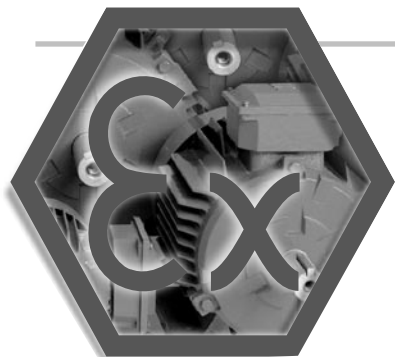


Ex d , Ex ec
Installation,
Operation and Maintenance Manual
安装、运行和维护说明书



ABB Motors

ABB



Ex d , Ex ec

安装、运行和维护说明书

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1. 概 述

注 意

请遵照本说明书的指示，安全、正确地安装、操作和维护电机。所有对电机或辅助设备进行分析、操作或维护的人员必须注意，不按照本说明书指示操作，可使其所适用的保用期失效。

警 告

用于危险区域的电机是按国家防爆相关规定特别设计的。操作不当、接线错误或进行任何方式的改装，不管改装有多少，都会影响电机的安全性。要考虑危险区域用设备接线和用法方面的规定，尤其是电机使用地国家对安装的要求。电机必须由训练有素且熟悉这些标准的人员操作。

合格声明书

所有铭牌上带CE标记的ABB防爆电机符合欧盟相关指令，详见所附的EU声明。

适用范围

本说明书适用于下列型号的ABB电机（用于爆炸性气体环境时）：

无火花型Ex ec

M2GP系列，机座号80至355

隔爆型外壳Ex d, Ex de

M2JA系列，机座号80至355

防粉尘点燃外壳Ex t

M2JA系列，机座号80至355

（ABB在决定某些用于特殊用途的电机的适用性或特殊设计变更时可能要求提供更多附加信息。）

符合性

除符合机械和电气属性相关标准外，用于爆炸性气体环境的电机必须符合下列中国/欧洲标准：

GB3836.1/EN 60079-0；防爆产品通用要求

GB3836.2/EN 60079-1；有关Ex d 防护标准

GB3836.3/EN 60079-7；有关Ex ec 防护标准

GB12476.1/EN 61241-0；防粉尘产品通用要求

GB12476.5/EN 61241-1/EN 60079-31；有关Ex t 防护标准

证书编号带“X”字母时的安全使用特定条件：

不同隔爆路径的间隙小于EN 60079-1标准表中指定的值。

不同隔爆接合面的宽度优于EN 60079-1标准表中规定的宽度。

ABB 低压电机（仅适用于II组）可安装在符合下列标记的区域内：

区 域	种类或标记
1	2类或Ex d
2	3类或Ex ec
21	2类或DIP； IP65或Ex tD A21

环境：G – 由气体引起的爆炸性环境
D– 由粉尘引起的爆炸性环境

预先检查

用户应核对标准技术资料中的所有内容以及防爆标准的相关数据，例如：

a) 气体组			b) 标注温度		
工业行业	气体组	气体类型	温度组	最高温度 °C	表面最高温升K
除煤矿外的 爆炸性环境	IIA	丙烷	T1	450	155
	IIB	乙烯	T2	300	155
	IIC	氢气 / 乙炔	T3	200	155
			T4	135	90
			T5	100	55
			T6	85	40
			T135°C	135	90

注意，电机是按组别认证并分类的。这是通过参考周围气体，根据标注温度（基于40℃环境温度计算出的）确定的。

电机若安装在温度高于40℃的周围环境下时，请向ABB咨询所需环境温度下的新的铭牌数据和试验报告。

正常环境温度不能低于-20℃。需要较低温度时，请咨询ABB。

2. 安 装

交付使用（启动）

到货检验

到货后，立即检查电机有无外部损伤。如果有，马上通知代理商。

检查所有的铭牌数据，尤其是电压、绕组的连接方式（星形或三角形）、类别、防护等级和标注温度。除最小机座号外，电机铭牌上都注明所用轴承的型号。

如果电机装有锁定装置，注意将其打开。用手旋转转轴，检测电机空转情况。

不要超出产品样本中的轴承允许负载值。

装有滚柱轴承的电机：

不施加径向力在电机轴上运转电机可能损坏滚柱轴承。

装有角接触（推力）轴承的电机：

不施加轴向力在电机轴上运转电机可能损坏角接触（推力）轴承。

轴承的型号见铭牌。

装有注油嘴的电机：

电机初次启动或长期存放后再次启动时，必须注入规定的润滑脂直至有润滑脂从排放口流出。

详细内容见第11页的“润滑”部分。

绝缘电阻检测

电机初次使用前或怀疑绕组受潮时，要测量绝缘电阻值。

警告

在对电机或被驱动设备操作前，先切断电源并进行锁定。检测绝缘电阻过程中一定要确保周围环境中无爆炸性气体存在。

25°C时测得的绝缘电阻值应大于参考值，如10 M ohm (用500V直流兆欧表测得)

警告

测量后绕组要立即放电，避免被电击。

环境温度每升高20°C，电阻的参考值减半。

绕组由于过潮而未能达到绝缘电阻参考值时，必须先用烘箱烘干。先在90°C下烘12–16小时，然后在105°C下烘6–8小时。

如果安装了排水孔塞，烘干时必须拿掉；如果安装了关闭阀，烘干时必须将其打开。烘干后须确保重新装上排水孔塞。

经海水浸泡过的绕组，通常需要重绕。

直接起动或“星/三角”起动

标准单速电机的接线盒通常有六个绕组接线柱和至少一个接地螺栓。

双速和特殊电机的电源接法必须依照接线盒内的接线图说明。

接入电源电压之前，电机必须按照当地规定可靠接地。

电压和接法在铭牌上有标注。

直接起动 (DOL)

绕组可以使用Y或D接法。

例如690VY，400VD分别表示690V Y-接法和400V D-接法。

“星 / 三角” 起动 (Y/D)

使用“D”接法时，电源电压必须等于电机的额定电压。

拆下接线板上的所有接线片。

增安型电机通常只允许直接起动。如需要采用“星/三角”起动，请咨询ABB。

其它起动方法和严酷起动条件：

使用其它起动方法如软起动器，或起动条件特别严酷时，请先咨询ABB。

接线端子和旋转方向

如果电源相序–L1、L2、L3–按照图1所示的方法与接线柱连接，那么，面对电机驱动端看，其旋转方向为顺时针。

将电源线上的任意两相互交换就可以改变电机的旋转方向。

装有单向风扇的电机应确保风扇的旋转方向与电机上箭头所示的方向一致。

管 理

存 放

所有电机应存放在室内，要求干燥、防振、防尘的环境。
裸露的加工面（轴伸和法兰）应采取防锈措施。
建议定期用手转动转轴，防止润滑脂流失。
装有防潮加热带的电机，加热带应投入使用。

运 输

安装有圆柱-滚柱轴承和/或角接触轴承的电机，运输时必须安装锁紧装置。

起 重

除非起重说明中另提到了其它起重方法，否则起重只能用吊耳。
由于输出功率、安装方式和辅助设备不同，相同中心高的电机的重心可能不同。
不可使用已损坏的吊环。起吊前先进行检查。吊环螺栓或整个起重吊耳应完好无损。
起吊螺栓在起重前必须上紧。必要时可以用垫圈作衬，以调整吊环螺栓的位置。
必须使用合适的起重设备，吊钩的大小应与起重吊耳相匹配。
小心保护电机的辅助设备和配套电缆不受损坏。

电机重量

相同机座号（中心高）的电机由于输出功率、安装尺寸和附加特性的不同而总重量可能改变。
下表列出了基本配置的电机的最大估计重量。
ABB电机（除最小机座外）的实际重量，在铭牌上都有标注。

机座号	铸铁重量kg (M2GP)	隔爆重量kg (M2JA)
80	20	35
90	30	45
100	40	55
112	50	70
132	80	100
160	150	200
180	200	250
200	280	350
225	350	450
250	480	580
280	600	800
315	1150	1400
355	2100	2600

