

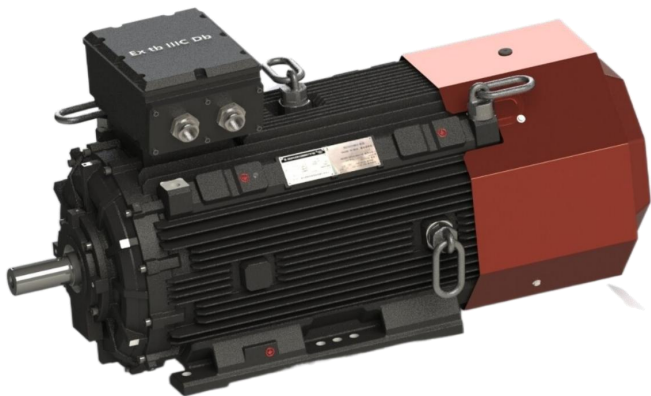


三相异步电动机使用维护说明书

Operation and Maintenance Manual of

Three~phase Induction Motor

(版本/ Ver: A-1, 2022)



山东华力电机集团股份有限公司

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一、概述

1、适用范围

本说明书适用于华力各标准系列及其所派生的各种系列电机（防爆系列电机除外）。机座中心高：63-355。包括：HM2/ HM3/ HM4/ YE3/ YE4/ YE5 等。

特殊设计或特殊应用场合的电动机还需参考其它指导说明。

2、能效标识

符合 GB18613-2020《电动机能效限定值及能效等级》和 CEL 007-2021《三相异步电动机能源效率标识实施规则》规定的三相异步电动机已在中国能效标识网上备案，并标贴相应的能效标识。

二、通用要求

1、使用环境

1.1 海拔 1000m 以下，否则需订购高原电机。

1.2 环境温度一般在-15~40°C范围内，否则需要特殊定制。

1.3 电机正常运转，轴承温度不宜超过 95°C；机壳表面温度不宜超过 120°C。

2、存放及运输

2.1 电机存放要求干燥、防尘及防震，避免周围环境温度的急剧变化。

2.2 电动机贮存中不宜堆放太高，以免损坏下层电动机的包装。

2.3 贮存及运输中应防止电动机倾倒或倒置。

2.4 湿度较大地域，应定制配有加热器的电机，并定期使用加热器进行抗凝露工作。

2.5 一般配置圆柱滚子轴承电机带有轴伸锁紧装置，在电动机到达终端用户之前，不宜拆除锁紧装置，否则易引起轴承损伤。

3、安装前的检查

- 3.1 电动机开箱前应检查包装是否完整无损，有无受潮的迹象。
- 3.2 电动机开箱后应小心清除电机上的尘土及开箱时产生的杂物。
- 3.3 检查电动机的铭牌数据是否符合要求。
- 3.4 仔细检查电动机有无损坏变形。紧固件是否松动或脱落，试用手转动电动机是否灵活。
- 3.5 用 500V 兆欧表测量定子绕组绝缘电阻，其值至少不应低于 $5M\Omega$ 。否则应进行干燥处理，以冷态绝缘电阻大于 $5M\Omega$ 为验收标准。

备注：烘箱干燥，打开电机排水阀，温度不超过 100°C ，干燥时间 4 个小时左右，检测绝缘电阻不低于 $0.5M\Omega$ ，然后冷却 24 小时后进行冷态绝缘电阻测量，其值大于 $5M\Omega$ 即表明烘干完成。否则重复上述工作直至合格。

4、安装

- 4.1 安装支架应平稳、足够坚固并避免与电机本体产生共振。
- 4.2 安装时，应保证电动机有良好的通风条件，风罩外侧预留空间不小于下表的规定。

中心高	H80~132	H160~180	H200~355
空间	25mm	30mm	50mm

- 4.3 将填料函内的橡皮圈穿孔后进行接线，并将压紧螺母拧紧，达到防水、防震的要求。
- 4.4 检查并确认电动机的排水阀位置是否朝下。
- 4.5 建议电动机采用联轴器连接，如果电机是双轴伸，第二轴伸必须采用联轴器连接。

