DC Machines
DMI

Operating and Maintenance Instructions

Contents

Safety instructions

Low-voltage directive

These safety instructions for the operation of direct-current machines are in conformity with the Low-Voltage Directive 73/23/EEC.

1 General

DC machines have rotating parts and parts which may be live even at rest, and possibly hot surfaces.

All operations serving transport, connection, commissioning and periodic maintenance must be carried out by skilled, responsible technical personnel (note EN 60034; EN 50110-1/VDE 0105). Improper handling can cause serious injury and damage to property.

The applicable national, local and installation-specific regulations and requirements must be taken into account.

To guarantee trouble-free operation the ABB documentation must be followed.

2 Intended use

These machines are intended for industrial and commercial installations. They comply with the standards series EN 60034 (VDE 0530). Their use in hazardous areas is prohibited unless they are expressly intended for such use (note additional instructions). Where, in exceptional cases, – use in non-commercial installations – more stringent requirements are to be met (e.g. protection against contact with children's fingers), these conditions must be ensured by the customer when the machine is installed.

The machines are generally rated for ambient temperatures of – 5 to + 40 °C and altitudes of up to 1000 m above sea level. Take note of different instructions on the rating plate. Conditions on site must conform to all data given on the rating plate.

DC machines are components for installation in machinery as defined in the Machinery Directive 89/392/EEC. Commissioning is prohibited until conformity of the end product with this directive has been established (see EN 60 204-1).

DC machines meet the requirements of the low voltage directive 73/23/EEC.

The normal operation of the DC machine must comply with the protection requirements of the EMC directive 89/336/EEC. The proper installation (e.g. separation of signal lines and power cables, screened cables etc.) is the responsibility of the erector of the installation. For installations with power converters, the EMC instructions of the converter manufacturer must be taken into account.

3 Transport, storage

Report damage discovered after delivery to the transport company immediately. If necessary, stop commissioning. Tighten screwed-in ring bolts before transport. They are designed for the weight of the machine. Do not apply extra loads. If necessary, use suitable, adequately dimensioned means of transport (e.g. rope guides).

When machines are stored, ensure a dry, dust-free, low-vibration ($V_{rms} \leq 0.2$ mm/s) environment (danger of bearing damage at rest). Long storage periods reduce the grease service life of the bearings. (Refer to the chapter "General storage precautions").

4 Installation

Make sure of an even supporting surface, of solid foot or flange mounting and of exact alignment in case of direct coupling.

Avoid resonances in the operating speed range and with sixfold (or, in the case of single-phase supply, double) mains frequency which may be caused by the assembly. Turn rotor by hand, listen for abnormal scraping noises. Check direction of rotation in uncoupled state (follow Section 5.) Mount or remove output elements (pulley, coupling) using only appropriate means and cover them with a guard. Avoid excessive belt tension (refer to DMI catalogue).

Before mounting the output element, make sure the machine is balanced. The balancing method for the machine is indicated on the shaft end face and on the rating plate (H = half key, F = full key).

For models with shaft ends pointing downward, a canopy is recommended; for models with shaft ends pointing upward, measures are needed to protect against ingress of water into the bearing.

Do not obstruct ventilation. Exhaust air, also from neighbouring sets, must not be drawn in again directly. Chemically polluted air, cooling air containing dust, or low-load operation for a prolonged period of time may negatively affect the commutation and brush life.

5 Electrical connection and commissioning

All operations must only be carried out by skilled technical personnel on machines at rest and isolated and provided with a safeguard to prevent unintentional reconnection. This applies also to auxiliary circuits (e.g. anti-condensation heating). Remove shipping brace before commissioning.

Check safe isolation from supply!

Exceeding tolerances according to EN 60034 (VDE 0530), i.e. voltage ± 5%, or an unfavourable form factor resulting from the type of converter used, leads to increased heating and shortens the life of the machine. Pay attention to rating plate markings as well as to the connection diagram.

The connection must be so made that a permanent and safe electrical connection is ensured (no loose wire ends). Use correct cable terminals.

Maintain clearances between live, uninsulated parts and between such parts and earth.

There must be no foreign objects, dirt or moisture in the terminal box. Close unused cable entrance holes and the box itself in a dust- and watertight manner.

For the trial run without output elements, fix the key to the shaft.

For the connection and installation of accessories (e.g. tacho-generators, pulse generators, brakes, temperature sensors, air-flow monitors, brush monitors), strictly follow the corresponding instructions. In case of doubt, consult ABB.

For machines with brakes, check satisfactory functioning of the brake before commissioning.

Before commissioning, measure the insulation resistance. With 500 V applied, the insulation resistance value measured should not be lower than 1 MΩ. For corrective measures, see the chapter “Insulation resistance”.

6 Operation

Operation without excitation can lead to dangerous overspeeds and must be prevented by interlocking.

Vibration severities $V_{rms} \leq 4.5$ mm/s at the bearings are acceptable in the coupled state. In the event of of deviations from normal operation – e.g. elevated temperatures, noise, vibrations – switch off the machine in case of doubt. Establish the cause. Consult ABB, if necessary.

Do not override protective devices even in trial runs.

For all inspection and maintenance operations, see the chapter “Observation and maintenance”.

In case of heavy dirt deposits, periodically clean air channels. Open condensate drain holes from time to time .

Regrease bearing assembly with a relubricating device while the machine is running. See the chapter “Lubrication”.

7 Maintenance and servicing

The ABB documentation must be followed.

Safety Notice: This equipment contains high voltage! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt installation, operation and maintenance of electrical equipment. Be sure that you are completely familiar with NEMA publication MG-2, safety standards for construction and guide for selection, installation and use of electric motors and generators, the National Electrical Code, IEC and local codes and practices. Unsafe installation or use can cause conditions that lead to serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

WARNING: Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

WARNING: Be sure the system is properly grounded before applying power. Do not apply power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury. National Electrical Code, IEC and Local codes must be carefully followed.

WARNING: Avoid extended exposure to machinery with high noise levels. Be sure to wear ear protective devices to reduce harmful effects to your hearing.

WARNING: Surface temperatures of motor enclosures may reach temperatures which can cause discomfort or injury to personnel accidentally coming into contact with hot surfaces. Protection should be provided by the user to protect against accidental contact with hot surfaces. Failure to observe this precaution could result in bodily injury.

WARNING: This equipment may be connected to other machinery that has rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt to install operate or maintain this equipment.

WARNING: Do not by-pass or disable protective devices or safety guards. Safety features are designed to prevent damage to personnel or equipment. These devices can only provide protection if they remain operative.

WARNING: Avoid the use of automatic reset devices if the automatic restarting of equipment can be hazardous to personnel or equipment.

WARNING: Incorrect motor rotation direction can cause serious or fatal injury or equipment damage. Be sure to verify motor rotation direction before coupling the load to the motor shaft.

WARNING: Be sure the load is properly coupled to the motor shaft before applying power. The shaft key must be fully captive by the load device. Improper coupling can cause harm to personnel or equipment if the load decouples from the shaft during operation.

WARNING: Use proper care and procedures that are safe during handling, lifting, installing, operating and maintaining operations. Improper methods may cause muscle strain or other harm.

WARNING: Thermostat contacts automatically reset when the motor has slightly cooled down. To prevent injury or damage, the control circuit should be designed so that automatic starting of the motor is not possible when the thermostat resets.

WARNING: UL Listed motors must only be serviced by UL Approved Authorized Baldor Service Centers if these motors are to be returned to a hazardous and/or explosive atmosphere.

WARNING: Pacemaker danger – Magnetic and electromagnetic fields in the vicinity of current carrying conductors and permanent magnet motors can result in a serious health hazard to persons with cardiac pacemakers, metal implants, and hearing aids. To avoid risk, stay away from the area surrounding a permanent magnet motor.

WARNING: The SCR Controller may apply hazardous voltages to the motor leads after power to the controller has been turned off. Verify that the controller is incapable of delivering hazardous voltages and that the voltage at the motor leads is zero before proceeding. Failure to observe this precaution may result in severe bodily injury or death.

WARNING: Before performing any motor maintenance procedure, be sure that the equipment connected to the motor shaft cannot cause shaft rotation. If the load can cause shaft rotation, disconnect the load from the motor shaft before maintenance is performed. Unexpected mechanical rotation of the motor parts can cause injury or motor damage.

WARNING: Do not use non UL/CSA listed explosion proof motors in the presence of flammable or combustible vapors or dust. These motors are not designed for atmospheric conditions that require explosion proof operation.

WARNING: Motors that are to be used in flammable and/or explosive atmospheres must display the UL label on the nameplate along with CSA listed logo. Specific service conditions for these motors are defined in NFPA 70 (NEC) Article 500.

WARNING: **Guards must be installed for rotating parts such as couplings, pulleys, external fans, and unused shaft extensions, should be permanently guarded to prevent accidental contact by personnel. Accidental contact with body parts or clothing can cause serious or fatal injury.**

Caution: **To prevent premature equipment failure or damage, only qualified maintenance personnel should perform maintenance.**

Caution: **Do not over–lubricate motor as this may cause premature bearing failure.**

Caution: **Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load (gears, pumps, compressors, or other driven equipment) from the motor shaft before lifting the motor.**

Caution: **If eye bolts are used for lifting a motor, be sure they are securely tightened. The lifting direction should not exceed a 20° angle from the shank of the eye bolt or lifting lug. Excessive lifting angles can cause damage.**

Caution: **To prevent equipment damage, be sure that the electrical service is not capable of delivering more than the maximum motor rated amps listed on the rating plate.**

Caution: **If a HI POT test (High Potential Insulation test) must be performed, follow the precautions and procedure in NEMA MG1 and MG2 standards to avoid equipment damage.**

Caution: **Do not use Silicone grease or Sealing Compounds (RTV) on or in the vicinity of the motor or its air supply. Silicone vapor inside the motor will result in extremely rapid brush wear.**

Caution: **Vertical mount hand hole covers are required to provide protection to vertically mounted drip–proof motors. Stock motors and other motors designed for horizontal mounting can be adapted for vertical mounting by ordering vertical mount hand hole covers from Baldor.**

Caution: **Use of these radial load capacities requires the accurate calculation of the radial load for the application. Radial loads for gears, sprockets, and flywheel are usually accurately determined. Radial loads for V–belt drives are subject to error due to the exclusion of pre–tension load (belt tightening). The calculations of the radial load for a V–belt drive must include the pre–tension for transmitting the horsepower, pre–tension for centrifugal force on the belts, Pre–tension for high start torques, Rapid acceleration or deceleration, Pre–tension for drives with short arc–of–contact between the V–belt and sheave and low coefficient of friction between belt and sheave caused by moisture, oil or dust.**

Caution: **Series wound motors must never be allowed to run with no load (broken belt etc.) An unloaded motor may reach destructive high speeds.**

Caution: **Motors designed for forced ventilation must have cooling air when fields are excited at rated voltage. Installations having the air supply interrupted when the motor is not operating must have field disconnected or field voltage reduced to 50% rated by means of field economizing resistor and relay or motor insulation life will be significantly reduced.**

If you have any questions or are uncertain about any statement or procedure, or if you require additional information please contact your Baldor distributor or an Authorized Baldor Service Center.

Machine description

Technical data on rating plate

The exact type designation and the most important technical data are shown on the rating plate located on the terminal box.

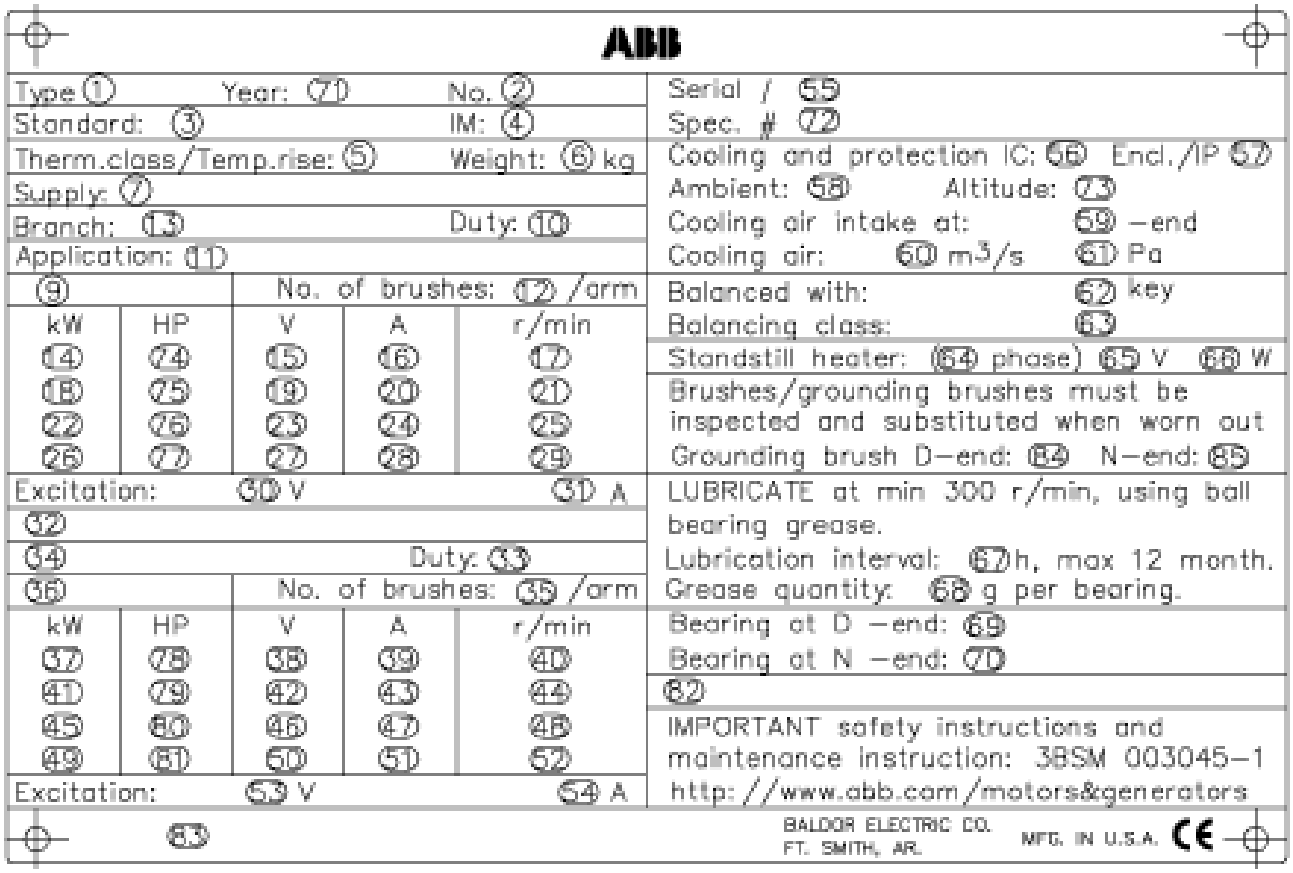


ABB					
Type (1) Year: (71) No. (2)					Serial / (55)
Standard: (3) IM: (4)					Spec. # (72)
Therm.class/Temp.rise: (5) Weight: (6) kg					Cooling and protection IC: (56) Encl./IP (57)
Supply: (7)					Ambient: (58) Altitude: (73)
Branch: (13) Duty: (10)					Cooling air intake at: (59) −end
Application: (11)					Cooling air: (60) m^3/s (61) Pa
(9)		No. of brushes: (12) /arm			Balanced with: (62) key
kW	HP	V	A	r/min	Balancing class: (63)
(14)	(74)	(15)	(16)	(17)	Standstill heater: (64) phase (65) V (66) W
(18)	(75)	(19)	(20)	(21)	Brushes/grounding brushes must be
(22)	(76)	(23)	(24)	(25)	inspected and substituted when worn out
(26)	(77)	(27)	(28)	(29)	Grounding brush D−end: (84) N−end: (85)
Excitation: (30) V				(31) A	LUBRICATE at min 300 r/min, using ball
(32)					bearing grease.
(34)			Duty: (33)		Lubrication interval: (67) h, max 12 month.
(36)		No. of brushes: (35) /arm			Grease quantity: (68) g per bearing.
kW	HP	V	A	r/min	Bearing at D −end: (69)
(37)	(78)	(38)	(39)	(40)	Bearing at N −end: (70)
(41)	(79)	(42)	(43)	(44)	(82)
(45)	(80)	(46)	(47)	(48)	IMPORTANT safety instructions and
(49)	(81)	(50)	(51)	(52)	maintenance instruction: 3BSM 003045−1
Excitation: (53) V				(54) A	http://www.abb.com/motors&generators
(83)					BALDOR ELECTRIC CO. FT. SMITH, AR. MFG. IN U.S.A. CE

Figure 1. Rating plate for DMI machine.

