河南宗久机电设备有限公司

ZD

主起升系列

锥形转子制动
三相异步电动机

使用安装维护说明书

中文说明书

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河南宗久机电设备有限公司
Henan Zongjiu Electromechanical Equipment Co., Ltd.

01 产品与选用

产品说明与主要配置

感谢您选用河南宗久机电设备有限公司产品。本说明书适用于本公司 ZD 系列主起升用锥形转子制动三相异步电动机，供安装、操作和维护人员使用。安装和使用前，应核对产品铭牌、随机接线图及配套电动葫芦或起重机要求。

本系列主要作为电动葫芦及起重机主起升机构的动力。电机功率不能单独确定设备允许起重量；选型还应核对起升速度、传动比、滑轮倍率、负载惯量、工作制及制动能力。法兰或功率相同不代表能够直接替换。

锥形转子与制动原理

通电后，锥形气隙中的磁场产生轴向磁拉力，使转子及相连制动部件沿轴向移动，克服弹簧力并释放摩擦副，电机开始运转。断电后，弹簧推动转子和制动部件复位，摩擦副压紧并产生制动转矩。轴向运动受阻会影响松闸或复位，因此必须保证安装配合和规定移动空间。

系列主要配置

产品用途	电动葫芦及起重机主起升机构
结构与制动	锥形转子 / 轴向松闸 / 弹簧复位摩擦制动
常规供电	三相交流 380 V / 50 Hz / Y 接
工作制	S4–40% / 起动频次按本型号允许值
绝缘等级	F 级
防护等级	IP44、IP54 或 IP55 / 按订货配置及铭牌
安装形式	B5 法兰安装 / IM3001
环境条件	−15 ℃至+40 ℃ / 海拔不超过 1000 m
功率及性能	具体功率、极数、转速、电流和制动力矩按铭牌及确认规格

具体型号、功率、额定电流、转速及制动力矩以产品铭牌和确认规格为准。额定运行电流、起动电流、轴向磁拉力及制动力矩是不同参数，不得相互替代；热保护整定不得直接采用起动电流。

保持环境干燥、洁净，电机周围通风良好；露天使用应设置防雨措施。本系列不适用于易燃易爆、熔化金属及酸碱蒸汽等场合。IP 防护等级不等于防爆或冶金专用资格，特殊环境须使用经确认适用的产品。

供电、安装及防护配置以本型号铭牌和随机资料为准。

河南宗久机电设备有限公司 Henan Zongjiu Electromechanical Equipment Co., Ltd.

02 安装与调试

安装与起升试运行

开箱与检修前准备

检查包装、电机外壳、法兰、轴伸、接线盒及防护罩有无损伤，清点随机文件和附件。核对型号、极数、法兰止口、孔位、轴伸或花键以及配套联轴器。搬运时防止碰撞和翻滚；储存场所应干燥、清洁、无腐蚀性气体。

安装、拆卸或调整前，应将吊载落地或采用经确认的独立承载措施，使电机和制动器不再承担悬挂载荷；同时固定吊钩组及相关部件，切断电源并防止误送电。不得仅靠待检制动器承载后进行拆修。

法兰与轴向运动

本公司供货采用 B5 法兰安装。清洁定位面并校正对中，紧固件按配套图纸要求锁紧。装配联轴器、花键套或传动件时，不得敲击轴端，不得使轴肩、卡簧或联轴器顶死；应按本型号图纸保留转子轴向运动空间。不得以限制转子轴向移动的方法消除窜动。

电气连接与绝缘检查

接线由具备相应能力的人员在断电、验电后按铭牌及随机接线图进行，可靠连接保护接地。供电电压、频率和允许偏差应符合本型号确认要求；起动困难时还应检查电机输入端的电压降。不得未经确认改变接法或改为降压、变频等运行方式。

按铭牌额定运行电流和工作制选配保护。配套控制回路应有正确的升降互锁、限位和急停功能，并按整机要求防止失电后意外再起动。电机内置制动动作与供电和轴向机构有关，控制方案不得削弱松闸或停车制动能力。