4.6 安装要求：采用联轴器连接时，要求电动机轴中心线与负载中心重合。采用皮带传动时，要求电动机轴中心线应与负载中心线平行且皮带中心线与轴中心线垂直。

备注：电机连接安装请采用加热安装方式，以免硬性安装损害轴承。热装时需及时强制冷却，使轴承温度不高于 95°C。

4.7 安装完毕，应检查各紧固件、联接件是否可靠，用手转动转轴应轻松无相擦。

5、电动机的接线及运转

5.1 电动机应妥善接地，接线盒内有接地装置。

5.2 电动机共有 6 根接线头，分别标以 U1、V1、W1、U2、V2、W2，电动机引出线接线方法请按接线盒盖上标明的方法连接。

5.3 电动机在实际负载运转中应继续观察其起动情况，运转时声音是否正常，以及实际负载电流是否超过铭牌上的规定值，在运转 0.5~1 小时后，应停车检查电动机各机械连接部分有无松动，轴承有无过热及漏油。电动机空载或负载运行时，不应有断续的或异常的声响或振动。如无异常情况发现，即可正式使用。

5.4 电动机应满压起动，如电源容量不足不能满压起动时，则可采用降压启动。电动机的起动转矩降低与电压降低的平方成正比，降压启动一般采用 Y- Δ 起动器，Y 接起动时，电源电压须为 Δ 接法的额定电压，起动转矩约为满压起动转矩的 1/3。

5.5 当电源相序依次与接线柱 U1、V1、W1 连接，电动机默认转向为顺时针（CW，从轴伸端视之），若调换任意两相，即可改变转向。

5.6 接线盒内若配有电子原件，例如热敏电阻 PTC、测温 PT100、加热带 Heater 等，可按接线盒内接线指示图接线。

6、电动机的运维、检修

6.1 电动机应按铭牌所载的额定值使用，切莫过载，并注意清洁和

检查，防止受潮或异物进入机体内部。

6.2 应按周期记录有关仪表数据，运行期间的检修情况，对故障处理做记录，以供后期维护及检修提供依据。

6.3 H80~132 电动机使用封闭免维护轴承不用再加润滑脂。H160 以上电动机采用的是开启式轴承，H160~355 机座号 2P 电机轴承使用的润滑脂为 HTHS，其余极数电机使用 HP-R 润滑脂。需要注脂时，将排油孔打开，用油枪将润滑脂从注油孔注入，注油完成后，清理废油并封闭排油孔。

定量注脂按下表执行：（带有注脂铭牌的电动机以铭牌为准）

机座号	驱动端 轴承	非驱动端 轴承	注脂间隔时间			油脂 量 g
			n<3600 r/min	n<1800 r/min	n<1200 r/min	
H160	6309C3	6309C3	6000	12000	18000	13
H180	6311C3	6311C3	4000	11000	16000	15
H200	6312C3	6312C3	3500	8500	13000	20
H225	6313C3	6313C3	3000	6000	9000	22
H250	6314C3	6314C3	2000	5000	8000	23
H280 2P	6314C3	6314C3	1200	-	-	30
H280 4-8P	6317C3	6317C3	-	4000	6000	35
H315 2P	6316C3	6316C3	1200	-	-	30
H315 4-10P	6319C3	6319C3	-	2000	3000	45
H355 2P	6319C3	6319C3	1200	-	-	30
H355 4-10P	6322C3	6322C3	-	1400	2200	60

