低压电机

安装，操作，维护及安全手册

Low voltage motors

Installation, operation, maintenance and safety manual

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

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一、产品介绍

1、 适用范围

本说明书适用于 ABB 的 M2QA、QABP、M2SV 及 QAL 等标准系列及其所派生的电机，机座中心高：56-355。

(对一些特殊应用场合或有特殊设计考虑的型号电机还需参阅其它特别的指导说明)。

2、 能效

本公司符合 CEL 007《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。

二、一般要求

1、 起动

1.1 收货检验

- 收货后，立即检验电机有无外部损伤，检验所有的铭牌数据，尤其是电压和绕组的连接方式(Y 或Δ)。
- 用手旋转转轴，检测电机空转情况，如果电机装有锁定装置，注意将其打开。

1.2 绝缘性能检测

- 电机初次使用之前，绕组有可能受潮，都要测量其绝缘阻值。
- 25℃时测量的绝缘电阻值应超过参考值，

$$Ri \geq \frac{20\times U}{1000+2P} M\Omega$$

U=电压 V， P=输出功率 kW

[注意]测量后绕组要立即放电，避免电击。

- 周围环境温度每升高 20℃，电阻的参考值减少一半。
- 如果没有达到绝缘电阻的参考值，绕组就必须烘干。
- 烘炉的温度为 90℃，时间 12-16 小时。
- 如果安装了排水塞，烘干时必须将其打开。
- 绕组被海水浸泡后一般要重绕。

1.3 直接起动或 Y/Δ起动

- 标准单速电机的接线盒一般有 6 个接线螺栓和至少 1 个接地螺栓。
- 电机通电之前，必须按规定要求可靠接地，不能接零代替接地。
- 电压和绕组连接方式在铭牌上有标注。

1.3.1 直接起动

绕组可以采用 Y 或Δ接法，例如 660VY、380VΔ分别表示 660V Y 接法和 380V Δ接法。

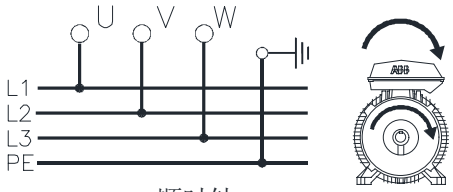
1.3.2 Y/Δ起动

- 电源电压必须等于Δ接法电机的额定电压。
- 拆下接线板上所有的接线片，按Y/Δ起动装置接线，妥善连接到电机六个接线柱上，并能从起动初期的Y连接跳到启动完成的Δ接。
- 双速电机和其他特种电机的电源接法必须依照接线盒内的接线图说明。

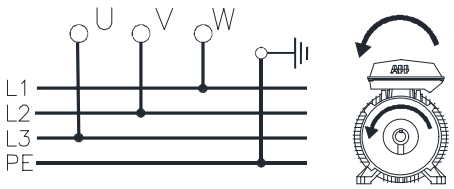
1.4 接线柱和旋转方向

- 如果电源相序L1(U1)，L2(V1)，L3(W1)依次与接线柱U1，V1，W1连接，从电机的驱动端观察转轴，其旋转方向为顺时针,如图所示。
- 换接电源线中的任意两相就可以改变电机的旋转方向，如图所示。
- 如果电机本身有单相旋转风扇，其旋转方向可以通过电机上的箭头来测定。

图1



顺时针



逆时针

2、 使用说明

2.1 运行环境

- 用于工业生产电机，正常的环境温度在-15℃到+40℃之间，海拔不高于1000m。
- 用于船用或类似场所电机，环境空气温度在-25℃到+50℃之间。

2.2 安全要素

- 电机应由熟悉相关安全要求的专业人员安装和接线。
- 安装时必须有安全装置以防止事故发生，安装的位置也必须符合规定。

2.3 遵守规则

- 电机不能用于加速和超载运行。
- 正常运行时，电机表面会发热，但不会超过额定许用温度的60%。
- 一些有特殊设计考虑的电机需要特别的指导说明。

3、 管理

3.1 贮存

- 所有电机都应保存在室内，要求干燥，防震，防尘的环境。
- 无保护层的电机表面(轴伸端部和法兰)应该采取防锈措施。
- 建议定期检查电机，用手转动转轴，防止润滑脂流失或其它问题。
- 如果装有抗凝露加热器，最好使用。

3.2 运输

安装有圆柱滚子轴承和推力球轴承的电机在运输时需要安装锁紧装置。

3.3 重量

- 相同机座号(中心高)的电机由于输出功率，安装尺寸，附加零件的不同而总重量有所不同。
- 电机的具体重量，可以在电机铭牌上找到。

4、 安装

4.1 垫板

- 安装垫板的准备工作由用户负责。
- 金属垫板应该涂防锈漆。
- 垫板应该平稳，并且足够坚固以防止短路造成的影响。选择尺寸时注意刚性避免共振。

4.2 底座螺栓安装

4.2.1 将底座螺栓固定在电机底脚上，并在螺栓和底脚之间放置一个1到2毫米的垫片。

4.2.2 采用合适的方式调整电机对接同心度后，再均匀拧紧螺栓。如果电机轴伸与负载刚性连接，则同心度调好后，两者的底脚都必须与底座间各安装二个定位钉，防止电机运转时破坏连接同心度而损坏电机。

4.2.3 用混凝土固定螺栓，检查电机的安装，并钻定位销。

4.3 出水孔

当安装非标准电机时，检查出水阀是否朝下。

4.4 调整安装

正确的安装对避免轴承振动和可能造成的外部磨损都是十分重要的。

4.5 滑轨和皮带轮

- 将滑轨水平放置。
- 检查电机转轴是否平行于被驱动轴。
- 不要超过产品说明中规定的最大张紧力(例如，轴承径向许用负载)。以上数据可在电机样本中查得。

[注意]皮带张得过分紧或皮带轮残留不平衡量大会损伤轴伸，甚至引起轴断裂，也会影响轴承寿命。

5、 电气联接

- 电机顶部的接线盒允许旋转，可按要求选择出线方向。也可选用旁出线的接线盒安装方式。
- 没有电缆进入的进线口必须封闭。
- 除了主绕组和接地端的接线，接线盒内还可包括热敏电阻，加热带，热敏开关或 PT100 电阻元件的接线部件。打开接线盒，可以在接线盒内找到这些辅助元件的连接示意图。

[注意]: 电机停转时，在接线盒内仍可能带电，不要立即触摸接线柱。

6、 安装和拆换

6.1 概论

必须由专业人员采用专门的工具按照规定安装和拆卸。

6.2 轴承

对轴承要予以特别重视，安装、拆换轴承要加热或使用特殊工具，关于拆换轴承的具体细节可以从本公司获得。

6.3 离合器和皮带轮的安装

- 安装离合器和皮带轮时，要使用适当的装置和工具，不要与轴伸配合太紧，装配前须拆下风罩，将转轴后端面顶紧在其它支承面上，使装配过程中的作用力不施加在轴承上，而是通过转轴传到其它定位工件上，以防损坏轴承和轴伸。
- 安装时不能重锤猛击，拆卸时也不能使用杠杆压靠机身。

