Low Voltage Motors

Manual for Low Voltage Motors

Installation, operation and maintenance manual

GB 3
Example of the Declaration of Conformity given by ABB.

EC Declaration of Conformity

The Manufacturer :- (Name and address of the manufacturer)

hereby declares that

The Products :- (Product identification)

are in conformity with provisions of the following Council Directives :


and, as components, with the essential requirements of the following :

EMC Directive 89/336/EEC (amended by 92/31/EEC and 93/68/EEC), regarding the intrinsic characteristics to emission and immunity levels,

and are in conformity with :

   EN 60 034-1

Additional Information :-

By design, the machines, considered as components, comply with the essential requirements of

Machinery Directive 98/37/EEC provided that the installation be correctly realised by the manufacturer of the machinery (for example : in compliance with our Installation Instructions and EN 60 204 “Electrical Equipment of Industrial Machines”).

Certificate of Incorporation (Directive 98/37/EEC, Art 4.2 and Annex II, Sub B) :

The machines above must not be put into service until the machinery into which they have been incorporated have been declared in conformity with the Machinery Directive.

Year of CE marking : CE00.

Signed by ..................................................

Title ...........................................................

Date ..........................................................
Low Voltage Motors

Installation, operation and maintenance manual

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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 this equipment. Ignoring the instruction may invalidate the warranty.

1.1 Declaration of Conformity

Declarations of Conformity with respect to the Low voltage Directive 73/23/EEC amended by Directive 93/68 EEC are issued separately with individual machines.

The Declaration of Conformity also satisfies the requirements of a Declaration of Incorporation with respect to the Machinery Directive 98/37/EEC, Art 4.2 Annex II, sub B

1.2 Validity

The instructions are valid for the following ABB electrical machine types, in both motor and generator operation.

- series MT*, MBT*, MXMA,

in frame sizes 56 - 450.

There is a separate manual for e.g. Ex motors ‘Low voltage motors for hazardous areas: Installation, operation and maintenance Manual’ (Low Voltage Motors/Manual for Ex-motors).

Additional information is required for some machine types due to special application and/or design considerations. Additional information is available for the following motors:

- roller table motors
- water-cooled motors
- open drip proof motors
- smoke venting motors
- brake motors
- permanent magnet motors

2. Installation

2.1 Putting into service (starting)

2.1.1 Reception check

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

Check all rating plate data, especially voltage and winding connection (star or delta). 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 bearings stated in the product catalogue.

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

**Motors equipped with regreasing nipples:** When starting the motor for the first time, or after long storage of the motor, apply the specified quantity of grease until grease is forced out of the grease outlet. For details see section “Manual lubrication” on page 9.

2.1.2 Insulation resistance check

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

Resistance, measured at 25°C, shall exceed the reference value, i.e. 10 M ohm (measured with 500 V dc Megger)

**WARNING**
Winings 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.
2.1.3 Direct-on-line or star/delta starting

The terminal box on standard single speed machines normally contains 6 winding terminals and at least one earth terminal.

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. 660 VY, 380 VD indicates Y-connection for 660 V and D-connection for 380 V.

**Star/Delta starting (Y/D):**

The supply voltage must be equal to the rated voltage of the machine in D-connection.

Remove all connection links from the terminal block.

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

If direct-on-line starting lasts for more than 10 seconds or Y/D starting more than 30 seconds, consult ABB Sales Office or see the publication ‘The Motor Guide’ (also available on the internet on www.abb.com/motors&drives).

2.1.4 Terminals and direction of rotation

Direction of rotation is clockwise when viewing the shaft face at the machine drive end, when the line phase sequence L1, L2, L3 is connected to the terminals as shown in the figure 1.

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

If the machine has a uni-directional fan, ensure that the direction of rotation is according to the arrow marked on the machine.

2.2 Handling

2.2.1 Storage

The machine should always be stored indoors, in dry, vibration free and dust free conditions.

Unprotected machined surfaces (shaft-ends and flanges) should be protected with anti-corrosive treatment.

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

Anti condensation heaters, if fitted, should preferably be energised.