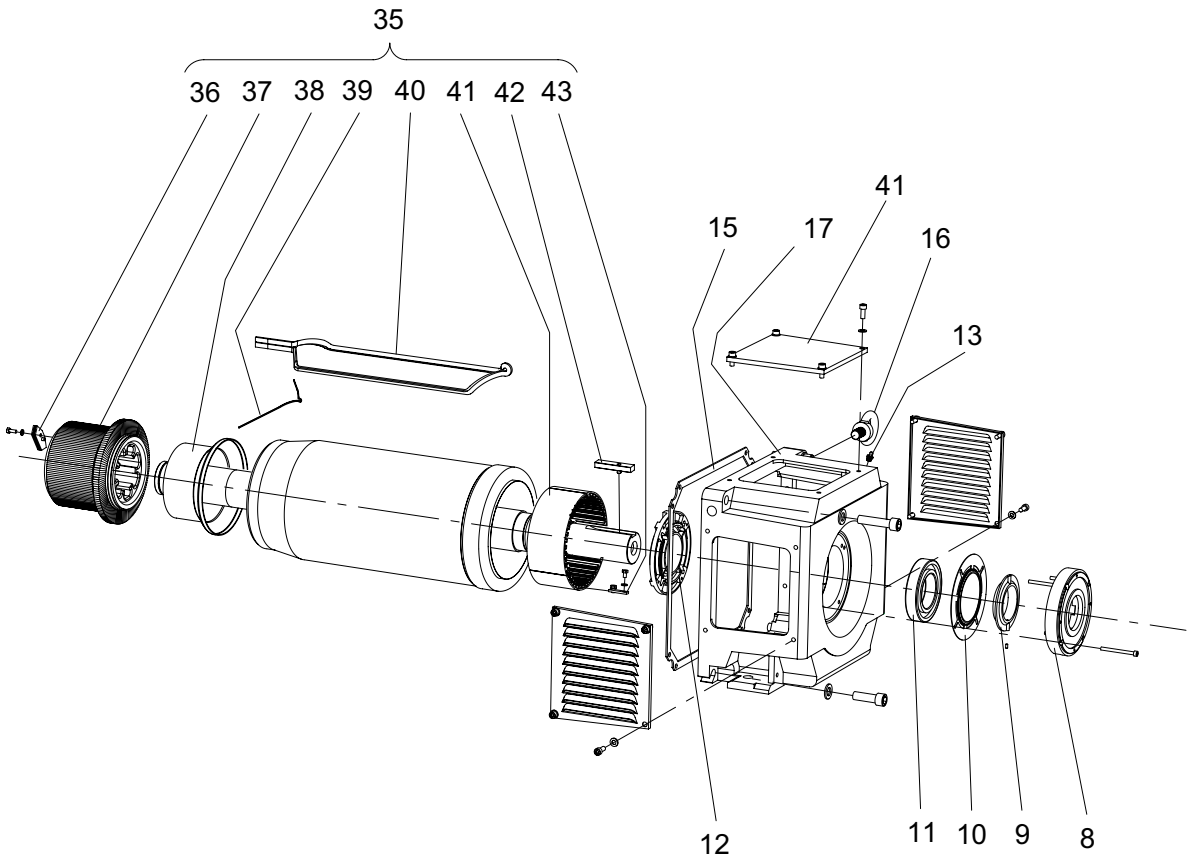
1	Type of motor
2	Motor number (specific for each motor)
3	Rating and performance standard
4	Mounting arrangement
5	Thermal class/Temperature rise
6	Motor weight (without cooling device)
7	Converter and/or AC supply data
9	Machine type
10	Duty cycle
11	Application
12	No. of brushes/arm on brush gear
13	Branch
14, 18, 22, 26	Mechanical power (kW) heater
15, 19, 23, 27	Armature DC voltage
16, 20, 24, 28	Armature DC current
17, 21, 25, 29	Speed (rpm)
30	Field exciter voltage
31	Field exciter current
32	Catalogue no.
33	Alternative duty cycle
34	Open row
35	No. of brushes/arm on brush gear, alternative operation
36	Alternative machine type
37, 41, 45, 49	Mechanical power (kW) for alternative operation
38, 42, 46, 50	Armature DC voltage for alternative operation
39, 43, 47, 51	Armature DC current for alternative operation
40, 44, 48, 52	Speed (rpm) for alternative operation
53	Field exciter voltage, alternative operation
54	Field exciter current, alternative operation
55	Open row
56	Method of cooling
57	Degree of protection
58	Valid temp. range for operation
59	Motor end for cooling air intake
60	Volume of cooling air (for heat dissipation)
61	Static air pressure drop
62	Key type used for balancing
63	Balancing class
64	Number of phases connected to standstill heater
65	Standstill heater voltage
66	Standstill heater power
67	Lubrication interval
68	Grease quantity
69	Bearing type at D-end
70	Bearing type at N-end
71	Manufacturing year
72	Open row
73	Valid altitude for motor operation
74, 75, 76, 77	Mechanical power (HP)
78, 79, 80, 81	Mechanical power (HP), alternative operation
82	Open row
83	CSA logotype (if CSA approved)
84	Grounding brush drive end
85	Grounding brush non-drive end

Description of parts

Part No.	Description
1	Outer bearing cover, N-end
2	Retaining ring, N-end
3	Grease-sling disc, N-end
4	Grease retaining ring, N-end
5	Bearing, N-end
6	Inner bearing cover, N-end
7	Grease nipple, N-end
8	Outer bearing cover, D-end
9	Grease-sling disc, D-end
10	Grease retaining ring, D-end
11	Bearing, D-end
12	Inner bearing cover, D-end
13	Grease nipple, D-end
14	Bearing end shield, N-end
15	Gasket
16	Lifting lug
17	Bearing end shield, D-end
18	Brush gear, complete
19	Brush rocker
20	Holder for brush rocker
21	Brush-holder arm

Part No.	Description
22	Pressure finger spring
23	Pressure finger
24	Brush
25	Stator, complete
26	Stator frame
27	Main field coil
28	Main field coil insulation
29	Interpole field coil
30	Interpole field coil insulation
31	Coil support
32	Compensating winding
33	Slot insulation
34	Slot key
35	Armature, complete
36	Counter weight, N-end
37	Commutator
38	Armature coil support, N-end
39	Equalizing winding
40	Armature coil
41	Armature coil support, D-end
42	Shaft-end key

Part No.	Description
43	Counterweight, D-end
44	Inspection cover, complete with gasket (state position and type)
45	Terminal box, complete
46	Gasket
47	Box bottom plate
48	Mounting rail
49	Terminal block
50	Terminal block
51	Earthing bar
52	Gasket
53	Box frame
54	Bar holder
55	Connection bar
56	Box cover
57	Gasket
58	Gasket
59	Connection cover
60	Bracket for brush gear positioning device
61	Screw for push gear positioning device
62*	Earthing bar (on 315 & 400)
63*	Spacer/O-ring (on 315 & 400)



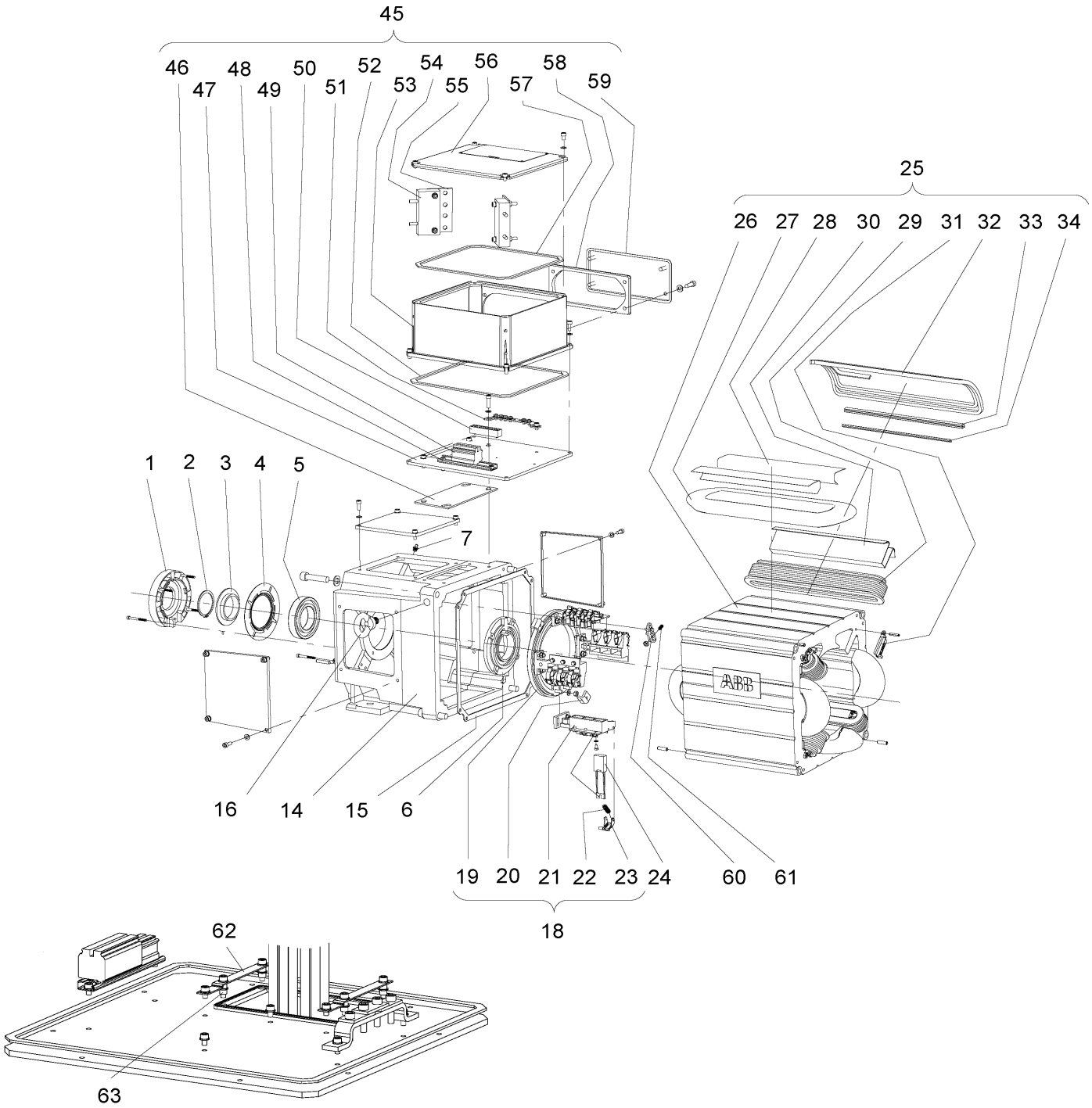

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ABB

General storage precautions

General

Special attention must be given to machines which are to be stored for a long period of time before commissioning.

Condensation, corrosive gases and vibrations should be avoided.

Caution
Lift all brushes and wrap protective paper around the commutator.

Condensation

Condensation in a machine may lead to corrosion and damp windings (low insulation readings).

If the machine is to be stored in an unheated room, heating elements must be provided to maintain a constant temperature.

The heating element should be such that the temperature of the machine is always at least 5 K above the ambient temperature.

Caution
In order to avoid condensation, the machine should be placed in a room or in a building where the temperature varies as little as possible.

Corrosive environment

There are added complications if corrosive gases are present which attack the commutator surface.

The gases that gives the greatest problems and should be avoided during storage are:

– sulphurous gases
– chlorine
– ammonia

Caution
Store the machine in a gas-free room.

Vibrations and bearings

If the machine is stored on a vibrating surface the antifriction bearings are subject to damage. If this is the case the bearings may have to be replaced before the machine can be put into operation.

If vibration cannot be avoided, turn the armature a few times per month.

Caution
Store the machine in a vibration-free room.

Shaft end protection

All machines leave the factory with an anti-corrosion coating on the shaft extension.

Caution
The coating should be inspected by the customer and re-applied if necessary.

Foundation

General

The erection of machines at the customer's site can be done by the customer or by ABB personnel.

The foundation must be strong enough to bear the machine, and to withstand torque reaction and stresses from a belt drive, if used.

Avoid resonances in the operating speed range and with sixfold mains frequency which may be caused by the six pulse converter.

The mounting area of the machine must be level and free from vibrations.

ABB does not accept responsibility regarding foundations, as this can be influenced by factors which are not controlled by ABB.

Caution
The foundation must be dimensioned in such a way that its own natural frequency, including the motor weight, does not correspond to those disturbing frequencies which normally exist in a thyristor-fed DC machine.

The mass of the foundation of a foot mounted motor should be five times the mass of the motor or higher.

Remark
Adequate space for inspection, maintenance, electrical cables and cooling ducts must be provided.

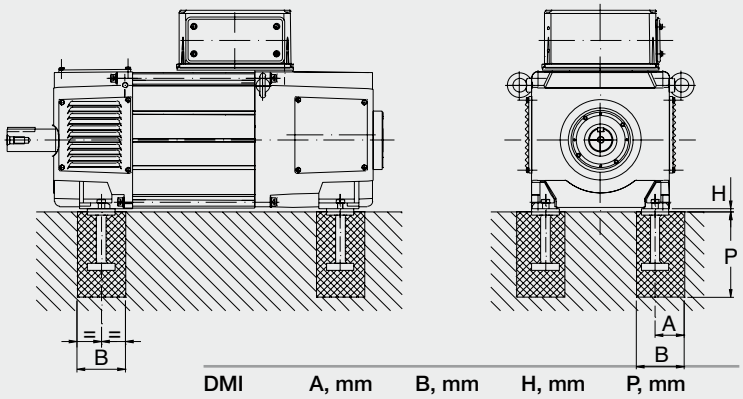
Grouting

To ensure satisfactory results, shrink-free concrete should be used. The instructions supplied by the manufacturer of the shrink-free concrete should be followed.

Mounting blocks or foundation bolts which are bolted to the machine must hang freely in the mounting holes during grouting.

Make sure that there are no air pockets in the concrete. Check that the compression strength of the concrete and the curing time are in accordance with the manufacturer's instructions.

Grouting is normally not permitted at an ambient temperature below + 5 °C.



DMI	A, mm	B, mm	H, mm	P, mm
180	70	120	10	200
200	80	140	10	250
225	80	140	10	250
250	90	160	10	270
280	90	160	10	270
315	160	250	15	450
400	185	280	15	450

Fig. 2 Foundation studs.

Machine installation

Checks before starting installation

- DMI-motor
- Accessories in separate packages
- Maintenance Instruction, including "Declaration of Incorporation" and "EC Declaration of Conformity"
- Check that the rating plate is in accordance with the order

Inspection

It is recommended to check that:

☑ The erection site is clean

☑ The erection site is prepared for installation.

☑ Access is provided for inspection and maintenance of the machine

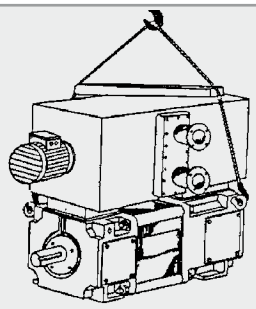
☑ Air ducts, if needed, are free from foreign matter which could be sucked into the machine during commissioning

Lifting

Always use all the lifting eyes of the machine (two or four).

The weight of the machine is shown on the rating plate.

WARNING
Machines with separate heat exchanger have lifting lugs on the heat exchanger. These are only for lifting the heat exchanger, not the entire machine.



Assembly of coupling

Some machines are shipped with a transport locking device. This device should not be removed as long as the machine remains in storage. Remove the locking device prior to installation of the motor.

As the machine is equipped with antifriction bearings, it must be connected to the driven equipment with a flexible coupling.

As standard, the armature is balanced with a half key. The balancing method is described on the rating plate.