6.4 平衡

- 标准电机，采用半键平衡。
- 为了避免振动，离合器和皮带轮必须经过半键平衡，才能安装到电机轴上。

7、 维护和润滑

7.1 概论

- 定期检修电机。
- 保持电机清洁，空气流通。
- 检查轴伸的密封圈，如有必要应及时更换。
- 检查安装连接状况和安装螺钉。
- 通过监听异常噪声，振动测量，温度检测，监控用油量或 SPM 轴承测振元件等来检查轴承运行情况。
- 如有异常发生，应立即停机，检查原因并及时排除。

7.2 润滑

7.2.1 装封闭式或开启式轴承的电机

电机中心高在 225 以下，用户无特殊要求的电机一般装配封闭式轴承，轴承的型号在相关的产品样本中有介绍。装开启式轴承的电机，要求重新加润滑脂，具体要求如下：

球轴承电机添加润滑脂的间隔时间 h

机座号	油脂量 g	3600 r/min	3000 r/min	1800 r/min	1500 r/min	1200 r/min	1000 r/min	500-900 r/min
112，132	15	4200	4800	7000	7800	8500	10000	10500
160，180	20	3200	4200	6000	7000	8000	9000	10000
200，225	25	1800	3100	5500	6500	7500	8500	9500
250，280	35	800	2000	5000	6000	7000	8000	9000
315	50	800	2000	4600	5500	6500	7500	8000
355	60	600	1000	4000	5000	6000	7000	8000

柱轴承电机添加润滑脂的间隔时间 h

机座号	油脂量 g	3600 r/min	3000 r/min	1800 r/min	1500 r/min	1200 r/min	1000 r/min	500-900 r/min
160，180	20	1600	2000	4700	5400	6200	6900	7800
200，225	25	900	1500	4300	5000	5800	6500	7000
250，280	35	400	1000	3300	4500	5500	6300	6800
315	50	400	1000	2700	3800	5000	6000	6500
355	60	300	500	2200	3200	4400	5500	6000

7.2.2 装注油嘴的电机

- 在电机运行时润滑。
- 加润滑油脂前，应打开油脂出口塞。
- 如果装有加油示意牌，亦可以它为准。
- 垂直安装的电机添加润滑脂的间隔时间是 7.2.1 表中规定数值的一半。
- 7.2.1 表中规定的数值基于轴承温度为 80℃。
- 轴承温度每升高 15K，7.2.1 表中规定数值应减少一半。
- 如果轴承最高温度为 70℃，7.2.1 表中规定数值应加倍。

[注意]运行温度不能超过油脂和轴承最高允许温度。

- 高速运行时(如变频装置)，需要缩短添加润滑脂的间隔时间。
- 一般多速电机添加润滑脂的间隔时间需要将 7.2.1 表中数值减少大约 40%，在高速运行时，必须检查轴承的适用性。

7.3 润滑脂

7.3.1 在重新注润滑脂时，建议优先采用本公司开启式轴承标配的润滑脂，牌号如下：

- 标准 NSK 轴承电机： “ESSO Unirex N2”润滑脂；
  (非 NSK 轴承，请采购相应品牌润滑脂，也可联系 ABB 营业部咨询)
- 烟道电机： “一坪 7017-1”润滑脂。

当无以上牌号润滑脂时，也可使用具有以下特性的球轴承专用润滑脂：

- ✓ 含有锂复合基以及矿物油或 PAO 油的优质润滑油；
- ✓ 在 40℃基脂 粘度为 100-140CST；
- ✓ 浓度等级 NLGL2 或 3；
- ✓ 温度范围从-30℃-+120℃。

注：可以从主要润滑脂生产商处得到具有良好特性的润滑脂。

7.3.2 如果润滑脂的成分发生改变并且不能确定新旧的兼容性，在短期内多次润滑以代替旧的润滑脂。

7.3.3 高负载或低转速的轴承需要 EP 润滑脂。

如果因轴承温度大于 80℃而缩短添加润滑脂的间隔，可使用高温润滑脂，这种高温润滑脂一般允许轴承温度再高 15K。

7.4 注意

7.4.1 高速电机

对高速电机(如 2 极电机)，检查润滑脂的 fn 参数是否足够高。

fn = Dm×n

Dm = 平均轴承直径(mm)

n = 转速(r/m)

[注意]大多数润滑脂会刺激皮肤，引起眼睛发炎。

请遵守生产商的注明所有安全预防措施。

7.4.2 零件备品、备件

- 如果订购零件作为备品、备件，应注明电机铭牌上的型号、规格和产品代码。
- 如果电机铭牌上标有系列号，也应注明。

7.4.3 噪声要求

- 对于 60Hz 电机，噪声数值较 50Hz 相应增加，2 极：+5dB(A)；4 极、6 极和 8 极：+3dB(A)。

三、电磁制动电机的使用和维护特点

1、 安装前的检查

紧固件是否松动或脱落，扳动释放手柄，用手转动电机转轴能否转动，解除制动。

用 500V 兆欧表测量电机绕组及电磁铁励磁线圈的绝缘电阻，其值不应低于 5 兆欧，否则应进行干燥处理。

2、 电气联接与运转

- 电机和直流电磁制动器接线示意图可以在电机接线盒内找到。

- 用户自供直流电源时应保证电机电源与制动器电源同步切换。
- 电机制动器励磁电压为直流 205V，整流器输入交流电压 220-240V，特殊订货制动器输入电压按约定。
- 特殊订货应核对电机铭牌及制动器标牌。
- 当电机制动器检查完毕，确认无误时，再接通电源进行空载运行，若电机接入电源后制动器仍未脱开，此时电机仍处在制动状态，必须立即切断电源，以免烧坏电机，请检查电磁制动器整流励磁电路，并予以纠正，再投入运行。
- 在电机空载运行一段时间后，应停车检查一次，观察各机械联接部分有无松动、轴承有无过热漏油现象、制动器是否能完全脱开。
- 如空载运行中有任何不正常现象和声响，应立即停车检查，并作必要的调整和修复，然后再进行负载运行。

3、 制动器气隙的调整

3.1、制动器的摩擦面经过长期使用后，将受到磨损，引起电磁铁与衔铁间的气隙增大和弹簧工作长度的增加，从而降低了弹簧压力，减少了制动力矩，同时由于气隙的增大，使衔铁吸合时电流值上升，严重时将使衔铁不能吸合，因此需经常检查气隙，进行调整或更换摩擦片。

3.2、气隙调整步骤如下：（参考图 2）

a) 向左旋动释放手柄，取下手柄。
b) 取下风罩(11)。
c) 向左旋螺母(5)螺栓(8)使之松开。
d) 向右旋螺栓(8)使衔铁的间隙调整在下表所列范围内。

机座中心高	71	80	90	100	112	132	160	180	200	225	250	280
工作气隙 (mm)	0.3	0.3	0.3	0.5	0.5	0.5	0.6	-	-	-	-	-
工作气隙 (mm)	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6