安 装

所有与认证相关的铭牌数据必须认真核对，确保电机防护等级、气体环境和区域相符。
电机垂直安装，转轴朝下时，必须有防护下落物体和液体的防护罩。

确保电机防护等级与环境和气候条件相匹配，如确保接线盒内不进水。

机座上的接地牌需用电缆连接到PE（保护性接地），如EN50014标准的表3所示。

电网和电机端子之间的电缆接线必须根据铭牌上的额定电流，符合国家相关安装标准或EN 60204-1标准的要求。

电机只用于固定安装。其它情况下，需确保仅使用经认证的增安型和隔爆电机用电缆接头。无火花型电机的电缆接头应符合GB3836.3/EN 60079-7。电缆接头的防护等级至少应等同于电机的防护等级。

注 意

电缆应经机械防护后紧固在接线盒上，以符合GB3836.1/EN50014和当地的安装标准的规定。

冷 却

检查电机是否通风良好。必须保证没有邻近设备、表面或直射阳光向电机额外辐射热量。对于Ex d电机，尤其是表面温度等级T5且装有法兰（B5，B35，V1…）的电机，法兰外表面必须确保 足够通风。欲知更高环境温度下冷却的详情，见ABB出版物《电机指南》或联系您当地的销售办 事 处。

基 础

用户承担准备基础的全部责任。

金属件基础应涂防锈漆。

基础要平直并具有足够的刚性以承受可能产生的短路引起的冲击力。选择尺寸时应注意避免产生共振(谐振)。

基础螺栓

将基础螺栓拧到电机底脚上，并在螺栓和底脚间置一个1-2mm厚的垫片。

采用适当的方式调整电机以使其对中。

检查电机的对中，钻定位孔并用混凝土灌浆定位销。

对 中

为避免轴承故障、振动及可能产生的轴伸断裂，正确的对中是其必要因素之一。

滑轨和皮带轮

- 按图2所示将电机固定在滑轨上。
- 将滑轨水平放置在同一平面上。
- 检查电机转轴是否平行于驱动轴。
- 皮带须按供应商的使用说明书要求张紧。

警 告

过大的皮带张力会损坏轴承，甚至引起轴断裂。

不得超过相关产品样本中规定的最大张紧力(即径向轴承负载)。

带排水孔塞的电机

无火花型

当安装方式与标准的水平安装方式不同时，检查开启的排水孔是否朝下。对配备有塑料的排水孔密封塞的电机，用于多粉尘型的环境，所有排水孔都要封闭。

隔爆电机

需要时，排水塞位于端盖或机座的低洼处，以方便冷凝水排出电机。

定期旋转排水塞的圆形旋钮，以防阻塞。执行这一操作时，电机必须处于静止状态且确保安全操作。检查频率取决于周围空气的湿度及当地的气候条件。起初可通过试验方式确定，确定后严格遵守。

电机的过载和堵转保护

应使用在线检测装置来防止Ex电机的过载和堵转停机。此类装置应具有良好的可靠性，且跳闸时间精确到 $\pm 20\%$ 。

轴 承

应特别注意轴承。必须使用拉模拆卸轴承，应通过热套工艺或使用特殊安装工具进行安装。ABB销售办事处有详细说明轴承拆卸方法的小册子备案。

半联轴器和皮带轮的安装

安装半联轴器和皮带轮，必须用合适的设备和工具，不能损坏轴承和密封圈。

决不能用锤击来使半联轴器和皮带轮就位或采用杠杆压靠电机的机身来拆卸它们。

半联轴器的安装精度：检查间隙 b 是否小于0.05mm，且 a_1 和 a_2 的差别也小于0.05mm。见图3。

接 线

除主接线和接地端子外，接线盒也可能还有热敏电阻、加热带或PT100电阻测温元件的接线端子。

警 告

电机停转时，由于加热元件或绕组直流电加热的缘故，接线盒内仍可能带电。

接线盒盖内有辅助元件和连接件的接线图。

辅助元件的接线必须采用经认可的接头。象其它开关和继电器一样，热敏电阻继电器必须放在爆炸危险区域外面。

无火花电机

标准电机的接线盒装在顶部，电缆入口可能在两侧。详细描述见产品样本。

不用的电缆入口必须用适当的（经Ex e认可）塞子进行密封，其防护等级须等同于铭牌上标注的防护等级。

隔爆电机

接线盒：

- Ex d, M2JA 电机

不用的电缆入口必须用经认可的塞子进行密封，其防护等级须等同于铭牌上标注的防护等级。

Ex d 电机/ M2JA

Ex d电机接线盒的接线是标准的,但选择管接头(葛兰)时须仔细考虑下列准则:
管接头必须是经认可的结构,且防护等级至少应等同于电机的防护等级。切记有些管接头的认可是以接线盒内一定的最大自由空间量为条件的。下表列出了M2JA系列电机接线盒内的自由空间量,供参考。

机型 M2JA	接线盒内自由空间量
80-132	1.45 - 1.7 dm ³
160-180	3 dm ³
200-225	8.5 dm ³
250-280	15 dm ³
315-355	25 dm ³

管接头的型号和尺寸大小必须与电缆的型号和截面积相符,有关防护等级和直径的详细描述见管接头相关资料。
盖上接线盒盖时,表面缝隙间不能有灰尘积聚。清洁并润滑表面,以方便将来拆卸。

警告

爆炸性环境下,在电机没有冷却和断电之前,不要打开电机和接线盒。

平衡

电机转子已校正动平衡。
作为标准,电机采用半键平衡,且转轴用红带注明“半键平衡”或缺省。
为避免振动,键槽加工好后,半联轴器或皮带轮必须经半键校平衡。
若采用全键平衡,则转轴用黄带注明“全键平衡”。
若采用无键平衡,转轴用蓝带注明“无键平衡”。

3. 运 行

使 用

警告

在电机或所驱动设备上进行操作前,先切断电源并锁定。工作过程中一定要确保无爆炸性气体存在。

电机的结构是设计用于下列环境条件的:
正常环境温度极限为: -40℃ ~ +40℃。(禁止在-40℃~-20℃之间直接起动电机。通过装加热带或在定子绕组内通以一定时间的低电压来预热电机,使其外壳温度在-20℃以上。在绕组中产生的直流电流不应超过铭牌上标明的额定电流。)
最高海拔为高出海平面1000m。
超出以上极限时,必须检查所有的电机数据和结构数据,使表面温度与温度组别(根据气体的点燃

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温度分类)相符。欲知详情,请联系ABB。

使用隔爆电机时应特别注意腐蚀性气体环境;隔爆外壳经腐蚀可能损坏,因此要确保防护油漆适用于周围环境条件。

安全要素

电机须由熟悉安全条例及国家法规的专业人员安装和使用。

按照当地规定,电机安装和操作场所应配备必要的安全防护设备,以避免意外事故。

警告

装有由热敏开关直接接通电源装置的小电机可能自动启动。

同时还应遵守以下几点:

- 不要踩踏在电机上;
- 电机外壳在正常工作状态下也可能发烫,不要用手触摸;
- 某些特殊应用电机需要遵循特别说明;
- 吊耳仅限用于起吊电机,当电机与其它设备连接在一起时,不可用吊耳起吊。

4. 维护

警告

必须遵循危险区域用电设备连线和用法的相关标准。只有经严格训练且熟悉相关标准的专业人员才允许操作这一类电机。

根据所述工作的特性,在对电机或所驱动设备进行操作前,先切断电源并锁定。工作过程中一定要确保无爆炸性气体存在。

一般检查

- 定期检查电机。检查频率取决于周围空气的潮湿程度以及当地的天气状况。可预先通过试验确定,并严格遵守;
- 保持电机清洁和自然通风。在多灰尘环境中使用电机时必须定期检查通风系统并进行清洁。
- 检查轴封(例如V型密封圈或骨架密封圈)的状况,必要时应更换;
- 检查接线和安装螺栓的状况;
- 通过监听噪音异常、振动测量、温度检测、监控用油量或SPM轴承检测等,判断轴承的运行状况。