使用前检查绕组绝缘。冷态绝缘电阻不应低于 5 MΩ；测试电压、测量接线和具体条件按本型号检验或维修规程执行。测试前隔离不允许承受试验电压的外接电路，测试后充分放电。不合格时先查明原因、处理并复测，不能直接通电试用。

配套设备试运行

确认机械装配和保护装置齐全后，先在无吊载的可控工况下检查转向、升降按钮与实际动作、松闸、停止及限位功能，再按配套设备规程进行规定负载试验。观察制动下滑量、轴向动作、运行电流、温度和噪声。空载能停止不等于载荷制动已合格。

电机内置制动器是起升机构的一部分，不能代替整机所需的限位、超载及其他保护装置。本说明书与配套设备规程共同使用；整机起重量、试验载荷、制动下滑量及验收条件按配套设备的确认要求执行。

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03 主起升使用与维护

运行与制动维护

工作制与起升操作

按 S4–40%工作制及本型号允许的起动频次、负载和运行时间使用。负载持续率不能单独确定每小时起动次数。正反向、点动或反接操作应符合配套设备控制设计，不得擅自通过反复点动、反向冲击或旁路保护克服起动困难。

观察起升和下降过程是否平稳、停车位置是否异常变化。不得超载、斜拉或将吊载无人看管地悬空；不得把起升限位装置作为正常停车手段。电机停止后，应确认制动已可靠作用，不得以反复通断电代替故障处理。

出现不能起动、制动不能释放、停车后载荷下滑、冒烟、焦味、严重振动、扫膛、轴承过热或外壳带电时，应停止作业并按整机应急规程处置。发生制动异常时隔离危险区域并妥善承载负载，查明原因并修复、验证后方可恢复运行。

日常检查

定期清理机壳和通风通道，检查接线、接地、紧固件、联轴器、轴承及防护罩。记录轴向动作、制动下滑量和异常温升的变化。检查周期应结合起停频次、负载、粉尘、湿度及磨损情况确定，发现变化及时处理。

轴向移动与制动检修

摩擦件磨损会改变转子轴向移动量及制动状态。检查时应区分转子移动量、联轴器避让间隙和制动摩擦副间隙，按本型号维修图规定的状态、位置和限值测量。调整由具备相应能力的人员按对应结构和工艺进行，调整后恢复全部锁紧及防松措施。

不得仅减弱弹簧力来改善起动，也不得以任意增减垫片或打磨摩擦件代替规定检修。摩擦面不得涂油或加脂；制动环、弹簧、制动轮或轴承损坏时，应采用匹配规格部件修复。调整仍不能满足要求时，应检查磨损、污染、卡滞和部件失效。

轴承润滑与恢复使用

按实际轴承类型及本型号润滑要求使用规定牌号、用量和周期的润滑脂，不得让润滑剂进入制动摩擦面。密封免维护轴承不得擅自拆封加脂。更换轴承时核对规格和配合，避免装配后限制转子轴向运动。

制动检修后，应恢复完整装配和防护，复查轴向运动、通电松闸和断电制动，并按整机规程完成无载及规定载荷下的停止和保持性能验证。检修与试验结果应记录；未经确认不得带载交付使用。