The characteristics of electrolytic capacitors, if fitted to single-phase motors, will require “reforming” following periods of storage exceeding 1-2 years.

Contact ABB Sales Office for details.

2.2.2 Transportation

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

2.2.3 Lifting

Lift the motor using the lifting lugs only, if not otherwise stated in the separate lifting instruction.

The center of gravity of motors with the same frame may vary due to different outputs, mounting arrangements and auxiliary equipment.

Check that eye bolts or the lifting lugs integrated with the motor frame are undamaged before lifting. Damaged lifting lugs must not be used.

Lifting eyebolts must be tightened before lifting.

If needed the position of the eyebolt must be adjusted with suitable washers.

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.
2.2.4 Machine weights

Total machine weight can vary within the same frame size (center height) depending on different output, mounting arrangements 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 our motors is stated on the rating plate except the smallest frame sizes.

<table>
<thead>
<tr>
<th>Frame size</th>
<th>Aluminum Weight kg</th>
<th>Cast iron Weight kg</th>
<th>Steel Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>56</td>
<td>4.5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>63</td>
<td>6</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>71</td>
<td>8</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>80</td>
<td>12</td>
<td>8</td>
<td>20</td>
</tr>
<tr>
<td>90</td>
<td>17</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>100</td>
<td>25</td>
<td>16</td>
<td>40</td>
</tr>
<tr>
<td>112</td>
<td>36</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>132</td>
<td>63</td>
<td>30</td>
<td>90</td>
</tr>
<tr>
<td>160</td>
<td>110</td>
<td>30</td>
<td>175</td>
</tr>
<tr>
<td>180</td>
<td>160</td>
<td>45</td>
<td>250</td>
</tr>
<tr>
<td>200</td>
<td>220</td>
<td>55</td>
<td>310</td>
</tr>
<tr>
<td>225</td>
<td>295</td>
<td>75</td>
<td>400</td>
</tr>
<tr>
<td>250</td>
<td>370</td>
<td>75</td>
<td>550</td>
</tr>
<tr>
<td>280</td>
<td>405</td>
<td>-</td>
<td>800</td>
</tr>
<tr>
<td>315</td>
<td>-</td>
<td>-</td>
<td>1700</td>
</tr>
<tr>
<td>355</td>
<td>-</td>
<td>-</td>
<td>2700</td>
</tr>
<tr>
<td>400</td>
<td>-</td>
<td>-</td>
<td>3500</td>
</tr>
<tr>
<td>450</td>
<td>-</td>
<td>-</td>
<td>5000</td>
</tr>
</tbody>
</table>

Table 1

2.3 Installation

2.3.1 Cooling

Normal ambient temperatures should not exceed 40°C (marine standard +45 or +50°C) if standard performance is to be achieved. Check that the motor has sufficient airflow. Ensure that no nearby equipment, surfaces or direct sunshine, radiate additional heat to the motor. For more information about higher ambient temperatures and cooling, see “the Motor Guide” or contact ABB Sales Office.

2.3.2 Foundation

The purchaser bears full responsibility for preparation of the foundation.

Metal foundations should be painted to avoid corrosion. Foundations must be even, and sufficiently rigid to withstand possible short circuit forces. They shall be dimensioned as to avoid the occurrence of vibration due to resonance.

2.3.4 Slide rails and belt drives

- Fasten the machine to the slide rails as shown in figure 2.
- Place the slide rails horizontally on the same level.
- Check that the machine shaft is parallel with driven, or driving, shaft.
- Any belt 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.
2.4 Connection

Normal machine design has the terminal box on top with cable entry possible from both sides.

Some machines are available with top mounted terminal boxes rotatable 4 x 90°, and some with side mounted terminal boxes.

Availability of these solutions is described in the product catalogues.

Unused cable entries must be closed.

As well as main winding and earthing terminals, the terminal box can also contain connections for thermistors, standstill heating elements, bimetallic, switches, or PT 100 resistance elements.

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

Connection diagrams for auxiliary elements are found inside the terminal box cover or in additional labels on the frame of the machine.