6.4 轴承属易损关键部件，应保证运行期间的良好润滑，电机运行过程中，应对轴承进行监测，以避免出现不可控的设备停机。轴承温度

监测采用装配 PT100 轴承测温元件或红外线测温仪远程测量,发现轴承温度接近 85°C预警线, 建议进行轴承质量排查。

6.5 电动机应定期进行检修, 每三个月小检修一次, 每年大检修一次。

检修类	检修项目	现象	解决方案
小检	机壳、端盖	有积尘、污垢	清理
	接线盒、接线板	有灰尘、受潮	清理、热风机吹干
	绝缘电阻	冷态 $<5M\Omega$ 热态 $<0.5M\Omega$	烘干
	接地线	松动	拧紧接地螺钉
	接头	松动	更换端子头, 可靠压接
	紧固件、传动件	松动	重新拧紧、装配各紧固件、传动件
	润滑脂	外部泄露	更换油封
	风罩通风孔	堵塞	清理
大检	开盖, 线圈检查	端部绑扎有损坏, 润滑脂泄露	重新对线圈绑扎、绝缘处理, 清理润滑脂, 更换密封圈
	润滑脂检查	变色或发黑、污染	更换润滑脂
	轴承检查	轴承损坏、异音	更换同型号轴承
	油封、密封圈	磨损、硬化	更换同型号油封、密封圈
	风扇	破损	更换风扇

注意事项: 大检修时手工更换润滑脂占轴承室的 2/3。应使用的刮除器(硬塑料制)刮除旧脂, 避免金属物、棉织物接触轴承。检修工作中应有效防止灰尘等杂物对轴承的污染, 要防止电机受潮。

7、保证期

在用户按照使用维护说明书的规定使用和存放电动机的情况下, 我公

司保证电动机使用的一年内（自制造厂起运的日期不超过二年）能良好的运行。如在此规定的时间内，电动机因制造质量不良而发生损坏或不正常工作时，我公司无偿地为用户修理更换零件或电机。

三、调速电动机的使用和维护特点

1、变极双速电动机

1.1 绕组型式分为双套绕组和单套绕组

双套绕组联接方式：高/低速——Y/Y

单套绕组联接方式：高/低速——YY/Y, YY/ Δ

具体接线方式可参照接线盒内接线指示图操作。

1.2 测量绝缘电阻时，双套绕组需要分别测量。

2、变频调速电动机

2.1 电动机按接线指示图和铭牌所示接法接线，强冷风机通过风机接线盒接线，风机电压一般与电机保持一致，风机旋向须与风机壳上的旋向标识保持一致。

2.2 启动前检查、确认电机可靠接地，同时注意电机和变频器避免公用接地。

2.3 由于变频器输出波形中含有高次谐波的影响，电机振动、噪声与工频电源相比会出现略大的情况，属于正常现象。另外，有可能会出现在调频至电机与机械负载的谐振点时，出现较大振动和噪声，可通过加强系统刚度或者设置变频器避开谐振频率。

四、高温消防电动机的使用和维护特点

1、电动机在不超过 40℃的环境下可正常连续运行。

2、电机绝缘等级为 H 级，高温排烟工作条件下满足 250℃，电机运转 2 小时；高温排烟工作条件下满足 300℃，电机运转 1 小时。具体

参见铭牌信息。

3、对于平时不运转仅在高温排烟工况使用的电动机，建议至少每月启动一次，运转 30 分钟以上，每 2 年更一次换润滑脂，以确保电机处于良好的备用工作状态。

五、电磁制动电机的使用和维护特点

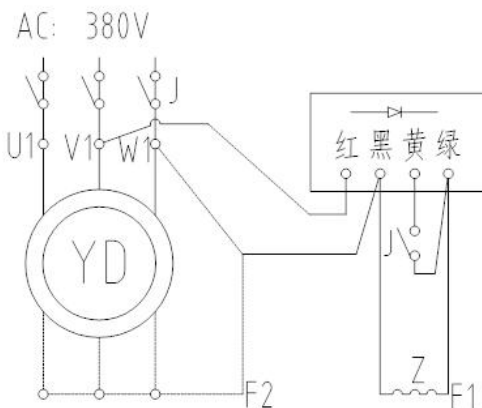
1、安装

检查紧固件是否松动或脱落，电磁控制器上有一个“手动释放装置”手柄，扳动手柄可使衔铁与制动盘脱离（释放），便于传动轴的安装和调节。

2、接线

电动机的接线盒内装有整流装置，接线方法如图 1，图中的虚线为 AC220V，DC99V 的接线。整流装置需配合快速制动量，将“黄、绿”两接线接到接触器的常开触点，当制动电机允许以较慢的速度制动，可将“黄、绿”两线直接短接。