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04 故障检修

故障分析与排除

先辨别起动困难、松闸故障与载荷制动故障，检修前妥善承载负载。

故障现象	可能原因	检查与处理
不能起动或载荷起升困难	1. 电源未通、缺相、压降过大或接线错误。 2. 制动器未充分释放。 3. 负载过大、传动卡住或绕组故障。	1. 检查供电、接触器、保护装置及机端电压。 2. 检查轴向运动和松闸状态。 3. 在妥善承载负载后排除卡滞，核对选型并检修绕组；不得强行反复起动。
制动不能释放或运行拖闸	1. 低电压或缺相使磁拉力不足。 2. 联轴器顶死、对中不良或轴向机构卡滞。 3. 制动调整不当、摩擦件锈蚀或部件损坏。	1. 检查供电及三相接线。 2. 按本型号图纸检查轴向运动和装配配合。 3. 由维修人员检查制动环、弹簧及相关部件，按工艺修复并验证充分松闸。
停车后下滑或制动不可靠	1. 摩擦件磨损、油污或损坏。 2. 弹簧失效、调整不当或锁紧件松动。 3. 转子复位受阻或传动连接异常。	1. 停止吊运，按整机应急规程固定负载并隔离危险区域。 2. 检查摩擦副、弹簧、锁紧件和轴向复位；按规定维修。 3. 检查传动连接，按整机要求验证载荷停止及保持性能后恢复使用。
温升过高或冒烟	1. 超载、超工作制或起动过频。 2. 缺相、电压异常或绕组故障。 3. 拖闸、通风堵塞或环境异常。	1. 停机核对负载和运行循环。 2. 检查供电、保护和绕组。 3. 排除拖闸并清理风道，处理环境问题；不得仅提高保护整定值。
振动异响或扫膛	1. 安装松动、对中不良或轴伸变形。 2. 轴承、转子或传动件损坏。 3. 轴向调整或装配异常。	1. 停机检查安装及对中。 2. 由维修人员检查轴承、转子和传动件。 3. 按维修图检查轴向位置及配合，修复后复测。
轴承过热	1. 轴承损坏或润滑不当。 2. 配合不良或异常轴向载荷。 3. 装配干涉。	1. 按轴承类型维护或更换同规格轴承。 2. 检查轴承配合及联轴器，消除异常载荷。 3. 复查装配及转子轴向运动。
外壳带电	1. 接线错误或保护接地失效。 2. 绕组或引出线绝缘受潮、损坏。	1. 立即断电，检查接线及保护接地。 2. 查明并修复绝缘故障，检验合格后再投入使用。

河南宗久机电设备有限公司 Henan Zongjiu Electromechanical Equipment Co., Ltd.

HENAN ZONGJIU

Electromechanical Equipment Co., Ltd.

ZD

MAIN HOIST SERIES

Conical Rotor Brake Motor
Three Phase Induction Motor

Installation Operation and Maintenance Manual

English Manual

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01 PRODUCT AND SELECTION

Product information and configuration

Thank you for choosing a product from Henan Zongjiu Electromechanical Equipment Co., Ltd. This manual covers Zongjiu ZD series conical-rotor three-phase induction brake motors for main hoisting. It is intended for installation, operating and maintenance personnel. Before use, check the nameplate, supplied wiring diagram and requirements of the associated hoist or crane.

The series primarily drives the main lifting mechanism of electric hoists and cranes. Motor power alone does not determine the permissible lifting capacity. Selection must also account for lifting speed, transmission ratio, reeving ratio, load inertia, duty and braking capability. Matching power or flange dimensions do not establish interchangeability.

Conical rotor and brake operation

When power is applied, the magnetic field in the conical air gap produces an axial force. The rotor and attached brake components move against the spring force, releasing the friction surfaces and allowing rotation. When power is removed, the spring returns the assembly and presses the friction surfaces together to produce braking torque. Restricted axial movement can prevent release or return, so the mounting fits and specified movement space are essential.

Series configuration

Application	Main hoisting of electric hoists and cranes
Structure and brake	Conical rotor / Axial release / Spring-return friction braking
Standard supply	Three-phase AC 380 V / 50 Hz / Star (Y)
Duty	S4–40% / Starting frequency within the model's permitted value
Insulation	Class F
Degree of protection	IP44, IP54 or IP55 / As ordered and nameplated
Mounting	B5 flange mounting / IM3001
Ambient conditions	−15 °C to +40 °C / Altitude up to 1000 m
Output and performance	Power, poles, speed, current and braking torque as nameplated and confirmed

The nameplate and confirmed specification govern the model, output, rated current, speed and braking torque. Rated operating current, starting current, axial magnetic pull and braking torque are different quantities and must not be substituted for one another. Do not set thermal overload protection directly to the starting-current value.