发现有磨损迹象时应拆卸电机并检查零部件,必要时进行更换。更换轴承时应同时用与原配相同质量和性能的密封圈更换轴用密封圈。正常情况下,更换的轴承型号须与原配相同。

装有排水孔塞的隔爆电机应定期旋转排水孔塞的圆形按钮,以防堵塞。进行此操作时,电机必须处于安全的静止状态。检查频率取决于周围空气的湿度和当地的天气状况。具体频率可通过预先试验确定,并严格遵守。

润 滑

警 告
注意所有的旋转部件。

警 告
润滑脂会刺激皮肤，引起眼睛发炎。请遵守生产商提示的安全预防措施。

轴承的型号在相关产品样本中有介绍。除较小电机外，电机铭牌上也有标注。

装有封闭型轴承的电机

通常是型号为1Z或2Z的封闭型轴承。

在25℃环境温度下按照L1（即99%的电机确保能达到的间隔时间），机座号180及以下的电机原则上可在下列时间内保持适当润滑。工作环境温度高于25℃情况下轴承的使用寿命见相关产品样本。

机座号	极数	运行时间
90–112	2–8	40 000
132	2	31 000
132	4–8	40 000
160	2	23 000
160	4–8	40 000
180	2	19 000
180	4–8	40 000

上述数值随应用工况和负载情况不同而不同，见相关产品样本。

立式电机的运行小时数为上表中数值减半。

装有注油嘴的电机

加油牌和通用的润滑建议

装有加油示意牌的以它上面的值为准。

加油牌上明确标识与安装方式、环境温度和转速相关的添加润滑脂间隔时间。

采取自动加油润滑时，溢油孔（出油孔）必须始终保持打开。

ABB的政策是将可靠性视作确定轴承加油间隔的至关重要的因素，所以我们遵循的是L1原则。

人工润滑

电机运行时加油

- 如果装有溢油孔塞或止逆阀的，应将其打开；
- 油脂通道一定要开启；
- 向轴承注入指定量的油脂；
- 运行电机1~2小时，使多余油脂全部排出轴承，然后盖上溢油孔塞或关闭止逆阀（若有）。

电机停机时加油

- 应在电机运转时加油。如果不可行，可在停机时加油。
- 在这种情况下，先加入规定油量的一半。起动电机，全速运行几分钟。
- 停机后，再将剩下的油注入轴承。
- 运行电机1~2小时后，盖上溢油孔塞或关闭止逆阀（若有）。

自动润滑

自动润滑时出油孔或止逆阀（若有）必须始终打开。

某些电机可能装有旧脂收集器，操作时请遵守其特殊说明。

我们仅建议使用电动机械的系统。请联系您当地的ABB销售办事处。

若采用自动润滑系统时，表中列出的每次加油间隔内的加油量要加倍。

2 极电机采用自动润滑时，请注意遵守润滑剂章节中的2极电机润滑注意事项。

添加润滑脂的间隔时间及润滑脂用量

机座号	滑脂量	3600	3000	1800	1500	1000	500~900
	g	r/min	r/min	r/min	r/min	r/min	r/min

滚珠轴承
添加润滑脂的间隔时间

112	10	10000	13000	18000	21000	25000	28000
132	15	9000	11000	17000	19000	23000	26500
160	25	7000	9500	14000	17000	21000	24000
180	30	6000	8000	13500	16000	20000	23000
200	40	4000	6000	11000	13000	17000	21000
225	50	3000	5000	10000	12500	16500	20000
250	60	2500	4000	9000	11500	15000	18000
280	70	2000 ¹⁾	3500 ¹⁾	8000	10500	14000	17000
315	90	1) ¹⁾	1) ¹⁾	6500	8500	12500	16000
355	120	1) ¹⁾	1) ¹⁾	4200	6000	10000	13000

滚柱轴承
添加润滑脂的间隔时间

160	25	3500	4500	7000	8500	10500	12000
180	30	3000	4000	7000	8000	10000	11500
200	40	2000	3000	5500	6500	8500	10500
225	50	1500	2500	5000	6000	8000	10000
250	60	1300	2200	4500	5700	7500	9000
280	70	1000 ¹⁾	2000 ¹⁾	4000	5300	7000	8500
315	90	1)	1)	3300	4300	6000	8000
355	120	1)	1)	2000	3000	5000	6500

¹⁾ IEC机座号为280~355的某些型号电机 (3600和3000 r/min) 的对应值见下页。

影响加油间隔的因素

立式电机的加油间隔为表中规定数值减半。

以上加油间隔时间基于轴承运行温度为80°C (环境温度 + 25°C)。

注意! 轴承温度随环境温度的升高相应升高。轴承温度每升高15°C, 表中规定数值应减半; 轴承温度每降低15°C, 表中规定数值可能加倍。

警告

运行温度不能超过润滑脂和轴承最高允许温度。

润滑脂

警告

不要将不同类型的润滑脂混合。不兼容的润滑脂可能损坏轴承。

添加润滑脂时, 仅允许使用具有下列特性的滚珠轴承润滑脂:

- 良好质量的锂基润滑脂, 带矿物油或PAO油
- 40°C时基脂粘度为70~160 cST
- 稠度等级NLGL 2~3*)
- 温度范围从-30°C到+140°C连续。

*) 对于立式电机或在较高的温度环境下, 建议使用更高的NLGL级。

主要的润滑剂生产商都备有良好性能的润滑脂。

润滑脂建议使用混合物, 但使用时, 尤其涉及到EP类混合物时, 必须从生产商处获得保证混合物不损伤轴承或润滑脂在工作温度范围内的属性的书面保证。

警告

机座号为280~355、轴承温度较高的电机不推荐使用含有EP混合物的润滑脂。

安装、运行和维护说明书

当环境温度低于-25℃或高于+55℃时，或轴承温度高于110℃时， 请向ABB销售办事处咨询适用的润滑脂。

可使用下列具有高性能的润滑脂：

- Esso Unirex N2、N3或S2 (锂复合基)
- Mobil Mobilith SHC 100 (锂复合基)
- Shell Albida EMS 2 (锂复合基)
- SKF LGHQ 3 (锂复合基)
- Klüber Klüberplex BEM 41-132 (特殊锂基)
- FAG Arcanol TEMP90 (钙聚脲基)
- FAG Arcanol TEMP110 (锂复合基)

满足所需特性要求的其它润滑脂的加油间隔， 请向当地ABB销售办事处咨询。

添加润滑脂的间隔时间及润滑脂用量， 铸铁机座， 2极， IEC机座号280-355

机座号	滑脂量	3600	3000
	g	r/min	r/min
滚珠轴承 添加润滑脂的间隔时间			
280	35	2000	3500
315	45	2000	3500
355	60	2000	2000
滚柱轴承 添加润滑脂的间隔时间			
280	35	1000	1700
315	45	1000	1700

注 意

对高速机械须使用高速润滑脂，如机座号为355的2极电机，其转速因数大于400000 (以 $D_m \times n$ 计算，这里 D_m = 平均轴承直径，毫米； n = 转速，r/min)。

可使用下列润滑脂：

- FAG L69 (聚脲基)
- Klüber Klüber quiet BH 72-102 (聚脲基)
- SKF LGHP2 (聚脲基)