**WARNING**
The capacitor in single-phase motors can retain a charge that appears across the motor terminals, even when the motor has reached standstill.

2.4.1 Connection for variable speed drive

Variable speed drives cause higher voltage stresses than the sinusoidal supply on the winding of the motor and may cause high frequency shaft voltages and bearing currents. Therefore the winding and the bearing insulation of the motor as well as the filter at the converter output must be dimensioned according to "Selection rules for VSD applications/Insulation" (3GZF500930-2), available on request from ABB.

In variable speed drives the motor (Pn > 30 kW) must be cabled by using shielded symmetrical cables and cable glands providing 360° bonding (also called EMC glands). More information can be found in ABB’s manual “Grounding and cabling of the drive system” (3AFY61201998).

In frequency converter applications motor frame external earthing must be used for equalising the potential between the motor frame and the driven machine, unless the two machines are mounted on the same metallic base.

For motor frame sizes above IEC 280, use 0.75 x 70 mm flat conductor or at least two 50 mm² round conductors. The distance of the round conductors must be at least 150 mm from each other.

This arrangement has no electrical safety function; the purpose is to equalise the potentials. When the motor and the gearbox are mounted on a common steel fundament, no potential equalisation is required.

To comply with EMC-requirements, use only cables and connectors approved for this purpose. (See instruction for frequency converters.)

The highest permissible rotational speed of a cast iron motor used in variable speed drive (M2BA/M3BP) must not exceed maximum permissible speeds as stated in the table 2 below or the speed stamped on the rating plate. For information on the highest permissible rotational speed for other motor sizes and types, please contact ABB. Bearing lubrication should follow the directions mentioned later.

<table>
<thead>
<tr>
<th>Frame size</th>
<th>Speed r/min 2 pole</th>
<th>4 pole</th>
</tr>
</thead>
<tbody>
<tr>
<td>280</td>
<td>3600</td>
<td>2600</td>
</tr>
<tr>
<td>315</td>
<td>3600</td>
<td>2300</td>
</tr>
<tr>
<td>355</td>
<td>3600</td>
<td>2000</td>
</tr>
<tr>
<td>400</td>
<td>3600</td>
<td>1800</td>
</tr>
<tr>
<td>450</td>
<td>3600</td>
<td>1800</td>
</tr>
</tbody>
</table>

Table 2

If there is uncertainty concerning the suitability of the motor for the variable speed drive, please contact ABB.

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

2.5 Balancing

The rotor of the machine is dynamically balanced.

As standard, balancing has been carried out using half key, and the shaft is marked with a RED tape, with the text “Balanced with half key”. In case of motors delivered without any tape defining the type of balancing, these motors are also balanced with half key.

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

In the event of balancing with full key the shaft is marked with a YELLOW tape, with the text “Balanced with full key”.

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

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3. Operating

3.1 Use

3.1.1 Operating conditions
The machines are intended for use in industrial drive applications.
Normal ambient temperature limits are -20° to +40°C.
Maximum altitude 1000 m above sea level.

3.2 Safety considerations
The machine is intended for installation and use by qualified personnel, familiar with relevant safety requirements.
Safety equipment necessary for the prevention of accidents at the installation and operating site must be provided in accordance with the local regulations.

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

3.2.1 Points to observe
1. Do not use the machine to step on.
2. The temperature of the outer casing of the machine may be hot to the touch during normal operation.
3. Some special machine applications require special instructions (e.g. using frequency converter supplies).
4. Lifting lugs must only be used for lifting the motor. They must not be used to lift the motor when it is attached to other equipment.

3.3 Assembly and dismantling

3.3.1 General
Dismantling and assembly of machines must be carried out by qualified personnel using only suitable tools and working methods. All repairs must be carried out according to the standard IEC-60079-19.

3.3.2 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.
How to replace bearings is described in detail in a separate instruction leaflet available from ABB Sales Office.

