20	25	35	40	45	50	55	60	65	70	75	80	85	90	95	100	
IC411[1]	45	62	73	84	95	100	104	105	106	101	92	84	76	69	64	59	55	50	48	46
IC411[2]	67	78	84	90	95	100	104	105	106	101	92	84	76	69	64	59	55	50	48	46
IC416[3]	106	106	106	106	106	106	106	106	106	101	92	84	76	69	64	59	55	50	48	46

[1] Self ventilated, IEC frame sizes 56-132
[2] Self ventilated, IEC frame sizes 160-450
[3] Separate cooling (force ventilated)

Figure 6c. Other voltage source PWM type converter, 50 Hz, temperature rise F



0	6	12	18	24	30	42	48	54	60	66	72	78	84	90	96	102	108	114	120	
IC411[1]	45	62	73	84	95	100	104	105	106	101	92	84	76	69	64	59	55	50	48	46
IC411[2]	67	78	84	90	95	100	104	105	106	101	92	84	76	69	64	59	55	50	48	46
IC416[3]	106	106	106	106	106	106	106	106	106	101	92	84	76	69	64	59	55	50	48	46

[1] Self ventilated, IEC frame sizes 56-132
[2] Self ventilated, IEC frame sizes 160-450
[3] Separate motor cooling (force ventilated)

Figure 6d. Other voltage source PWM type converter, 60 Hz, temperature rise F

12. Additional manual for Hoisting Instructions

Note! See also manual for Low Voltage Motors chapter Handling.

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.

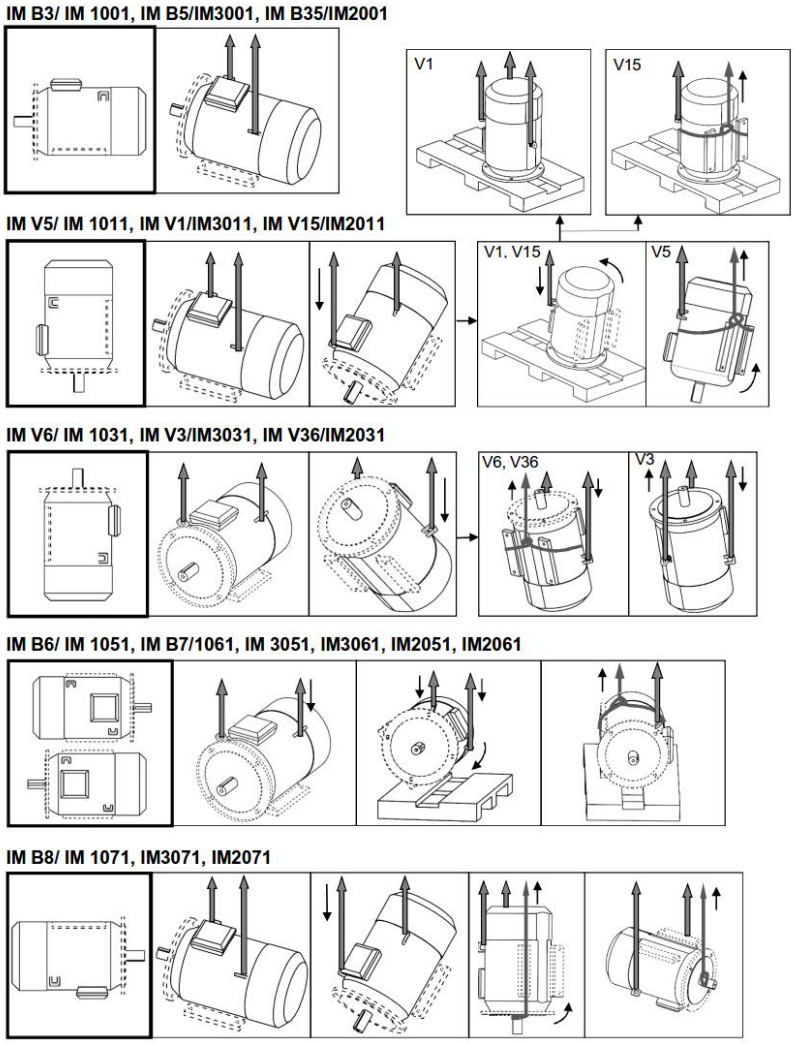
Frame size	Weight
90	35kg
100	50kg
112	56kg
132	103kg
160	181kg
180	230kg
200	305kg
225	408kg
250	495kg
280	890kg
315	1700kg
355	2700kg
400	3500kg
450	4800kg