When assembling the coupling halves, take into account the following instructions:

☑ Remove the anti-corrosion coating from the shaft extension.

☑ Follow the coupling supplier's assembly instructions.

The normal procedure of assembly is by heating the coupling. The required heating temperature depends on the interference fit between shaft and coupling. For this reason a specific temperature cannot be given. Make sure that the couplings are balanced before assembly.

A clearance of 0.2-0.3 mm is sufficient during assembly. The armature shaft should be rotated while the coupling cools, to avoid temperature stresses and hence bending moments on the shaft.

WARNING
Never use impact tools. They will damage the bearings.

Alignment of direct coupled machines

Good alignment ensures safe operation and long machine life. Check the misalignment between the coupling flanges after the machine has been installed. Maximum deviations, see fig. 3 and 4.

A common method is the use of dial indicators, which are mounted according to fig. 5.

Machine alignment must be continued until dial indicator readings of max. 0,05 mm are obtained. To ensure correct alignment of the machine, place suitable metal shims between machine feet and mounting blocks. Installation instructions from the suppliers of pumps, gear drives, etc. often specify the vertical and lateral displacement of the driving shaft at operating temperature. It is important that these instructions are observed during alignment in order to avoid vibrations and other disturbances during operation.

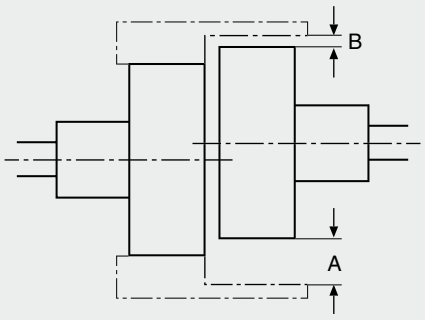


Fig. 3 Parallel alignment. A-B = max. 0.05 mm.

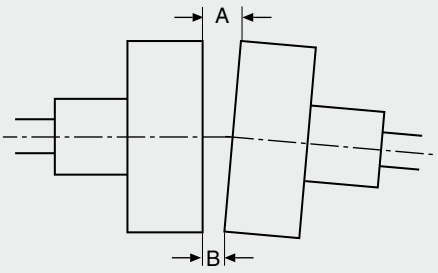


Fig. 4 Angular alignment. A-B = max. 0.05 mm.

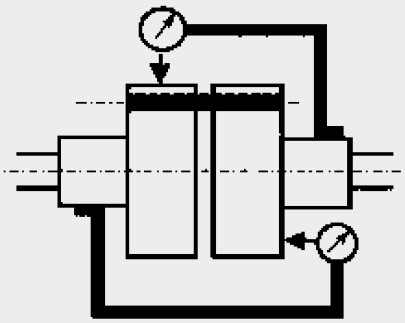


Fig. 5 Dial indicator for proper machine alignment.

Alignment of V-belt drive

The drive should be arranged in such a way that the lower belts are the driving ones, i. e. so that the slack is in the upper belts. The slide rails (accessories) are to be bolted to the machine feet and positioned in such a way that the tensioning screws are diagonally opposite each other and the tensioning screw at the D-end is located between the motor and the driven object.

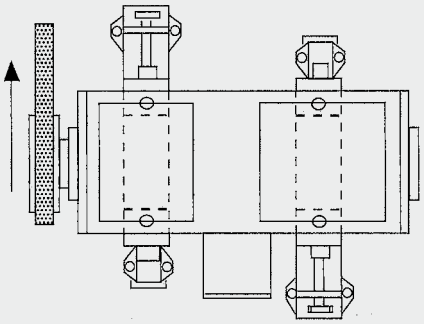


Fig. 6 Slide rail and tensioning screw arrangement.

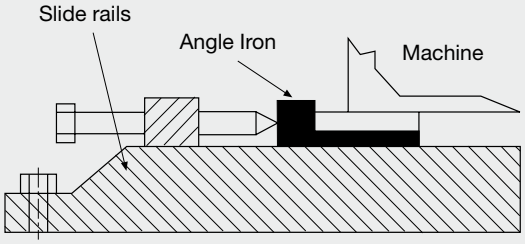


Fig. 7 Distance piece.

Max allowed belt tension according to DMI catalogue.

Tightening torque of foundation bolts

DMI	Tightening torque *)	
180	84 Nm	(62 lb.ft)
200	205 Nm	(150 lb.ft)
225	205 Nm	(150 lb.ft)
250	430 Nm	(315 lb.ft)
280	430 Nm	(315 lb.ft)
315	745Nm	(547lb.ft)
400	1520Nm	(1116lb.ft)

*) Above values without lubrication

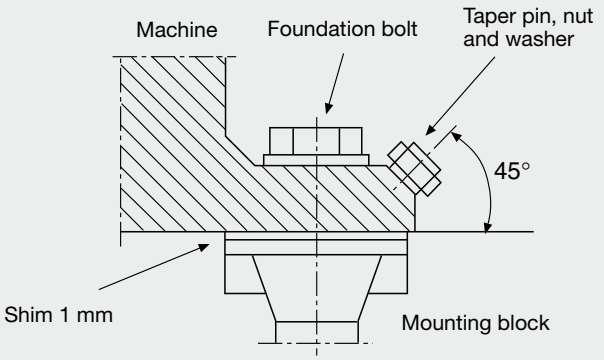


Fig. 8 Tightening torque of foundation bolts.

Connection of cables

As standard, the terminal box is mounted on the top of DMI machines. However, the machines can also be supplied with the terminal box mounted on the side.

The terminal box is normally (top mounting) mounted in such a way that the cable connection is made from the right-hand side (seen from the drive end). Cable connection from the left-hand side or from the non drive end or drive end is possible by removing the terminals from A1 and A2 bar. Turn the box frame so that the terminal opening faces the desired direction.

If the terminals from the main field coils are obstructing the main cable entrance, it is possible to interchange positions with the grounding bar. Make sure that all cable shoes are connected to the same terminals as before.

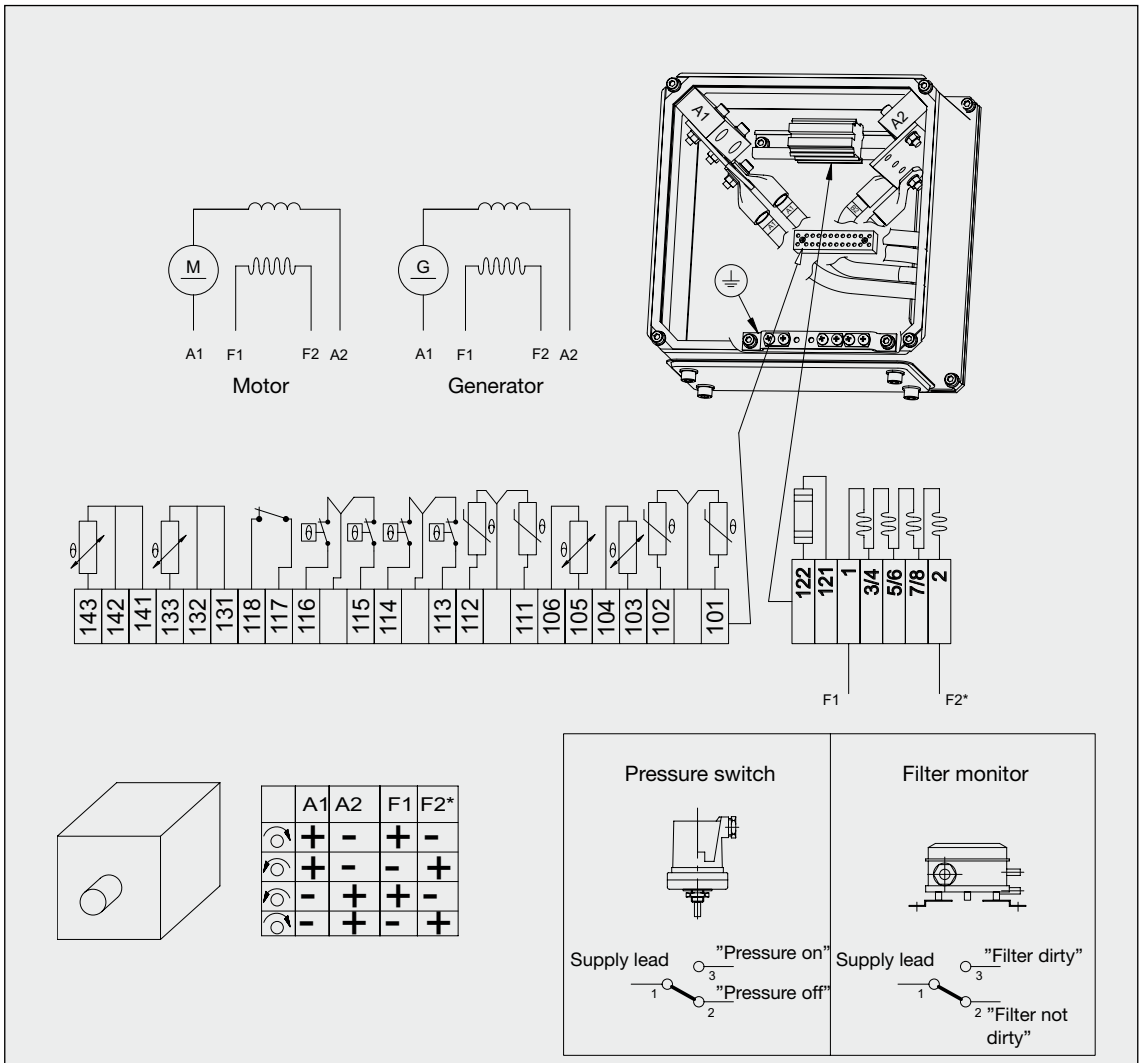
The terminal box has sealed side covers for external cable connections. For DMI 180-280 the cover can be exchanged with a standardized cover or it can be bored out to suit the customer's cable connection.

Tightening torque for cable connections inside the terminal box:

– 40 Nm for M10
– 84 Nm for M12

Terminal diagram

Terminal diagram for DMI 180-280, standard design (shunt wound machine).



101, 102
Connection thermistors 3BSM 004640- on main field coil (101) and interpole field coil series connected, switch off [1)]

103, 104
Connection PT 100 3BSM 004647-1 on main field coil [1)]

105, 106
Connection PT 100 3BSM 004647-1 on interpole field coil [1)]

111, 112
Connection thermistors 3BSM 004640- on main field coil (111) and interpole field coil series connected, alarm [1)]

113, 114
Connection thermostats 3BSM 004641- on main field coil (113) and interpole field coil series connected, switch off [1)]

115, 116
Connection thermostats 3BSM 004641- on main field coil (115) and interpole field coil series connected, alarm [1)]

117, 118
Connection brush wear protection acc to order [1)]

121, 122
Connection heater [1)]

131, 132, 133
Connection PT 100 for bearings on D-end [1)]

141, 142, 143
Connection PT 100 for bearings on D-end [1)]

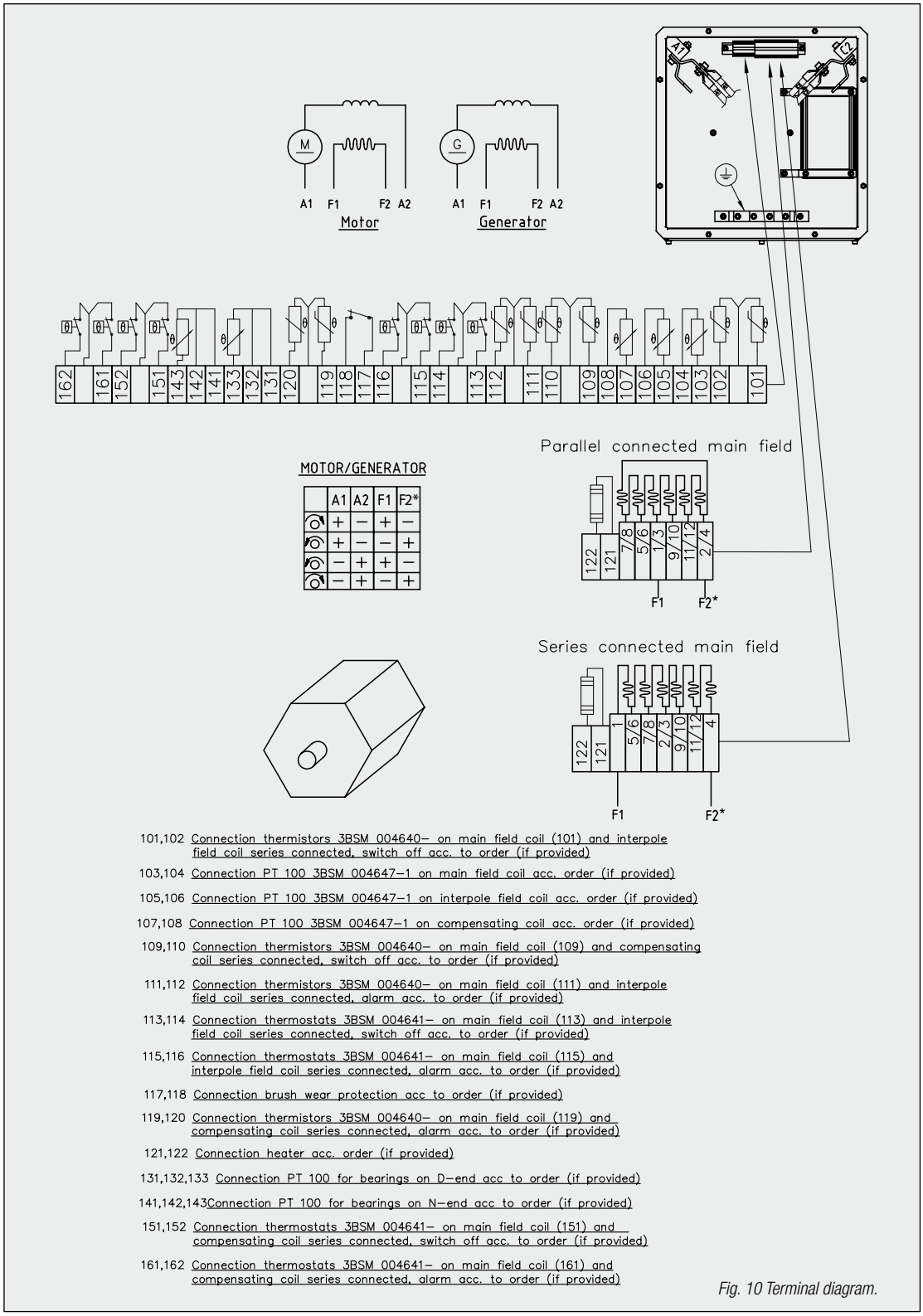
[1)] If provided

Fig. 9 Terminal diagram.

** Former designated F4. Changed to F2 according to IEC 60034-8.*

Terminal diagram

Terminal diagram for DMI 315 – 400, standard design (shunt wound machine).



101,102 Connection thermistors 3BSM 004640– on main field coil (101) and interpole field coil series connected, switch off acc. to order (if provided)

103,104 Connection PT 100 3BSM 004647–1 on main field coil acc. order (if provided)

105,106 Connection PT 100 3BSM 004647–1 on interpole field coil acc. order (if provided)

107,108 Connection PT 100 3BSM 004647–1 on compensating coil acc. order (if provided)

109,110 Connection thermistors 3BSM 004640– on main field coil (109) and compensating coil series connected, switch off acc. to order (if provided)

111,112 Connection thermistors 3BSM 004640– on main field coil (111) and interpole field coil series connected, alarm acc. to order (if provided)

113,114 Connection thermostats 3BSM 004641– on main field coil (113) and interpole field coil series connected, switch off acc. to order (if provided)

115,116 Connection thermostats 3BSM 004641– on main field coil (115) and interpole field coil series connected, alarm acc. to order (if provided)

117,118 Connection brush wear protection acc to order (if provided)

119,120 Connection thermistors 3BSM 004640– on main field coil (119) and compensating coil series connected, alarm acc. to order (if provided)

121,122 Connection heater acc. order (if provided)

131,132,133 Connection PT 100 for bearings on D–end acc to order (if provided)

141,142,143 Connection PT 100 for bearings on N–end acc to order (if provided)

151,152 Connection thermostats 3BSM 004641– on main field coil (151) and compensating coil series connected, switch off acc. to order (if provided)

161,162 Connection thermostats 3BSM 004641– on main field coil (161) and compensating coil series connected, alarm acc. to order (if provided)

Fig. 10 Terminal diagram.