3.3.3 Fitting coupling halves and pulleys
Coupling halves and pulleys must be fitted using suitable equipment and tools that do not damage the bearings.
Never fit a coupling half or pulley by hammering into place or remove it using a lever pressed against the body of the machine.
Mounting accuracy of coupling half:
check that the clearance $b$ is less than 0.05 mm and that the difference $a_1$ to $a_2$ is also less than 0.05 mm. See figure 3.
4. Maintenance

4.1 Maintenance and lubrication

4.1.1 General inspection
- Inspect the machine at regular intervals.
- Keep the machine clean and ensure free ventilation airflow.
- Check the condition of shaft seals (e.g. V-ring) and replace if necessary.
- Check the condition of connections and mounting and assembly bolts.
- Check the bearing condition by listening for unusual noise, vibration measurement, bearing temperature, inspection of spent grease or SPM bearing monitoring.

* When changes of condition occur, dismantle the machine, check the parts and replace if necessary.

4.1.2 Lubrication

**WARNING**
Beware of all rotating parts!

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

4.1.3 Machines with permanently greased bearings

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

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

As a guide, adequate lubrication for sizes up to 200 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 temperatures higher than 25°C, see the respective product catalogue.

<table>
<thead>
<tr>
<th>Frame size</th>
<th>Poles</th>
<th>Duty hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>56-80</td>
<td>2-8</td>
<td>for life</td>
</tr>
<tr>
<td>90-112</td>
<td>2-8</td>
<td>40 000</td>
</tr>
<tr>
<td>132</td>
<td>2-8</td>
<td>40 000</td>
</tr>
<tr>
<td>160</td>
<td>2-8</td>
<td>40 000</td>
</tr>
<tr>
<td>180</td>
<td>2-8</td>
<td>40 000</td>
</tr>
<tr>
<td>200</td>
<td>2</td>
<td>27 000</td>
</tr>
<tr>
<td>200</td>
<td>4</td>
<td>40 000</td>
</tr>
</tbody>
</table>

*Table 3*

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

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

Motors with roller bearings have considerably shorter grease life. For continuous operation regreasing nipples should be considered.

4.1.4 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, regreasing intervals with regard to mounting, ambient temperature and speed of rotation can be defined.

During the first start or after a bearing lubrication it may appear a temporary temperature rise, appr. 10-20 hours. ABB policy is to have reliability as a vital issue in bearing lubrication intervals. That is why we follow the L1-principle.

**A. Manual lubrication**

Regreasing while motor is running
- Remove grease outlet plug or open closing valve if fitted.
- Be sure that the lubrication channel is open
- Press 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 or closing valve 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.

**B. 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 tables 4-5 should be doubled if an automatic regreasing system is used.

If 2-pole motors are being automatically regreased, the note (NOTE!) concerning lubricant recommendations given for 2-pole motors in the chapter Lubricants shall be followed.
4.1.5 Lubrication intervals and amounts

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 of about + 25°C). Note! An increase in the ambient temperature raises the temperature of the bearings 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.

![Table 4](#)

<table>
<thead>
<tr>
<th>Frame size</th>
<th>3600 r/min</th>
<th>3000 r/min</th>
<th>1800 r/min</th>
<th>1500 r/min</th>
<th>1000 r/min</th>
<th>500-900 r/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball bearings</td>
<td>Lubrication intervals in duty hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>112</td>
<td>10</td>
<td>10000</td>
<td>13000</td>
<td>18000</td>
<td>21000</td>
<td>25000</td>
</tr>
<tr>
<td>132</td>
<td>15</td>
<td>9000</td>
<td>11000</td>
<td>17000</td>
<td>19000</td>
<td>23000</td>
</tr>
<tr>
<td>160</td>
<td>25</td>
<td>7000</td>
<td>9500</td>
<td>14000</td>
<td>17000</td>
<td>21000</td>
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<td>8000</td>
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<td>16500</td>
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<td>250</td>
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<td>2500</td>
<td>4000</td>
<td>9000</td>
<td>11500</td>
<td>15000</td>
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<td>280</td>
<td>70</td>
<td>2000</td>
<td>3500</td>
<td>8000</td>
<td>10500</td>
<td>14000</td>
</tr>
<tr>
<td>315</td>
<td>90</td>
<td>7000</td>
<td>12000</td>
<td>18000</td>
<td>24000</td>
<td>30000</td>
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<tr>
<td>355</td>
<td>120</td>
<td>4200</td>
<td>6000</td>
<td>10000</td>
<td>13000</td>
<td>17000</td>
</tr>
<tr>
<td>400</td>
<td>120</td>
<td>4200</td>
<td>6000</td>
<td>10000</td>
<td>13000</td>
<td>17000</td>
</tr>
<tr>
<td>400 M3BP</td>
<td>130</td>
<td>2800</td>
<td>4600</td>
<td>8400</td>
<td>12000</td>
<td>16000</td>
</tr>
<tr>
<td>450</td>
<td>140</td>
<td>2400</td>
<td>4000</td>
<td>8000</td>
<td>8800</td>
<td>12400</td>
</tr>
</tbody>
</table>