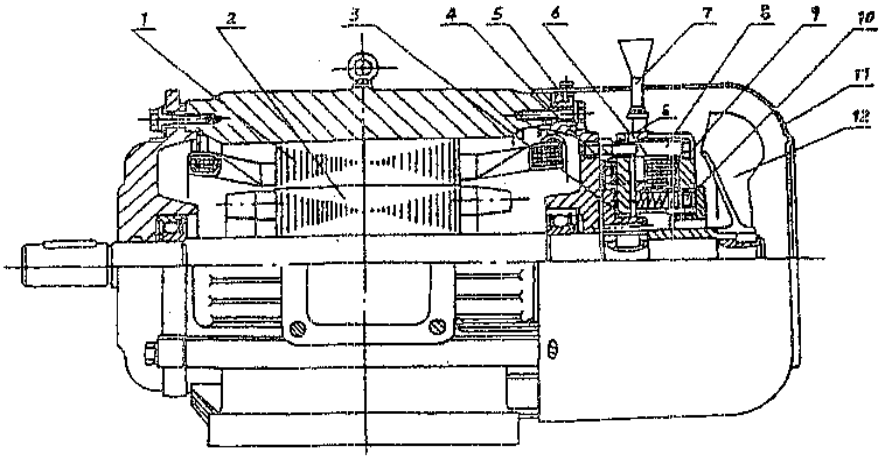
e) 向右旋螺母(5)使之紧固。
f) 重新上好风罩(11)。
g) 按上释放手柄。

3.3、更换摩擦片

摩擦片属易损件，当单边磨损 2.5 毫米以上时，就需要更换新的摩擦片，步骤如下：

a) 取下释放柄。
b) 取下风罩(11)。
c) 取下风扇(12)。
d) 松开螺母(5)，螺栓(8)。
e) 旋下螺栓(8)。
f) 将制动器线圈引接线拆下。
g) 将电磁铁和衔铁一同拆下。
h) 取下制动盘，便可更换摩擦片。

图 2 电磁制动电机



1-定子 2-转子 3-制动器 4-衔铁 5-气隙调整螺母 6-励磁线圈 7-释放手柄 8-气隙调整螺杆 9-制动弹簧 10-制动弹簧调整螺杆 11-风罩 12-风扇

4、 手动释放手柄的原理与使用

向右推动手柄，利用杠杆原理把力传递到与衔铁连接的螺钉，使衔铁与摩擦片脱离接触，达到释放制动的目的。

5、 直流制动器接线图

主要涉及整流器的接线方式。

5.1、四级整流器接线按图 3

5.2 六级整流器（快速制动）接线按图 4

5.3 用户自供直流电源时应保证电机电源与制动器电源同步切换。

图3

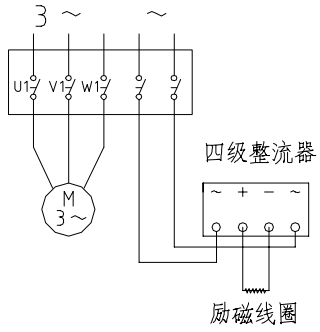
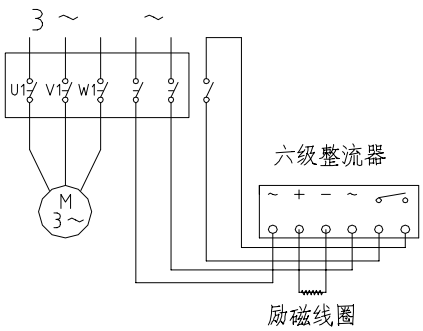


图4



四、变极多速电机的使用和维护特点

1、 安装前检查

测量绝缘电阻时，对双绕组多速电机要分别测量两套绕组的绝缘电阻。

2、 电气联接和运行

- 变极多速电机接线应严格按电机接线盒内的接线标识和接线图接线。
- 变极多速电机是利用换接出线的方法来控制转速变化，故出线数目多于一般电机，双速、三速及四速电机的出现数分别为 6、9 及 12 根。为提高多速电机的运行可靠性，设计和配置性能良好的变速控制装置是重要的。设计和操作多速电机的控制装置，在高速与低速切换时，必需在切断电源的同时，断开星形接线的中心点，以免在低速绕组接通时引起电源短路。

五、变频电机的使用和维护特点

1、 电气联接

1.1 电动机的接线应按照铭牌上所提供的接法及接线盒内所提供的接线图。

1.2 冷却方式为 IC416 的变频电机需安装轴流风机。轴流风机配有专用的接线盒。风机电动机应与相应的电源电压相接，注意风机电动机须用不变频电源，其接线应按照提供的接线图接线。风机叶轮的正确旋转方向必须与风机机壳上的旋转方向箭头相一致。

2、 起动前的准备工作

2.1 检查电机和风机的接线是否符合要求，外壳是否可靠接地，为了避免电机与变频器之间互相的电磁干扰，注意电机与变频器不应公用接地，而且各自的接地均应切实可靠。

2.2 按照变频器的使用说明书，对变频器正确地实施接线并进行通电前的检查。检查无误后，先不接电机，对变频器的各项参数逐一设定、调整。在确认变频器运转无问题后，再联接电机。

2.3 上述检查任何一项有问题，都必须彻底解决，在确认准备工作无误时方可起动电动机。

3、 起动

3.1 给出“接通”指令后，若电机不转，请先检查一下变频器，是否设定了输出频率；加减速时间设定的是否恰当；V/f 模式选择的是否合适；电子热保护的给定标度是否正确等。若电动机还不转，请再检查电机的接线和负载情况。

3.2 电动机起动后，立即起动风机（对 IC416 冷却方式），并注意观察电机、传动装置、生产机械及变频器面板的显示数据，若有异常现象应立即停机，查明故障并排除之后，方可重新启动。

4、 正常运行中的维护

用变频器对电动机进行调速运转，由于变频器输出波形中含有的高次谐波的影响，电动机噪音及振动比电网供电时的略大是正常的。随着运转频率的变化，基波分量、高次谐波分量在广范围内变化，与电机各部分及机械负载的谐振现象也增加，在调速到与系统谐振频率相一致的点时，机械系统将有大的振动和噪音。产生这种现象时，可采用增强系统刚度的方法来避免谐振，也可利用变频器的频率跳变功能，使与谐振点相当的输出频率向上或向下跳变，避开谐振频率，实现平滑运转。

5、 附件的使用和维护

5.1 对于电机所带的光电编码器或测速机，请注意不应随意拆卸，并应避免碰撞。电动机在搬动时，也不应以此处作为受力部位。安装与使用必须严格遵守编码器或测速机使用说明书的规定。

