PR No. 1000028687   **Rfx No. 6100001273**

Technical Specifications

OPTICAL INTERROGATOR AND SENSORS

System Architecture:

The dynamic optical interrogator should have at least 8 optical channels and each channel should be capable of having at least 16 optical sensors. The fiber optic sensor should be capable to measure strains in concrete and steel, ambient temperature, and ambient humidity. The data acquisition system should meet the following specifications. All the specification must be mentioned in the datasheet and highlighted by the supplier in the datasheet.

The same product range should have a possibility of further expandable and communicate with Foil/Electrical data logging module and log data synchronously under one software platform.

I. Specifications of Interrogator	
Optical Interrogator	8 Channel Dynamic Optical Interrogator with continuous swept laser scanning technology
Transducer types	• All sensors based on Fiber Bragg Grating (FBG) • Each of the Fiber Optic channel should be capable of connecting min 12 sensors in one connector • Should support sensors based on Fiber Bragg Grating • Dynamic range of > 20dB • Connector Type should be FC/APC • Must include a traceable wavelength
Optical wavelength measurement range	1,500 to 1,600 nm [**100 range**]
Sample rate	**2000 S/s**
Output rate	0.1 … 2,000 S/s
Signal bandwidth (-3 dB)	800 Hz
Repeatability	< 1.5pm @ 100 Samples/s

	< 2.5pm @ 2000 Samples/s Both over full temperature range and over full wavelength range for more than 50 h
Dynamic range	>20dB
Smart Peak detection	Required to ensure all sensor peaks are detected automatically even for large cable lengths with multiple connections.
Optical Spectral Analysis	Must include a NIST traceable wavelength reference with 10,000 points per trace providing continuous calibration to ensure system accuracy over long term operation.
Filters	Bessel & Butterworth Filter 0.05Hz to 500 Hz. Low pass & High pass required.
Damping Poles	50 or 60Hz Damping Poles to suppress power line induced voltage
Communication	10Base-T/100Base-TX with direct IP address & DHCP **Should be possible to have EtherCAT/ ProfitNet for future upgradation.**
Synchronization	IEEE1394b, IEEE1588 and NTP required.
Interface	RS-232C, USB, Ethernet.
Power consumption	**<30W**
Hybrid Operations	Required synchronized operation capability with foil type gauges / electrical sensor datalogger with datalogging in one software.
Supply voltage	18 … 30 V with 230V AC Adapter required
Operating temperature range	-20 … +50
Shock resistance (EN60068-2-27)	15g, 6ms,600 impacts
Vibration resistance (EN60068-2-6)	2g, 30 min, 5 to 65Hz
Dimensions (w x h x d) & Weight	Portable and light weight ≤ 2Kg
EMC	As Per EN 61326 (certificate to be submitted with tender)

II. Software	
Software	The software setup, simplified data Logging, simplified Hardware setup, simplified data Logging, simplified Data Viewing. The user interface must be standard and proven. No programming knowledge should be necessary.
Channel configuration	Manual, via integrated sensor database, Calibration factor Automatically via TEDS, Project file

Data logging / start and end	Start: Manual, via signal thresholds (limit values), End: Manual, triggered (post), timing, number of measured values.
Trigger	Analog, calculated signals, digital input (0 / 1) Trigger type Edge (rising, falling), level (above, below)
Online calculations	Arithmetic, exponent, root, root mean square value, logic, trigonometry, integral/differential, exponential, logarithm, limit values (connect digital output, play audio file via external speaker, entry in log file), software filters (moving averages, Bessel, Butterworth), Experimental stress analysis using SG, frequency analysis (FFT + trigger)
Software Display Elements	Online digital & graphical monitoring of all selected channels with Numeric display, chart recorder (y-t, x-y, y-f), polar diagram, Spectrum visualization, frequency diagram / color spectrogram (FFT), table (universal, simple spreadsheet), pointer, bar graph, LED (multi, uni), indicator, push button / switch (button), checkbox, list box, background image and text. The user must be able to modify the visualization screen by drag and drop, without use/knowledge of any programming.
Data Storage Format	ASCII, Microsoft Excel, RPC III, MATLAB, nCode, MDF 4.0, DIAdem. The complete meta data (sensors, measurement, configuration, test parameters), statistics log should be stored for data traceability. Should have Fast Stream for highly dynamic measurements. Stable in the event of sudden interruption (no more than last data block should be lost)
Hybrid Operations	Capability to log and visualize in parallel both Foil gauges and Optical gauges.

