



Test and Inspection for Machine Status Assessment (TIMSA)

An advanced inspection protocol to mitigate the risk of failures on MV/HV rotating machines

Proactive inspection scheme

Rotating machines have increased risk of failures while aging. Proactive and comprehensive health inspections are a boon to safeguard them from such failures. GE developed a detailed inspection protocol with a deeper focus on rotating machine stators. This could enable you to schedule well-planned maintenance actions to extend its life further and limit the unplanned outages.

MOTOR FAILURES - 4kV and greater

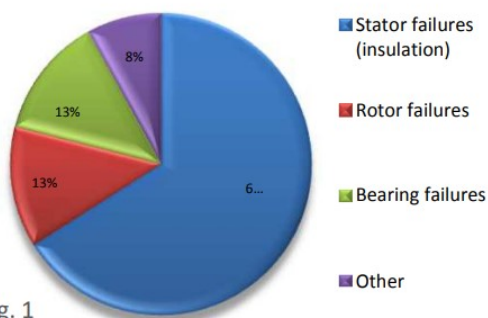


Fig. 1

How do we do it? Here's an overview!

Dedicated electrical and mechanical tests will be performed, and test results analyzed. Based on its results, an action plan will be recommended to fix any issues proactively. We recommend customers a full TIMSA electric protocol (to the right) that can be complemented with several optional mechanical tests (below):

| Mechanical (Optional) |
|---|
| <ul style="list-style-type: none"> Bearing inspection Bearings will be opened, then surface and clearances will be checked for proper running. Vibration analysis Stator will be checked for wearing issues due to vibrations with actual vibration pattern. Bearing oil checks (includes PMG when present) Overall service condition of bearing oil and antifriction greases will be checked and analyzed (antifriction grease will be replaced, if required). |

| Electrical |
|---|
| <ul style="list-style-type: none"> Internal Visual Inspection or borescope Experts' visual assessment on winding and core health. Recording and analysis of operating data Operating data such as voltage, current, temperature, vibrations etc. will be measured and analyzed. Insulation Resistance test (IR) Winding to ground resistance will be checked by grounding the motor frame and imposing a DC voltage on unit windings. Polarization Index (PI) Insulation polarization rate will be measured to determine dryness and cleanliness of windings. Dielectric Discharge (DD) Aging and deterioration of stator insulation will be diagnosed, via insulation discharge pattern. RLC Measurement Any variation of RLC measurements of the windings versus the as-built measures is investigated Step Voltage (SV) Increasing steps of voltage will be applied to insulation, as per IEEE43 §6.4 standard. Results will give indication on overall insulation condition. Surge test Inter-turns surge test is conducted following IEEE522 standard. It will apply a fast rise time voltage peak between each phase, then comparing the waveforms obtained. Partial Discharge (PD) measurement* Winding's response to specific stress levels will be checked and its future performance will be predicted accordingly. Dissipation factor (tan δ) measurement* Stator winding's insulation quality will be evaluated. <p><i>* Tests excluded on machines <4kV</i></p> |



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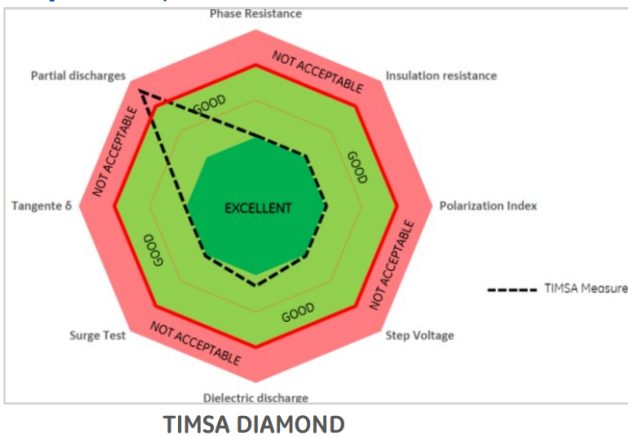
Highlights

- Applicable to all induction, synchronous & DC units.
- GE recommends TIMSA at every major outage (or dry dock, for marine units).
- Electrical tests will require our Field Service Engineer to work at your site for 1-2 FSE day/machine. Mechanical checks will require 2-4 days extra, based on unit size and tests included.

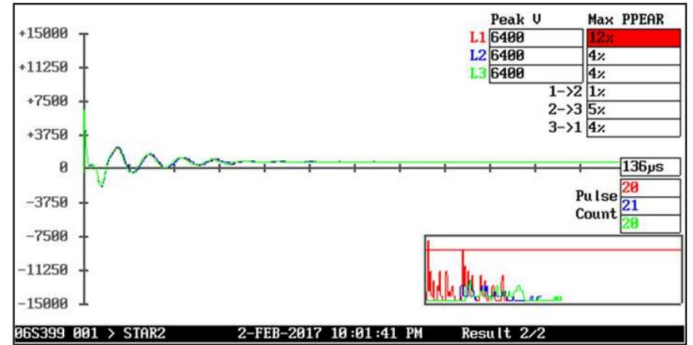
Benefits

- GE experts will perform a detailed inspection and analysis to identify the potential problems well in advance.
- GE experts will recommend an action plan, along with the evaluation report, to fix any problems identified.
- Critical spares list will be recommended for immediate recovery of the system from unexpected breakdowns.
- Customer will be empowered to select tests to be performed based on their unique site conditions.
- Significant cost savings over routine or time-based preventive maintenance.

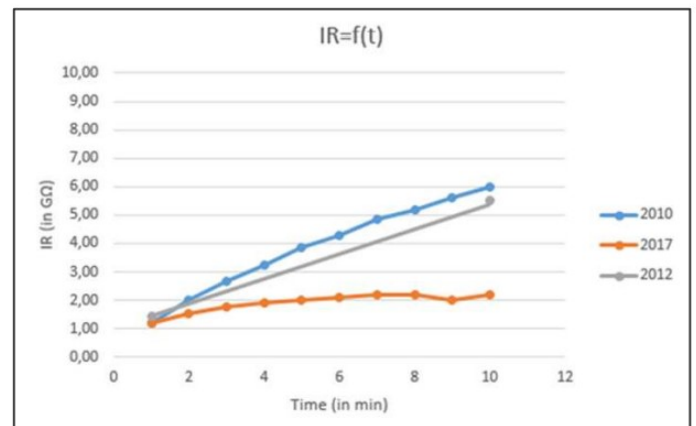
Sample analysis



TIMSA Diamond is a simplified snapshot of key RM electrical indicators. Comparing the latest TIMSA diamond with previous helps understand deeper the stator health evolution.



Surge test



Insulation Resistance & PI test

GE's services for a lifetime

GE offers integral service support including spares and replacement parts, onsite and remote technical support, maintenance services, upgrades, customized trainings and service agreements aimed at helping customers with their unique needs.

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