5.2 带有制动器的电机采用变频器驱动时，需要注意以下几点：

a) 电动机所带的电磁制动器为失电制动型，通电后制动器即释放。此时，用手转动电机轴伸，应转动灵活，无阻塞现象。制动器中磨擦副内的间隙已在出厂前调整好，一般不宜随意变动。应严防油脂内物质和其它杂质进入磨擦副，以确保制动器断电后制动器的可靠性。

b) 制动器电源不能接在变频器的输出侧，而一定要接在变频器的输入侧。

c) 由于制动作功量与转速的平方成正比，因此，高速时制动不应直接采用电磁制动器。而应利用变频器的再生制动功能，先将电机转速降低到工频转速以下，然后再进行电磁制动。

d) 如果变频器正在输出功率时制动器动作，将造成过电流切断。所以要在变频器主回路切断之后进行制动。

六、烟道电机使用和维护特点

1、 运行条件

1.1 正常环境温度：

电动机温度不超过+40℃的环境下能正常连续运行。

1.2 非正常环境温度：

电机采用 H 级绝缘：高温排烟满足 250℃，电动机运转 2 小时；高温排烟满足 300℃，电动机运转 1 小时。

2、 电动机的维护和检修

- 对于平时不使用，仅在高温排烟工况下使用的电动机，必须至少每月起动一次，每次运行时间不少于 30 分钟，以确保电动机处于良好的备用工作状况。
- 日常使用的电动机应经常检查轴承发热、漏油等情况（使用的润滑脂为 7017-1 高温润滑脂），在正常情况下，工作 5000 小时左右，应补充或更换润滑脂一次。为了保证电动机的正常运行及防止和消除故障的产生，电动机必须定期检修，通常每三个月小检修一次，每年则应大检修一次，大检修后在使用前仍应经过试转。
- 对于平时不使用，仅在高温排烟工况下使用的电动机，通常应每两年更换一次润滑脂，每六个月应小检修一次。

3、 使用期限

- 电动机一般正常工作使用寿命为 20000 小时，且最长使用期限应不超过 8 年。
- 电动机经历非正常环境温度高温排烟后，必须整机更换或整机检修。

七、铝壳电机使用和维护特点

除了电机的一般使用和维护要求外，铝壳电机由于外壳材质特性比较软，使用时应小心轻放，严禁磕碰，避免外壳损坏和变形。另外，各连接螺纹处如果用力过大容易造成滑牙现象，使用时接线柱和其余地方的连接螺纹处的紧固扭矩不得超过下表规定的数值。

电机连接螺纹紧固扭矩（N.m）										
螺纹直径	M3	M4	M5	M6	M8	M10	M12	M16	M20	M24
紧固扭矩（N.m）	0.4	1.2	2	3	7.5	14	23	30	98	170

接线柱螺栓紧固扭矩（N.m）							
接线端子直径	M4	M5	M6	M8	M10	M12	M16
紧固扭矩（N.m）	1.2	2	3	6	10	15.5	30

八、电动机的常见故障与维护方法

故障现象	造成故障的可能原因	处理方法
(1)不能起动	a. 定子绕组有一相开路	检查定子绕组，查出断路处，加以修复
	b. 定子绕组匝间及相间短路	测量定子绕组每相电阻和各相空载电流是否平衡，查出所在处，加包绝缘
	c. 定子接线错误	按铭牌上规定的接法和接线图，查出定子绕组的接线，纠正错误联接
	d. 负载或传动机械有故障	把电动机和负载分开，如电动机能正常起动，应检查被拖动机械，消除障碍
	e. 变频器参数设置不当	检查变频器参数，进行调整（变频电机）
	f. 制动器未动作	检查制动器及其电器（制动电机）
(2)变频电动机起动后转速低于额定转速	a. 变频器的输出频率与输出电压设定不当	按使用要求重新设定
	b. 负载过重	检查负载传动装置是否正常
(3)电动机有异常噪声或振动过大	a. 机械摩擦（包括定转子相擦）	检查转动部分与静止部分间隙，找出相擦原因，进行校正
	b. 缺相运行	断电，再合闸，如不能起动，则可能有一相断电，检查电源或电动机并加以修复
	c. 轴承缺油或损坏	清洗轴承，加新油。或更换新轴承
	d. 电机接线错误	查明原因，加以更正
	e. 修理后转子平衡被破坏	重新校动平衡
	f. 轴伸弯曲、变形	校直，必要时须更换转轴
	g. 联轴器俩连接松动	查清松动处，把螺栓拧紧
	h. 安装基础不平衡或有缺陷	检查基础固定情况，加以纠正

故障现象	造成故障的可能原因	处理方法
(4)电动机温升过高	a. 过载	用电磁式电流表测量定子电流或检查变频器面板上的电流显示值（变频电机），发现过载时，应减轻负载
	b. 缺相运行	检查电动机定子接线或变频器接线（变频电机），并加以修复
	c. 电动机接法错误	Δ接法电动机误接成 Y 接工作或相反，必须立即断电改接
	d. 定子绕组接地或匝间或相间短路	检查找出短路和通地的部分，进行修复
	e. 定、转子相擦	检查轴承装配有无松动，定子和转子装配有无不良情况，加以修复
	f. 通风不畅	检查风机和风叶有否损坏，风道有否阻塞。风机或风叶损坏应予以修复或更换。风道阻塞应移开妨碍通风的物件，清除风道污垢、灰尘及杂物，使空气流通
	g. 变频器的 V、f 参数设置不当，使电动机低速轻载时出现过激励，电流大于额定值	调整 V/f 的参数设置（变频电机）
	h. 利用变频器的直流制动功能对电机进行制动时，制动电流太大	调整直流制动电流的设置，根据制动频繁程度，一般设置在额定电流的 100%-150%。（变频电机）
	i. 制动器动作迟缓	检查制动器气隙和直流励磁电压（制动电机）
(5)轴承过热	a. 轴承损坏	更换轴承
	b. 轴承润滑脂过多、过少或有杂质	调整或更换润滑脂
	c. 轴承与轴、轴承与端盖配合过松或过紧	修整到合适的配合
	d. 电动机两侧端盖或轴承盖没有装配好（不平行）	将两侧端盖或轴承盖止口装平，旋转螺栓
	e. 轴伸端油封安装不良	调整到合适的安装状态
	f. 皮带安装过松或过紧，或联轴器装配不良	调整到合适的安装状态调整皮带松紧或联轴器的安装
(6)电动机外壳带电	a. 接地不良	检查接地螺栓，接地线同机壳接触是否紧密
	b. 绕组受潮，绝缘电阻过低	绕组干燥处理
	c. 绝缘损坏，定子线圈碰铁芯	予以修复

故障现象	造成故障的可能原因	处理方法
	d. 接线板有污垢	清理接线板
	e. 引出线绝缘磨破	破损处用绝缘材料包扎
(7)电机在负载时不能起动	a. 定子绕组有匝间短路	检查各相电阻和各相电流
	b. 过载	检查电机负载电流
(8)三相电流不平衡	a. 匝间短路	修理绕组
	b. 接线错误	改正接线
	c. 三相电源电压不平衡	改善供电质量
(9)保险丝融断	a. 两相间短路	修理绕组
	b. 负载过大	减小负载
	c. 电压过低	升高电压
(10)绝缘电阻低或击穿	a. 绝缘老化或损伤	检修绝缘
	b. 不清洁	用干燥的压缩空气吹净内部
	c. 绕组或接线板受潮	拆开烘干或处理后再用
	d. 电机过热	拆开检修防止继续过热
(11)制动电机制动失灵	a. 摩擦片磨损较大	调整气隙
	b. 弹簧失效	调换弹簧
	c. 动作迟缓	调整气隙，检查励磁电压
	d. 整流器损坏	调换整流器
	e. 制动线路故障	正确排除制动线路故障

注：1.用户想获得更详细的资料，请与本公司联系；

2.无需通知，本公司保留对电机使用维护说明书的修改权。

Operation and Maintenance Manual of ABB Motors

1 Motor introductions

1.1 Validity

The instructions are valid for ABB M2000 and its derived series of electrical motors (except the explosion-proof series of motors).
Frame sizes: 56 - 355.