** Formerly designated F4. Changed to F2 according to IEC 60034-8.*

Commissioning

Checks before start-up

Before starting the motor, check that:

☑ the armature turns freely and no scraping noise can be heard.

☑ the couplings and other mechanical components are properly tightened.

☑ the cooling air inlet is located according to the rating plate.

☑ the fans rotate in the correct direction.

☑ the cooling air has free access into and out of the motor.

☑ the air inlet and outlet are at opposite ends of the machine (if the air inlet is at the N-end then the air outlet must be at D-end, or if the air inlet is at the D-end then the outlet must be at the N-end).

☑ all brushes, including the grounding brush (if ordered), are in position. The spring-loaded pressure fingers are snapped against the brushes and the brushes can move freely in their pockets.

☑ the commutator surface has been cleaned (if it has been exposed to corrosive gases during storage). See the chapter “Commutator”.

☑ the electrical connections are tight and are in accordance with the terminal diagram.

☑ the protective equipment as well as other monitoring equipment are functioning properly.

☑ the insulation resistance has been measured and approved. See the chapter “Insulation resistance”.

WARNING
Don’t seal air ducts to the motor with products containing silicone, as silicone oil particles will adhere to the surface of the commutator and cause high brush wear.

Caution
It is advisable to contact ABB if there are any abnormal observations

Checks during start-up

Check the following points during the start-up:

☑ that the bearings are filled with grease. See the chapter “Lubrication”.

☑ that the bearing temperatures show normal values after a few hours of running. At an ambient temperature of 20 °C the values should be below 80 °C (measured on the outer bearing cover).

☑ that no unusual bearing noise is heard.

☑ that all instruments show normal readings.

☑ the control system of the thyristor converter.

☑ the shape and form of the current response.

☑ the commutation of the machine.

☑ that the vibration level does not exceed 4.5 mm/s r.m.s.

WARNING
If one of the covers close to the cooling air inlet is to be opened for motor inspection while the machine is running, observe the following:
- **If the machine is equipped with a built-on fan, the air intake to the fan must be sealed off (to avoid overheating of the fan motor).**
- **From the time the cover has been opened, or the fan intake has been sealed off, a maximum of three minutes is available for inspection.**

Lubrication during start-up

Caution
Immediately after start-up of a newly-installed machine or of a machine which has been standing for a long period, new grease must be pressed into the bearings. Follow the lubricating instructions on the rating plate and in chapter “Lubrication”.

Checks after 100 operating hours

After 100 operating hours inspect the commutator and the brushes while the machine is at rest. The surface of the commutator should show a homogeneous film (patina). The brush contact surface should be homogeneous without patchy discolouring.

If the results of the inspection are not satisfactory, ABB should be consulted.

Observation and maintenance

General

Careful maintenance is the best insurance against failures and interruption of operation. The maintenance schedule shown below is the result of many years of experience.

However, the needs for maintenance can vary widely depending on local conditions. The schedule is therefore to be regarded as a guide only.

Maintenance schedule

Once a month

- ☑ Inspect brushes for wear and freedom of movement.
- ☑ Inspect the condition of the commutator.
- ☑ Check the commutation.
- ☑ Check for vibrations.
- ☑ Check bearing conditions.
- ☑ Check the function of thermostat regulators for coolers.
- ☑ If necessary clean away oil or grease that may have entered into the motor.
- ☑ If needed, exchange main air filter as well as air leakage filter in the cooler.
- ☑ If necessary, replace the fan's filter.

Caution
The vibration should not exceed 4.5 mm/s r.m.s.

Remark
Lubricate the bearings at intervals according to the rating plate.

Every 4 month

- ☑ Clean the inside of the motor with a vacuum cleaner in combination with clean, dry compressed air or by wiping off the contamination.
- ☑ Measure the insulation resistance of the windings using a 500 V megger (both before and after cleaning).
- ☑ Inspect all connections including the brush flexibles.

Insulation resistance

Measuring of insulation resistance

The measurement should be done with a 500 V megger.

It is not practical to state a definite minimum value of the insulation resistance. In some cases the machines can operate satisfactorily with lower values than the recommended minimum value. The recommended minimum insulation resistance can be obtained from the following formula (1):

R_m = kV+1 (1)

R_m = the lowest recommended insulation resistance in MΩ at 40 °C

kV = the rated voltage of the machine in kV

For recalculation of the measured insulation resistance to 40 °C, the following must be taken into consideration: Temperature dependence of the insulation resistance. When measuring the insulation resistance, the temperature of the winding should be measured at the same time to enable the insulation resistance to be recalculated to correspond to a temperature of 40 °C. This can be accomplished by using the following formula (2):

$R_{40\,°C} = K_{t40\,°C} \times R_t$ (2)

$R_{40\,°C}$ = insulation resistance corrected to 40 °C

R_t = measured insulation resistance in MΩ at t °C

$K_{t40\,°C}$ = correction factor according to the diagram below.

Example

In the winding of a 750 V motor, the insulation resistance has been measured as 100 MΩ at 6 °C. We obtain from the diagram:

$K_{t40\,°C}$ at 6 °C = 0.1

The recommended minimum insulation resistance R_m according to formula (1) is:

R_m = 0.750 + 1.0 = 1.75 MΩ

According to formula (2):

$R_{40\,°C}$ = 0.1 x 100 = 10 MΩ

Conclusion

$R_{40\,°C}$ is larger than R_m and the insulation resistance is approved.

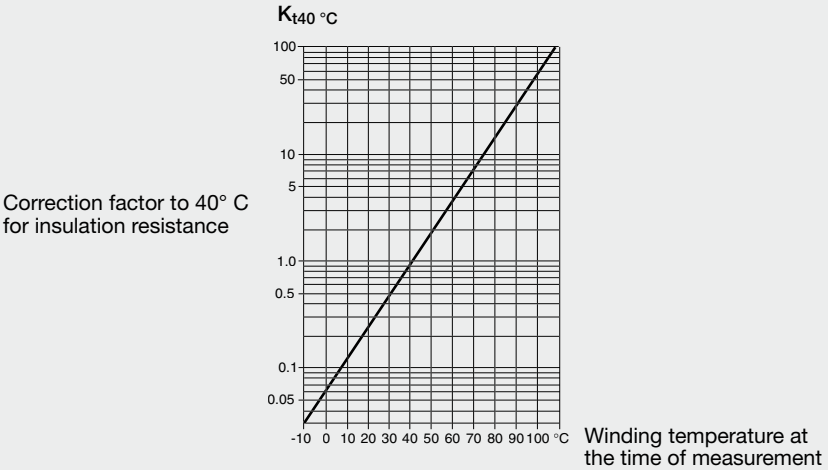


Fig. 11 Correction factor.

Brushes and commutation

General

Good commutation depends on many influences such as the air humidity, the gas or oil content in the air, dust particles.

Other factors are: cooling air temperature too low, low loads over extended periods of time or vibrations. A critical factor for achieving good commutation is the correct choice of brush grade. ABB has many years of experience in the selection of suitable types. Nevertheless, the brush grade may have to be changed if unexpected operating conditions occur.
Please contact ABB if a change of brush grade is planned.

To get the right advice, the following information should be provided:

- Type and serial number of the machine
- Actual normal and overload current
- Description of the commutator contact surface condition
- Brushes: grade, wear/1000h, condition of the contact surfaces, wedging effect (lateral wear)
- Environment: air humidity, oil mist, dust, chemical vapours and surrounding air temperature

Patina

A new commutator has a clean copper surface. After some time of operation a patina is formed, consisting of copper oxides mixed with particles from the brushes which together produce a hard, resistant coating which protects the commutator.

A homogeneous patina, whose colour is not relevant, produces ideal running conditions and minimum wear.

It is important that the temperature of the contact surface is sufficiently high to activate the chemical process. The temperature is primarily dependent on the current density in the brush, the frictional losses and the cooling air temperature.

Another important fact or is the humidity of the surrounding air, since moisture is a necessary element in the chemical process.

A favourable water content for a satisfactory patina is about 10 gram/m^3.

Caution
Do not touch a good patina.

Sparking

The most common reason for sparking is poor contact between the brush surface and the commutator surface. It is also possible that certain brushes which have better contact than others take more current and therefore spark due to overloading.

Sparking may be progressive, i.e. start with small sparks, seemingly harmless, and then slowly or quickly progress to more serious sparking, especially if the commutator surface has been burnt. It is important that the commutator surface is inspected regularly and any sign of increased sparking at the brush edges is noted.

Faint sparking may occur and can be accepted if it does not go any further than that.

So called patterning may also occur, which means that certain evenly spaced laminations, for instance every third, acquire a dark patina or becomes slightly blackened in parts on the edge of lamination. Usually this may be considered merely as a blemish, but in some cases it may lead to flattening and damage on the commutator surface. In certain applications there are often rapid current and speed fluctuations. The sparking occurring in this case is usually quite harmless.

If a motor supplied by a converter begins to spark without apparent reason, a fault in the converter may be suspected. Possible reasons might be a fault in the control equipment, a fuse etc.

Poor brush contact

As mentioned, poor brush contact can cause sparking and produce burn marks on the commutator contact surface. The following are the most likely causes:

Vibrations

Vibrations have a decisive influence on brush contact. For example, unbalanced couplings or fans with dirt deposits may lead to imbalance error. Other causes are poor alignment of the DC machines and vibration excitation via the foundation. If the brushes exhibit wedging effect (lateral wear), this indicates inadmissible vibrations.

Caution
If the measured vibration level exceeds 4.5 mm/s r.m.s. , appropriate measures should be taken to reduce the level of vibrations.

Low load

If the machine is permanently operated at low load, it is advisable to reduce the number of brushes. As the ideal current load depends on the brush grade, ABB should be consulted in such cases.

Humidity

Humidity is an important factor for the formation of the patina. If the air is dry and the moisture content less than 3 g/m^3, normally no patina can form. If the humidity exceeds 15 g/m^3, the patina becomes too thick.

Corrosive environment

Corrosive gases in the surroundings result in a deterioration of contact between brushes and commutator.

The problem can show up in different ways, e.g. as sparking, high brush wear or scratched commutator.

The gases that give the greatest problem and should be avoided are sulphur dioxide, hydrogen sulphide, chlorine and ammonia.

These gases, in sufficient concentration, attack the patina, break through it and attack the commutator.

Jammed brushes or pressure fingers

If one of the brushes does not move freely or if it is jammed, sparking will normally not be severe. However, if several brushes are affected, the remaining ones will be overloaded and sparking becomes dangerous.

Worn brushes

If worn brushes are not replaced in time, the commutator contact surface will be damaged by the brush lead.

Caution
Do not let the brush wear down so much that the flex attachment embedded in the brush comes into contact with the rotating surface. This can have serious consequences.

Oil-contaminated surfaces

The oil forms an insulating film and the current is transferred by small arcs. In the process the film is burned, leaving black spots on the commutator contact surface.

Scratched contact surface

Cement dust or similar hard particles can scratch the commutator surface. If construction work is to be done near the machine, it must be specially protected.

Brush wear

Brush wear is influenced by both mechanical and electrical factors, and differs greatly from one brush grade to another. It is therefore not possible to give universal, definitive figures for brush wear. The figures given here are indicative only but should not be exceeded by machines in this range.

Commutator peripheral speed	Approximate brush wear
below 20 m/s	3 mm/1000 h
20 – 30 m/s	5 mm/1000 h
30 – 40 m/s	7 mm/1000 h

Replacing worn brushes

The carbon brushes must be changed when they have worn down to the wearmark on the brush surface. They must be replaced by carbon brushes of the same grade as the original ones.

Worn brushes must be exchanged as a complete set. All brushes must be bedded-in after they have been placed into their holders (refer to “Bedding-in brushes” below).
Only after bedding-in and cleaning of the entire brush gear may the machine be started.

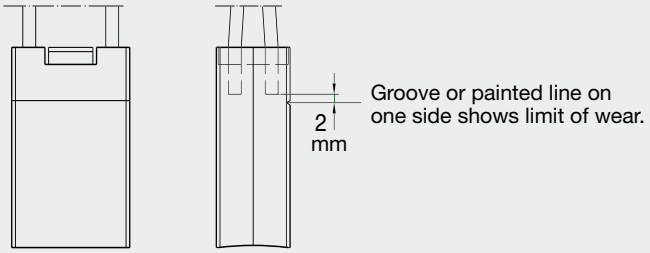


Fig 12 Brush.

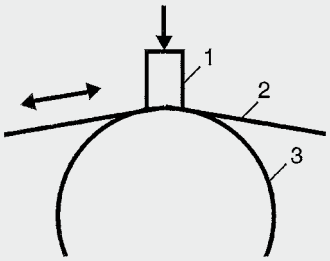
Caution
All brushes must be present for each commutator track surface in use, otherwise brush wear will be increased. Use only one brush grade per DC machine.

Commutation problems and consequential damage to machines equipped with different type of brush grade than the original type or the type suggested by ABB is not covered by warranty.

Bedding-in brushes

A medium-coarse emery cloth is used for bedding-in the carbon brushes. This is done when the machine is stationary. The emery cloth is inserted between brushes and commutator with the abrasive surface facing the brushes and should slide over the curvature of the commutator.

After bedding-in, the commutator and the brush gear must be cleaned, the brushes removed from their pockets, blown clean and checked to see that there are no abrasive particles on the brush surface.



1 Brush
2 Emery cloth
3 Commutator

Fig 13 Shaping a brush.

Commutator

General

Under normal operating conditions the commutator does not require any special maintenance.

If the commutator surface is rough, it is essential to check the operating conditions such as current loading, and environmental conditions. See the chapter “Brushes and commutation”.

The action to be taken in the event of a defect arising from the commutator must be determined from case to case. Only general advice can be given.

If the defects are slight, fine emery cloth or rubber polishing block should be tried first so as not to remove more of the patina than necessary.

If the patina is of poor quality, ABB recommends removing it completely.

If the surface is burnt to the extent that craters have appeared, an abrasive cloth or fine grindstone may be used, but great care must be taken to avoid short-circuits at the laminations. Grinding should be done at reduced voltage.

Corrosive environment

Inspect the commutator surface before start-up to see if the machine has been exposed to corrosive gases. If this has happened, remove the coating with fine emery cloth, a rubber polishing block or fine stone.

Commutator out of true

If the commutator is badly out of true (brush chatter) or if strong burn marks are evident, the commutator may have to be skimmed with a grinder or be carbide/diamond-turned on a lathe. Centring of The axis must be centred with reference to the bearing seats.

Roundness is very important. The total indicator reading (TIR), on a newly-turned commutator must not exceed 0.020 mm.

In addition, there is also a requirement that the difference in radius from one lamination to the next must not exceed 0.004 mm.

The surface roughness should be R_a=1.6 µm.

Type	Commutator diameter, D (mm)		
DMI	New	Min	Depth of wear
180	178	170	4
200	178	170	4
225	235	225	5
250	265	255	5
280	265	255	5
315	330	318	6
400	414	402	6

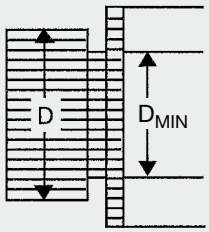


Fig 14 Turning down dimensions.

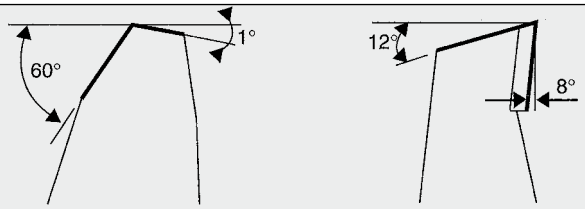


Fig 15 Cutting tool for turning.

After skimming, the segment insulation may have to be undercut according to the figure below. The insulation must be cut back far enough so that chamfering is possible.

The distance between the brush holder and the commutator surface should be 2.5 ±0.5 mm. If the distance has become larger after turning of the commutator, the brush holder must be reset.