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。



3、电动机制动的主要技术参数如表

机座号	额定制动力矩 N.M	正常工作气隙 mm	最大允许工作气隙 mm	励磁电压 V
80	7.5	0.3	1	99
90	15	0.3	1	99
100	30	0.4	1	99
112	40	0.4	1	170
132	75	0.5	1.2	170
160	150	0.5	1.2	170
180	200	0.6	1.5	170
200	300	0.6	1.5	170
225	450	0.6	1.5	170
250	600	0.8	2	170
280	850	0.8	2	170
315	2000	1.2	1.2	170

六、主要故障及修理方法

故障	可能原因	修理方法
起动异常(异响、振动)	一相断路	查出断电处并修理
转动异响且电机过热	绕组短路	修理绕组
起动后转速低	(1) 相绕组首末端末端接错 (2) 电压降低	(1) 找出每相首末端末端后正确连接 (2) 检查电源电压
绝缘电阻较低	绕组脏污或受潮	清理电机干燥绕组
绕组温升过高	电机过载	减轻负载
轴承过热	(1) 电动机与转动机械连接偏心, 皮带张力过大 (2) 轴承润滑脂过多或过少 (3) 轴承损坏	(1) 检查同心 (2) 检查润滑脂储量
轴承响	(1) 轴承磨损 (2) 轴承脏污, 润滑脂干少	(1) 换轴承 (2) 换新润滑脂
振动超标	(1) 基础刚度不够 (2) 电动机轴与传动机械轴不同心	(1) 重新安装 (2) 检查同心

I Introduction

1 Validity

The instruction is valid for HuaLi standard series and its derived series of three- phase induction motor (except the explosion- proof motors). Frame size: H63~ 355, including HM2/ HM3/ HM4/ YE3/ YE4/ YE5 series etc. Additional information is required for some motor types due to special application or design consideration.

2 Energy efficiency label

Motors valid for GB 18613-2020 and CEL 007-2021 have been registered in the official website of China Energy Label.

II General requirements

1 Service environment

1.1 Altitude should be lower than 1000 meters, otherwise order high land motor.

1.2 Environment temperature should be in the range of $-15 \sim 40^{\circ}\text{C}$, otherwise special order is expected.

1.3 Bearing temperature should not surpass 95°C and surface temperature of enclosure should not surpass 120°C during normal running.

2 Storage and transportation

2.1 Dry, dust-proof, anti- vibration, and no rapid change of temperature are required for motor storage.

2.2 Stack too high is not suitable for avoiding to damage substrate motor packing.

2.3 During storage and transportation, the motor should be prevented from toppling or turning upside down.

2.4 Where the humidity is large, the motor equipped with heater should be customized, and the heater should be used regularly for anti-condensation work.

2.5 Generally, cylindrical roller bearing motor is equipped with shaft extension locking device. Before the motor reaches the end user, the locking device should not be removed, otherwise it is easy to cause bearing damage.

3 Check before installation

3.1 Before unpacking the motor, check whether the package is intact and whether there is any sign of dampness.

3.2 After the motor is unpacked, the dust on the motor and sundries produced during unpacking should be carefully removed.

3.3 Check whether the nameplate data of the motor meets the requirements.

3.4 check the motor for any damage or deformation carefully. Whether the fastener is loose or fall off, try whether the hand rotating motor is flexible.