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

1.2 Energy efficiency

Products in consistence with the regulation of Small and Medium 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 https://www.energylabel.com.cn

2 General requirements

2.1 Put into service (starting)

2.1.1 Reception check

- Immediately upon receipt check the motor for external damage, and all rating plate data, especially voltage and winding connection (star or delta).
- Turn shaft by hand to check free rotation, remove transport locking if employed.

2.1.2 Insulation resistance check

- Measure insulation resistance before commissioning and when winding dampness is suspected.
- Resistance, measured at 25℃, shall exceed the reference value.

$$Ri \geqslant \frac{20 \times U}{1000 + 2P}\ M\Omega$$

U = voltage, in V
P = output power, in kW

Warning: Windings should be discharged immediately after measurement to avoid risk of electric shock.

- Insulation resistance reference value is halved for each 20℃ rise in ambient temperature.
- If the reference resistance value is not attained, the winding is too damp and must be dried in the oven.

- Oven temperature should be 90°C for 12-16 hours.
- Drain hole plugs, if fitted, must be removed and closing valve, if fitted, must be opened during heating.
- Windings drenched in seawater normally need to be rewound.

2.1.3 Direct-on-line or star/delta starting

- The terminal box on standard single speed motors normally contains 6 winding terminals and at least one earth terminal.
- Earthing must be carried out according to local regulations before the motor is connected to the supply voltage, which should not be substituted by zero.
- The voltage and connection are stamped on the rating plate.

2.1.3.1 Direct-on-line:

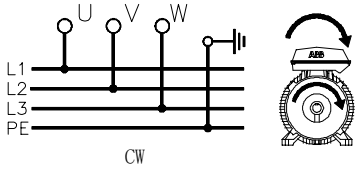
Y or D winding connections may be used, e.g. 660 VY and 380 VD indicate Y-connection for 660 V and D-connection for 380 V.

2.1.3.2 Star/delta starting (Y/D)

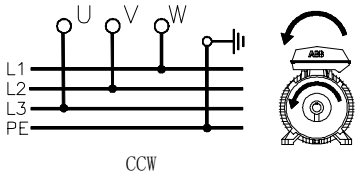
- The supply voltage must be equal to the rated voltage of the motor in D-connection.
- Remove all connection links from the terminal block, and properly connect them to 6 winding terminals in Y or D connections, and this shall be done to switch over from Y connection at the initial starting to D connection after starting.
- For two-speed and special motors, electrical connection must follow the diagram instructions inside the terminal box.

2.1.4 Terminals and direction of rotation

- Direction of rotation is clockwise when viewing the shaft at the motor drive end, when the line phase sequence U1，V1，W1 is connected to the terminals U1，V1，W1.
- To alter the direction of rotation, interchange the connection of any two line cables.
- If the motor has a uni-directional fan, ensure that the direction of rotation is according to the arrow marked on the motor.



CW



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2.2 Use

2.2.1 Operation conditions

- The motors are intended for application in industrial driving. Normal ambient temperature limits-15℃ to +40℃. Maximum altitude 1000m above the sea level.
- The motors are used in ships or similar places. Normal ambient temperature limits-25℃ to +50℃.

2.2.2 Safety considerations

- The motors are intended to be installed and connected by qualified personnel who are familiar with relevant safety requirements.
- Safety equipment necessary for the prevention against accidents during the installation shall be provided. Mounting position must be in accordance with the regulations.

2.2.3 Points to observe

- The motor shall not be used to acceleration and overload operation.
- The temperature of the motor enclosure may be hot to touch during normal operation, but it shall be subject to 60% of the permissible rated temperature.
- Additional information is required for some motor types due to special application and/or design considerations.

2.3 Handling

2.3.1 Storage

- All motors should always be stored indoors, in dry, vibration and dust free conditions.
- Unprotected machined surfaces (shaft-ends and flanges) should be protected with anti-corrosive treatment.
- It is recommended that shafts be rotated periodically by hand to prevent grease shortage or other problem.
- Anti-condensation heaters, if fitted, should preferably be used.

2.3.2 Transportation

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

2.3.3 Motor weights

- Total motor weight can be different for the same frame size (center height) depending on different output, mounting arrangements and added features.
- The actual weight of all our motors is stamped on the rating plate.

2.4 Installation

2.4.1 Foundation

- The purchaser bears full responsibility for preparation of foundations.
- Metal foundations should be painted to avoid corrosion.
- Plates must be even, and sufficiently rigid to withstand possible short circuit forces. They shall be dimensioned so as to avoid the occurrence of vibration due to resonance.

2.4.2 Foundation studs

- Bolt the foundation studs to the feet of the motor and place a 1-to-2 mm shim between the stud and the feet.
- Align the motor directly using appropriate means, and tighten the studs evenly. If shaft extension of the motor is coupled rigidly to the driven machine, foundations and feet of two machines shall be fixed individually by 2 locking pins to avoid damaging the motor due to the centricity deviation during operation.
- Grout the studs with concrete, check alignment and drill holes for locating pins.

2.4.3 Drain holes

- When mounting non-standard motors, discharging valve shall be checked for downward.

2.4.4 Alignment

Correct alignment is essential to avoid bearing vibrations and possibly surface wear.

2.4.5 Slide rails and belt drives

- Place the slide rails horizontally on the same level.
- Check that the motor shaft is parallel with driven, or driving, shaft.
- Belt to be tensioned (i.e. radial bearing loadings) according to suppliers instructions.

Warning: Excessive belt tension or the residual unbalance of the belt drives will damage bearings, cause shaft breakage, and impact the lifetime of the bearing too.

2.5 Electrical Connection

- Some motors are available with top mounted rotatable terminal boxes and with cable entry possibilities from both sides, and also with side mounted terminal boxes.
- Unused cable entries must be closed.
- Besides main winding and earthing terminals, the terminal box can also contain connections for thermistors, heating elements, bimental switches, or PT 100 resistance elements. Connection diagrams for auxiliary elements are found inside the terminal box.

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

2.6 Assembly and Dismantling

2.6.1 General

Dismantling and assembly of motors must be carried out by qualified personnel using only suitable tools and working methods.

2.6.2 Bearings

Special care should be taken of the bearings. They must be removed by pullers and fitted by heating or using special tools for the purpose. How to replace bearings is described in detail in a separate instruction leaflet available from ABB Sales Office.

2.6.3 Fitting coupling halves and pulleys

- Coupling halves and pulleys must be fitted using suitable equipment and tools, and must not be contacted tightly to shaft extensions. Fan cover shall be removed before assembly, and press shaft back end against the other support so that external force during the assembly shall not be applied to the shaft but to other locking pins through shaft transference, therefore, avoid damaging the bearings.
- Never fit a coupling half or pulley by hammering into place or remove it by a lever pressed against the body of the motor.