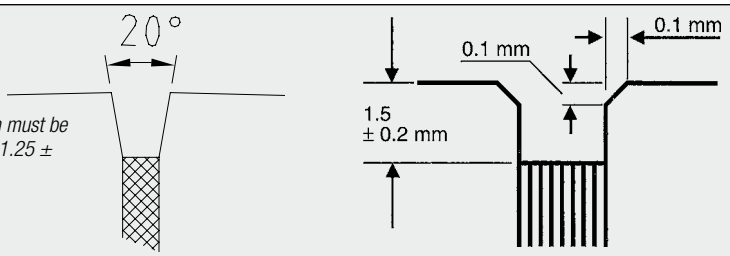


Fig 16 The segment insulation must be undercut to a depth of 1.25 ± 0.45 mm.

Bearings

Changing the bearings

Disassembling

- Dismantle the motor according to page 40.
- After removing the end shield, remove the rotor.
- Great care should always be taken during bearing assembly / disassembly to avoid any damage to the bearing seating on the shaft.
- The bearing must be removed with a purpose-designed extractor. See figure below.

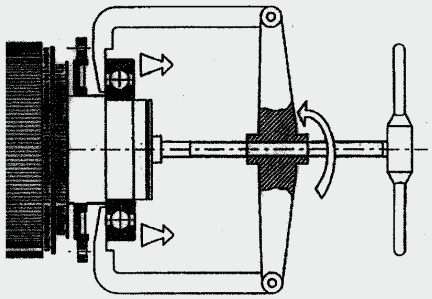


Figure 17. Disassembling a bearing using a purpose-designed extractor.

Assembling

- Carefully clean bearings and the inside of the bearing covers.
- Then place the inner bearing cover on the shaft.
- Heat the new bearing to 100 °C by induction, by placing in an oven or dipping it in an oil bath. Note! The new bearing must be of the same type as shown on rating plate.
- Fit the bearing on the shaft and hold it against the shoulder for 60 – 90 seconds.
- Remove the pressure applied and check that the inner ring does not rotate on the shaft
- Fill the bearing with grease. Note! Use only grease that fulfils ABB requirements, see page 25.
- Fill the bearing covers 2/3 full before assembly.
- Reassemble the motor according to page 40.

Standard bearings and roller bearings

The table below shows standard bearings and roller bearings for different DMI shaft heights. Differences may occur due to special design depending on application. The bearings fitted to each specific motor are shown on. the rating plate.

Lubrication

General

DMI machines should be lubricated with a grease gun while the machine is running.

Remark
Lubrication intervals and amount of grease are listed on the rating plate.

Lubrication during start-up

Immediately after start-up of a newly installed machine or of a machine which has been standing for a long period, new grease must be pressed into the bearings. Follow the lubricating instructions on the rating plate. The bearing temperature increases initially because there is a surplus of grease in the bearing housing. After the surplus grease has run out of the bearing housing, the temperature should reach normal running values (< 80°C at ambient 20°C) again.

Normally this takes a few hours.

If the machine is lubricated while standing still, the old grease does not pass out through the discharge opening. Instead it squeezes between the seal ring and the shaft into the machine and may cause serious contamination.

Use only high quality grease equivalent to ABB grease.

Lubrication during operation

Use a manual grease gun and lubricate while the machine is running with the amount and within the intervals specified on the rating plate. Use only high quality grease.

Caution
Clean the grease nipples prior to lubrication to prevent any impurities from being pressed into the bearings.

Remark
Lubricate only when the machine is running, preferably over 300 r/min.

ABB grease is equivalent to Shell Albida EMS2 with the basic data below:

NLGI-class: 2*
Soap thickener .....lithium complex
Lubrication oil.....Synthetic polyalphaolefin
Viscosity at 40°C .....100-200mm^2/s

No EP/AW-additives with harmful effects on bearings with polyamide or brass holder are allowed.

*) Vertical machines are recommended to use NLGI-class 3 if the pumpability properties of the grease allow it.

Cleaning

General

The most important factor in preventive maintenance is that everything is clean. The machine itself and the surroundings must be kept free from dust, oil and other matter which can come from the driven object or which can enter through ventilation openings, etc.

Cleaning of windings

Accumulated dirt on open insulated surfaces should be removed. This is especially important when revarnishing the windings because a new varnish coat will trap any existing dirt beneath the new coat.

Blowing and vaccuming are used if the dirt is dry and can be removed easily. Vacuuming is recommended, since blowing tends to redistribute the dirt or move it deeper between the insulation layers.

Wiping is used when spray-wash is not possible. Surfaces easily reached are wiped clean with a cloth dampened with detergent. In cramped areas of windings, a special brush may be more effective. Low insulation resistance is often caused by dirt on insulated surfaces, which should be carefully cleaned.

A spray wash is done with an airless high-pressure spray or a conventional spray. The high-pressure spray is more effective in removing dirt. The detergent used should remove the dirt without softening or damaging the insulation. Avoid using excessive amounts of the cleaning agent.

A dip wash can be used if the detergent does not soften or damage the insulation. Since the dirt is not removed mechanically in this method, a very effective cleaning and scouring agent is needed. A long dipping time may be required.

A water wash involves rinsing with water to prevent the detergents from penetrating into places where it cannot be removed. A water wash is done if needed following the instructions given above for wiping, spray wash or dip wash. After washing, the windings are rinsed with clean water several times. Distilled or de-ionised water is recommended for the final rinse.

Caution
Use only detergents specially made for cleaning windings in electrical machines and which do not damage the winding surface or insulation.

Drying of windings

The windings must be dried after a wash or if they have become damp in use or during a standstill. Drying in an oven with good ventilation is the most effective technique. Unfortunately, this is not usually possible at the motor's operating site. Therefore, either hot-air-blow or heating element should be used. Adequate fresh-air exchange is essential, whatever heating method is used.

A washed or a very wet motor should be dismantled and the windings dried in an oven. When drying in the oven, the temperature rise and the maximum temperature should be monitored carefully. The oven temperature should be 90 °C for 12-16 hours and then 105 °C for 6-8 hours. The rate of temperature rise of the windings should not exceed 5 K per hour, and the final temperature should not exceed 105 °C. Good ventilation must be ensured to remove the moisture completely.

The drying of the windings should be followed by insulation resistance tests. At the beginning of the drying treatment, the insulation resistance decreases due to the temperature rise. As the drying continues, however, the insulation resistance increases until it reaches a maximum value. Minimum insulation resistance value is given in chapter "Insulation resistance".

Filter

Fans with air filters

Machines which have fans with air filters must be checked at regular intervals and the filters must be exchanged when necessary.

Remove the inlet protection screen and fit a clean filter.

Remark
Note that the filter material has a different structure on each side. The side with the coarser structure must be placed outward.

Machines with heat exchangers

See the chapter ”Motors equipped with heat exchangers”

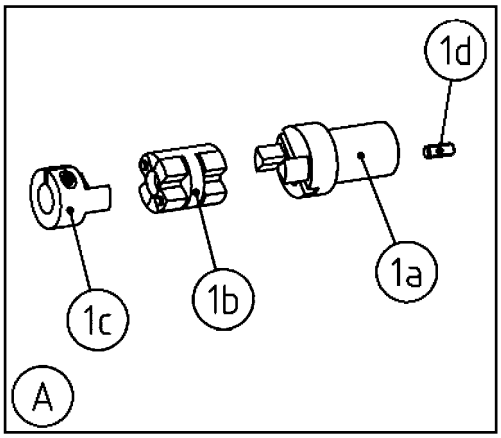
Specification of filter material

If new filter material is to be bought, the following specifications must be met by the vendor:

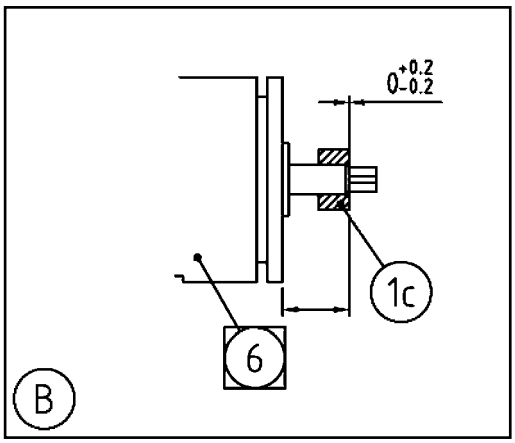
a) The filter must be made of 100% continuous glass fibre.
b) The filter must have an open structure at the air intake side, but the fibre structure must get tighter toward the air-exit side.
c) Allowed air flow 3 m/sec.
d) Tests according to ASHRAE-standard 52-76, with an air flow of 2 m/sec., must show that:
   - the pressure drop through a clean filter is less than 60 Pa.
   - the filter absorbs more than 90 % at a contamination rate of 850 gram/m^2 (93 % for the air-leakage filter.
   - max. air pressure drop 200 Pa.

Speed control device

Mounting the speed control device

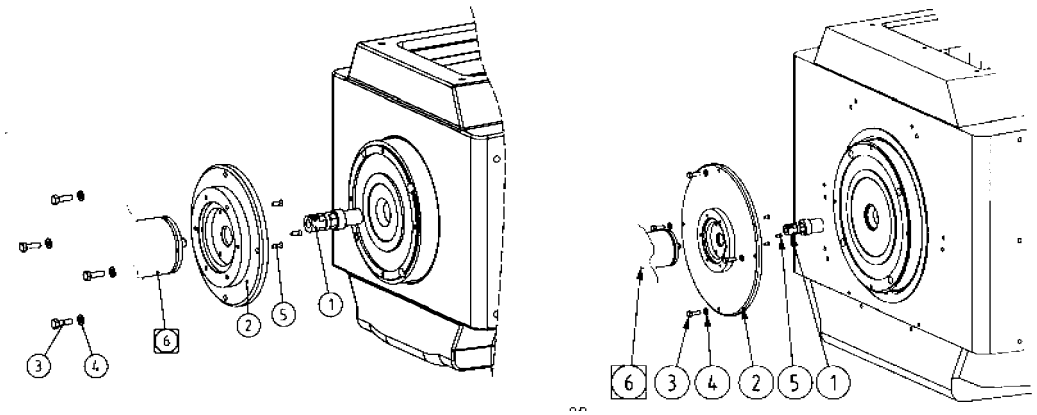


1. Split the coupling (1) into three parts (A).
2. Make sure that grease and dirt are removed from the shaft hole.
3. Mount the part from the coupling (1a) inside the rotor shaft and tighten it with a screwdriver.
4. Lock the part from the coupling inside the shaft with the set screw (1d). Check the dimension.
5. Lubricate plastic parts on the middle part of the coupling (1b) with paraffin oil and assemble it on the part inside the shaft.
6. Assemble the last part of the coupling (1c) with the shaft of the speed control device. (6). Check the distance (B).



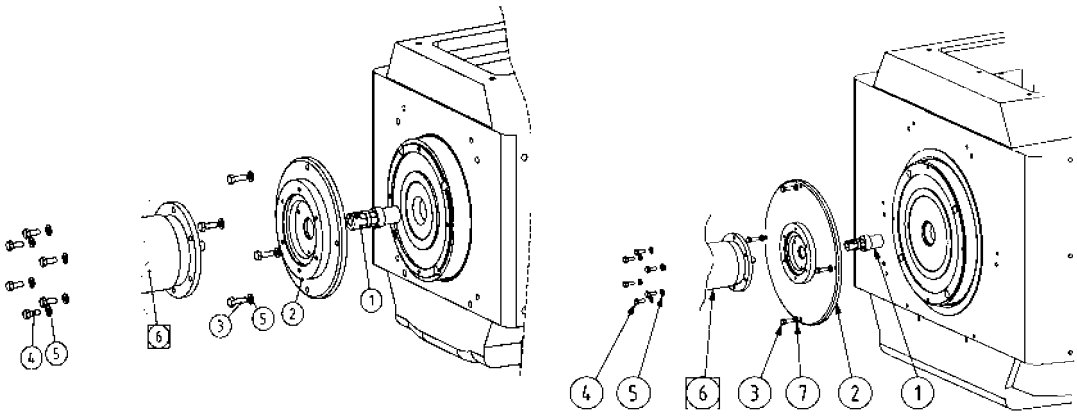
For Leine & Linde speed control devices:

7. Assemble the speed control device on the tachoadapter (2) with three bolts (5).
8. Assemble the adapter package on the bearing cover with four bolts and washers (3+4). Tightening torque M6 10Nm for shaft heights 180-280 or M8 24.5 Nm for shaft heights 315-400 with a dynamometric wrench. Be gentle when pressing the coupling parts together. Maximum axial assembly force 100N.



For POG, REO and TDP speed control devices:

7. For shaft heights 180-280; assemble the adapter (2) on the bearing cover with four bolts and washers (3+5). Tightening torque M6 10Nm with a dynamometric wrench. For shaft heights 315-400; assemble the adapter (2) on the bearing cover with four bolts and washers (3+7). Tightening torque M8 24,5Nm with a dynamometric wrench.
8. Assemble the speed control device (6) on the tachoadapter (2) with six bolts and washers (4+5). Be gentle when pressing the coupling parts together. Maximum axial assembly force 100N.



Heat exchangers

General

The motors described in this paragraph are similar to those already described in previous paragraphs. The only difference is the cooling method (code IC 86 W for air/water heat exchanger and IC 666 for air/air heat exchanger) and the degree of protection that can be IP 54 or IP 55, according to customer request.

The operation of these motors requires special care since the cooling air flows in a closed loop. The smallest particles of carbon dust produced by the brush wear may pass through the filter and is circulated inside the motor and can settle on the windings, so affecting the ground insulation level. ABB recommends users to follow all maintenance instructions described previously and to clean the motor regularly by opening all covers and vacuuming out all dust not held by the filtering material.

Air/air heat exchangers

Air/air heat exchangers are normally supplied separately. Unless otherwise stated on the delivery orders, the cooling equipment must always be installed so that the cooling air enters DMI at the N-end.

Two constant speed fans provide air circulation for the outer and inner circuits.

Outer circuit: Ambient air is forced through the heat exchanger by a fan. For motors with low loads or low ambient air temperature a thermostat control is recommended.

Inner circuit: A constant speed fan circulates the internal cooling air. Carbon dust is filtered out by a polyamide filter. A second filter is included for leakage air.

Air/water heat exchangers

A totally-enclosed motor with an air/water heat exchanger is recommended for polluted operating environments.

The heat exchanger unit, which is supplied separately, is located on top of the motor as standard. Unless otherwise stated on the delivery orders, the cooling equipment must always be installed so that the cooling air enters DMI at the N-end (Non drive-end).

Note!

The max water pressure is 1 x 106 Pa (10 bar). The max inlet water temperature is 25°C. A water temperature rise of 8-13 K is to be expected

Outer circuit: As seen from the drive end, the water connection flanges are on the left-hand side as standard. Thermostat control is recommended on motors with low loads or a low incoming water temperature to avoid condensation in the cooling air circuit and to minimize water consumption.

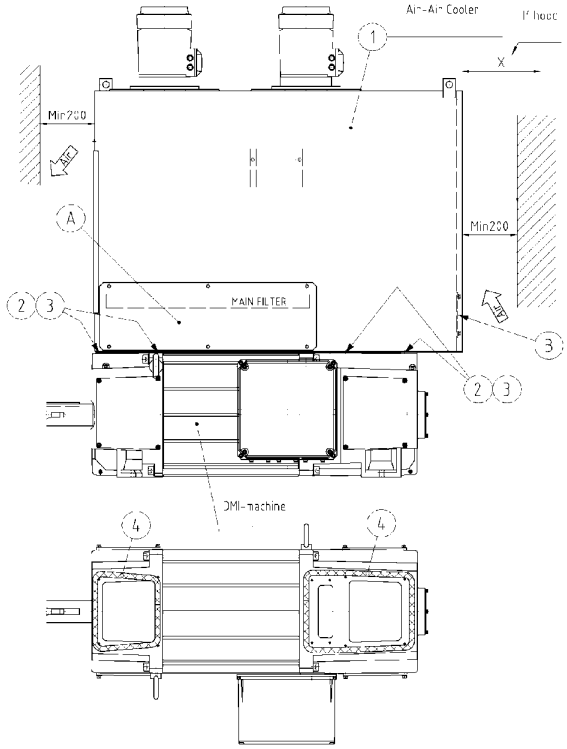
Inner circuit: A constant-speed fan circulates the internal cooling air. A polyamide filter is provided to filter out carbon dust. A second filter is included for leakage air.