III. Optical Strain Sensors (packaged encapsulated Surface Mountable / Embedded)	
Sensitivity	0.96 ± 0.03 pm / (µm/m)
Bragg Wavelength	1500 to 1600 (Vendor to specify wavelength)
Resolution	0.5 µm/m
Measurement range	± 2500 µm/m
Temp. Cross Sensitivity	5.8 ± 1 deg C
Side lobe suppression	>7dB
Spectral width (FWHM)	> 0.2 nm

Reflectivity	20 ± 6%
Attachment type	Directly cast, cable ties
Material	Stainless steel, ormocer
Cable type	Ø3mm armor cable
Cable length	2 m each side (±5 cm) Free ends
Operation Temperature	-20 …. +80°C
Protection Type	IP68

36 CHANNELS DIGITAL SIGNAL CONDITIONER

DESCRIPTION	SPECIFICATION
Input modules	24 channels of Strain Inputs 8 channels of ±10 Voltage Inputs 4 channels of ICP/IEPE Accelerometer Inputs 8 FO connectors 8/16 Channel digital Signal Conditioners modules preferred
A/D Converter	Each channel should have separate 24-bit A/D Converter. (No, Track & Hold, sample & hold or multiplexing)
Sampling rate per channel	2400 Samples/s/channel Simultaneously and parallel Sampling
Transducer connection	¼ bridge via 3 wire regulated or 4 wire regulated circuit. The voltage drop across the cables must be measured, compensated & fed back to the excitation circuit to auto correct the excitation voltage drop.
Measuring ranges	$\pm$ 8 to $\pm$ 80 mv/V 1,500 to 1,600 nm [100nm range] for Optical channels
Excitation Voltage	0.5; 1; 2.5; 5V with tolerance < 0.1%
Linearity deviation	≤0.1%
Internal Completion resistors	Software selectable – 120, 350,700 ohm with 2ppm/°C stability. Completion Resistors with higher ppm will not be acceptable.
Permissible cable length	Must support at least 200 meters cable length between ¼ bridge strain gauge and connection board. Must be mentioned in the datasheet.
Calibration	Inbuilt shunt with ±2 ppm/°C temperature co-efficient required giving 1mv/V on every channel. Software selectable.

	No external shunt resistors or manually hardwiring of shunt resistors is acceptable. Auto calibration is required (No external wiring or Jumper will be accepted)
Zero Balancing	100% auto balancing, one touch (Must be done in Parallel for all channels)
Noise	System Noise <±0.05μm/m
Resolution	Must have ±7,680,000 steps resolution. Atleast 0.02 μm/m for 160,000 μm/m at 5V excitation
Measurement frequency	0 to 500Hz
Temperature on zero	≤ 0.01% for 1°C change in temperature
Temperature on sensitivity	≤ 0.01% for 1°C change in temperature
Fiber Optic Channel	• Each of the Fiber Optic channel should be capable of connecting min 12 sensors in one connector • Should support sensors based on Fiber Bragg Grating • Dynamic range of > 20dB • Connector Type should be FC/APC • Must include a traceable wavelength
Filter Frequency (Hz)	Bessel & Butterworth Filter 0.05Hz to 500 Hz. Low pass & High pass required.
Damping Poles	50 or 60Hz Damping Poles to suppress power line induced voltage
Trigger function	Pre, Post & Conditional trigger Capability required. Capability to switch sample rate on a conditional trigger
Interface	RS-232C, USB, Ethernet. Transfer rate of 307200 values / second