3.5 Insulation resistance in cold condition of stator winding should not lower than $5M\Omega$ by using 500V megohmmeter, otherwise, dry treatment should be carried out.

Note: Dry the oven, open the drain valve of motor, the temperature is not more than 100°C , the drying time is about 4 hours, test the insulation resistance is not less than $0.5M\Omega$, and then test resistance after 24 hours, if the value is greater than $5M\Omega$, indicates that the drying is completed. Otherwise, repeat the above work until qualified.

4 Installation

4.1 The mounting bracket should be stable, strong enough to avoid resonance with the motor body.

4.2 When installing the motor, it should be guaranteed that the motor has good ventilation conditions, and the reserved space on the outside of the wind hood is not less than the provisions in the table below.

Height of center	H80~132	H160~180	H200~355
space	25mm	30mm	50mm

4.3 Perforate the rubber ring in the stuffing box for wiring, and tighten the pressing nut to meet the requirements of waterproof and shock proof.

4.4 Check and confirm that the motor's drain valve position is facing down.

4.5 It is recommended that the motor be connected with a shaft coupling. If the motor is a double shaft extension, the second shaft extension must be connected with a shaft coupling.

4.6 Installation requirements: when the coupling is used, the center line of the motor shaft shall coincide with the load center line. When the belt drive is used, the center line of the motor shaft shall be parallel to the load center line and the center line of the belt shall be perpendicular to the center line of the shaft.

Remark: Please use heating installation method to connect the motor, so as not to damage the bearing by hard installation. Forced cooling shall be required in time when hot loading, so that the bearing temperature shall

not be higher than 95°C.

4.7 After installation, check whether the fastener connection is reliable. Turn the shaft by hand easily without rubbing.

5 Connection and operation of motor

5.1 The motor should be properly grounded and there is a grounding device in the junction box.

5.2 Motor has 6 connecting ends, respectively marked U1, V1, W1, U2, V2, W2. Connect the motor's lead wire accord to the method marked on the cover of the terminal box.

5.3 During the actual load operation, the motor should continue to observe its starting condition, whether the sound is normal during the operation, and whether the actual load current exceeds the specified value on the nameplate. After 0.5~1 hour of operation, the motor should be stopped to check whether the mechanical connections of the motor are loose, whether the bearings are overheating and oil leakage. When the motor is running under no load or load, there should be no discontinuous or abnormal sound or vibration. If no abnormal situation is found, it can be formally used.

5.4 The motor should be started at rated voltage. If the power supply capacity is not enough to start at rated voltage, the step-down start can be adopted. The starting torque of the motor is proportional to the square of the voltage reduction. The step-down starting generally uses Y- Δ starter. When Y is connected to start, the power supply voltage must be the rated voltage of the Y connection method, and the starting torque is about 1/3 of the rated starting torque.

5.5 When the phase sequence of the power supply is connected to the

terminal U1, V1 and W1 in turn, the default rotation direction of the motor is clockwise (CW, as seen from the shaft extension). If any two phases are replaced, the rotation direction can be changed.

5.6 Electronic device equipped in the terminal box, such as thermistor PTC, temperature measuring PT100, Heater, etc., can be connected according to the wiring indication diagram.

6 Operation and maintenance

6.1 The motor should be used according to the rated value on the nameplate, avoid overload, and pay attention to cleaning and inspection to prevent dampness or foreign matter from entering the body.

6.2 Instrument and maintenance data during operation should be recorded periodically, and the fault treatment should be recorded, so as to provide basis for later maintenance.

6.3 H80~132 motors use closed maintenance-free bearings without adding grease. Open type bearings are used for motors above H160, HTHS, lubricating grease, is used for bearings of 2P motors with frame size H160 ~ 355, and HP-R grease is used for bearings of motors with other pole numbers. When grease is needed, open the drain hole and inject the grease from the hole with the oil gun. After oil is filled, clean up the waste oil and close the drain hole.