Mounting

Mounting of IC 666 and IC 86W heat exchangers, DMI 180-280

1. Mount the 19x4 mm gasket (item 4) on the DMI-machine according to the figures below.

   Note! The gasket must surround both holes at the N-end.
2. Remove the covers A (and B if the heat exchanger is equipped with it) from the heat exchanger.
3. Place the heat exchanger on the DMI-machine.
4. Mount the screws (item 2) and the washers (item 3).
5. Assemble the covers A (and B if the heat exchanger is equipped with it) on the heat exchanger.



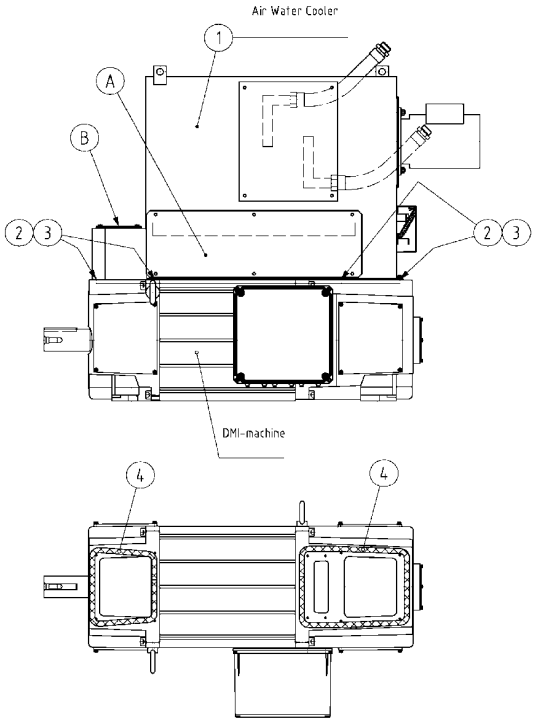


Figure 18. Mounting of heat exchanger for DMI 180-280.

Note!

Do not lift the motor and heat exchanger by the heat exchanger's lifting eyes.

DMI 315 and 400 prepared for IC 666 and IC 86W heat exchangers are delivered with pre-mounted gaskets (item 1), set screws (item 2), washers (item 3 and 4), spacers (item 5 and 6) and hexagon nuts (item 7) according to figure 19 as standard.

1. Remove nuts and plain washers (item 5, 6 and 7) from the DMI machine.
2. Heat exchanger spacers must be in position inside the punched holes at the sealing strip.
3. Remove the covers A (and B if the heat exchanger is equipped with it) from the heat exchanger.
4. Place the heat exchanger on top of the DMI machine and joint the heat exchanger at the flat point set screws of the DMI machine (item 2).
5. Tighten the heat exchanger with the plain washers and nuts (item 5, 6 and 7).
6. Assemble the covers A (and B if the heat exchanger is equipped with it) on the heat exchanger.

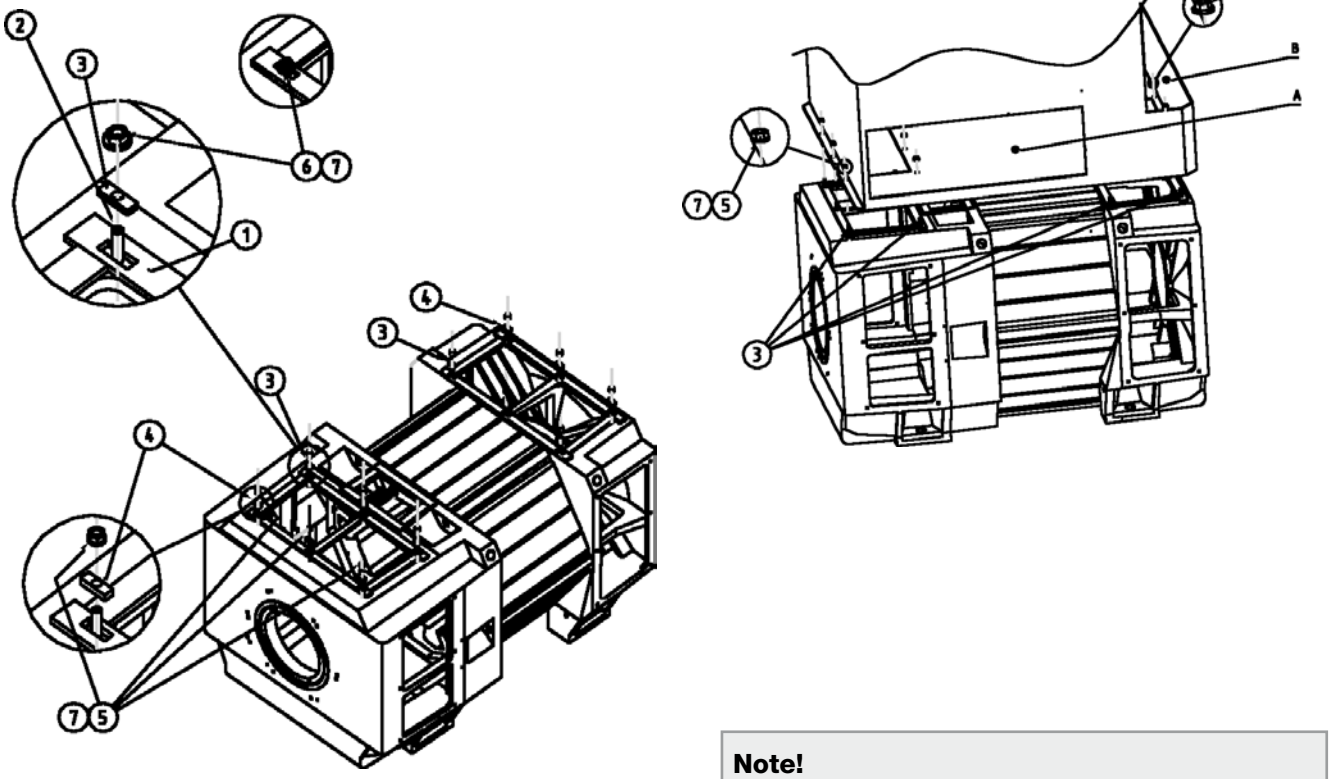


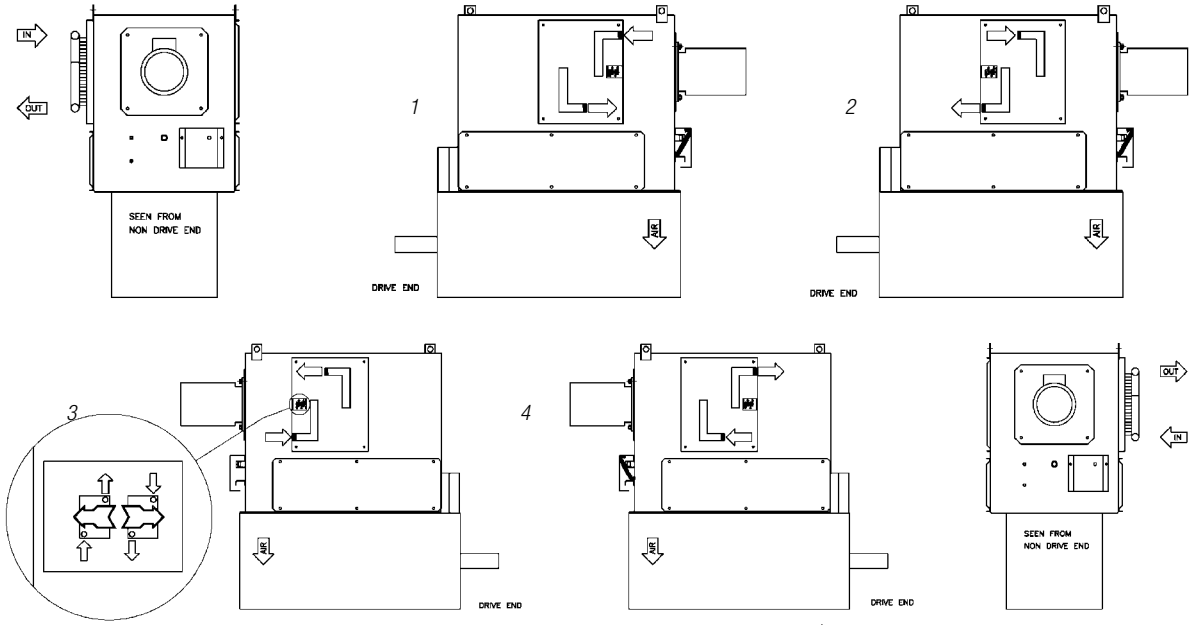
Figure 19 Mounting of heat exchanger for DMI 315 and 400.

Note!

Do not lift the motor and heat exchanger by the heat exchanger's lifting eyes

Specific information about air/water heat exchangers

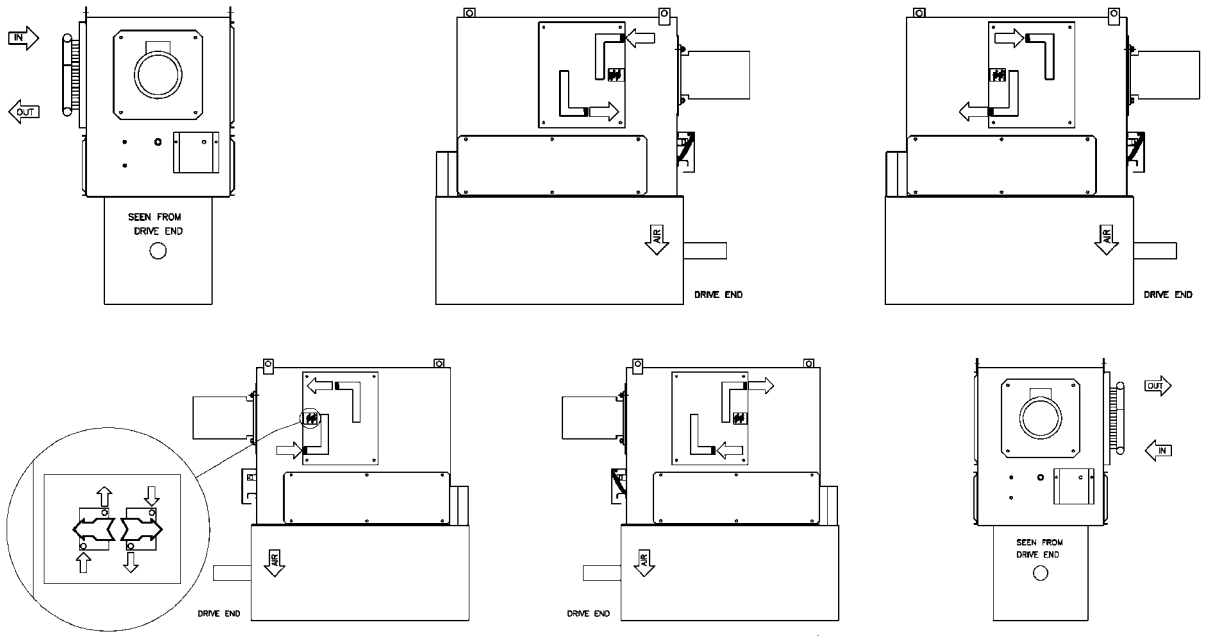
Water connection of air/water heat exchanger with air inlet at N-end (standard)



1. Water connection on right side (seen from D-end) towards N-end.
2. Water connection on right side (seen from D-end) towards D-end.
3. Water connection on left side (seen from D-end) towards N-end. Label on cooling coil shows the in- and outlet of water depending on the air direction. NB: The air direction through the cooling coil is always towards the fan motor.
4. Water connection on left side (seen from D-end) towards D-end

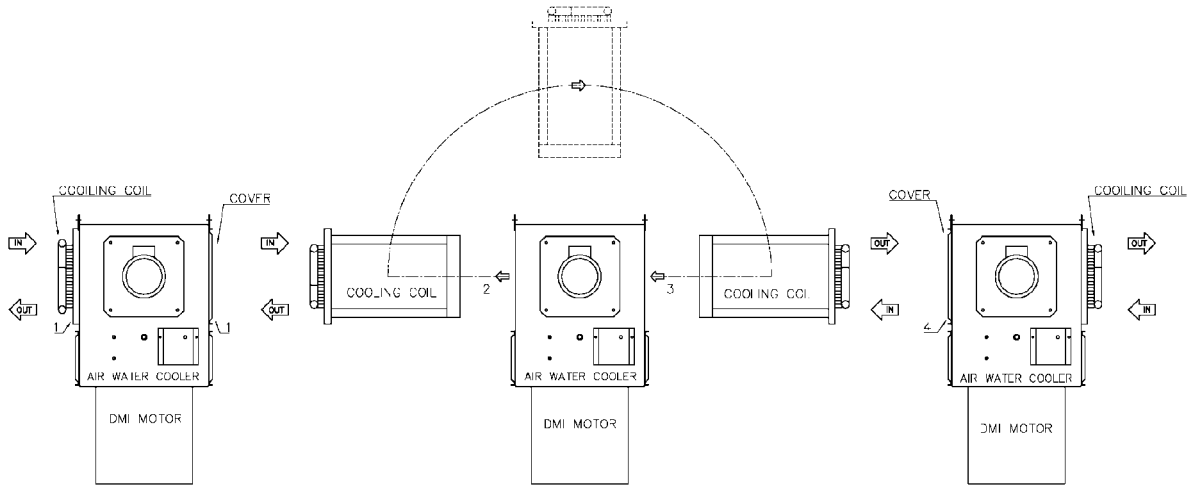
Figure 20

Water connection of air-water heat exchanger with air inlet at D-end



1. Water connection on left side (seen from D-end) towards D-end.
2. Water connection on left side (seen from D-end) towards N-end.
3. Water connection on right side (seen from D-end) towards D-end. Label on cooling coil shows the in- and outlet of water depending on the air direction. NB: The air direction through the cooling coil is always towards the fan motor.
4. Water connection on right side (seen from D-end) towards N-end

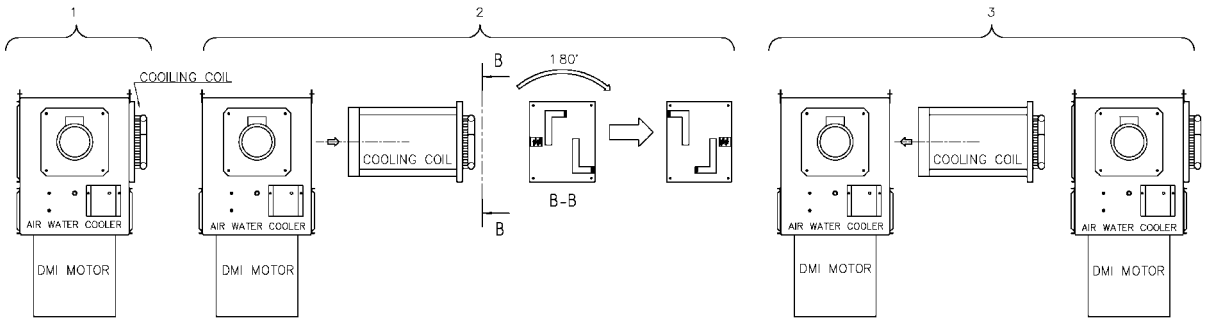
Figure 21



1. Remove screws holding the cooling coil and the cover.
2. Slide the coil out of the housing and rotate as shown above.
3. Slide the coil into the housing and replace the screws.
4. Replace the cover at the opposite side.

Figure 22

Changing the water connection direction



1. Remove screws holding the cooling coil.
2. Slide the coil out of the housing and rotate it 180° according to the picture above.
3. Slide the coil back into the housing and replace the screws.