Keep the environment dry and clean and provide good ventilation around the motor. Protect outdoor installations from rain. This series is not intended for flammable or explosive environments, molten-metal applications or acidic or alkaline vapours. An IP rating does not establish explosion protection or suitability for molten-metal service; use a product specifically approved for the application.

The model-specific nameplate and supplied documents govern the supply, mounting and protection configuration.

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02 INSTALLATION AND COMMISSIONING

Installation and hoist commissioning

Unpacking and preparation

Inspect the packaging, housing, flange, shaft extension, terminal box and guards for damage, and check the supplied documents and accessories. Verify the model, pole count, flange pilot, hole pattern, shaft or spline and mating coupling. Prevent impact and rolling during handling. Store in a dry, clean place free from corrosive gases.

Before installation, removal or adjustment, lower the load or use an approved independent support so that the motor and brake no longer carry a suspended load. Secure the hook block and associated components, isolate the power and prevent inadvertent reconnection. Do not rely on the brake being serviced to support the load.

Flange mounting and axial movement

The supplied configuration uses B5 flange mounting. Clean the locating surfaces, align the assembly and tighten fasteners to the mating-drawing requirements. Do not hammer the shaft or allow the shaft shoulder, retaining ring or coupling to bottom out when fitting the coupling, spline sleeve or transmission parts. Preserve the axial travel specified for the model. Do not restrain rotor travel merely to eliminate axial movement.

Connections protection and insulation

A competent person shall verify isolation and connect the motor according to its nameplate and supplied diagram, including a secure protective earth connection. Voltage, frequency and permitted variation must meet the model-specific requirements. Check voltage drop at the motor terminals if starting is difficult. Do not change the connection or introduce reduced-voltage or inverter operation without confirmation of suitability.

Select protection using the rated operating current and duty. The equipment controls must provide the required raising/lowering interlocks, limit functions and emergency stop, and prevent unintended restart after loss of power as required by the equipment design. The integral brake depends on the supply and axial mechanism; the control arrangement must preserve reliable release and stopping.

Check winding insulation before use. Cold insulation resistance shall be at least 5 MΩ. Follow the model-specific inspection or service procedure for test voltage, connections and conditions. Isolate external circuits that must not receive the test voltage and discharge fully afterwards. If the result is unacceptable, identify and rectify the cause and retest before energizing.

Commissioning with the driven equipment

After confirming complete assembly and protection, first check rotation, the correspondence between commands and movement, brake release, stopping and limit functions under controlled conditions without a suspended payload. Then conduct the specified equipment load tests. Observe brake slip, axial movement, current, temperature and noise. Stopping without load does not establish satisfactory loaded braking.

The integral brake is one part of the hoisting mechanism and does not replace the limit devices, overload protection or other safeguards required by the complete equipment. Use this manual with the equipment instructions. Follow the confirmed equipment requirements for lifting capacity, test loads, brake slip and acceptance.

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03 MAIN HOIST OPERATION AND SERVICE

Operation and brake maintenance

Duty and lifting operations

Operate within the S4–40% duty and the model's permitted starting frequency, load and running time. The cyclic duration factor alone does not define starts per hour. Reversing, jogging or plugging must conform to the equipment control design. Do not overcome starting difficulties by repeated jogging, reversal shocks or bypassing protection.

Observe the smoothness of lifting and lowering and any change in stopping position. Do not overload, side-pull or leave a suspended load unattended. Do not use the hoist limit device as the normal stopping method. Confirm that the brake has applied after stopping; repeated switching is not a substitute for fault correction.

Stop work and follow the equipment emergency procedure if the motor fails to start, the brake fails to release, the load slips after stopping, or there is smoke, a burning smell, severe vibration, rotor rubbing, bearing overheating or a live housing. For a brake fault, isolate the hazardous area and secure the load. Resume only after the cause has been corrected and performance verified.

Routine inspection

Regularly clean the housing and ventilation passages and inspect wiring, protective earth, fasteners, coupling, bearings and guards. Record changes in axial movement, brake slip and temperature. Set inspection intervals according to operating frequency, load, dust, humidity and wear, and investigate changes promptly.

