

Technical specification of Magnetic Field Analyzer for PM Machine

- 1.0 The magnetic field analyzer/mapping system should have the mechanical positioning device for handling small/medium PM Machine rotors up to 800 mm diameter with tolerance of ± 20 mm and 1200 mm with tolerance of ± 50 mm length.
- 2.0 The rotation of the PM rotor should be achieved by an electric motor with speed reduction device and suitable controller. The rotation of the motor should be controlled for selecting suitable scanning speed required for the sample.
- 3.0 The speed reduction ratio of the motor can be in the range of 200:1 to 500:1. Details of the motor and control device should be specified along with technical offer.
- 4.0 During the rotation, the encoder should measure the angular position of the rotor with an accuracy of 0.72 Deg with tolerance of 2% (i.e 5000 smooth steps or higher for one rotation or better).
- 5.0 The system should also have Hall probe along with Gauss meter to measure the magnetic field produced by the PM Machine rotor under test and being rotated by the electric motor under controlled environment (i.e no additional magnetic structure nearby and at a set temperature).
- 6.0 The magnetic field mapping system should be capable for magnetic field measurement on PM Rotors with NdFeB, SmCo and Ferrite magnets (rotors having diameter in the range of 100 to 800 mm and length up to 1200 mm).
- 7.0 The hall probe as mentioned in SI . No 4 should have following specification.
 - 7.1 Linearity 1 % up to 10 kG
 - 7.2 Active area should be at least 0.8 mm diameter or less.
 - 7.3 Temperature range 0 – 70 °C
 - 7.4 Zero stability with temperature ± 0.2 G/°C
 - 7.5 Calibration stability with temperature should be less than 0.20 /°C
 - 7.6 Probe Stem base material should be rigid glass epoxy
 - 7.7 Probe Stem tip material should be Kapton with lead strip.
- 8.0 The Gauss meter as mentioned in SI . No 4 should have following specification.
 - 8.1 Ranges (corresponding resolution) 300 G (0.3 G), 3 kG (3 G), 30 kG (30 G) or better.
 - 8.2 Accuracy (display e RS232) ± 1 % of reading, ± 3 counts
 - 8.3 Accuracy (analog output) ± 1 % of reading, ± 3 counts
 - 8.4 Min/max hold acquisition time 180 ms ($\pm 10\%$)
 - 8.5 Peak hold acquisition time 1 ms ($\pm 10\%$ time)
 - 8.6 Should have Liquid crystal display (LCD).
 - 8.7 The user should be able to adjust the zero or relative point.
 - 8.8 The meter should have control to change its range, units of measure, ac or dc measurement, hold modes, operation of the analog output.
 - 8.9 The meter should have Shielded 9-pin "D" connector supporting RS-232-C for serial communications along with computer and the controller.

8.10 The meter should operate with battery and also with 230 Volts, 50 Hz with an adapter.

The center pin is positive (+). The internal batteries are disconnected when this connector is to be used.

8.11 Corresponding analog voltage signal for magnetic flux density being measured is available at a BNC connector with ± 3.0 to 5 V dc or 3.0 to 5 V rms ac.

8.12 The Hall probe cable should get plugged into suitable connector in Gauss meter..

8.13 Suitable stand and locking arrangement should be provided to support the meter to stand upright when placed on a flat surface.

9.0 The dedicated computer for automation for the system operation with user friendly embedded software for control and magnetic analysis should be provided. Report generating printing facility with colour laser printer.

10.0 The interface control board between the computer and the Hall probe/Gauss meter should be of National instrument make and meet following technical requirement.

10.1 Should be Multifunction I/O board

10.2 Analog inputs (16) at 200 kS/s, 16-bit resolution to be provided.

10.3 Analog outputs (2) at 16-bit resolution to made available.

10.4 Counter/timers 2 at 24-bit required.

10.5 Necessary Accessories including data transfer cable (at least 1 metre length) to be provided.

11.0 The system should have facility to measure both radial and axial magnetized rotors/samples.

12.0 The system should measures the surface magnetic field on multi polar magnetized rotors or any sample with cylindrical symmetry.

13.0 During automatic measurement, the inputs like date, time, sample name, serial number of rotor/sample under test, operators' name, approvers' name, Radial or axial magnetization measurement selection, Number of poles of the sample should be available in the magnetic field analyzer.

14.0 The reference in X and Y axes should be linked to the measurement procedure and accuracy should be less than 0.8%.

15.0 The embedded software should have the option for displaying the graphs in a time scale, provide actual values measured in a tabular form, and should have the facility to compare the MMF wave forms and curves recorded for various pole pairs.

16.0 The software should also provide data storage facility, edit options where ever applicable, generating reports in languages like English, Hindi and German should be possible.

17.0 Measurements in two systems of units i.e. SI and CGS should be provided.

18.0 The Wave form Analysis through Fast Fourier transform algorithm (FFT) of the reordered should be provided.

- 19.0 Calculation of parameters like zero crossing, pole width, slopes, area, for checking defects should be provided.
- 20.0 Facility for presenting data in Cartesian or polar co-ordinates should be available.
- 21.0 Superimposing of a perfect sinusoidal wave, rectangular wave, trapezoidal wave with the same number of poles on the machine rotor/sample should be possible.
- 22.0 Reset of Hall probe and Gauss meter should be possible by the embedded software.
- 23.0 The embedded software should guide the operator for carrying out the measurement with automation and checks for the mistakes done by the operator with help/assistant.
- 24.0 It should be possible to set or vary the scan speed depending upon the rotor size by the operator. The minimum value is zero, the maximum can be 2.0 mts/sec / less / higher as applicable for the measurement.
- 25.0 Inspection to be carried out by BHEL before dispatch of equipment.
- 26.0 E & C should be carried out by OEM or their representative at BHEL, R&D Hyderabad.
- 27.0 On site warranty to be provided for all Hardware and Software for a period of 2 years.
- 28.0 Spares required after two years warranty period to be specified along with their cost.
- 29.0 The support for the embedded or dedicated software to be provided by the OEM even after the warranty period.
- 30.0 OEM or their representative should carry out periodical check during warranty period.
- 31.0 Calibration procedure for the equipment to be provided along with the Calibration certificate.

List of Deliverables:

1. Complete mechanical system with programmable logic and controller.
2. Necessary flux meter, Hall Probes, Gauss meter and feed back devices.
3. Computer & control desk with necessary dedicated software, printing facility, controlling facility, magnetic field analysis facility etc as per the specifications.

Note:

1. Any civil work, and power cable connection etc will be carried out by BHEL R&D.
2. Supplier may give complete list of unpriced deliverables along with technical offer.
3. Technical bid and commercial bid are to be sent in separate closed and sealed cover.
4. The supplier should enclose technical compliance sheet, the brochure or technical literature of the equipment along with their offer.
5. The layout should be enclosed along with the offer.

For any technical clarifications, please contact :

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