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

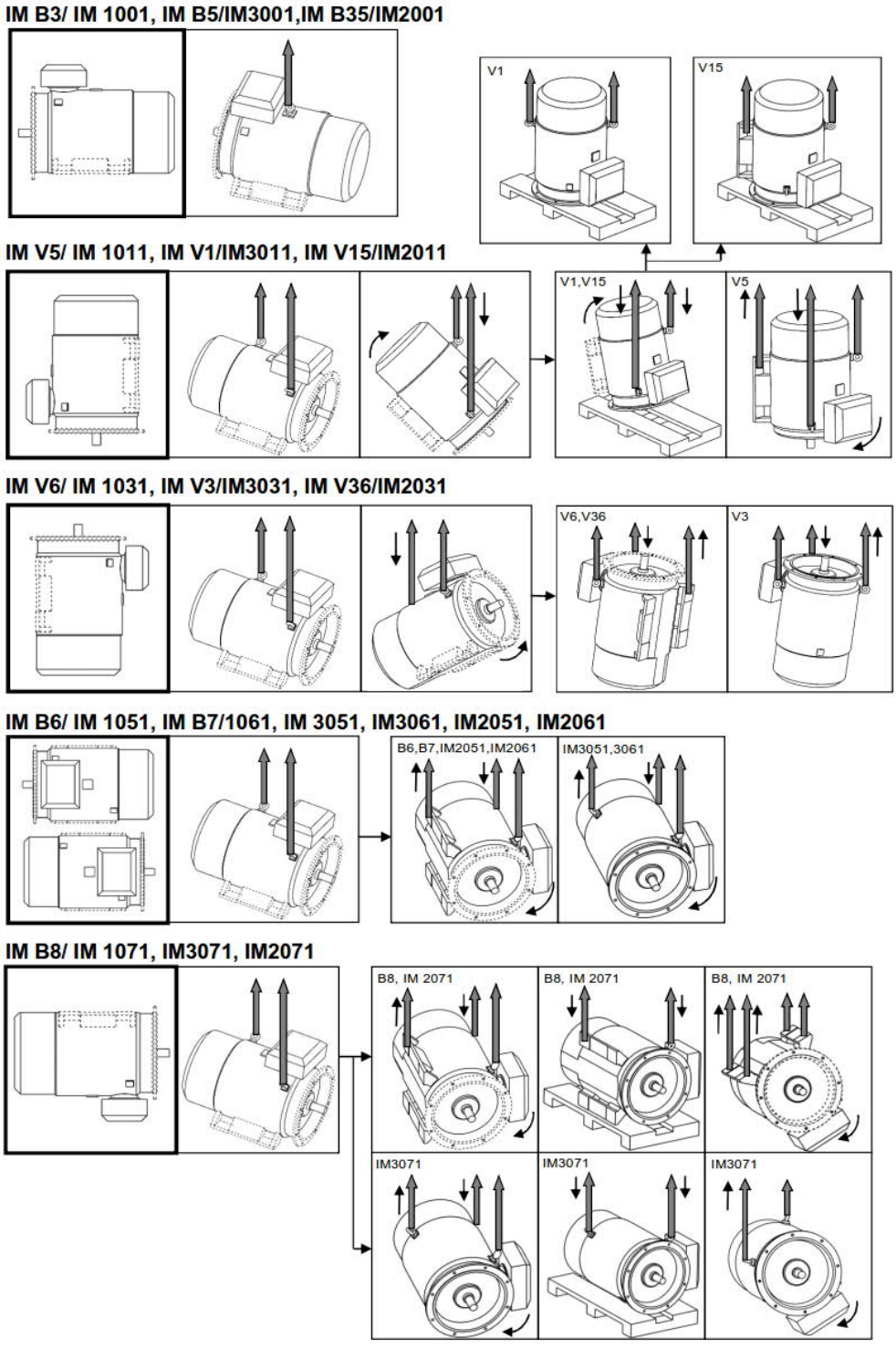
www.abb.com/motors&generators
online.abb.com/bol