Quantitative grease should be performed accord to table below: (For motors with grease nameplates, the nameplate shall prevail)

Frame size	D- end Bearing	N- end bearing	Grease interval time			Grease (g)
			n<3600 r/min	n<1800 r/min	n<1200 r/min	
H160	6309C3	6309C3	6000	12000	18000	13
H180	6311C3	6311C3	4000	11000	16000	15
H200	6312C3	6312C3	3500	8500	13000	20
H225	6313C3	6313C3	3000	6000	9000	22
H250	6314C3	6314C3	2000	5000	8000	23
H280 2P	6314C3	6314C3	1200	-	-	30
H280 4-8P	6317C3	6317C3	-	4000	6000	35
H315 2P	6316C3	6316C3	1200	-	-	30
H315 4-10P	6319C3	6319C3	-	2000	3000	45
H355 2P	6319C3	6319C3	1200	-	-	30
H355 4-10P	6322C3	6322C3	-	1400	2200	60

6.4 Bearing is a key and damageable component, and good lubrication should be guaranteed during operation. During the operation of the motor, the bearing should be monitored to avoid uncontrollable equipment shutdown. Bearing temperature monitoring adopts PT100 bearing temperature measuring element or infrared thermometer for remote measurement, if the bearing temperature is close to the 85°C, it is recommended to carry out bearing quality inspection.

6.5 The motor should be inspected regularly, every three months a line check, overhaul once a year.

Category	Item	Phenomenon	Solution
Line check	frame, shield	Dirt retention	Clear
	Terminal box and board	Dusty, damp	Clear, air heater
	Insulation resistance	Cold state<5MΩ Thermal state<0.5MΩ	Drying
	Ground lead	Looseness	Tighten the ground screw
	Terminal	Looseness	Replace the terminal
	Fastener	Looseness	Retighten
	Grease	Reveal	Replace the seal
	Fan cover aspirail	Blocking	Clear
Overhaul	Check winding	Winding strap damage	Retie the coil
	Check grease	Discoloration or blackness, contamination	Replace grease
	Check bearing	Abnormal noise	Replace bearing
	Seal	Abrasion	Replace seal
	Fan	Damage	Replace

Note: manual replacement of grease accounts for 2/3 of the bearing room during overhaul. Scraper should be used (made of hard plastic) to scrape old grease, to avoid metal and cotton fabric contact bearing. The maintenance work should effectively prevent dust and other sundries

from polluting bearing and to prevent the motor from damp.

7 Guarantee period

Under the condition that the user uses and stores the motor according to the operation and maintenance manual, we guarantee that the motor can run well within one year (the date of shipment from the manufacturer shall not exceed two years). If the motor is damaged or does not work normally due to poor manufacturing quality within the specified time, we will repair and replace the parts or motor for the user free of charge.

III Characteristics of use and maintenance of variable-speed motor

1 Double speed motor

1.1 The winding type include double winding and single winding

connection way of double winding: high/ low speed——Y/Y

connection way of single winding: high/ low speed——YY/Y, YY/ Δ

Connect motor to power by referring to the wiring indication diagram in the terminal box

1.2 Insulation resistance of double speed winding should be measured separately.

2 Variable frequency motor

2.1 The motor is wired according to the wiring instruction diagram and the nameplate, and the ventilator is wired through the separate terminal box. The fan voltage is generally consistent with the motor, and the rotation direction of the fan must be consistent with the rotation mark on the fan shell.

2.2 Check and confirm that the motor is grounded reliably before starting,

and pay attention to avoid common grounding of the motor and frequency converter.

2.3 Due to the influence of ultraharmonics in the output waveform of the frequency converter, the vibration and noise of the motor will be slightly larger than that of the power frequency power supply, which is a normal phenomenon. In addition, there may be large vibration and noise when the frequency is modulated to the resonance point of the motor and mechanical load. The resonance frequency can be avoided by strengthening the stiffness of the system or setting the frequency converter.