如果使用的是其它润滑脂，与生产商核对质量是否符合以上特性；或当无法确定润滑脂是否兼容时， 请向当地ABB销售办事处咨询。

备 件

备件必须是ABB供应且经检验合格的原配件。

应遵守标准IEC 60079-19的规定。

订购备件时，必须注明电机铭牌上的完整型号、规格与产品代码。

电机铭牌上标有生产序列号的，也应注明。

拆卸、重装和重绕

请遵守标准IEC 60079-19规定的拆卸、重装和重绕说明。相关操作必须由生产商，即ABB或其审查合格的公司完成。

应注意，构成隔爆外壳的零部件不允许自行改装。而且在任何情况都要确保通风顺畅。

重绕须在经Ex 认可的修理车间进行。

将端盖或接线盒重装到机座上时，止口处除一层薄的油脂外，应无油漆和灰尘。

轴承

轴承应予以特别重视。必须用拉模拆换轴承，通过热套或用专用工具安装。

ABB销售办事处备有详细描述更换轴承说明的小册子。

电机上的所有信息，如标签，都必须遵守。

注 意

除经生产商特别同意的，最终用户自行对产品进行修理，将免除生产商承担的产品合格责任。

5. 环境要求

噪声等级

大部分ABB电机在50 Hz 交流电下的声压级都不超过85 dB (A) (± 3 dB)。

特殊电机的声压级值见相关产品样本。

60 Hz 正弦电源供电情况下的声压级，请与ABB销售办事处联系。

本说明书无法覆盖电机的所有细节或附加特性，也无法预见安装、操作或维护过程中所有可能发生的情况。欲知更多详情，请与当地ABB销售办事处联系。

电机故障处理

您的电机维护和故障排除必须由专业人员用适当的工具和设备进行。

故障现象	造成故障的可能原因	处理方法
电机不能起动	保险丝熔断	用适当型号和额定值的保险丝替换。
	过载跳闸	检查并重调起动器的过载系数。
	供电电源不配	检查电源是否与电机铭牌和负载数值一致。
	电源连接错误	核对接线是否与电机接线图一致。
	绕组或控制开关开路	表现为合闸时有嗡嗡声。检查是否有接线是否松脱。并确保所有的控制开关都闭合。
	机械故障	检查电机和传动装置是否可以自由转动。检查轴承和润滑脂。
	定子短路	表现为保险丝熔断。电机必须重绕。
	定子线圈连接不牢	用探视灯查找。
	转子故障	寻找断排和端圈。
	电机可能过载	减小负载。
电机堵转	可能有一相断路	检查电源线是否有开路。
	使用工况不当	更换型号或机座号。咨询生产商。
	过载	减轻负载
	电压低	确保按铭牌电压供电。检查接线。
	开路	保险丝熔断，检查过载继电器、定子和按钮。
电机运行后逐渐停机	电源故障	检查电源、保险丝及控制开关的接线是否松脱。
电机达不到额定转速	使用工况不当	咨询供应商合适的型号。
	电源压降引起电机端电压过低	使用较高电压或变压器终端或减轻负载。检查接线。检查导体大小是否合适。
	起动负载太高	核对电机起动时所带负载是否规定值。
	转子断排或松动	由于修补是不牢靠的，所以可能需要更换新转子。
	原级开路	用测试仪查寻故障，并进行修理。
电机加速过慢 且/或电流太大	过载	减少负载。
	起动过程中电压低	检查电阻是否太大。线缆尺寸应适合。
	鼠笼转子故障	更换新转子。
	外加电压过低	让供电公司增加电力供应。
转向错误	相序错误	换接电机端或开关柜端的接线。

故障现象	造成故障的可能原因	处理方法
欠载运行时电机过热	过载	减轻负载
	机座或轴承座上的风道可能被灰尘阻塞，妨碍电机通风。	打开通风孔，检查是否有连续的风流来自电机。
	电机可能一相开路	检查所有的导线是否连接完好。
	线圈接地	查寻并修理。
	端电压不平衡	检查端子、接线和变压器是否有误。
电机振动	电机不对中	重新对中。
	支撑太弱	加固基座。
	联轴器不平衡	校正联轴器平衡。
	所驱动设备不平衡	校正所驱动设备的平衡。
	轴承故障	拆换轴承。
	轴承同轴度不好	适当调整。
	平衡重量移位	重新校电机平衡。
	转子和联轴器的平衡不一致（半键-全键）。	重新校对联轴器或电机的平衡。
	多相电机单相运行	检查是否开路。
刮擦噪音	轴向窜动太大	调节轴承或增加垫片。
	风扇擦风罩	消除摩擦。
	风扇碰撞绝缘体	清洗风扇。
运行噪音大	底板松动	拧紧固定螺栓。
	气隙不均	检查并校正轴承座配合或轴承。
	转子不平衡	重新校平衡。
轴承滚珠发烫	转轴弯曲或发生弹性形变	校直或替换转轴。
	皮带拉力太大	减小皮带张力。
	皮带轮离轴颈太远	皮带轮移近电机轴承。
	皮带轮直径太小	使用较大的皮带轮。
	对中不好	重新与所驱动设备对中。
	润滑脂不够多	轴承中应保持一定量的润滑脂。
	润滑脂变质或润滑油受污染	除去旧润滑脂，用煤油充分清洗轴承，然后加入新的润滑脂。
	润滑脂过量	减少润滑脂用量，轴承被覆不应超过1/2。
	轴承过载	检查对中，侧向与轴向推力。
	滚珠破碎或弹道拉毛	先彻底清洗轴承座，再更换轴承。

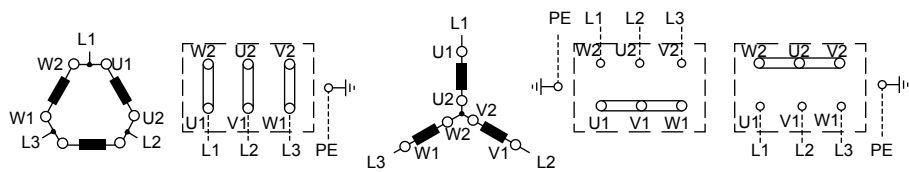


图1. 连接图

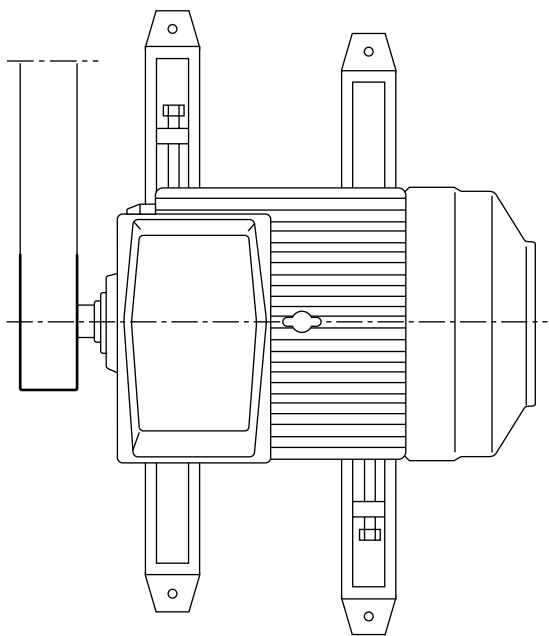


图2. 皮带驱动

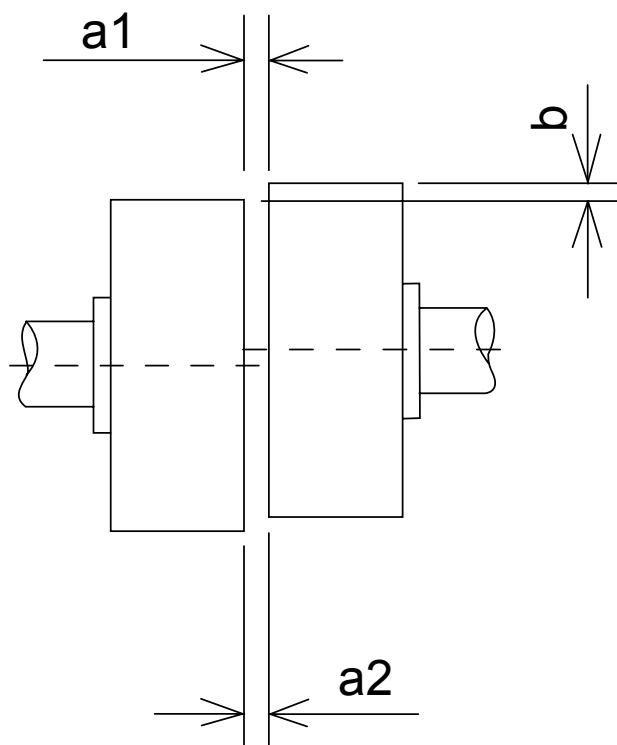


图2. 联轴器安装



Ex d , Ex ec Installation, Operation and Maintenance Manual

List of Contents

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1. General

NOTE

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. Ignoring these instructions may invalidate all applicable warranties.