Figure 23

Before starting

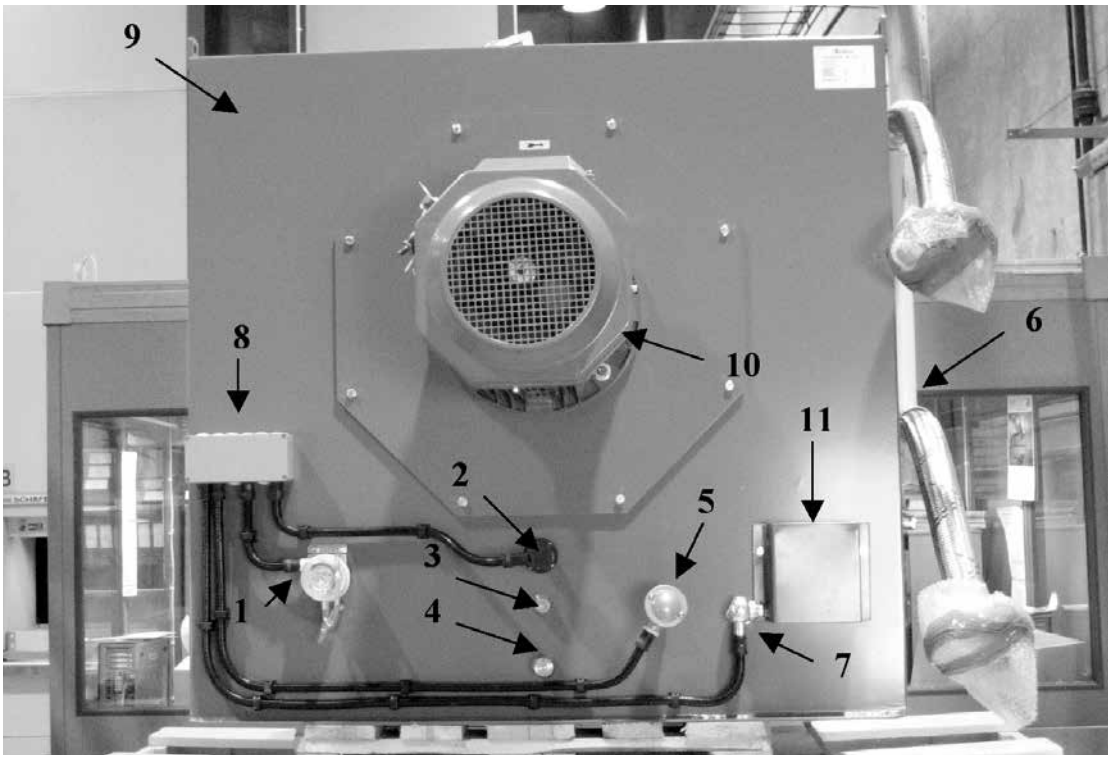
- The water supply pipe system must be flushed out before coil is connected.
- Pressure tests of pipe system, after coil is connected, must not exceed test pressure indicated on the rating plate.
- When heat exchanger is taken into use, all air must be evacuated from water pipe system and the cooling coil.

  Air in the coil can be evacuated through venting plugs on the coil headers.
- The water flow must be regulated to obtain water flow indicated on data plate of the heat exchanger.
- To avoid erosion damages in coil tubes do not exceed maximum water flow.
- Check gaskets for air leakages in connection areas such as between cooler and motor, cable entrances or incorrectly fitted inspection covers

Verification of monitoring equipment of heat exchangers

This is an instruction in how to verify that the monitoring devices on the heat exchangers are working properly. Monitoring devices (1-8) mentioned in this chapter are optional and not included in the heat exchanger.

Pictures and text in this chapter apply to top-mounted air/water heat exchangers. For side-mounted air/water heat exchangers and air/air heat exchangers, the location of the equipment might vary a bit. Unless noted, the principle is however the same.



1. Filter monitor
2. Pressure switch
3. Mounting device for thermostat
4. Mounting device for Samson regulator
5. PT 100
6. Flow sensor
7. Water leakage detector
8. Terminal box
9. Housing
10. Fan motor
11. Leakage air filter

Picture 24 Location of monitoring equipment of air-water heat exchanger.

1 **Filter monitor, HUBA 604**

Function: When the filter gets too dirty, an alarm will be triggered.

Verification: Open the cover for the filter cassette and put a piece of cardboard (approximately half the size of the filter) under the filter for top-mounted heat exchangers, and on the far side from the fan for side-mounted heat exchangers. Turn the fan on and the alarm should go off. Turn the fan off, remove the cardboard and turn the fan back on and the filter monitor must not give an alarm.

Adjustment: The setting depends on the size of the heat exchanger. The settings from the factory should not be changed.

Note: The pressure drop of the filter monitor is measured over the filter plus the heat exchanger

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2 **Pressure switch, HUBA 625**

Function: When the fan stops, the pressure drops and an alarm will be trigged off.

Verification: Turn the fan on and the pressure switch must not give an alarm. Shut the fan down and the alarm should go off

Adjustment: Setting is same for all sizes of heat exchangers for DMI 180-400. The settings from the factory should not be changed

---

3 **Thermostat, Trafag MST 9515**

Function: Gives an alarm if the air intake temperature is above the maximum allowable temperature for the specific DC-motor

Verification: Open the casing and turn the adjustment knob. The alarm should go off when the setting gets below room temperature. Remember to set the knob back to the same position again

Adjustment: The setting is dependent on size and type of the DC-motor. The settings from the factory should not be changed

---

4 **Temperature regulator, Samson 43-6**

Function: A self-regulated temperature regulator that requires no auxiliary energy. Sets the water flow to obtain a set temperature

Verification: Only to be done by trained personnel from Samson. If done wrongly, the thermostat might be destroyed

Adjustment: Contact ABB

---

5 **PT100, Inor RNT8**

Function: For measuring the temperature of the cooling air

Verification: Compare the readings with another thermometer

Adjustment: N/A

6 **Flow sensor Uniflow SW4000 or Weber 4120M**

Function: Monitoring the water flow in order to lower the water consumption depending on workload of the DMI-motor

Verification: Readings should say “Zero” when the valve is shut. Compare with the other flow sensor/meter when valve is opened

Adjustment: Contact ABB

7 **Leakage water detector, SIE07065**

Function: **Top- and side-mounted heat exchangers:**

If a water leakage occurs or if there is condensation inside the heat exchanger, water will be evacuated through the leakage air filter canal and an alarm goes off.

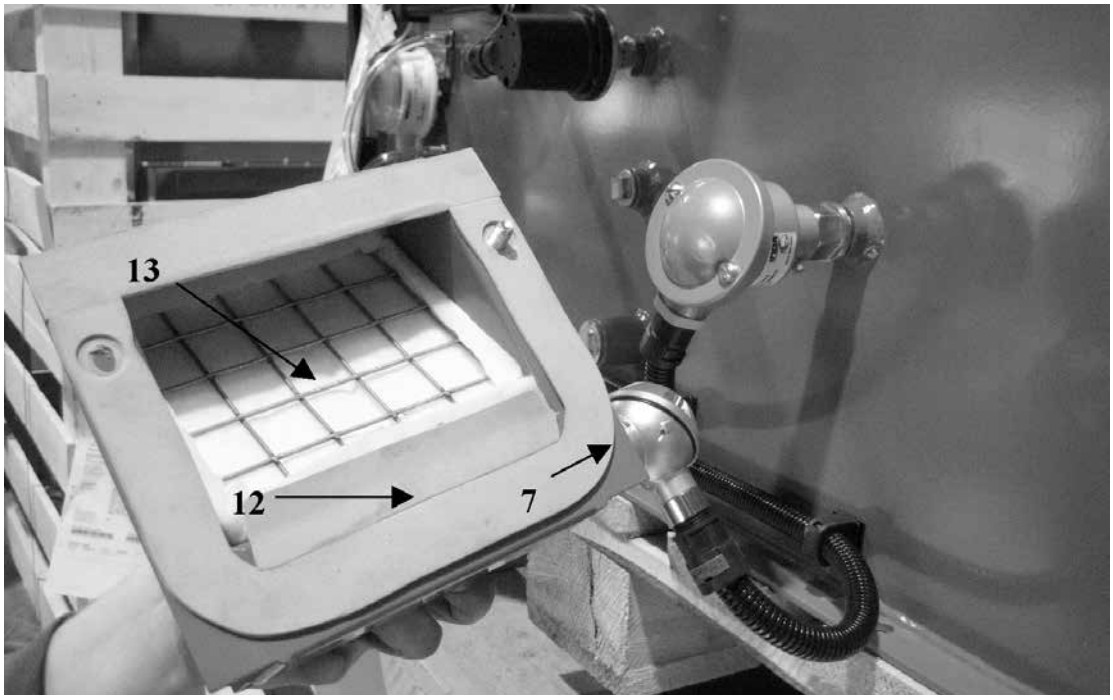
Verification: **Top-mounted heat exchangers:**

Remove the make-up filter box from the heat exchanger as seen in picture 25. Then remove the filter and the grating. The alarm must go off when touching the sensor by hand or pouring some water on it.

Side-mounted heat exchangers:

Unscrew the detector from the heat exchanger. The alarm must go off when touching the sensor by hand or pouring some water on it.

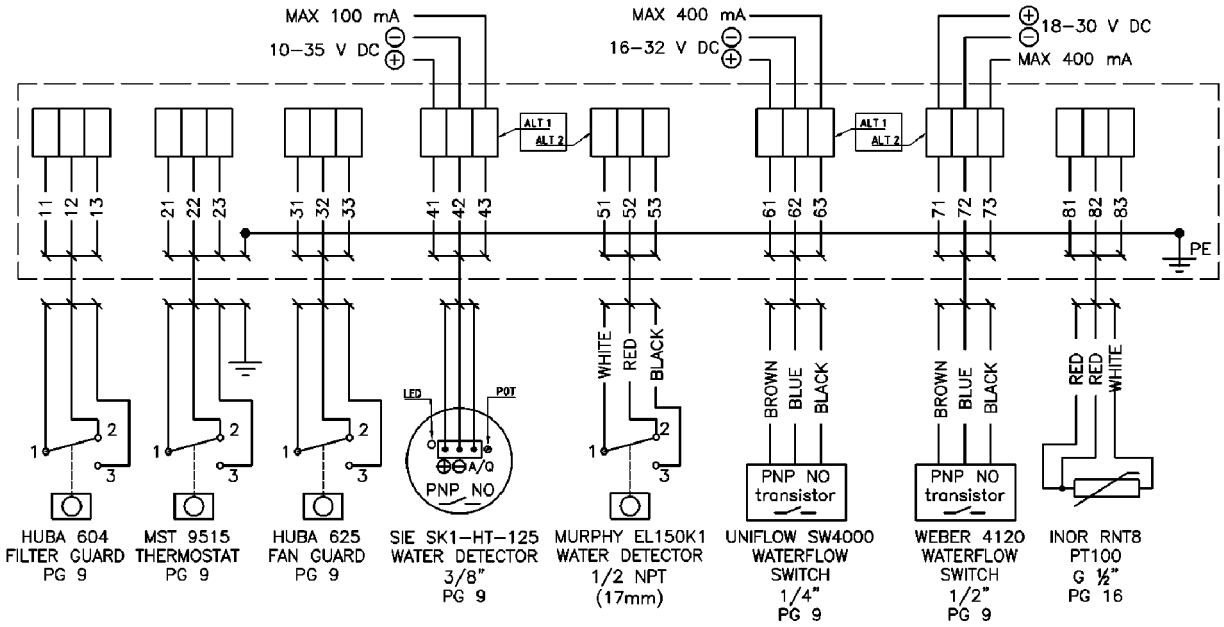
Adjustment: The setting depends on the type of heat exchanger. The settings from the factory will be sufficient for most cases. However, if the humidity is high a slight adjustment as per the attachment might be necessary on site.



Picture 25 The leakage air filter box removed

7. Water leakage detector
12. Water tray
13. Leakage air filter with grating

Terminal diagram for heat exchangers



11, 12, 13: HUBA 604 — FILTER GUARD — TERMINAL 3 LIVE AT INCREASING PRESSURE — ALARM—CLOGGED FILTER

21, 22, 23: TRAFAG MST 9515 — THERMOSTAT IN COLD AIR — TERMINAL 3 LIVE AT INCREASING TEMPERATURE — ALARM

31, 32, 33: HUBA 625 — FAN GUARD — TERMINAL 3 LIVE AT INCREASING PRESSURE WHEN FAN IS RUNNING (OK)— TERMINAL 2 (Nc) LIVE AT NO PRESSURE — ALARM FAN IS NOT RUNNING

41, 42, 43: SIE SK1—HT—125 — LEAK WATER DETECTOR — "A/Q" TERMINAL LIVE WITH WATER PRESENT — ALARM (AIR/WATER HEAT EXCHANGER ONLY)

51, 52, 53: MURPHY EL15OK1 — LEAK WATER DETECTOR — "RED" LIVE WITH WATER PRESENT — ALARM (AIR/WATER HEAT EXCHANGER ONLY)

61, 62, 63: UNIFLOW — WATER FLOW GUARD — "BLACK" TERMINAL LIVE WHEN WATER FLOW IS OK (AIR/WATER HEAT EXCHANGER ONLY)

71, 72, 73: WEBER 4120.13M — WATER FLOW GUARD — "BLACK" TERMINAL LIVE WHEN WATER FLOW IS OK (AIR/WATER HEAT EXCHANGER ONLY)

81, 82, 83: INOR RNT8 — TEMPERATURE SENSOR — 3—WIRE PT100

Figure 26 Terminal diagram for heat exchangers. The terminal box of the heat exchanger is shown in figure 24, item 8.

Maintenance of motors with heat exchangers

In addition to the usual maintenance operations for standard motors which have been previously described, the totally-enclosed motors need a supplementary maintenance program, due to their special construction and operation: Suggested activities are given below:

Check the housing (Figure 24, item 9) for paint damage. Repair paint damage to protect against corrosion. For information regarding paint contact ABB.

Check fan motor (Figure 24, item 10) for unusual noise and replace bearings if necessary. (The fan motor is normally fitted with permanently greased bearings free of maintenance). Keep the motor clean and ensure free ventilation airflow.

Check gaskets for leakage monthly. Gaskets need to be replaced every 2 years.

Change the air filter of the cooling air circuit every time DC-motor brushes are changed.
If the heat exchanger is provided with a filter monitoring device, normal pressure drop when the filter must be changed is 200 Pa (normal set point for filter monitor higher due to measuring over the cooling coil and the filter). Use filter type EU3 according to Eurovent 4/5 or similar filter with efficiency 85% according to Ashrae 52-76. Do not use a filter with higher efficiency due to its higher pressure drop.

Remark

Note that the filter material has a different structure on each side. The side with the coarser structure is to be placed outward.

Special maintenance of air-water heat exchangers

Check leakage air filter every month during first time of operation and change if clogged.

Due to its position, where pressure in the inner air circuit is lowest, the leakage air filter will provide substitute air if an unwanted leak has occurred somewhere else in the air circuit.

Rapid clogging of the leakage air filter indicates that an unwanted leak is present. If so, do the necessary tightening and change the filter. Normally use the same filter as above.

In environments with harmful contaminations, use filter EU5 according to Eurovent 4/5 or similar filters with efficiency 90-95% according to Ashrae 52-76.

In DC-motor heat exchangers with internal air circuit protected by leakage air filter, the outer surface of the cooling coil normally does not have to be cleaned. If exceptional cases, dry deposits can be cleaned by cautious use of compressed air. For greasy deposits use a detergent and rinse with water.

Normally cleaning the inside of tubes in the water flow circuit is not necessary but in areas with heavy polluted water, use a filter in the water distribution system is recommended. If, after long service, the heat exchanger appears to have decreased capacity, the tubes can be cleaned inside by re-circulation of water with the appropriate cleaning compound. Knowledge about type of contamination and appropriate cleaning compound will highly benefit efficiency of such cleaning procedure. For most deposits use of warm water is to be preferred.

Note:

- The tubes in the standard heat exchanger cannot be mechanically cleaned on the inside.
- To avoid corrosion, choose a cleaning agent that does not harm the tube material.
- The standard tube material is copper.

When the cooling coil is not in operation, protect it from damage due to corrosion or freezing in sub-zero temperatures by draining it off.