Axial movement and brake service

Friction wear changes rotor axial travel and brake condition. Distinguish rotor travel, coupling clearance and friction-interface clearance, and measure in the state, locations and limits defined by the model-specific service drawing. Competent personnel shall adjust the correct structure using its procedure and restore all locking and anti-loosening measures.

Do not simply weaken the spring to improve starting, or replace the service procedure with arbitrary shim changes or grinding of friction parts. Keep oil and grease off friction surfaces. Use matching components to repair damaged brake rings, springs, brake wheels or bearings. If adjustment does not restore performance, investigate wear, contamination, binding and component failure.

Bearings and return to operation

Use the grease type, quantity and interval specified for the actual bearing and motor model. Keep lubricant away from the brake friction surfaces. Do not open sealed-for-life bearings for regreasing. When replacing bearings, verify the specification and fits and ensure that reassembly does not restrict rotor axial movement.

After brake service, restore complete assembly and guards. Recheck axial movement, release on energization and braking on de-energization, then verify stopping and holding without load and under the specified loads using the equipment procedure. Record the service and test results. Do not return the equipment to loaded service until satisfactory performance is confirmed.

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04 FAULT DIAGNOSIS

Troubleshooting

Starting and hoist braking

Symptom	Possible cause	Inspection and corrective action
Motor will not start or cannot lift the load	1. No supply, phase loss, excessive voltage drop or incorrect wiring. 2. Incomplete brake release. 3. Excessive load, jammed transmission or winding fault.	1. Check the supply, contactor, protection and motor-terminal voltage. 2. Check axial movement and brake release. 3. Secure the load, clear obstructions, verify motor selection and inspect the winding. Do not force repeated starts.
Brake fails to release or drags during operation	1. Low voltage or phase loss reduces magnetic pull. 2. Coupling bottoming, misalignment or axial binding. 3. Incorrect adjustment, corroded friction parts or component damage.	1. Check the supply and three-phase wiring. 2. Check axial movement and assembly fits against the model-specific drawing. 3. Have maintenance personnel inspect the brake ring, spring and associated parts, repair as specified and verify complete release.
Load slips after stopping or braking is unreliable	1. Worn, oily or damaged friction parts. 2. Failed spring, incorrect adjustment or loose locking parts. 3. Restricted rotor return or a transmission connection fault.	1. Stop lifting, secure the load and isolate the hazardous area using the equipment emergency procedure. 2. Inspect the friction surfaces, spring, locking parts and axial return; repair as specified. 3. Inspect the transmission connections and verify loaded stopping and holding to the equipment requirements before reuse.

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04 FAULT DIAGNOSIS

Troubleshooting continued

Temperature mechanical faults and electrical insulation

Symptom	Possible cause	Inspection and corrective action
Excessive temperature rise or smoke	1. Excessive load, duty or starting frequency. 2. Phase loss, abnormal voltage or winding fault. 3. Brake drag, blocked ventilation or abnormal ambient conditions.	1. Stop and check the load and operating cycle. 2. Inspect the supply, protection and windings. 3. Eliminate brake drag, clear the air passages and correct ambient conditions. Do not merely increase protection settings.
Vibration noise or rotor rubbing	1. Loose mounting, misalignment or a bent shaft. 2. Bearing, rotor or transmission damage. 3. Incorrect axial adjustment or assembly.	1. Stop and inspect mounting and alignment. 2. Have maintenance personnel check the bearings, rotor and transmission. 3. Check axial position and fits against the service drawing, repair and retest.
Bearing overheating	1. Damaged bearing or incorrect lubrication. 2. Poor fit or abnormal axial load. 3. Assembly interference.	1. Service according to bearing type or replace with the same specification. 2. Check the bearing fits and coupling and eliminate abnormal loads. 3. Recheck assembly and rotor axial movement.
Motor housing is live	1. Incorrect wiring or failed protective earth. 2. Damp or damaged winding or lead insulation.	1. Disconnect power immediately and check wiring and protective earthing. 2. Locate and repair the insulation fault, then test before returning to service.

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