WARNING

Motors for hazardous areas are specially designed to comply with official regulations concerning the risk of explosion. The reliability of these motors may be impaired if they are used improperly, badly connected, or altered in any way no matter how minor. Standards relating to the connection and use of electrical apparatus in hazardous areas must be taken into consideration, especially the national standards for installation in the country where the motors are being used. Only trained personnel familiar with these standards should handle this type of apparatus.

Declaration of Conformity

All ABB motors with a CE-mark on the rating plate comply with the relevant instructions of EU. See the attached EU Declaration of Conformity for details.

Validity

These instructions are valid for the following ABB electrical motor types, when used in explosive atmosphere.

Non-sparking Ex ec

M2GP sizes 80 to 355

Flameproof enclosure Ex d, Ex de

M2JA sizes 80 to 355

Dust Ignition Protection Ex t

M2JA sizes 80 to 355

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

Conformity

As well as conforming to the standards relating to mechanical and electrical characteristics, motors designed for explosive atmosphere must also conform to the following Chinese / European standards:

GB3836.1 / EN 60079-0; General standard concerning explosion proof material

GB3836.2 / EN 60079-1; Std. concerning Ex d protection

GB3836.3 / EN 60079-7; Std. concerning Ex ec protection

GB12476.1/EN 61241-0; General standard concerning dust ignition protection material

GB12476.5/EN 61241-1/EN 60079-31; Std. concerning Ex t protection

Special conditions for safe use when the certificate number is followed by sign "X"

The gaps of the different flame path are less than the values specified in the tables of the EN 60079-1 standard.

The width of the different flameproof joints are superior to these specified in tables of EN 60079-1 standard.

ABB LV motors (valid only for group II) can be installed in areas corresponding to following marking:

Zone	Category or Marking
1	Category 2 or Ex d
2	Category 3 or Ex ec
21	Category 2 or DIP; IP56 or Ex tD A21

Atmosphere:

G – explosive atmosphere caused by gases

D – explosive atmosphere caused by combustible dust

Prior checking

Users should check all information quoted in the standard technical information in conjunction with data concerning standards on explosion-proofing, such as:

a. Gas group

Industry	Gas group	Gas type
Explosive atmosphere other than mines	IIA	Propane
	IIB	Ethylene
	IIC	Hydrogen /Acetylene

b. Marking temperature

Temperature class	T1	T2	T3	T4	T5	T6	T135°C
Max. temperature °C	450	300	200	135	100	85	135
Max. temperature rise of surface K	155	155	155	90	55	40	90

It should be noted that the motors are certified and classified according to their group. This is determined by reference to the ambient gas or dust atmosphere and by the marking temperature, calculated as a function of the ambient temperature of 40°C.

If the motor is to be installed in higher ambient temperature than 40°C, please consult ABB for new rating data and test reports at the required ambient temperature.

The normal ambient temperature must not be lower than -20°C. If lower temperatures are expected, please consult ABB.

2. Installation

Putting into service (starting)

Reception check

Immediately upon receipt check the motor for external damage and if found, inform the forwarding agent without delay.

Check all rating plate data, especially voltage, winding connection (star or delta), category, type of protection and temperature marking. The type of bearing is specified on the rating plate of all motors except the smallest frame sizes.

Remove transport locking if employed. Turn shaft by hand to check free rotation.

Do not exceed permissible loading values of bearing stated in the production catalogues.

Motors equipped with roller bearings:

Running the motor with no radial force applied to the shaft may damage the roller bearing.

Motors equipped with angular contact bearings:

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

The type of bearing is specified on the rating plate.

Motors equipped with regreasing nipples:

when starting the motor for the first time, or after the motor has been stored for a long time, the specified grease must be injected until grease is forced out from the grease outlet.

For details see section “Manual Lubrication” on page 12.

Insulation resistance check

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

WARNING

Disconnect and lock out before working on the motor or the driven equipment. Ensure no explosive atmosphere is present while executing insulation resistance check procedures.

Resistance, measure at 25°C, shall exceed the reference value, i.e.

10 M ohm (measured with 500V dc Megger)

WARNING

The winding should be discharged immediately after measurement to avoid risk of electric shock.

Insulation resistance reference value is halved for each 20°C rise in ambient temperature.

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

Drain hole plug, if fitted, must be removed and closing valves, if fitted, must be opened during heating. After heating, make sure the plugs are refitted.

Windings drenched in seawater normally need to be rewound.

Direct-on-line or star / delta starting

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

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

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

The voltage and connection are stamped on the rating plate.

Direct-on-line starting (DOL)

Y or D winding connections may be used.

E.g. 690VY, 400VD indicates Y-connection for 690V and D-connection for 400V.

Star / 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.

For increased safety, only direct-on-line starting of motors is normally allowed. If star-delta starting is required, please consult ABB.

Other starting methods and severe starting conditions:

In case other starting methods are used, such as a soft starter, or if starting conditions are particularly difficult, please consult ABB first.

Terminals and direction of rotation

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

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

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

Handling

Storage

The motor should always be stored indoors, in dry, vibration free and dust free conditions. Unprotected machined surfaces (shaft-ends and flanges) should be treated against corrosion.

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

Anti condensation heaters, if fitted, should be used.

Transportation

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

Lifting

Lift the motor using the lifting lugs only, unless the lifting instructions state a different method can be used.

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

Damaged lifting eyes 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 attached to the motor.

Machine weights

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

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 is shown on the rating plate.

Frame size	Cast iron Weight(M2GP)kg	Flameproof Weight(M2JA)kg
80	20	35
90	30	45
100	40	55
112	50	70
132	80	100
160	150	200
180	200	250
200	310	350
225	350	450
250	480	580
280	600	800
315	1150	1400
355	2100	2600

Installation

All rating plate values relating to certification must be carefully checked, to ensure that the motor protection, atmosphere and zone are compatible.

When fitted in a vertical position with the shaft pointing downwards, the motor must have a protective cover against falling objects and fluid.

Ensure that the motor protection corresponds to the environment and weather conditions; e.g. make sure that water cannot enter the terminal box.

The earth terminal on the frame has to be connected to PE (protective earth) with a cable as shown in EN50014.

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

Motors are intended for fixed installation only. In other cases ensure only certified cable glands for increased safety and flameproof motors are used. For non-sparking motors, cable glands should comply with GB 3836.3 / EN 60079-7. The IP-class of the cable gland should be at least same as the motor protection.

NOTE:

Cables should be mechanically protected and clamped close to terminal box to fulfill requirements of GB 3836.1 / EN 60079-0 and local installation standards.

Cooling

Check that the motor has sufficient airflow. Ensure that no nearby equipment, surfaces, or direct sunshine radiate additional heat to the motor. For Ex d motors especially of the surface temperature classed T5 with flange mounting (B5, B35, V1...), make sure that the construction allows sufficient air flow on the outer surface of the flange. For more information about higher ambient temperatures and cooling, see ABB publication "The Motor Guide " or contact your local Sales Office.

Foundation

The purchaser bears full responsibility for preparation of the foundation.

Metal foundation should be painted to avoid corrosion.

Foundation must be even, and sufficiently rigid to withstand possible short circuit forces.

