

RQA 125/SATS-2

Rotor Quality Analyzer



Features

- Most sophisticated testing system for squirrel cache die cast rotors.
- Standardised by leading manufacturers of electrical motors and compressors world-wide.
- Fully automatic test and evaluation cycle.
- Cycle time of approx. 5,5 sec. plus loading, allowing 100% testing of production series.
- Fostering SPC - In-process Monitoring and Correction.
- Easy set-up for different type of rotors to be tested.
- RQA Software based on Windows 98 including statistics.

Introduction

Computer controlled evaluation technique for rotor quality control in a laboratory or industrial environment. This stand alone system is configured for automatic inductive and power measurement with manual loading and unloading of the rotor. The test cycle is started by pressing a start button. The automatic test cell is protected with an infrared light grid barrier (curtain). All measurement and result evaluations are automatically conducted, processed, evaluated, and stored for statistical evaluation. Max. dimensions of rotors to be tested: Outside-Ø 125mm, stack height 150mm. For receiving a firm quotation please send us your rotor dimensions including OD, ID and stack length. These testing procedures are used for the detection of the following quality problems:

- Broken or interrupted rotor bars as well as no connection to the short circuit rings.
- Missing material in the rotor bar (incomplete injection) or air enclosures (porosity) as well as poor connections to the end rings.
- Deviation of the rotor bar angle relevant to the axis (skew).
- Changes in the consistency of the aluminum alloy and/or the iron core.
- A short circuit between two or more rotor bars (soldering).
- Faults in the end rings.
- Resistance errors (R_2') in the rotor as a whole, and/or in the end rings.
- Reactance errors (X_2') in the magnetic conductivity of the rotor core.

System Description

The RQA 125/SATS-2 Rotor Quality Analyzer is an automated tester for squirrel cache die cast rotors combining all mechanical, electrical as well as instrumentation components into a stand-alone automated tester. The system is based on an industrial PC to facilitate automatic measurement and evaluation of rotor quality.

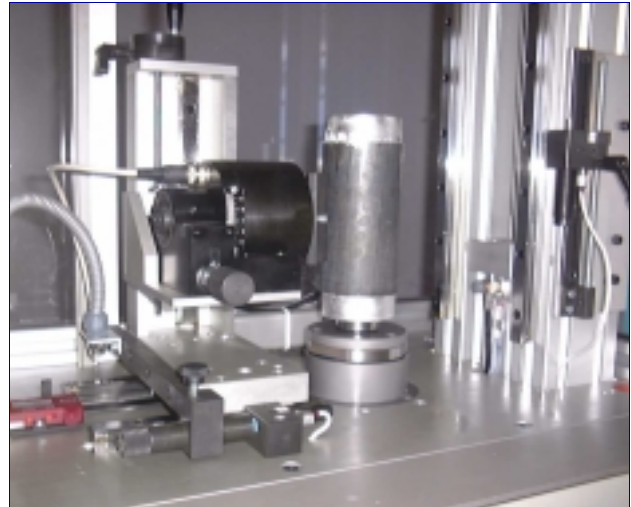
The computer is responsible for the accept/reject judgment of the rotor based on a pre-programmed set of parameter tolerances. The loading and unloading of the rotor remains a manual procedure.

The test station is capable of testing rotors either with or without shafts according to customer specifications. The required tooling needs to be clarified and quoted separately.

The industrial computer is placed underneath the test cell. The measuring and control unit is housed inside a cabinet mounted in the frame of the Test Station. The 15" VGA monitor and keyboard are mounted on an adjustable platform attached to the frame.

The RQA 125/SATS-2 Rotor Quality Analyzer is configured for both inductive and power measurement of the rotor. The system is equipped with a Precision Dual-conic *Expandable Arbor Rotation Mechanism* for rotors without shaft and/or optionally with a Clamping mechanism for rotors already fitted with shaft - assuring concentric rotation of the rotor during test.

The Inductive Sensor for the inductive measurement is placed on a mechanical slide - with automatic actuation during the measurement process. An adjustable platform with ruler allows easy adjustment of the vertical position of the Sensor. The Adjustment of the air gap between rotor



and inductive Sensor is done by adjustment skew and mikrometer - or fixed distance parts - easing the job of readjusting to different type of rotors.

The Encapsulated Measurement Stators with integrated temperature measurement sensors for power measurement are mounted to special holding plate assemblies with quick change connector and precision positioning posts for easy setup to different type of rotors. For testing the specific model of stator assembly is placed on a Mechanical slide with automatic actuation during the measurement process.

An intelligent and user-friendly test station safety enclosure insures operator safety. Testing starts automatically after clearing the safety area and pressing the start button.