**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 100-160 cST at 40°C
- consistency NLGI grade 1.5 - 3 *)
- temperature range -30°C - +120°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 major lubricant manufacturers.

Admixtures are recommended, but a written guarantee must be obtained from the lubricant manufacturer especially concerning EP admixtures, that admixtures do not damage bearings or the properties of lubricants at the operating temperature range.

**WARNING**
Lubricants containing EP admixtures are not recommended in high bearing temperatures in frame sizes 280 to 450.

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

The following high performance grease can be used
- Esso Unirex N2, N3 or S2 (lithium complex base)
- Mobil Mobilitith 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 TEMP110 (lithium complex base)

Lubrication intervals for other grease fullfilling the required properties, contact your local ABB Sales Office.
NOTE!
Always use high speed grease for high speed machines and some other models, e.g. M2BA 355 and 400 2-pole machines, where the speed factor is higher than 400 000 (calculated as \( D_m \times n \) where \( D_m = \) 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)
- Lubcon Turmogrease PU703 (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.

WARNING
Especially in high rotational speed (the speed factor > 400000) over greasing may cause damage.

4.1.7 Frequency converter drives
Higher speed operation, e.g. in frequency converter applications, or lower speed with heavy load will require shorter lubrication intervals. Consult your local ABB Sales Office in such cases.

Typically a doubling of speed will require a reduction of lubrication intervals to approx. 40 % of values tabulated above.

WARNING
The constructional maximum speed of the motor must not be exceeded (see table 2).

Suitability of bearings for high speed operation must be checked.

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

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

For more information, please visit our web site www.abb.com/partsonline.

4.1.9 Rewinding
Rewinding should always be carried out by qualified repair shops.

Smoke venting and other special motors should not be rewound without first contacting ABB.

5. Environmental requirements

5.1 Noise levels
Most of our motors have a sound pressure level not exceeding 82 dB(A) refer to 50 Hz sinusoidal supply conditions, tolerance ± 3 dB(A).

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

For sound pressure levels for 60 Hz sinusoidal supply and with non-sinusoidal supplies, contact ABB Sales Office.

Sound pressure levels for all machines having separate cooling systems and for series M2F*/M3F*, M2L*/M3L*, M2R*/M3R*, M2BJ/M3BJ and M2LJ/M3LJ are indicated in separate Manuals.
6. Troubleshooting

These instructions do not cover all details or variations in equipment nor provide for every possible condition to be met in connection with installation, operation or maintenance. Should additional information required, please contact the nearest ABB Sales Office.

Motor troubleshooting chart

Your motor service and any troubleshooting must be handled by qualified persons with proper tools and equipment.