2.6.4 Balancing

- As standard, balancing has been carried out using half key.
- To avoid vibration the coupling-half or pulley must be balanced with half key before installing on the shaft of the motor.

2.7 Maintenance and lubrication

2.7.1 General

- Inspect and maintain the motor at regular intervals.
- Keep the motor clean and ensure free ventilation airflow.
- Check the condition of shaft seals and replace if necessary.
- Check the condition of connections and mounting and assembly bolts.
- Check the bearing condition by listening for unusual noise, vibration measurement, temperature measurement, inspection of spent grease or bearing monitoring and so on.
- When abnormal phenomenon occurs, shut down the motor, check the parts and replace if necessary.

2.7.2 Lubrication

2.7.2.1 Motors with permanently greased bearings or with grease nipples

Motors with frame size below 225 are normally fitted with permanently greased bearings if no special customers' requirements. Bearing types are specified in the respective product catalogues. Motors fitted with grease nipple can be regreased with the following requirements:

Ball bearing Lubricating intervals in duty hours

Frame size	Amount of grease g	3600 r/min	3000 r/min	1800 r/min	1500 r/min	1200 r/min	1000 r/min	500-900 r/min
112，132	15	4200	4800	7000	7800	8500	10000	10500
160，180	20	3200	4200	6000	7000	8000	9000	10000
200，225	25	1800	3100	5500	6500	7500	8500	9500
250，280	35	800	2000	5000	6000	7000	8000	9000
315	50	800	2000	4600	5500	6500	7500	8000
355	60	600	1000	4000	5000	6000	7000	8000

Roller bearing Lubricating intervals in duty hours

Frame size	Amount of grease g	3600 r/min	3000 r/min	1800 r/min	1500 r/min	1200 r/min	1000 r/min	500-900 r/min
160，180	20	1600	2000	4700	5400	6200	6900	7800
200，225	25	900	1500	4300	5000	5800	6500	7000
250，280	35	400	1000	3300	4500	5500	6300	6800
315	50	400	1000	2700	3800	5000	6000	6500
355	60	300	500	2200	3200	4400	5500	6000

2.7.2.2 Motors fitted with grease nipples

- Lubricate the motor while running
- If grease outlet plug fitted, remove temporarily when lubricating.
- If the motor is fitted with a lubrication nameplate, follow the given values.
- The lubricating interval for vertical motors is half of the values referred to tables in 2.7.2.1.
- Values referred to tables in 2.7.2.1 are based on 80℃ bearing temperature.
- Values referred to tables in 2.7.2.1 should be halved for every 15 K increase in bearing temperature.
- If the maximum bearing temperature is 70℃, values referred to tables in 2.7.2.1 may be doubled.

Warning: The maximum operating temperature of the grease and bearings must not be exceeded.

- Higher speed operation, e.g. frequency converter, should shorten lubrication intervals.
- Typically a doubling of speed shall reduce lubrication intervals to approx. 40 % of values referred to tables in 2.7.2.1. Suitability of bearings for high speed operation must be checked.

2.7.3 Lubricants

2.7.3.1 When regreasing, following lubricating greases specified by ABB company are suggested to grease the open bearings：

- Standard motors with NSK bearings: “ESSO Unirex N2”grease

(When mounting other bearings than NSK bearings, corresponding grease is suggested to purchase, or you can also contact ABB service department for consultant.)

- Smoke-venting motors: “Yiping 7017-1”grease.

When no more than grade grease, you can use with the following features special grease for ball bearings:

- High quality grease with lithium base
- Base oil viscosity 100-140 cST at 40℃
- Consistency NLGI grade 2 or 3
- Temperature range -30℃ - +120℃

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

2.7.3.2 If the ingredient of grease is changed and compatibility is uncertain, lubricate several times at short intervals in order to displace the old grease.

2.7.3.3 Highly loaded and/or slowly rotating bearing requires EP- grease.
If lubrication intervals are short due to bearing temperatures of 80°C or above, use high temperature grease which normally permits approximately 15 K higher bearing temperature.

2.7.4 NOTE

2.7.4.1 High speed motors

For high speed motors (e.g. 2-pole motors), check that the f_n factor of the grease is sufficiently high.

$f_n = Dm \times n$

Dm = average bearing diameter (mm)

n = rotational speed (r/m)

Warning: Most grease can cause skin irritation and eye inflammation.

Follow all safety precautions specified by the manufacturer.

2.7.4.2 Spare parts

- When ordering spare parts, the full type designation and product code as stamped on the rating plate must be specified.
- If the motor is stamped with a serial manufacturing number, this should also be given.

2.7.4.3 Noise levels

For motors at 60Hz, noise level will be correspondingly increased comparing with motors at 50Hz , 2 poles: +5dB(A)； 4,6 and 8 poles：+3dB(A).

3 Electromagnetic brake motors

3.1 Inspection before mounting

- Check all fastening pieces for loose. Pull hand release lever, run the rotor by hand for free. Release brake.
- Measure insulation resistance of the motor winding and excitation coil with 500V Megohmmeter, the measurement shall not be less than 0.5MΩ; otherwise they shall be dried in the oven.

3.2 Electric connection and operation

- Connection diagram of motor and DC electromagnetic brake can be found inside the terminal box.
- If DC power is supplied by customers, make sure the synchronous power switchover between the motor and the brake.
- Excitation voltage of brakes is DC 205V, AC input voltage of the rectifier is 220 V ~ 240 V. For specific motors, input voltage of brakes shall be agreed upon.
- For special motors, check rating plates of the brake and the motor
- Motors shall be connected to voltage and be operated under no-load after checking the brake. If the brake cannot be released, switch off the power supply of motors immediately to avoid burnout. Check the rectifying excitation circuit of the brake and correct, then put into service again.
- After no-load operation for a certain period, shut down the motor and check mechanical connections for loose, bearing for grease leakage or overheat and break for free release.
- In case of any abnormal phenomenon or noise during no-load operation, shut down the motor immediately and check, make necessary correction or reparation prior to running the motor with load.

3.3 Air gap adjustment of brake

3.3.1 After a long-term use, friction surface of the brake may be worn out, which leads to the increase of the air gap between electromagnetic iron and armature as well as the working length of spring, and decrease the spring strain and brake torque, at the same time, due to increased air gap, the current also rises when armature is released, the armature can not even be released in some extreme cases. Therefore, air gap shall be regularly checked and adjusted, or replace the friction disc if necessary.

3.3.2 Air gap is adjusted as follow (figure 1)

a) Turn the hand release lever left and remove it.
b) Remove fan cover (11).
c) Turn nut (5) and bolt (8) left to loose them.
d) Turn bolt (8) right to adjust air gap of armature within values in the table below.