IV The use and maintenance characteristics of high temperature fire motor

1 The motor can operate normally and continuously under the environment of no more than 40°C.

2 The insulation class of the motor is H, which can meet 250°C under the working condition of high temperature smoke extraction, and the motor runs for 2 hours. High temperature smoke exhaust working conditions meet 300°C, motor operation for 1 hour. See the nameplate information for details.

3 For motors that do not operate at ordinary times and are only used in high temperature smoke exhaust conditions, it is recommended to start motor at least once a month, run for more than 30 minutes, and change the grease once every 2 years to ensure that the motors are in good condition.

V Characteristics of use and maintenance of electromagnetic brake motor

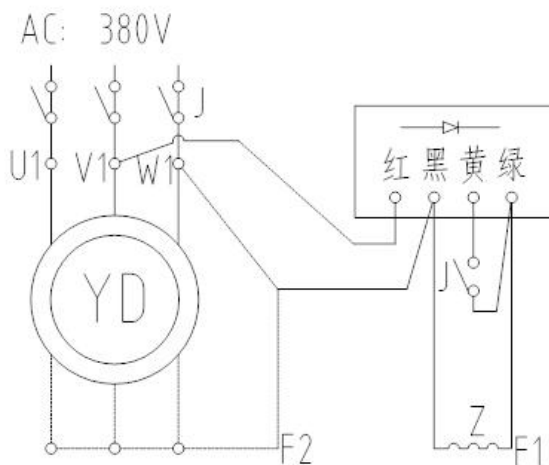
1 Installation

Check whether the fastener is loose or fall off. There is a "manual release device" handle on the electromagnetic controller. By pulling the handle, the armature can disengage (release) from the brake disc, which is convenient for the installation and adjustment of the transmission shaft.

2 Connection

The motor's junction box is equipped with a rectifying device. The wiring method is shown in Figure 1. To realize prompt breaking action, keep "yellow" and "green" wires open contact. When the braking motor allows to brake at a slower speed, the "yellow" and "green" wires can be directly short-connected.

Switch on the power to carry out no-load operation. If the brake is still attached after the motor is connected to the power, the motor is still in the braking state, so the power must be cut off immediately to avoid burning the motor.



3 The main technical parameters of motor braking are shown in the table

Frame size	Rated breaking torque N.M	Normal gap mm	Maximum gap mm	Exciting voltage V
80	7.5	0.3	1	99
90	15	0.3	1	99
100	30	0.4	1	99
112	40	0.4	1	170
132	75	0.5	1.2	170
160	150	0.5	1.2	170
180	200	0.6	1.5	170
200	300	0.6	1.5	170
225	450	0.6	1.5	170
250	600	0.8	2	170
280	850	0.8	2	170
315	2000	1.2	1.2	170

VI Main troubles and trouble shooting

Trouble	Cause	Remedy
Fails to start with noise or vibration	One phase line open circuited	Find out the broken points and connect well
Rotates with noise and overheated	Winding short circuited	Repair the winding
Speed is very low after starting	1. Beginning and end terminals of phase winding are wrong connected 2. Applied voltage is too low	1. Find out the beginning and end terminals of every phase and connect them correctly 2. Check main voltage
Insulation resistance reduces	Winding is dirty or damped	Clean motor and dry the winding
The temperature rise of the winding is too high	Motor overloaded	Reduce the load and check other parts
Bearing overheated	1. Motor is not concentric with driven machine, or belt tension is too high 2. Grease in bearing is too much or little 3. Bearing is damaged	1. Check concentricity 2. Check the storage of grease

Bearing sounds	<ol style="list-style-type: none"> 1. Bearing is damaged 2. Bearing is dirty or with little grease 	<ol style="list-style-type: none"> 1. Replace bearing 2. Refresh grease
Greater vibration	<ol style="list-style-type: none"> 1. The stiffness of foundation is too low 2. Motor's shaft is not concentric with driven machine 	<ol style="list-style-type: none"> 1. Reinstall 2. Check concentricity

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