Dismantling and reassembling

Dismantling

- ☑ Make sure the machine and fan motor are electrically disconnected.
- ☑ Remove air ducts (if present at installation), disconnect coupling or V-belts and dismantle the machine from the foundation.
- ☑ Remove accessories if necessary as well as inspection covers.
- ☑ Loosen the leads and cables inside the terminal box which go to the stator.
- ☑ Disconnect leads which go to the stator from the brush rocker.
- ☑ Remove the brushes and wrap a piece of 1 mm thick insulating material around the commutator.
- ☑ Put blocks underneath the stator so that both end shields are unsupported.
- ☑ Remove the terminal box.
- ☑ Remove N-end outer bearing cover.
- ☑ Place a piece of insulating material between armature and stator.
- ☑ Unscrew the fixing bolts which tie stator and end shield together at the N-end.
- ☑ Remove the end shield at the N-end. Do not damage the main gasket between end shield and stator. Do not use sharp-edged tools.
- ☑ Remove the outer bearing cover at the D-end.
- ☑ Unscrew the end shield fixing bolts at the D-end. Use the same precautions regarding the main gasket.
- ☑ Lift the armature out of the stator (if necessary use an extension tube slipped over the armature shaft).
- ☑ Protect the bearings against contamination by suitable means.
- ☑ Remove the main gasket very carefully from the stator.
- ☑ Clean the bearing covers and remove the old grease.

WARNING

The armature must be dismantled or reassembled from the drive end side of the stator.

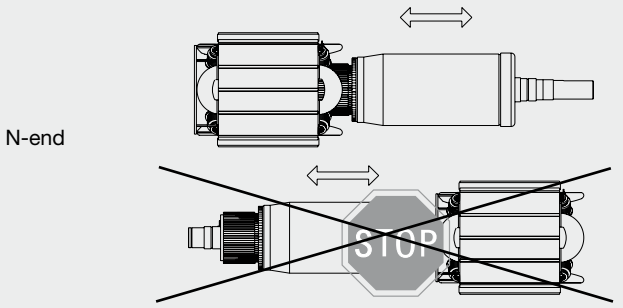


Fig. 27

Reassembling

- ☑ Wrap a piece of 1 mm thick insulating material around the commutator.
- ☑ Place a suitable piece of insulating material into the lower part of the stator.
- ☑ Inspect the main gaskets on the stator for damage. Make sure that the mating surfaces of stator and end shields are clean.
- ☑ Do not forget to fill the bearings with grease during assembly.
- ☑ Lift the armature into the stator.
- ☑ Assemble the end shield at the D-end.
- ☑ Assemble the bearing details at the D-end.
- ☑ Assemble the end shield at the N-end.
- ☑ Remove the piece of insulating material.
- ☑ Thread the cables through the seal into the terminal box.
- ☑ Assemble the bearing details at the N-end.
- ☑ Check that the armature turns easily.
- ☑ Fasten the leads to the brush gear.
- ☑ Assemble the terminal box and attach cables and leads according to the terminal diagram.
- ☑ Remove the protective insulating material from the commutator.
- ☑ Insert brushes into brush holders and check that they can move freely in their brush holder pockets.
- ☑ Assemble inspection covers including gaskets.
- ☑ Assemble all accessories.

Tightening torque for stator bolts

DMI	Torque with oil lubrication	
180	190 Nm	(140 lb.ft)
200	190 Nm	(140 lb.ft)
225	420 Nm	(310 lb.ft)
250	735 Nm	(540 lb.ft)
280	735 Nm	(540 lb.ft)
315	420 Nm	(310 lb.ft)
400	735 Nm	(540 lb.ft)

Spare parts

Recommended spare parts

	Number of identical motors			
	1	**2 – 4**	**5 – 9**	**10 –**
Brushes (number of sets)	1	2 – 4	5 – 9	10 –
Brush gear	-	1	1	1
Bearings (number of sets)	1	1	1	2
Set of armature coils + 4 resp. 6 commutating coils	-	1	-	-
Armature, complete + main field coil + 4 resp. 6 commutating coils	-		1 *)	-
Motor, complete	-	-	-	1

*) Also two compensating windings incl. slot insulations and slot keys when the machine has compensating windings.

Remark
Please state when ordering: motor type, motor serial number and part number.

Faults and remedies

Mechanical

Fault	Possible cause	Remedy
Rough running		
When coupled, machine runs unevenly or with strong vibration, with no fault when uncoupled	Fault in power transmission components or in driven equipment	Check power transmission, drive components and alignment
	Settling of foundation	Restore correct foundation level, realign machine set
	Transmission or driven equipment badly balanced	Rebalance
Machine runs roughly when uncoupled	Bearing damage Holding-down bolts loose	Refer to bearing faults below Tighten and lock
	Post-mounted coupling adversely affecting rotor balance	Rebalance rotor with coupling

Damage to rolling bearings

Overheating immediately after starting or regreasing	Too much grease filled	Fill and press in only the prescribed amount of grease (See rating plate). Overheating automatically disappears after some time
Overheating after long period of operation	Bearing cover seals rubbing	Remachine bearing cover, replace damaged seals
Scraping, rubbing or knocking noises in bearing		Change bearing (cause to be determined by specialists)
Whistling sounds in grease lubricated bearings	Bearing is dry	Inject grease
	Damage on bearing cage	Replace bearing
Formation of indentations when machine stationary	Vibrations being transferred to bearings from external source	Isolate motor from external vibration or keep rotor turning continuously
Formation of indentations when machine in operation	Electric current flowing through the bearing	Consult ABB

Electrical

Fault	Possible cause	Remedy
Motor will not start at no load	No armature voltage	Check supply
	Armature coils burnt out or short-circuited	Clear short-circuit (generally only possible in specialist's or manufacturer's workshop)
	Brushes not making proper contact	Check pressure and position of brushes, replace worn brushes
	No excitation voltage	Check supply
	Open circuit in field winding	Remedy open circuit
	Interturn short-circuit in the armature winding	Repair in workshop
	Short-circuit between commutator segments	Check commutator and eliminate short
Motor will not accept load	Overload	Check current input and eliminate overload
	Voltage decreasing	Check supply
Motor overspeeding and hunting under load	Brushes displaced from neutral zone in opposite direction to rotation position	Set brush-bracket to mark under load
	Fault in field circuit	Eliminate fault
	Auxiliary series winding wrongly connected	Check connection and correct
Generator not supplying voltage	Open circuit in excitation circuit	Check excitation circuit for fault
	Short in main circuit	Check circuit
	Open circuit or interturn short-circuit in rotor winding	Check winding for open circuit or interturn short-circuit
Voltage drop on unregulated generator on load is too high	Speed reduction of drive too great	Set drive to normal speed, drive too weak
	Incorrect brush setting	Check brush setting, correct
Overheating in operation	Overload	Check voltage and current, eliminate overload
	Insufficient cooling air	Improve cooling
	Temperature of cooling air or water too high	Clean internal and external air passages
	Insufficient cooling water	Check flow rate of cooling water, increase if necessary
	Cooler or filter dirty	Clean cooler, change filter

Commutation

Type of fault	Causes and remedies
Brush sparking at the leading edge	1 4 8 9 10 38 39
Brush sparking at the trailing edge	1 3 22 24 37 38 39
Slight sparking	1 3 4 6 8 9 14 19 22 24 28 29 33 39
Violent sparking with showers	6 8 9 10 13 31 32 34 35 36 37 38
Arc or flash	1 10 22 26 35
Sparking of some brushes or sets of brushes	2 6 7 9 14 19 20 24 25 27 28 29 31 32 33 36 37
Burning of the rear corner of the brushes	1 4 8 14 19 27 29 30 32 35 37
Vibration and breaking of the brush edges	5 12 14 23 24 25 30 32 33 36 37
Brushes wear out too fast	6 7 8 9 12 15 16 22 23 27 30 31 32 33 37 38 39
Uneven brush wear	2 6 7 12 16 20 24 27 29 30 31 32 34 37
Plait interruptions and burning	2 6 8 10 11 16 17 18 20 23 31 35
Grooves on the brush sides	16 25
Grooves on the surfaces of contact	6 8 17
Metal particles on the surfaces of contact	14 17 20 21
Uneven commutator wear	6 11 12 15 17 18 20 23 38 39
Grooves on the commutator surface	6 12 14 15 16 17 18 20 24 27 30 33
Symmetrical stains on the commutator	1 10 13 21 28 35
Asymmetrical stains on the commutator	20 34 36 37
Scored commutator surface	6 7 12 14 16 17 19 24 27 30 38 39

Possible cause	Remedy
1) The brushes are out of neutral zone	Reset neutral position
2) Asymmetry between the brush holder studs	Correct the distance between the studs
3) Commutating pole flux too high	Increase commutating pole air gap
4) Commutating pole flux too low	Decrease commutating pole air gap
5) Excessive no load operation	Use suitable brushes, reduce the number of brushes
6) Dirt and oil on the commutator	Clean the commutator and identify cause
7) Abrasive dust on the brush surfaces	Remove the brushes and brush them clean
8) Overload	Reduce the load
9) Vibrations	Check the alignment, rebalance if necessary
10) The armature winding is damaged	Repair, rewind if necessary
11) Inadequate ventilation	Trace the causes, then consult ABB if necessary
12) Current density at the brushes is too low	Reduce the number of brushes
13) Current surges	Choose suitable brush types
14) The air is too damp	Let in fresh air, select suitable brushes
15) The air is too dry	Let in fresh air, select suitable brushes
16) Dust or sand suspended in the air	Fit filters and eliminate the causes
17) Gases or acids in the air (*)	Let in fresh air, select suitable brushes
18) Excessive brush friction	Reduce brush pressure, make use of non-abrasive brushes
19) Brushes not adapted to the commutator	Adapt the brushes perfectly, as previously shown
20) Different brush types	Use brushes of the same type
21) The commutator is stained when the machine is not in operation	Raise the brushes
22) Brush pressure is too weak	Replace the brush spring and brush presser pad
23) Excessive brush pressure	Replace the brush spring and brush presser pad
24) Uneven brush pressure in different brushes	Adjust pressure, replace the faulty brush springs if necessary
25) The brush holders are not perpendicular	Restore the correct distance between brush holder cases and commutator (2 ÷ 2.5 mm)
26) The brushes are jammed in the brush holders	Clean the brush holders
27) Too much play in the brush holder	Change brush holder
28) Vibrations on the brush holder studs	Reinforce the studs with insulating rings
29) The brush holders are not parallel	Adjust brush holders
30) The brush holder case is too distant from the commutator	Adjust distance to about 2 ÷ 2.5 mm
31) Uneven current distribution to the brushes	Increase current density; adjust pressure, make use of more abrasive brushes
32) Mica insulator protruding from the commutator	Smooth the mica insulator and the edges of the segments
33) Burrs on the commutator segments	Remove the burrs, smooth the edges, replace brushes with a more suitable grade
34) Ovalized commutator	Turn the commutator
35) Broken soldering	Solder the commutator lugs
36) Scored commutator	Turn the commutator
37) Protruding commutator segments	Rub the commutator with a pumice stone, turn the commutator if necessary
38) No choke coil where needed	Connect the choke coil
39) Choke coil reactance different from specified one	Replace the choke coil

(*) Harmful gases which may be present in the air: sulphates, silicones, chlorine, ammonia. consult ABB in these cases

BALDOR
A MEMBER OF THE ABB GROUP

EC Declaration of Incorporation

Article 6(2) of 2006/42/EC

The undersigned, representing the following supplier and the authorised representative established within the Community -

Baldor Electric Company
5711 R. S. Boreham, Jr. Street
Fort Smith, Arkansas 72901
USA

ABB Automation Products GmbH
Hermann-Heinrich-Gossen-Strasse 3
50858 Köln- Cologne, Germany

herewith declare that the Products Product identification (brand and catalogue number/part number):	***DC Component Motors and Generators*** ***Series/Frame Size: ABB●Baldor brand IEC frame diameters DMI 180 through DMI 400 and their length variations, Rated up through 2000 KW maximum, 815 volts maximum (consult product marking for details)*** ***Series/Frame Size: Baldor●Reliance brand, NEMA frame diameters 500 through 1600 (IEC frame diameters 315 through 900) and their length variations, Rated up through 4000 Hp (2982 kW) maximum, 850 Volt maximum (consult product marking for details)***

may not be put into service before the machinery in which it is to be incorporated is declared to comply with the provisions of Directive 2006/42/EC (Machinery Directive) with the regulations transposing it into national law. These motors comply with the following Essential Health and Safety Requirements of the Directive:

1.1.2 Principles of safety integration

1.1.3 Materials and products

1.1.5 Design of machinery to facilitate handling

1.5.4 Errors in fitting

1.7.3 Marking of machinery

Reference: CHK-BEZ-SN-706-_-EN; CHK-BEZ-MACH-SN--706-_-EN
and that the standards and/or technical specifications referenced below have been applied:

EN 60204-1: 2006/ AC:2010-	*Safety of machinery - Electrical equipment of machines*
Clause 14	*Part 1: General requirements*

Supplier:	*Authorised Representative in the Community:*
Signature	***Signature:***
Evans Massey	i.V. M. Klein
Name: L. Evans Massey	*Name:* Michael Klein
Position: Mgr. Standards and Certification	*Position:* Product Group Director- Europe
Date: **12 November 2013**	*Date:* **12 November 2013**

BALDOR
A MEMBER OF THE ABB GROUP

EC Declaration of Conformity

The undersigned, representing the following supplier and the authorised representative established within the Community --

Baldor Electric Company	***ABB Automation Products GmbH***
5711 R. S. Boreham, Jr. Street	***Hermann-Heinrich-Gossen-Strasse 3***
Fort Smith, Arkansas 72901	***50858 Köln- Cologne, Germany***
USA	
herewith declare that the Products	***DC Component Motors and Generators***
Product identification (brand and catalogue number/part number):	***Series/Frame Size: ABB●Baldor brand IEC frame diameters DMI 180 through DMI 400 and their length variations, Rated up through 2000 KW maximum, 815 volts maximum (consult product marking for details) Series/Frame Size: Baldor●Reliance brand, NEMA frame diameters 500 through 1600 (IEC frame diameters 315 through 900) and their length variations, Rated up through 4000 Hp (2982 kW) maximum, 850 Volt maximum (consult product marking for details)***

are in conformity with the provisions of the following EC Directive(s) when installed in accordance with the installation instructions contained in the product documentation:

2006/95/EC	*Low Voltage Directive*
2004/108/EC	*EMC Directive*
2011/65/EU	*RoHS Directive*

Reference: CHK-BEZ-SN-706-_-EN

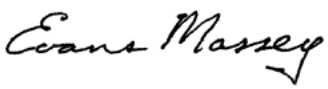
Note- In the case of the Low Voltage Directive, this Declaration only applies to motors rated less than 1500 Volts DC and that the standards and/or technical specifications referenced below have been applied (Safety only):

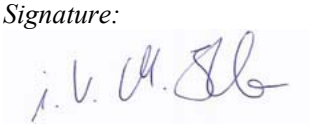
EN 60204-1: 2006/AC:2010-Clause 14	*Safety of machinery – Electrical equipment of machines – Part 1: General requirements*
EN 60034-1:2010/AC:2010	*Rotating Electrical Machines- Part 1:Rating and Performance*
EN 60034-5:2001/A1:2007	*Rotating Electrical Machines-Part 5: Classification of degrees of protection…*
EN 50581:2012	*Technical documentation for the assessment of electrical and electronic products with respect to restriction of hazardous substances*

Conformance via a EMC Technical File (TF) is declared using all or parts of the following standards (EMC only):

EN 60034-1:2010/AC:2010	*Rotating Electrical Machines- Part 1:Rating and Performance*
EN 55011: 2009/A1:2010	*ISM radio frequency equipment- Radio disturbance characteristics- Limits and methods of measurement*
EN 61000-6-2: 2005	*Electromagnetic Compatibility - Generic Immunity Standard- Industrial Environment*

EMC Technical File - TF No:	*BEZ-DC-EMC-09*
Notified Body Statement of Compliance Reference No.	*NB1765BEC1.CPS*
	Notified Body:
	Technology International (Europe), Ltd.
	56 Shrivenham Hundred Business Park
	Shrivenham, Swindon,
	Wiltshire SN6 8TY, England
	Notified Body number: 0673
Year of CE Marking (Low Voltage Directive)	*1996*
Supplier:	*Authorised Representative in the Community*
Signature	*Signature:*





Name:	L. Evans Massey	*Name*:	Michael KleinMichael Klein
Position:	Mgr. Standards and Certification	*Position:*	Product Group Director Europe
Date:	**12 November 2013**	*Date:*	**12 November 2013**

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