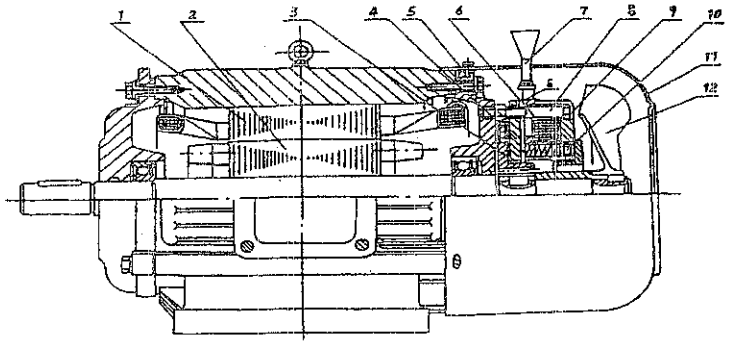
Frame size	71	80	90	100	112	132	160	180	200	225	250	280
air gap mm	0.3	0.3	0.3	0.5	0.5	0.5	0.6	-	-	-	-	-
air gap mm	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.5	0.6	0.6	0.6

e) Turn nut (5) right and tighten firmly.
f) Reassemble fan cover (11).
g) Reassemble hand release lever.

3.3.3 Replace friction disc

Friction disc is easily worn out. If the wear is above 2.5mm on one side, it must be replaced with the following steps:

a) Remove hand release lever.
b) Remove fan cover (11).
c) Remove fan (12).
d) Loose nut (5) and bolt (8).
e) Screw off bolt (8).
f) Disconnect leads of excitation coil of brake.
g) Remove electromagnetic iron and armature.
h) Remove brake disc and replace friction disc.



1 – stator 2 – rotor 3 – brake 4 – armature
5 – air gap regulating nut 6 – excitation coil 7 – hand release lever
8 - air gap regulating screw 9 – brake spring
10 - brake spring regulating screw 11 – fan cover 12 - fan

Figure 1 – Electromagnetic Brake Motors

3.4 Principle and use of hand release lever

Pull the hand release lever right, transfer the force by lever to screws which are connected with armature, this may separate the armature from the friction disc so that the brake torque is released.

3.5 DC brake connection diagram

Connection method of the rectifier is mainly covered.

Four-pole rectifier is in accordance with figure 2.

Six-pole rectifier (for fast brake) is in accordance with figure 3.

DC power supply applied by customer shall ensure the synchronous power switchover between the motor and brake.

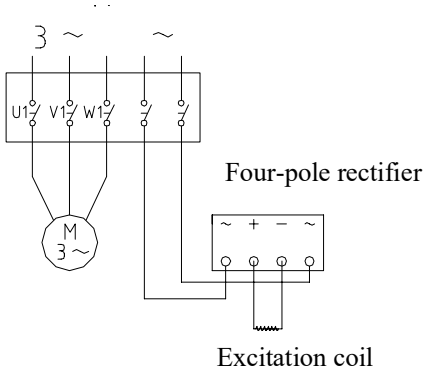


Figure 2

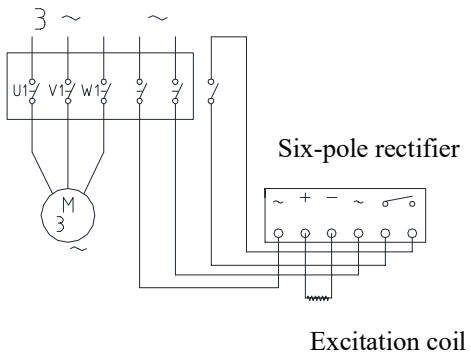


Figure 3

4 Operation and maintenance of pole-changing and variable speed motors

4.1 Inspection before mounting

Insulation resistance of double layers of windings on the variable speed motor shall be measured respectively.

4.2 Electrical connection and operation

- Connections of pole-changing and variable speed motors shall be carried out according to terminals marking and connection diagram inside the terminal box.
- Pole-Changing and variable speed motors controls the speed by changing the poles number, so poles are more than that of general-purpose motors. Two-, three- and four-speed motors have their poles 6,9 and 12 in respective. Design and configuration of a proper speed-regulating device is necessary in order to increase the operation reliability of multi-speed motors. Design and control of the speed-regulating device when performing the switchover between high-speed and low-speed shall make sure that the central point of star connection shall be disconnected while turning off the power supply, so as to avoid short-circuit of the power supply when switching to low-speed winding.

5 Operation and maintenance of motors with frequency converter

5.1 Electrical connection

5.1.1 Motor connection shall be carried out according to the connection method specified on the rating plate and connection diagram inside the connection box.

5.1.2 Axial flow fan, which shall be provided with additional terminal box, shall be required to install on motors with frequency converter (cooling method IC416). The fan shall be supplied with proper voltage; attention should be drawn into motors with axial flow fan that the power supply shall be provided in constant frequency. Connection diagram is supplied with the motor. The rotation direction of the fan's blade shall follow the arrow marked on the enclosure.

5.2 Preparation before start

5.2.1 Connections of the motor and the axial flow fan shall be carried out as per requirement; the enclosure shall be safely grounded; motors and converters shall be separately and safely grounded in order to avoid electromagnetic interference between them.

5.2.2 Proper connection shall be conducted according to instructions of converters, and check before switching on power. Set and adjust the converter parameters before coupling the motor. Make sure the performance of the converter, and then couple the motor.

5.3 Starting

5.3.1 If the motor fails to start when turning on power, first check the converter for proper output setting, time setting of acceleration and deceleration, selection of V/F mode and limits of electronic overheat protection element .If the motor still doesn't work, check motor connection and load.

Start axial flow fan immediately after motor is put into service (for IC416), careful attention shall be drawn into the motor, driving device, loading machine and the readings on the panel of the converter. In case of any abnormal phenomenon, shut down the motor immediately, check and repair the faulty before restart.

5.4 Maintenance during normal operation

When motors run at variable speed by converter, due to high harmonic effect from output waveform of the converter，it is normal that the noise and vibration of motors driven by converter will be a little higher than that of motors supplied by network voltage. The harmonic and high harmonic components vary with frequency in a wide range, the resonance with the motor parts and mechanical loading also increases. When regulating the speed to the point corresponding to system resonance frequency, much noise and vibration in the mechanical system occurs, in this case, system rigidity may be strengthened to avoid the resonance, or the skip function of the converter may be employed to keep the skip frequency corresponding to the resonance point so as to avoid resonance frequency and realize smooth speed.

5.5 Operation and maintenance of auxiliary device

5.5.1 For electrical-optical encoder or tachometer installed on motors, attention shall be paid not to allow the intentional disassembly and the impact, when moving the motor, no external force is permitted to apply on them. The specification of encoder or tachometer shall be strictly observed during installation and operation.

For brake motors, which are driven by the converter, shall note the following points:

a) The electromagnetic brake of the motor is of deenergized brake type, the brake

is released when connecting to voltage. At this moment, turn the shaft extension by hand for free or blocked. The friction disc gap of the brake has been adjusted properly in the workshop; generally, it is not allowed to change randomly. The friction disc shall be strictly prevented against the grease and other material so as to ensure the reliability of the brake after switching off the power.

b) The supply power of brakes shall not be connected to the output side of the converter but the input side.

c) Due to the supply power of brakes proportional to the square of speed, the brake shall not be released by electromagnetic brake at high speed. Regeneration braking function of the converter shall be employed to reduce the motor speed down to the speed at power-frequency, and then apply the electromagnetic brake.

d) If the brake is released while the converter is outputting the power, this may lead to shutdown due to overcurrent, so the brake shall be not released until the main circuit of the converter is open.