Low voltage motors / Hoisting Instructions
M3BP 90-450
M3AA 90-280
M2BAX 90-355
3GZC503900-338 04-2016

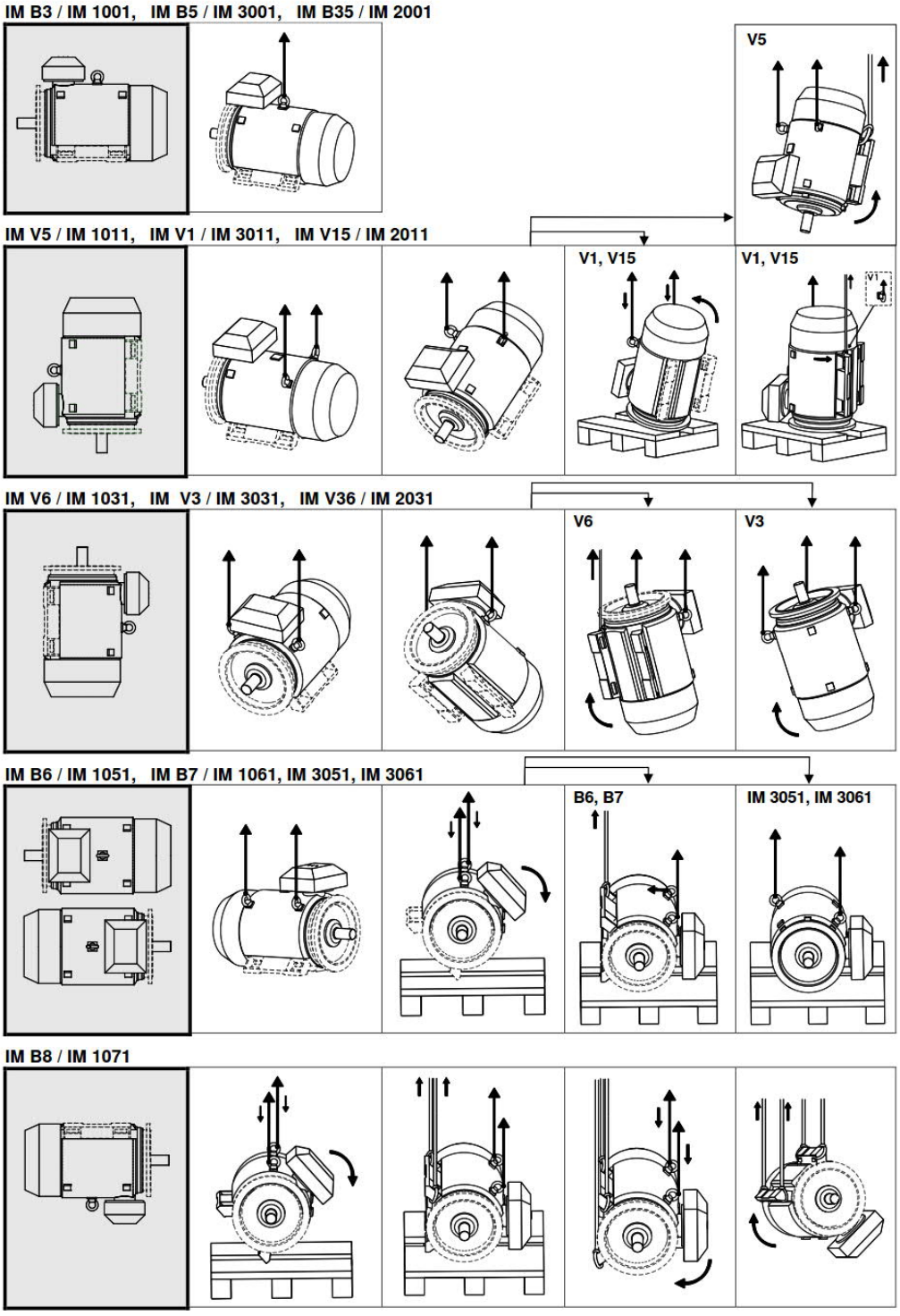
Picture 1.



Picture 2.


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
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.


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

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