Green/red lamps indicate good/bad evaluation of rotor after test. To ensure correct manual manipulation, the expandable mandrel remains engaged for rejected rotors requiring the operator to disengage the mandrel before the rotor can be removed.

An integrated cabinet allows for storage of tools and accessories.

Windows based Testing Software

- User friendly menu-driven windows based software for automatic Accept/Reject evaluation of rotors according to user selected parameter tolerance levels.
- Automatic set-up of all measurement and evaluation procedures (parameter tolerances) via the selection and retrieval of the *Master Parameter File* (reference rotor),
- Automatic learn feature to establish new *Master Parameter Files* for additional type of rotors to be tested.
- Mechanical set-up specifications for rotor type tested via the *Master Information Menu*.
- Temperature compensation of resistance values to 20 °C.
- Automatic fault classification into different error types

Error I - Broken or interrupted rotor bars

Error II - Minimum amplitude

Error III - Maximum amplitude

Error IV - Deviation of amplitudes

Error V - Slope error

Error VI - Over-all evaluation error

Error VII - Resistance (R_2') error

Error VIII - Reactance (X_2') error

- Integrated counter for the total number of tested and failed rotors, and a complete record of the specific type and frequency of fault errors is recorded.
- Complete statistics package to facilitate a complete and thorough analysis of both rotor quality and productions capability via the SPC concepts of in-process monitoring and correction on either an audit or 100% QC basis. Presentation of the statistics is facilitated with histograms and chronological occurrence charts for all different parameter tolerances.

- Interactive parameter tolerance functions via a "what if" approach in combination with the present and recommended C_p and C_{pk} values.
- Zoom function for rejected rotors automatically records all measurement results including the inductive waveform for more thorough analysis of the fault mechanism.
- Printout for Statistics and Zoom on external printer - not included in the scope of supply.

Testing Procedure for Rotor with Test Station already set-up:

- Place the rotor on the shaft
- Start test by pressing the START button
- The complete test cycle is performed automatically within min. 5,5 sec.
- A GREEN or RED light is indicating rotor good or reject.
- Remove rotor and insert next rotor for test, in case of reject disengage holding mandrel by pushbutton.

Set-up Test Station for new rotor type:

- Selecting *Master Parameter File* of the new type and set-up the test station according to the information given in the file.
- Following mechanical settings needed:
 - pole shoe size of the inductive sensor (if different) and angle of magnetic field with scale 0,1° steps
 - front position of inductive sensor (with built in micrometer)
 - size of mandrel according type of rotor
- Changing stator for resistance test. Adjust vertical position of the stator in relation to the rotor.

Technical Data

Rotor Quality Analyzer Model	RQA 125/SATS-2
Maximum rotor dimensions	outside Ø 125mm, stack length 150mm without shaft, optionally with shaft
Loading of test rotors	manually
Testing cycle / time	Fully automatic / minimum 5.5 seconds plus loading
Testing methods	Inductive test for rotor bar analysis and resistance/reactance test for general quality and performance
Industrial PC	Industrial PC min. 400Mhz, HD 10GB, Floppy Disk, CD-ROM, A/D Data Aquisition Card, Optically Isolated I/O Board
Automatic controls by	PLC
Rotor clamping mechanism	modular Precision Dual-conic Expandable Arbor Rotation Mechanism for rotors without shaft, optionally available Clamping Mechanism for rotors already fitted with shaft
Rotor rotation for test by	Variable frequency drive and reluctance synchrone motor
Pneumatic activation of	Rotor Clamping, Movement of Inductive Sensor and Movement of Measuring Stator on mechanical slide with precision linear guides
Synchrone start feature	for physical identification of defective rotor bars
Rotor temperature measurement	On integrated Rotor Temp. Measurement Station with PT100
Measuring stator	Moulded measuring stator with built in temp. sensor and quick change connector, mounted to special holding plates with precision guiding bolts for exact placement - required for each rotor family. Supplied on extra cost - original stators according to Deltatronic specification to be supplied by customer adjustable position of mechanical slide for positioning of stator towards test rotor
Inductive sensor	With exchangable Pole Shoes to match different rotor stack length, adjustable angle of magnetic field in steps of 0.1°, adjustable vertical position and adjustable gap towards the test rotor (micrometer)
Operator security	Infrared light grid barrier for protection, emergency STOP button
Pneumatic system	with water separatur, pressure gauch, soft start facility and monitoring of minimum pressure, control valves Requested Supply: Dry pressured air, minimum 6 bar
Electrical Supply	Single phase 230V, 50/60 Hz or 110V, 50/60Hz to be specified with purchase order
Dimensions approx.	width 700mm + 600mm (monitor), depth 600mm, height 1.820mm
Packing (box for air freight)	length 210cm, width 85cm, heigth 90cm
Weight approx.	net 290 kg, gross 340 kg

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