They must be dimensioned to avoid vibration caused by resonance.

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 using appropriate means.

Check the alignment, drill locating holes and grout the locating pins into position with concrete.

Alignment

Correct alignment is essential to avoid bearing failure, vibrations and possible fractured shaft extensions.

Slide rails and belt drives

- Fasten the motor to the slide rails as shown in figure 2.
- Place the slide rails horizontally on the same level.
- Check that the motor shaft is parallel with the drive shaft.
- Belts must be tensioned according to the supplier's instructions.

WARNING

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

Do not exceed the maximum belt forces (i.e. radial bearing loading) stated in the relevant product catalogues.

Motors with drain plugs for condensation

Non-sparking & Increased safely motors

Check that open drain holes face downwards when the mounting orientation differs from standard horizontal mounting. For motors with sealable plastic drain plugs are delivered, in very dusty environment, all drain holes should be closed.

Flameproof motors

Drain plugs, if requested, are located at the lower part of the end shields or the frame in order to allow condensation to escape from the motor.

Periodically turn the knurled head of the drain plug in order to prevent jamming. This operation must be done when the motor is at a standstill and has been made safe to work on.

The regularity of checks depends on the humidity of the ambient air, and on the local weather conditions. This can initially be determined experimentally and must then be strictly adhered to.

Motor protection against overload and stalling

A line sensitive device should be used to protect Ex motors against overload and motor stalling. Such devices should have good reliability and a tripping time accurate to $\pm 20\%$.

Bearings

Special care should be taken with the bearings. These must be removed using pullers and fitted by heating or using of special tools for the purpose. A separate instruction leaflet, available from ABB Sales Offices, gives details on how to replace bearings.

Fitting coupling halves and pulleys

Coupling halves and pulleys must be fitted using suitable equipment and tools that do not damage the bearings and seals.

Never fit a coupling half or pulley by hammering it into place or remove it using a lever

pressed against the body of the motor.

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

Connection

In addition to the main winding and earthing terminals, the terminal box can also contain connections for thermistors, stationary heating elements, or PT 100 resistance elements.

WARNING

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

Connection diagrams for auxiliary elements and connection parts can be found inside the terminal box cover.

Approved connectors must be used to connect the auxiliary equipments. Thermistor relays, like other switches and relays, must be placed outside the explosion hazard zone.

Non-sparking & increased safely motors

Standard motors have the terminal box fitted on the top and cable entry possibilities on both sides. A full description is contained in the product catalogues.

Unused cable entries must be closed with appropriate (certified for Ex e) plugs and with same IP protection as stamped on the rating plate.

Flameproof motors

Terminal box:

- M2JA motors

Unused cable entries must be closed with certified plugs and the same IP protection as stamped on the rating plate.

Ex d-motors/M2JA

In an Ex d motor, the connection to the terminal box is standard, but care must

taken by using the following criteria when selecting the cable gland.

The cable gland must be of an approved design and have at least the same protection as the motor. It should be remembered that some cable glands are approved for a maximum amount of free space in the terminal box. The amount of free space for M2JA series is listed below for reference.

Motor type M2JA	Terminal box free space
80-132	1.45 - 1.7 dm ³
160-180	3 dm ³
200-225	8.5 dm ³
250-280	15 dm ³
315-355	25 dm ³

The type and dimensions of the cable gland must conform to the type and section of the cable. The degree of protection and diameter are specified in the documents relating to the cable gland.

When closing the terminal box cover ensure that no dust has settled on the surface gaps. Clean and grease the surface to ensure easy dismantling in the future.

WARNING

Do not open the motor nor the terminal box while the motor is still warm and energized, when explosive atmosphere is present.

Balancing

The motor's rotor is dynamically balanced.

As standard, balancing has been carried out using half key, and the shaft is marked a RED tape, with the text "Balanced with half key" or no mark at all as default.

To avoid vibration, the coupling-half or pulley must be balanced with a half key after the keyway has been machined.

When balancing with full key, the shaft is marked with a YELLOW tape, with the text "Balanced with full key".

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

3. Operating

Use

WARNING

Disconnect and lock out before working on the motor or the driven equipment. Ensure no explosive atmosphere is present while the work is in progress.

The motors are designed for the following environmental conditions:

Normal ambient temperature limits are -40°C to $+40^{\circ}\text{C}$.

(Direct starting under range -40°C to -20°C is prohibited. Appropriate measures should be taken to preheat motors to keep the temperature on the motor enclosure above -20°C by space heaters and heating stator winding with low voltage supply for a certain time. This direct current generating in the windings should not exceed the rated current on the nameplate.)

Maximum altitude 1000m above sea level.

If these limits are exceeded, all motor data and construction data must be checked to equalize the surface temperature with the temperature class according to the ignition temperature of any gases. Please contact ABB for further information.

Particular attention must be paid to corrosive atmosphere when using flameproof motors; ensure that the paint protection is suitable for the ambient conditions as corrosion can damage the explosion-proof enclosure.

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

Small motors with supply current directly switched by thermally sensitive switches can start automatically.

Points to observe:

- Do not step on the motor.
- The temperature of the outer casing of the motor may be hot to the touch during normal operation.
- Some special motor applications require special instructions.
- Lifting lugs must only be used for lifting the motor itself. They must not be used to lift the motor when it is attached to other equipment.

4. Maintenance

WARNING

Standards relating to connection and use of electrical apparatus in hazardous areas must be taken into consideration. Only fully trained personnel competent with these standards must handle this type of apparatus.

Depending on the nature of the work in question, disconnect and lock out before working on motor or driven equipment. Ensure no explosive gas or dust is present while work is in progress.

General inspection

- Inspect the motor at regular intervals. The frequency of checks depends on 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 skeleton seal ring) 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.

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

For flameproof motors, periodically turn the knurled head of the drain plug, if equipped, in order to prevent jamming. This operation must be done when the motor is at standstill. The frequency of checks depends on the humidity level of ambient air, and on the local weather conditions. This can initially be determined experimentally and must then be strictly adhered to.

Lubrication

WARNING

Beware of all rotating parts.

WARNING

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

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

Motors with permanently greased bearings

Bearings are usually permanently greased bearings of either 1Z or 2Z types.

As a guide, adequate lubrication for sizes up to 180 can be achieved for the following duration, according to L1 (i.e. that 99% of the motors are sure to make the interval time) at ambient temperature of 25°C. For duties with ambient temperature higher than 25°C, see the respective product catalogue.

Frame size	Poles	Duty hours
90–112	2–8	40 000
132	2	31 000
132	4–8	40 000
160	2	23 000
160	4–8	40 000
180	2	19 000
180	4–8	40 000

Depending on application and load conditions, see applicable product catalogue.

Hours of operation for vertical motors are half of the above values.

Motors with regreasing nipples

Lubrication information plate and general lubrication advice

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

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

The grease outlet plug must be removed permanently with automatic lubrication.

ABB policy is to have reliability as a vital issue in bearing lubrication intervals. That is why we follow the L1-principle.

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 1-2 hours to ensure that all excess grease is forced out of the bearing.
- Close the grease outlet plug if fitted.

Regreasing while motor is at a standstill

Regrease motors while running. If this is not possible, lubrication can be carried out while the machine is at a standstill.

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

Automatic lubrication

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

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

We recommend only the use of electromechanical systems. Contact your local ABB Sales Office.

The amount of grease per each lubrication interval stated in the table should be doubled if an automatic regreasing system is used.

When 2-pole motors are automatically regreased, the note about lubricant recommendations for 2-pole motors in the chapter on Lubricants should be followed.

