

# Motor and Generator Preventive Maintenance

## Reduce costs and help prevent outages



ABB has been manufacturing and maintaining motors and generators for more than 100 years. This extensive experience provides a solid basis for the company's maintenance services. In addition, preventive maintenance is planned to take environmental and operating conditions into account, and the on-site and service center work is performed by fully qualified employees.

### Maintenance need

The main reason for machine failure is component aging during normal operation. As any unplanned stop in operation is costly, and as component failure may result in sequential damage to vital parts such as the stator and rotor, it is of great importance to avoid any failure.

ABB's Life Cycle Management plan for electrical machines is based on extensive experience and know-how of electrical machine technology and covers the entire life cycle of the machine.

ABB offers standardized preventive maintenance products tailored for the many life cycle phases of machines, to give maximum availability and reliability based on ABB's unique knowledge as the original manufacturer.

### Recommended maintenance program

The recommended maintenance program for motors and generators is based on vast experience and consists of four levels, L1-L4, that are to take place throughout the life of the machine.

The time for each maintenance depends on the machine's age and ambient conditions. Tough

conditions – such as high ambient temperatures, humidity, dirt, or heavy loads – can significantly shorten component lifetime, therefore reducing maintenance and component replacement intervals.

### Customer benefit

- Maximum availability and reliability
- Maximum unplanned downtime
- Increased machine lifetime
- Comprehensive maintenance report

### Benefits achieved

Tailor-made maintenance tools:

- Improved service personnel safety
- Machine damage prevention
- Reduced service time

Service engineers with machine specific certificate:

- Fully qualified with vast experience
- Safe and effective work

Original machine manufacturer:

- Unsurpassed machine-specific knowledge
- Access to factory expert evaluation
- Supply of original or upgraded parts

### Maintenance personnel

ABB can provide qualified personnel to perform preventive maintenance of all machine types. Personnel are fully qualified and trained in maintaining the machine type in question in a correct and safer manner, according to the machine manufacturer's recommendations.

The final composition of the service team depends on the scope of work and may include customer personnel for on-site work.

### Preventive maintenance kits

Preventive maintenance kits consist of parts that need to be replaced during preventive maintenance; therefore, the kit should be available on site in time for the maintenance to minimize shutdown time.

### Preparations for preventive maintenance

For effective preventive maintenance, planning must be made well in advance, as the required resources and maintenance parts must be available on site in time for the maintenance.

For smooth and effective work, it is important to know the site conditions prior to the maintenance in order to prepare detailed plans for any lifting and rotor removal.

If sufficient information of site and operating conditions is not available, it is strongly recommended to have ABB conduct a thorough site survey prior to the maintenance.

#### Example of preventive maintenance recommendations for motors and generators

Maintenance level F=Field S=Service Shop	Level 1 (L1) - (F1)	Level 2 (L2) - (F2)	Level 3 (L3) - (F3 or S3)	Level 4 (L4) - (F3 or S4)
<b>Interval</b>	Max 10,000 equivalent hours <sup>1</sup> of operation	Max 20,000 equivalent hours <sup>1</sup> of operation, or max 3 years	Max 40,000 equivalent hours <sup>1</sup> of operation, or max 6 years	Max 80,000 equivalent hours <sup>1</sup> of operation, or max 12 years
<b>Main customer preparations prior to maintenance</b>	Disconnect the machine electricity Connect outgoing lines to the earth	L1 Give access to terminal connections	L2 Block cooling and oil system Disconnect piping from machine, if applicable Drain water coolers and bearing house	L3 Split shaft couplings Prepare for rotor removal
<b>Measurements, tools and special instruments</b>		IR/PI <sup>2</sup> of stator. Stator diagnostic measurement <sup>3</sup> IR of rotor	IR/PI <sup>2</sup> of stator. Stator diagnostic measurement <sup>3</sup> IR of rotor. Impedance measurement of rotor coils Bearing and exciter removal tools Fiber optic or video borescope Rectifier test equipment	IR/PI <sup>2</sup> of stator. Stator diagnostic measurement <sup>3</sup> IR of rotor. Impedance measurement of rotor coils Rotor, bearing, exciter removal tools Rectifier test equipment
<b>Maintenance parts</b>	L1 Preventive maintenance kit	L2 Preventive maintenance kit Parts recommended in previous preventive maintenance	L3 Preventive maintenance kit Parts recommended in previous preventive maintenance	L4 Preventive maintenance kit Parts recommended in previous preventive maintenance
<b>Expected duration</b>	Approx 1 working day	Approx 2 working days	Approx 5 working days <sup>4</sup>	Approx 10 working days <sup>4</sup>

The table above is an example only; variations might occur.

1 Equivalent hours = total hours of operation + number of starts x 20, or 1.2 x actual operating hours for variable speed motors

2 IR = Insulation Resistance, PI = Polarization Index

3 Option: Diagnostic insulation test of the stator winding (ABB LEAP)

4 Depending on the accessibility of the machine and lifting equipment

#### Example of maintenance intervals

Interval [approx. years]	1	2	3	4	5	6	7	8	Repeat years 1-8 for years 9-16
<b>Interval [hours x 1000]</b>	10	20	30	40	50	60	70	80	90
<b>Level</b>	L1 - (F1)	L2 - (F2)	L1 - (F1)	L3 - (F3 or S3)	L1 - (F1)	L2 - (F2)	L1 - (F1)	L4 - (F4 or S4)	L1 - (F1)

Each maintenance schedule is determined by the actual site conditions, the number of operating hours, the operating mode, and the number of starts of the motor/generator. The table above is for information only. Consult your ABB motor/generator specialist for specific recommendations.

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