Synchronization	Must be able to sync with the existing DAQ in the Lab and log data in parallel in one software
Other Essential functionalities	- Must support TID (Strain Gauge identification). - Fiber Optic channels should support Smart Peak detection - Hybrid datalogging of Fiber Optic and electrical sensor is required. - Data should be stored with all setup parameters (as sensor type, excitation, filter, zero, tare value etc.) for traceability - EMC and CE certified according to EN61326 and EN61010 for electromagnetic compatibility & electrical safety.
Power supply (V AC)	230 V -25+15%
Software	The User-friendly GUI software should include. Hardware setup, simplified data Logging, visualization, analysis and documentation of at least 100 measurement channels, working under latest current Windows versions The software should be ready to use without any programming. Custom programmed package not acceptable. The software should be established and in use for 10 years. No programming knowledge should be required to work on the software.
Channel configuration	Automatic sensor recognition through TEDS (integrated editor). Manually via integrated sensor database which must be open & expandable. Provision for defining no of channels, channel definition, data file name, channel scan rate, recording rate, no of channels for recording etc., Scan rate and recording rate to be user-definable Continuous logging at preset intervals or on manual key Provision to set high and low values for watch-dog purposes for all channels with visual indication Comprehensive trigger functions
Online calculations	Arithmetic, exponent, root, root mean square value, logic, trigonometry, integral/differential, exponential, logarithm, limit values (connect digital output, play audio file via external speaker, entry in log file), software filters (moving averages, Bessel, Butterworth), virtual channels.

Stress Analysis Package	Provision to assign input data like gage factor, gage resistance, α material & gauge etc
	Library for experimental Stress Analysis for standard materials for different strain gage configurations (2 element, 3 elements rectangular, Y, delta) based on major theories
	Temperature Compensation via Temperature response Polynomial, via compensation strain gauges, 2-point temperature reference
	User editable Materials table for Young's Modulus, Poisson's Ratio, and Thermal expansion co-efficient.
	Transverse sensitivity and non-linearity corrections
	Online and offline Von Mises Failure criteria, Principal nominal stress, principal strain, shear stress, shear strain, angle calculations
Hybrid Operations	Capability to log and visualize in parallel both Foil gauges and Optical gauges.
Software Display Elements	Online digital & graphical monitoring of all selected channels with fully configurable visualization (like plots with curser, tables, digital Numeric display, line recorder (y–t, x–y, y–f / FFT), spreadsheet, indicator, bar graph, LED, polar diagram, switch (button), checkbox, selection box, background image, text etc)
	Provision for auto scaling and manual scaling online plot
	It should be possible to plot with X-axis and multi (>10) Y-axes Provision for multi windows with tabs & different user defined visualization on multiple Screens
Data Storage Format	ASCII, Microsoft Excel, RPC III, MATLAB, nCode, MDF 4.0, NI DIAdem. The complete meta data (sensors, measurement, configuration, test parameters), statistics log should be stored for data traceability.
Integration	All Hardware and Software **should be from an Single OEM and already working successfully in India for >2 years**
Manufacturer Experience	The manufacturer must have at least 3 years' experience in the field of manufacturing strain gauges and strain measuring amplifier system.

Warranty: 36 Months
Training: 4 days on site training

Requirement of the bidder:

- The bidder should be capable of supplying all relevant hardware / software
- The manufacturer must have at least 03 years' experience in the field of manufacturing Strain gauges, Strain Acquisition system, interrogators. Similar

equipment supplied in India and the contact details for verification should be provided.
- The product proposed must be that of an internationally recognized brand
- The manufacturer should have direct presence in India
- The bidder should produce documentary support for the above. Only those who satisfy the above criteria are eligible to bid and will be considered for further participation

LIST OF DELIVERABLES

S.NO	DESCRIPTION	QTY
1)	8 Channel Interrogator system	1
2)	Software which can log both Electrical sensor and Optical	1
3)	sensors without programming	1
	Optical Strain Sensor – Surface Mountable type	
4)	With all other essential accessories	1
5)	36 Channels Digital Signal Conditioner	1