Lubrication intervals and amounts

Frame size	Amount of grease	3600	3000	1800	1500	1000	500–900
	g	r/min	r/min	r/min	r/min	r/min	r/min

Roller bearings

Lubrication intervals in duty hours

112	10	10000	13000	18000	21000	25000	28000
132	15	9000	11000	17000	19000	23000	26500
160	25	7000	9500	14000	17000	21000	24000
180	30	6000	8000	13500	16000	20000	23000
200	40	4000	6000	11000	13000	17000	21000
225	50	3000	5000	10000	12500	16500	20000
250	60	2500	4000	9000	11500	15000	18000
280	70	2000 ³⁾	3500 ³⁾	8000	10500	14000	17000
315	90	3)	3)	6500	8500	12500	16000
355	120	3)	3)	4200	6000	10000	13000

Roller bearings

Lubrication intervals in duty hours

160	25	3500	4500	7000	8500	10500	12000
180	30	3000	4000	7000	8000	10000	11500
200	40	2000	3000	5500	6500	8500	10500
225	50	1500	2500	5000	6000	8000	10000
250	60	1300	2200	4500	5700	7500	9000
280	70	1000 ¹⁾	2000 ¹⁾	4000	5300	7000	8500
315	90	1)	1)	3300	4300	6000	8000
355	120	1)	1)	2000	3000	5000	6500

¹⁾Values for IEC sizes 280 to 355 in certain motor types (3600 and 3000 r/min), please see the next page.

Factors influencing the lubrication intervals

Lubrication intervals for vertical machines are half of the above values.

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

Note! An increase in the ambient temperature raises the temperature of the bearing correspondingly. The values should be halved for 15°C increase in bearing temperature and

may be doubled for 15°C decrease in bearing temperature.

WARNING

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

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 70-160 cST at 40°C
- Consistency NLGL grade 2-3*)
- Temperature range -30°C - +140°C, continuously.

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

Grease with the correct properties is available from all the major lubricant manufactures. Admixtures are recommended, but a written guarantee must be obtained from the lubricant manufacturer especially concerning EP admixtures, that admixtures do not damage bearing or the properties of lubricants at the operating temperature range.

WARNING

Lubricants containing EP admixtures are not recommended in high bearing temperature in frame sizes 280 to 355.

If the ambient temperature is below -25°C or above +55°C, or bearing temperature is above 110°C, consult the ABB Sales Office regarding suitable grease.

The following high performance grease can be used

- Esso Unirex N2, N3 or S2 (lithium complex base)
- Mobil Mobilith SHC 100 (lithium complex base)
- Shell Albida EMS 2 (lithium complex base)
- SKF LGHQ 3 (lithium complex base)
- Klüber Klüberplex BEM 41-132 (special lithium base)
- FAG Arcanol TEMP90 (calcium polyurea base)
- FAG Arcanol TEMP110 (lithium complex base)

Lubrication intervals for other grease fulfilling the required properties, contact your local ABB Sales Office.

Lubrication intervals and amounts, cast iron frame, 2-pole, IEC frame sizes 280 to 355

Frame size	Amount of grease		
	3600	3000	
	g/bearing	r/min	r/min

Ball bearings

Lubrication intervals in duty hours

280	35	2000	3500
315	45	2000	3500
355	60	2000	2000

Roller bearings

Lubrication intervals in duty hours

280	35	1000	1700
315	45	1000	1700

NOTE!

Always use high-speed grease for high-speed machines and some other methods, e.g. 355 2-pole machine, where the speed factor is higher than 400 000 (calculated as $Dm \times n$ where Dm = average bearing diameter, mm; n = rotational speed, r/min).

The following grease can be used:

- FAG L69 (polyurea base)
- Klüber Klüber quiet BH 72-102 (polyurea base)
- SKF LGHP2 (polyurea base)

If other lubricants are used, check with the manufacturer that the qualities correspond to those of the above-mentioned lubricants, or if the compatibility of the lubricant is uncertain, contact your local ABB Sales Office.

Spare parts

Spare parts must be original parts supplied and checked by ABB.

Requirements in Standard IEC 60079-19 should be respected.

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

If the motor is stamped with a serial manufacturing number, this should also be given.

Dismantling, re-assembly and rewinding

Follow the instructions given in standard IEC 60079-19 regarding dismantling, re-assembly and rewinding. Any operation must be undertaken by the manufacturer, i.e. ABB, or by an accredited company.

It must be remembered that no manufacturing alterations are permitted on the parts that make up the explosion-proof enclosure. Also ensure that the ventilation is never, under no circumstances, obstructed.

Rewinding should be carried out by qualified Ex / EEx approved repair shops.

When re-assembling end shield or terminal box to the frame, check that the spigots are clean of paint and dirt with only a thin layer of grease.

Bearings

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

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

Any indication placed on the motor, such as labels, must be followed.

NOTE!

Any repair by the end user, unless expressly approved by the manufacturer, releases the manufacturer from his responsibility of conformity.

5. Environmental requirements

Noise levels

Most of ABB's motors have a sound pressure level not exceeding 85 dB (A) (± 3 dB) at 50 Hz AC.

Values for specific machines can be found in the relevant product catalogues.

For sound pressure levels for 60 Hz sinusoidal supply, contact ABB Sales Office.

These instructions do not cover all details or variations in equipment nor provide for every possible condition to be met in connection with installation, operate or maintenance.

Should additional information be required, please contact the nearest ABB Sales Office.

Motor trouble shooting chart

Your motor service and any trouble shooting must be handles by qualified persons who have proper tools and equipment.

TROUBLE	CAUSE	WHAT TO DO
Motor fails to start	Blown fuses	Replace fuses with proper type and rating.
	Overload trips	Check and reset overload in starter.
	Improper power supply	Check to see that power supplied agrees with motor rating plate and load factor.
	Improper line connections	Check connections with diagram supplied with motor.
	Open circuit in winding or control switch	Indicated by humming sound when switch is closed. Check for loose wiring connections. Also, ensure that all control contacts are closing.
	Mechanical failure	Check to see if motor and drive turn freely. Check bearing and lubrication.
	Short circuited stator	Indicated by blown fuses. Motor must be rewound.
	Poor stator coil connection	Locate with test lamp.
	Rotor defective	Look for broken bars or end rings.
Motor stalls	Motor may be overloaded	Reduce load.
	One phase may be open	Check lines for open phase.
	Wrong application	Change type or size. Consult manufacturer.
	Overload	Reduce load.
	Low voltage	Ensure the rating plate voltage is maintained. Check connection.
Motor runs and then dies down	Open circuit	Fuses blown, check overload relay, stator and push buttons.
	Power failure	Check for loose connections to line, to fuses and to control.
Motor does not come up to speed	Not applied properly	Consult supplier for proper type.
	Voltage too low at motor terminals because of line drop	Use higher voltage or transformer terminals or reduce load. Check connections. Check conductors for proper size.
	Starting load too high	Check load motor is supposes to carry at start.
	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	Locate fault with testing device and repair.
Motor takes too long to accelerate and/or draws high amp	Excessive load	Reduce load.
	Low voltage during start	Check for high resistance. Adequate wire size.
	Defective squirrel cage rotor	Replace with new rotor
	Applied voltage too low	Get power company to increase power tap.
Wrong rotation	Wrong sequence of phases	Reverse connections at motor or at switchboard.

