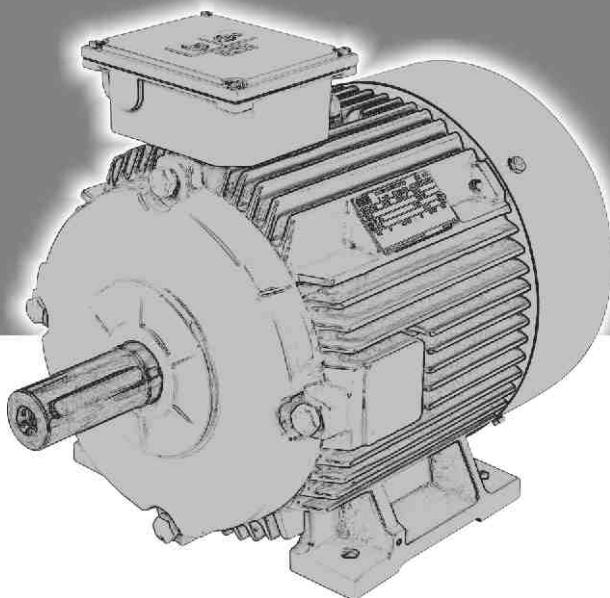


# Operation & Maintenance Manual



**BCH MOTORS**



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Low Voltage AC TEFC Squirrel Cage Induction Motors



BCH  
ELECTRIC  
LIMITED



## Operation & Maintenance Manual

### General Notice



#### **WARNING**

**The recommendations & information specified in this operating instruction must always be observed.**

This is mandatory to avoid hazardous situations & the risk of personal injury or damage to property & equipment. This booklet also contains information on safety measures to be observed when working with electrical machines & equipments.

The relevant national, local & plant-specific standards, recommendations & guidelines must also be observed.

### Description

BCH motors are designed & manufactured in accordance with IS: 325-1996. This instruction manual provides information for installation, operation & maintenance of all types of motors.

Unless or otherwise specified the motors are rated for continuous duty at temperature upto 50°C & at altitudes of upto 1000m above mean sea level.

### General Notice



#### **WARNING**

**Before starting any work on the motor, be sure to isolate it from the main power supply.**

Motor should be carefully unpacked & checked to ensure that there is no damage in transit. The rating plate details should be checked for requirement. Please report the damages to us giving the complete nameplate details.

Motor should be lifted & placed carefully in a vibration & dust free environment. Use all the lifting facilities provided. Do not use any other part of the motor for lifting. If the motor is stored for more than four years in a dry place or for more than two years under adverse conditions prior to being put into service, the bearings should be replaced.

Special protective measures should be taken (i.e. provision of protective roofing etc.) in case of motors with shaft extension pointing upwards or downwards or motors exposed to direct sunlight.



Before putting the motor into service, blow out all the dust & dirt accumulated on the motor.

## **Transmission elements**

Make sure that the transmission elements fitted on the shaft are dynamically balanced with 1/2(half) key, as the rotor is dynamically balanced. Preferably the tolerance of the bore of pulley/coupling/pinion should be H7.

Before fixing the drive component, the red/blue coloured anti corrosive lacquer on the shaft extension & yellow coloured lacquer on the face & spigot of the flange should be removed with the help of thinner. Do not use any sharp objects like knife, blade etc.

While fixing or removing the coupling, pulley, pinion etc. proper tools should be used so that they are fitted on the shaft smoothly without any jerks. **THEY SHOULD NEVER BE HAMMERED** as this will damage the bearings.

## **Mounting**

The motor must be securely installed to a rigid foundation or mounting surface to minimize vibration and maintain alignment between the motor and shaft load. Failure to provide a proper mounting surface may cause vibration, misalignment and bearing damage.

After installation is complete and accurate alignment of the motor and load is accomplished, the base should be grouted to the foundation to maintain this alignment.

## **Alignment**

### **Direct Drive**

Motors that are directly coupled should be carefully & correctly aligned. Any angularity out of parallelism between the motor shaft & the driven machine shaft should not be allowed. Shafts can be aligned perfectly by keeping metal shims under the foot of the motor. The shift of the centerline of the shafts should not be more than 0.03mm. The clearance between the couplings halves measured at four peripheral points must also be within 0.03mm.

### **Belt Drive**

Motors with belt & pulley arrangement should be aligned such that the belt is exactly perpendicular to the motor shaft. Also the belt tension should be limited to the value sufficient for transmission of the rated torque. Only recommended pulley sizes are to be adopted on the motor shaft. If the peripheral speed & weight permit, pulleys with diameters larger than the recommended standard pulley size can be adopted.