<table>
<thead>
<tr>
<th>TROUBLE</th>
<th>CAUSE</th>
<th>WHAT TO DO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor fails to start</td>
<td>Blown fuses</td>
<td>Replace fuses with proper type and rating.</td>
</tr>
<tr>
<td></td>
<td>Overload trips</td>
<td>Check and reset overload in starter.</td>
</tr>
<tr>
<td></td>
<td>Improper power supply</td>
<td>Check to see that power supplied agrees with motor rating plate and load factor.</td>
</tr>
<tr>
<td></td>
<td>Improper line connections</td>
<td>Check connections with diagram supplied with motor.</td>
</tr>
<tr>
<td></td>
<td>Open circuit in winding or control switch</td>
<td>Indicated by humming sound when switch is closed. Check for loose wiring connections. Also, ensure that all control contacts are closed.</td>
</tr>
<tr>
<td></td>
<td>Mechanical failure</td>
<td>Check to see if motor and drive turn freely. Check bearings and lubrication.</td>
</tr>
<tr>
<td></td>
<td>Short circuited stator Poor stator coil connection</td>
<td>Indicated by blown fuses. Motor must be rewound. Remove end bells, locate with test lamp.</td>
</tr>
<tr>
<td></td>
<td>Rotor defective</td>
<td>Look for broken bars or end rings.</td>
</tr>
<tr>
<td></td>
<td>Motor may be overloaded</td>
<td>Reduce load.</td>
</tr>
<tr>
<td>Motor stalls</td>
<td>One phase may be open</td>
<td>Check lines for open phase.</td>
</tr>
<tr>
<td></td>
<td>Wrong application</td>
<td>Change type or size. Consult manufacturer.</td>
</tr>
<tr>
<td></td>
<td>Overload</td>
<td>Reduce load.</td>
</tr>
<tr>
<td></td>
<td>Low voltage</td>
<td>Ensure the rating plate voltage is maintained. Check connection.</td>
</tr>
<tr>
<td></td>
<td>Open circuit</td>
<td>Fuses blown, check overload relay, stator and push buttons.</td>
</tr>
<tr>
<td>Motor runs and then dies down</td>
<td>Power failure</td>
<td>Check for loose connections to line, to fuses and to control.</td>
</tr>
<tr>
<td>Motor does not come up to speed</td>
<td>Not applied properly</td>
<td>Consult supplier for proper type.</td>
</tr>
<tr>
<td></td>
<td>Voltage too low at motor terminals because of line drop</td>
<td>Use higher voltage or transformer terminals or reduce load. Check connections. Check conductors for proper size.</td>
</tr>
<tr>
<td></td>
<td>Starting load too high</td>
<td>Check load motor is supposed to carry at start.</td>
</tr>
<tr>
<td></td>
<td>Broken rotor bars or loose rotor</td>
<td>Look for cracks near the rings. A new rotor may be required, as repairs are usually temporary.</td>
</tr>
<tr>
<td></td>
<td>Open primary circuit</td>
<td>Locate fault with testing device and repair.</td>
</tr>
<tr>
<td>Motor takes too long to accelerate and/or draws high amp</td>
<td>Excessive load</td>
<td>Reduce load.</td>
</tr>
<tr>
<td></td>
<td>Low voltage during start</td>
<td>Check for high resistance. Adequate wire size.</td>
</tr>
<tr>
<td></td>
<td>Defective squirrel cage rotor</td>
<td>Replace with new rotor.</td>
</tr>
<tr>
<td></td>
<td>Applied voltage too low</td>
<td>Get power company to increase power tap.</td>
</tr>
<tr>
<td>Wrong rotation</td>
<td>Wrong sequence of phases</td>
<td>Reverse connections at motor or at switchboard.</td>
</tr>
<tr>
<td>TROUBLE</td>
<td>CAUSE</td>
<td>WHAT TO DO</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-----------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Motor overheats while running underloaded</td>
<td>Overload</td>
<td>Reduce load.</td>
</tr>
<tr>
<td></td>
<td>Frame or bracket vents may be clogged with dirt and prevent proper ventilation of motor</td>