6 Operation and maintenance of smoke-venting motors

6.1 Operation condition

6.1.1 Normal ambient temperature:

Normal ambient temperature of motors shall not be higher than +40℃.

6.1.2 Abnormal ambient temperature:

- Motor is designed with H class insulation; High-temperature smoke-venting at 250℃, motors operate for 2 hours; High-temperature smoke-venting at 300℃, motors operate for 1 hour.

6.2 Repair and maintenance

- Motors not for regular service but for the purpose of high temperature smoke-venting shall be started at least once a month, and at lease 30 minutes every time. This will ensure motors in good backup condition.
- Motors for regular service shall be checked for bearing overheat and grease leakage (7017-1 high temperature grease used). In the normal condition, grease shall be refilled or replaced after 5000 hours. In order to ensure the normal operation and protect against any failure, motors shall be performed a regular reparation. Generally, reparation shall be conducted in every three months, and overhaul in every year. Trial run shall be always conducted after finishing the overhaul.
- Motors not for regular service but for the purpose of high temperature smoke-venting shall be replaced the grease every two years, and the reparation shall be scheduled every six months.

6.3 Lifetime

- The lifetime of motors, normally, is 20,000 hours. The maximum lifetime is subject to 8 years.
- After the motor has experienced high temperature smoke-venting at abnormal ambient temperature, the complete motor must be replaced or repaired.

7 Operation and Maintenance of Aluminum Motors

Besides general operation and maintenance requirements of motors, care should be taken for placing motors, bumping must be prohibited due to soft enclosure material of aluminum motors in order to avoid enclosure damage and distortion. Additionally, connecting treads may be damaged if exerting much strength. Terminal treads and other connecting treads shall not be more than tightening torque values in the table below.

Tightening torque of motors connecting threads （N.m）										
thread diameter	M3	M4	M5	M6	M8	M10	M12	M16	M20	M24
tightening torque	0.4	1.2	2	3	7.5	14	23	30	98	170

Tightening torque of terminal screw（N.m）							
terminal block diameter	M4	M5	M6	M8	M10	M12	M16
tightening torque	1.2	2	3	6	10	15.5	30

8 Troubleshooting chart

TROUBLE	POSSIBLE CAUSE	WHAT TO DO
Motor fails to start	One phase missing	Check stator windings for open circuit and repair.
	Interturn and phase short-circuit of stator winding	Check the resistance and no-load current of phases for unbalance ,and repair
	Improper line connections	Check and correct the winding connections according to the nameplate and diagram.
	Loading or driving device failure	Uncouple the motor and loading machine .if the motor can be started, check the loading machine and repair
	Improper converter settings	Check converter settings and reset (for brake motor)
	Brake failure	Check the brake and motor (for brake motor)
Converter motor runs at lower than rated speed	Improper output frequency and voltage setting of converter	Reset according to instructions
	Overloading	Check loading machine
Abnormal noise and severe vibration	Mechanical friction (between stator and rotor)	Check the air gap between dynamic and static parts for friction，and align.
	One phase missing	Switch off the power, and then switch on again. If the motor fails to start, check on phase for missing. Check power supply or motor and repair.
	Grease shortage or bearing failure	Clean the bearing and refill the lubricants, or replace bearing

TROUBLE	POSSIBLE CAUSE	WHAT TO DO
	Improper line connection	Find out the faulty and correct
	Rotor unbalance after reparation	Balancing
	Bending and deformation of shaft extension	Alignment or replace shaft if necessary
	Coupling loose	Check coupling for loose and tighten the bolt
	Foundation unbalance or failure	Check foundation for solid, and repair
higher temperature rise	Overloading	Measure stator current with electromagnetic ammeter or check the readings on the panel of the converters (for converter motors), and repair
	One phase missing	Check connections of stator windings and converter (for converter motors), and repair
	Improper line connections	Star connection is mistaken for delta connection and vice versa. Power off and correct connections.
	Winding earthed and interturn or phase short-circuited	Find out earth and short-circuit and repair
	Friction between stator and rotor	Check bearing for loose, or check stator and rotor for improper assembly and repair.
	Improper ventilation	Check ventilator and blade and repair or replace if damaged. Check vent channel for blocked, remove the blocking object, dirt and dust.
	Improper v/f settings of converter causes the motor over-excitation and over current at low speed and light load	Adjust the V/F settings (for converter motor)
	Higher locked current when using the DC brake of converter	Current settings of the DC brake is normally adjusted to 100%-150% of the rated current based on the braking times (for converter motor)
	Brake delay	Check the air gap of brake and DC excitation voltage (for brake motor)
Bearing overheat	Bearing failure	Replace bearing
	Excessive, insufficient and contaminated bearing grease	Fill or replace lubricants
	Bearing contacts with shaft or end shield too loose or tight	Refit
	Improper assembly of end shields or bearing covers (unbalance)	Refit the end shields and bearing cover and tighten the bolts
	Improper assembly of oil sealing on shaft extensions	Refit
	Belt is too loose or tight , or improper coupling assembly	Refit and adjust the belt or coupling
Motor enclosure is electriferous	Improper earth	Check earth bolt if the earth line firmly contacts with the enclosure
	winding dampness, and insulation resistance is too low	Dry the winding

TROUBLE	POSSIBLE CAUSE	WHAT TO DO
	Insulation damaged, and stator windings touch the iron core	Repair
	Unclean terminal board	Clean terminal board
	Leads insulation damaged	Bind damaged insulation with insulation material
Motor fails to start when loading	Interturn short-circuit of stator winding	Check phase resistance and current
	Overloading	Check loading current
three phase unbalance current	Interturn short-circuit	Repair winding
	Improper line connection	Correct the connection
	three phase voltage unbalance	Improve power supply
Fuse is blown	Phase short-circuit	Repair the wind
	Overloading	Reduce the load
	Lower voltage	Increase the voltage
insulation resistance is low or broken down	Insulation aging or damaged	Repair insulation
	Dirty	Clean inside with dry compression air
	Winding or terminal board dampness	Dismantle for dry or treatment
	Motor overheat	Dismantle and repair
Brake failure of the brake motor	Friction disc worn	Adjust air gap
	Spring failure	Replace spring
	Brake delay	Adjust air gap and check the excitation voltage
	Rectifier damaged	Replace Rectifier
	Brake circuit failure	Properly check brake circuit failure

Note: More information can be available from ABB service.

We reserve rights to alter the operation and maintenance manual of motors without prior notice.

9 Appendix

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 in-cluded 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 pur-chase 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 coun-try.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 sup-plier 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 elec-trical and electronic equipment (WEEE) should not be mixed with general household waste.
If you wish to dispose of this product, please contact your local authorities or dealer for the correct method of disposal.
Disposing of this product correctly will help save valuable resources and prevent any potential negative effects on human health and the environment, which could otherwise arise from inappropriate waste handling.

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