### **Pulley ratio**

The pulley ratio should not exceed 6:1.

## **Electrical Connections**

### **Insulation Resistance**

Before putting the motor into service for the first time or after a long period of storage or standstill, measure the insulation resistance of the windings between phase & the motor frame with a DC voltage using 'Megger'. The insulation resistance should be



more than 1M $\Omega$  when the motor is cold. If it is low due to moisture, the motor should be dried before full voltage is applied.

Motor can be dried by placing heater around it or by blocking the rotor & applying such voltage to the motor terminal that the full load current flows in the winding. Space heater should be switched on if it is provided in the motor. Care must be taken during drying that the temperature of the coil does not exceed the maximum value permissible for class of insulation used in the motor.

## Connections

Check that the system voltage & frequency match with that of the nameplate. Motors up to 2HP are connected in star & above 2HP are connected in delta. In both the cases 6 terminals are brought out & connection is made externally by terminal links. Connect the terminal links as shown in the connection diagram inside the terminal box.

Thread dia.		M4	M5	M6	M8	M10	M12	M16
Tightening Torque (kg.m.)	Min	0.08	0.18	0.28	0.56	0.92	1.43	2.75
	Max	0.12	0.25	0.41	0.82	1.33	2.04	4.08

Connect the earthing conductor to the terminal marked  $\oplus$ .

Use bent eyes or cable lugs to connect the phase conductor.

Before commissioning the motor, check for the correct fuse rating. This is important for proper protection of the motor.

## Starting

Squirrel cage motors can be started directly on the line. Only motors connected in delta are suitable for star delta starting. Before starting on star/delta, the load characteristics as well as the moment of inertia (GD<sup>2</sup>) of the load should be checked with the motor characteristics to obtain satisfactory acceleration torque & time. When star delta starting is used, the motor should be switched to delta only after it reaches the rated speed in star.

After the motor is started, attention should be given to the proper running of the bearings, vibration or unusual noises if any. If any such symptoms are noticed, it should be stopped immediately, & the cause is to be found & corrected.

Also check the direction of rotation of the shaft. If the direction is not as per requirement then change any two terminals in the terminal box to reverse the direction of rotation.

## Motor Protection

While selecting the control gear for the motor, it is essential to see that the motor is properly protected against faulty operations. The general guidelines for motor control gears are as under;

A voltmeter & ammeter should be provided for indicating voltage & current preferably with a selector switch so as to check the unbalance.

Provision for adequate protection should be made against following conditions.

**Overload:** Overload setting should be adjustable to operating load current.

**Single phasing:** Single phasing preventer should be provided in the control gear.



**Under voltage:** Under voltage relay should be provided whenever the motor is subjected to frequent under voltage. Motor & associated equipment should be earthed according to regulations.

## Maintenance



### WARNING

**Before starting any work on the motor, be sure to isolate it from the main power supply.**

- Under normal operating condition, the grease filling in the bearing should last for several years. Should the operating conditions differ, the bearing housing of motors upto 3000 rpm must be cleaned & the bearings replaced after 20,000 working hours or latest after every 3 years.
- For replenishing, fresh grease of Lithium base to be used.
- To prevent loss of lubricating properties, mixing of different base grease should be avoided.
- Always use a suitable jig & puller to fit & remove the rolling contact bearing.
- Heat the rolling contact bearing to a temperature of about 80 to 100°C before fitting them.
- Avoid any hard blows with a hammer or similar tools.
- When replacing the bearings, it is also advisable to replace any sealing elements that are subject to wear (e.g. oil seal, felt etc.).
- Replace any other damaged parts

## Safety Information for Electrical Equipments

**The electric motors & equipments are used in heavy current installations. During operations, there are bare parts that are live & some rotating parts. For this reason, unauthorised removal of all the necessary covers, improper use, incorrect operation or insufficient maintenance could lead to severe personal injury or property damage.**

**Persons responsible for the safety of the installations must therefore ensure that only qualified personnel are entrusted to work on the machines or equipments. these persons always have at their disposal the product documentations & operating instructions supplied when they do such work. non-qualified personnel are not permitted to work on or near to the machines or equipments.**

It is assumed that qualified personnel carry out all the work for installation, assembly, commissioning, maintenance & repair.

Particular note must be taken of the following:

The technical data & information on permissible use that are contained in the catalogue, operating instructions, rating plate & other documentations.



The local, plant-specific specifications & requirements.

Proper use of tools, lifting mechanism & transport devices.