<td>Open vent holes and check for a continuous stream of air from the motor.</td>
</tr>
<tr>
<td></td>
<td>Motor may have one phase open</td>
<td>Check to make sure that all leads are well connected.</td>
</tr>
<tr>
<td></td>
<td>Grounded coil</td>
<td>Locate and repair.</td>
</tr>
<tr>
<td></td>
<td>Unbalanced terminal voltage</td>
<td>Check for faulty leads, connections and transformers.</td>
</tr>
<tr>
<td>Motor vibrates</td>
<td>Motor misaligned</td>
<td>Realign.</td>
</tr>
<tr>
<td></td>
<td>Weak support</td>
<td>Strengthen base.</td>
</tr>
<tr>
<td></td>
<td>Coupling out of balance</td>
<td>Balance coupling.</td>
</tr>
<tr>
<td></td>
<td>Driven equipment unbalanced</td>
<td>Rebalance driven equipment.</td>
</tr>
<tr>
<td></td>
<td>Defective bearings</td>
<td>Replace bearings.</td>
</tr>
<tr>
<td></td>
<td>Bearings not in line</td>
<td>Line up properly.</td>
</tr>
<tr>
<td></td>
<td>Balancing weights shifted</td>
<td>Rebalance motor.</td>
</tr>
<tr>
<td></td>
<td>Contradiction between balancing of rotor and coupling (half key - full key)</td>
<td>Rebalance coupling or motor.</td>
</tr>
<tr>
<td></td>
<td>Polyphase motor running single phase</td>
<td>Check for open circuit.</td>
</tr>
<tr>
<td></td>
<td>Excessive end play</td>
<td>Adjust bearing or add shim.</td>
</tr>
<tr>
<td>Scraping noise</td>
<td>Fan rubbing fan cover</td>
<td>Remove interference.</td>
</tr>
<tr>
<td></td>
<td>Fan striking insulation</td>
<td>Clear fan.</td>
</tr>
<tr>
<td></td>
<td>Motor loose on bedplate</td>
<td>Tighten holding bolts.</td>
</tr>
<tr>
<td>Noisy operation</td>
<td>Airgap not uniform</td>
<td>Check and correct bracket fits or bearing.</td>
</tr>
<tr>
<td></td>
<td>Rotor unbalance</td>
<td>Rebalance.</td>
</tr>
<tr>
<td>Hot bearings ball</td>
<td>Bent or sprung shaft</td>
<td>Straighten or replace shaft.</td>
</tr>
<tr>
<td></td>
<td>Excessive belt pull</td>
<td>Decrease belt tension.</td>
</tr>
<tr>
<td></td>
<td>Pulleys too far away</td>
<td>Move pulley closer to motor bearing.</td>
</tr>
<tr>
<td></td>
<td>Pulley diameter too small</td>
<td>Use larger pulleys.</td>
</tr>
<tr>
<td></td>
<td>Misalignment</td>
<td>Correct by realignment of drive.</td>
</tr>
<tr>
<td></td>
<td>Insufficient grease</td>
<td>Maintain proper quality of grease in bearing.</td>
</tr>
<tr>
<td></td>
<td>Deterioration of grease or lubricant contaminated</td>
<td>Remove old grease, wash bearings thoroughly in kerosene and replace with new grease.</td>
</tr>
<tr>
<td></td>
<td>Excess lubricant</td>
<td>Reduce quantity of grease, bearing should not be more than 1/2 filled.</td>
</tr>
<tr>
<td></td>
<td>Overloaded bearing</td>
<td>Check alignment, side and end thrust.</td>
</tr>
<tr>
<td></td>
<td>Broken ball or rough races</td>
<td>Replace bearing, first clean housing thoroughly.</td>
</tr>
</tbody>
</table>
Figure 1. Connection diagram
Bild 1. Anschlußdiagram
Figure 1. Connection
Figura 1. Conexión
Figura 1. Collegamento
Figur 1. Anslutningdiagramm
Kuva 1. Kytkentäkaavio

Figure 2. Belt drive
Bild 2. Riementrieb
Figure 2. Glissières et entraînements à courroie
Figure 2. Carriles tensores y correas
Figura 2. Slitte tendicinghia e pulegge
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Bild 3. Anbau von Kupplungshälften und Riemenscheiben
Figure 3. Montage des demi-accouplements et des poulies
Figura 3. Montaje de mitades de acoplamiento y poleas
Figura 3. Montaggio di semigiunti e pulegge
Figur 3. Montering av kopplinshalvor och drivskivor
Kuva 3. Kytkinpuolikkaan ja hihnapyörän asennus
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