TROUBLE	CAUSE	WHAT TO DO
Motor over-heats while running under-loaded	Overload	Reduce load.
	Frame or bracket vents may be clogged with dirt and prevent proper ventilation of motor	Open vent holes and check for a continuous stream of air from the motor.
	Motor may have one phase open	Check to make sure that all leads are well connected.
	Grounded coil	Locate and repair
	Unbalanced terminal voltage	Check for faulty leads, connections and transformers.
Motor vibrates	Motor misaligned	Realign.
	Weak support	Strengthen base.
	Coupling out of balance	Balance coupling.
	Driven equipment unbalanced	Rebalance driven equipment.
	Defective bearings	Replace bearings.
	Bearings not in line	Line up properly.
	Balancing weights shifted	Rebalance motor.
	Contradiction between balancing of rotor and coupling (half key-full key)	Rebalance coupling or motor.
	Polyphase motor running single phase	Check for open circuit.
Scraping noise	Excessive end play	Adjust bearing or add shim.
	Fan rubbing air shield	Remove interference.
	Fan striking insulation	Clear fan.
Noisy operation	Loose on bedplate	Tighten holding bolts.
	Airgap not uniform	Check and correct bracket fits or bearing.
Hot bearings ball	Rotor unbalance	Rebalance.
	Bent or sprung shaft	Straighten or replace shaft.
	Excessive belt pull	Decrease belt tension.
	Pulleys too far away from shaft shoulder	Move pulley closer to motor bearing.
	Pulley diameter too small	Use larger pulleys.
	Misalignment	Correct by realignment of drive.
	Insufficient grease	Maintain proper quality of grease in bearing.
	Deterioration of grease or lubricant contaminated	Remove old grease, wash bearings thoroughly in kerosene and replace with new grease.
	Excess lubricant	Reduce quantity of grease, bearing should not be more than 1/2 filled.
	Overloaded bearing	Check alignment, side and end thrust.
	Broken ball or rough races	Replace bearing, first clean housing thoroughly.

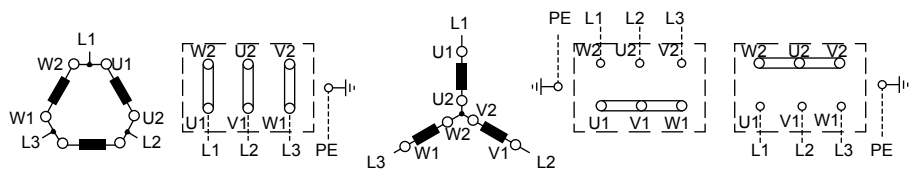


Figure 1. Connection diagram

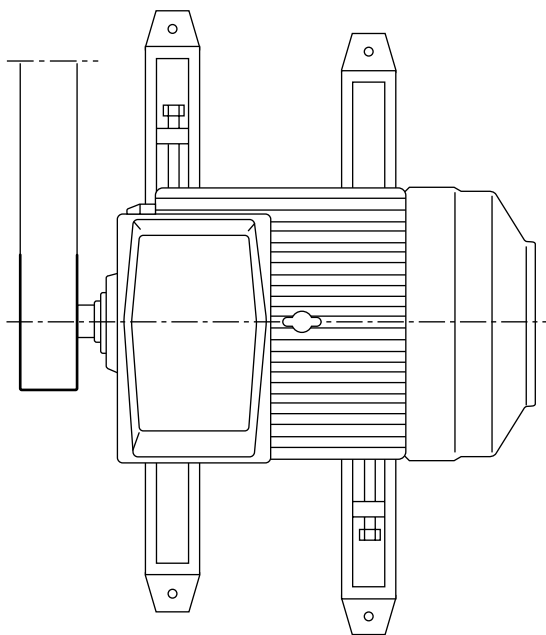


Figure 2. Belt drive

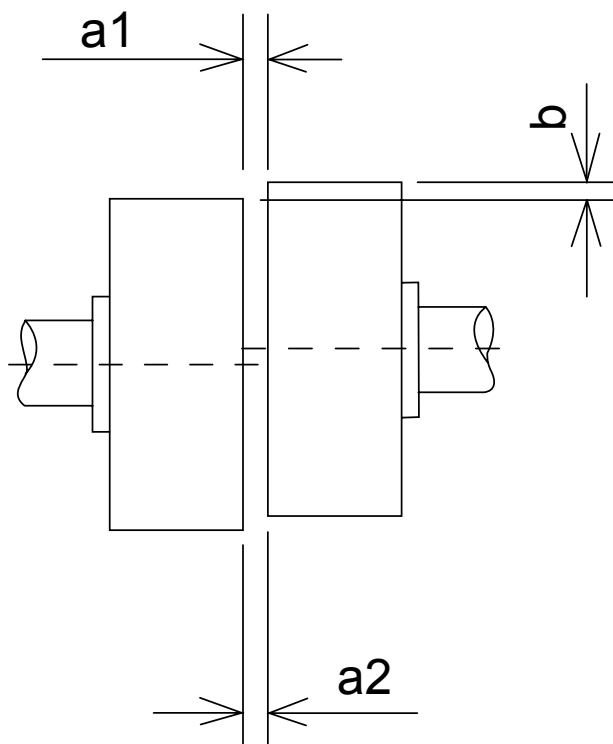


Figure 3. Mounting of half-coupling or pulley

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 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.



EU Declaration of Conformity

The Products: 3-phase induction motors of series M2JA as listed in this document on the page 2 having correspondent name plate marking covered by those as listed.

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 motors of the declaration described above are in conformity with the relevant Union harmonisation legislation:

Directive 2014/34/EU

The following harmonised standards are applied in relation to which conformity is declared:
EN 60079-0:2012+A11:2013¹, EN 60079-1:2014², EN 60079-7:2015⁴, EN 60079-31:2014³ and relevant parts of the EN 60034 –series of standards.

Directive 2011/65/EU

Motors are in conformity with the Directive 2011/65/EU and the amending Annex II to Directive 2011/65/EU of the Delegated Directive (EU) 2015/863 of the European Parliament of the Council on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

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

Note:

Motors have to be installed and maintained according to the relevant standards and instructions of ABB Shanghai Motors Co., Ltd. When installed in converter supplied applications, additional requirements must be respected regarding the motor as well as the installation as described in the appropriate dedicated addendum.

Notified Body (ExNB): LCIE (0081) ; Av. Du Général Leclerc. 33, 92266 Fontenay-aux-Roses, France.

Signed for and on behalf of: ABB Shanghai Motors Co., Ltd.

Place and date of issue: Shanghai, China, 2019-06-19

Signed by RC
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2019-06-19

Certificates:

Group & category, temperature class, type of protection, equipment protection level (EPL)	Motor type, IEC frame size	Certification number
3-phase induction motors, series M2JA Cat.2 Flameproof enclosure "d" II 2 G Ex d or d e IIB or IIC T5...T1 Gb IP55, IP56, In addition: Dust ignition protection by enclosure "t" II 2 D Ex tb IIIC T100°C...T450°C Db IP65, IP66 3-phase induction motors, series M2JA Cat.3 Dust ignition protection by enclosure "t" II 3 D Ex tb IIIC T100°C...T450°C Dc IP65, IP66	M2JA 80	LCIE 04 ATEX 6095 X / 02
	M2JA 90	LCIE 04 ATEX 6096 X / 02
	M2JA 100	LCIE 04 ATEX 6097 X / 02
	M2JA 112	LCIE 04 ATEX 6098 X / 03
	M2JA 132	LCIE 04 ATEX 6099 X / 03
	M2JA 160	LCIE 04 ATEX 6100 X / 02
	M2JA 180	LCIE 04 ATEX 6101 X / 02
	M2JA 200	LCIE 04 ATEX 6102 X / 02
	M2JA 225	LCIE 04 ATEX 6103 X / 02
	M2JA 250	LCIE 04 ATEX 6104 X / 02
	M2JA 280	LCIE 04 ATEX 6105 X / 02
	M2JA 315	LCIE 04 ATEX 6106 X / 02
	M2JA 355	LCIE 04 ATEX 6107 X / 02
Special conditions for safe use when the certificate number is followed by sign "X" The gaps of the different flame path are less than the values specified in the tables of the EN 60079-1 standard. The width of the different flameproof joints are superior to these specified in tables of EN 60079-1 standard.		

1) A comparative study of the standards; EN 60079-0 (version A11:2013 and 2012) shows that the products are not concerned by the substantial modifications.

2) A comparative study of the standards; EN 60079-1 (version 2007 and 2014) shows that the products are not concerned by the substantial modifications.

3) A comparative study of the standards; EN 60079-31 (version 2009 and 2014) shows that the products are not concerned by the substantial modifications.

4) A comparative study of the standards; EN 60079-7 (version 2007 and 2015) shows that the products are not concerned by the substantial modifications.

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