Use of proper protective gear.

These instructions do not cover all the details of possible equipment variations, nor does it cover all the possible examples of installations. This means that the instructions normally include only directions to be followed by qualified personnel where the equipment is used for its purpose.

**The requirements are more stringent in special cases where the machines or equipments are required to be issued in non-industrial areas e.g. protection against contact by young children etc., compliance with such requirements must be assured during installation by providing additional protective measures on site.**



### WARNING

Trained service personnel must carry out the specified inspection & maintenance measures regularly in order to avoid any interruptions or breakdowns. Deviation from the normal performance (higher power input,

higher temperatures, vibrations, unusual noise or odors etc.,) indicate that the proper function of the unit is impaired. In order to avoid faults that can cause property damage or personal injury, the responsible maintenance personnel must be informed immediately.



### WARNING

**INCASE OF DOUBT SWITCH OFF THE EQUIPMENT IMMEDIATELY**

Sr. No.	Trouble	Cause	Remedy
1.	Hot bearing	<p>Excessive belt pull</p> <p>Pulley too far qway</p> <p>Pulley dia. too small</p> <p>Misalignment</p> <p>Broken ball or rough races</p> <p>Excess lubricant</p> <p>Overloaded bearings</p> <p>Bearing running dry</p>	<p>Decrease belt tension.</p> <p>Move pulley closer to bearing</p> <p>Use larger pulley.</p> <p>Correct by realignment fo drive.</p> <p>Replace bearing</p> <p>Reduce quantity of grease (Bearing should be filled only half)</p> <p>Check alignment, side thrust &amp; end thrust.</p> <p>Regrease the bearing.</p>



Sr. No.	Trouble	Cause	Remedy
2.	Motor connected but does not start	No supply voltage/One phase open/Voltage too low Motor may be overloaded Control gear defective  Starting torque too high  Rotor defective Short circuit to earth Fault in starter or star/delta switch	Check voltage on each phase.  Reduce load or start at no load. Examine each step of the control gear for bad contacts or open circuit. If with autotransformer starting, change to higher tap. Look for broken rings. Check with Megger. Check contacts & connections.
3.	Motor runs & then stops down	Power failure  Over load	Check for loose connections to line, fuses & control gear. Examine overload trips & see that they are set at approx. 150% of full load current.
4.	Motor starts sluggishly, speed fails when load is put on	Rating not proper Not applied properly Voltage too low at motor terminals because of line drop Starting load torque too high Broken rotor bars	Get correct type of motor. - do - - do -  Check load characteristics with motor speed torque. Look for cracks near the ring & if required get new rotor.
5.	Motor starts with difficulty on star connection or not at all	Load too high Supply voltage low Contacts burnt in star/delta starter	Reduce load or use larger motor. Check supply lines to motor. Overhaul or replace starter.
6.	Stator heats up quickly & takes large no load current	Stator wrongly connected Phase short Multiple earth	Check connection  Rewind Rewind
7.	Motor overheats while running on load	Overload One phase open Shorted stator coil Faulty connection Motor operated on load cycle not in accordance with name plate	Reduce load. Check connections. Repair & check wattmeter reading. Correct the connections. Run the motor on duty for which it is specified



Sr. No.	Trouble	Cause	Remedy
		High or low voltage Foreign material in air gap Rotor rubs stator bore	Check voltmeter reading. Dismantle & remove obstruction. Recondition the rotor. Replace worn out bearings.
8.	Motor vibrates after connections are made	Motor misaligned Weak foundation Coupling out of balance Driven equipment unbalanced Balancing weights shifted Defective bearings Bearings not in line Excessive end play	Realign. Provide strong base. Balance coupling. Re-balance.  Re-balance the rotor. Replace bearings. Line up properly. Adjust bearings or add washers. Use shims for alignment. Use vibration pads to dampen external vibrations.
9.	Scraping noise	Fan touching fan cover Loose on bed plates	Remove interference. Tighten mounting bolts.
10.	Magnetic noise	Air gap not uniform Loose bearings	Check & correct bearings. Correct or replace bearings.
11.	Shaft end breaks or stator rotor rubbing	Excessive radial loads due to pulley drives	Check for suitability.
12.	Heavy vibrations	Load unbalance	Re-balance.
13.	Current unbalance	Unbalanced supply voltage	Check voltage.

## NOTES





## NOTES

<b>Power Control Products</b>
<b>Starters &amp; Submersible Pump Starters</b>
<b>Industrial Enclosures</b>
<b>Industrial Products</b>
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