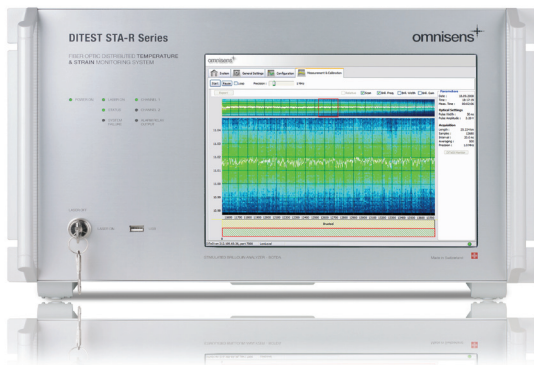


DITEST STA-R Series

FIBER OPTIC DISTRIBUTED TEMPERATURE & STRAIN MONITORING SYSTEM



THE DITEST STA-R Series IS THE LATEST MODEL OF THE FIBER OPTIC BRILLOUIN-BASED SENSING TECHNIQUE PIONEERED BY OMNISENS

DATASHEET



> SUPERIOR MONITORING PERFORMANCE

- Longest distance distributed sensing - 50 km per channel
- Simultaneous fast and accurate temperature and strain measurements
- Robust optical budget supports the most demanding deployment conditions

> INTELLIGENT MEASUREMENT CONTROL AND CONFIGURATION

- Automatic measurement settings maintains highest instrument performance
- Self-adjusting configurations to varying external conditions
- Intelligent measurement control and performance diagnostic

> COMPLEX MONITORING CONFIGURATIONS MADE EASY

- Library of pre-configured calibrated sensing elements
- Combinations of multiple cable/fiber sections in single configuration
- Well adapted to complex applications combining temperature and strain sections

> POWERFUL MEASUREMENT DATA MANAGEMENT

- Advanced data management, storage, interpretation and analysis
- Full remote control capabilities of multiple instruments

OMNISENS DITEST IS ESPECIALLY SUITED TO APPLICATIONS REQUIRING FAST ACQUISITIONS, LONG DISTANCE OR HIGH OPTICAL BUDGET

SUPERIOR MEASUREMENT PERFORMANCE

The superior DITEST sensing technique offers fast and accurate strain and temperature measurements and its associated configuration flexibility makes the DITEST STA-R well adapted to demanding applications.

The use of stimulated Brillouin scattering in single mode fibers makes possible high spatial resolutions (down to 0.5m) measurements with short updating times while offering long distance measurement capabilities with optimized performances in terms of spatial resolution and measurement resolution (see Figure 1)

The DITEST STA-R Series integrates an enhanced optical signal processing and a complete control of optical signal levels which are automatically adapted to the sensing conditions. This outstanding measurement flexibility leads to an unrivalled dynamic range (up to 20dB of optical budget) which guarantees that the measurement performance is maintained even in the case of large fiber losses.

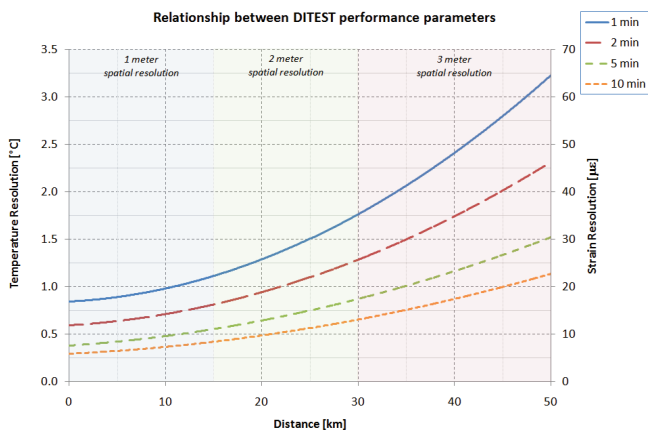


Figure 1: The measurement performance figure shows typical achievable performances in terms of temperature and strain resolution (2σ repeatability) obtained with the designated typical recommended spatial resolution from 1m to 3m depending on the distance range. The performance specification of distributed monitoring system requires mentioning interrelated parameters such as distance, spatial resolution, acquisition time and fiber attenuation. The most appropriated performance description is a graphical presentation with the additional mention of the measurement settings.

INTELLIGENT MEASUREMENT CONFIGURATION

The DITEST STA-R Series integrates an intelligent configuration routine which automatically configures the measurement parameters and optimizes each measurement with respect to targeted performance.

SENSOR AUTO CONFIGURATION

Once a sensing fiber is connected to the instrument, the intelligent measurement configuration routine automatically adjusts the measurement settings such as :

- Distance and sampling interval
- Measurement contrast optimization
- Temperature and strain measurement range

MEASUREMENT OPTIMIZATION

While measurements are being performed, the user has full flexibility to change the measurement parameters and to adapt them to specific situations or project requirements. Measurement parameters are :

- Spatial resolution / number of distance points
- Measurement repeatability / resolution
- Acquisition time

Measurements are made in a very simple way, since the instrument automatically controls and optimizes the measurement based on the required performance parameters defined by the user. Alternatively, a given acquisition time can be set by the user and the measurement configuration is automatically adjusted in order to maintain an optimized measurement resolution within the specified measurement updating time.

The system integrates self performance monitoring which provides information about the measurement quality of every temperature or strain profile and which ultimately is used to adapt the measurement settings in the case of varying sensing conditions.

ADVANCED GRAPHICAL USER INTERFACE

In practical applications, a sensing cable is often made of several different optical fibers or cable types with different characteristics and lay loss.

The instrument Graphical User Interface (GUI) allows the user to segment the monitoring distance in sections associated to different fiber characteristics (e.g. index of refraction, fiber excess length, temperature or strain sensor type, calibration coefficients, etc.) or segments (connectors, splices, etc) which can be modified during the acquisition.

A combination of multiple cable or fiber sections which can be either temperature or strain sensing sections is stored as one single configuration. In complex monitoring applications, this feature is especially powerful and guarantees an accurate mapping of the sensing locations taking into account the installation setup (e.g. fiber excess length, junction boxes, lead cable length, etc.).

The system includes a library of comprehensive pre-configured calibrated sensing elements featuring the most commonly used optical fibers and cable sensors. User-defined fiber sensor types can be added to the library to complement the provided database of sensors, whereas Omnisens can assist users in the calibration of specific sensing cables. An unlimited number of configurations can be stored in the database and exchanged between different DITEST instruments, which is useful for routine measurements, reducing the likelihood of differences in user criteria and ensuring fast setup and operation.

The DITEST STA-R combines the versatility and flexibility of a Test & Measurement instrument with the requirements of long term automatic and unattended monitoring. Measurement sequences using pre-defined configurations can be programmed and automatically recorded according to a scheduler. The instrument continuous performance monitoring is able to qualify and to store measurement quality indicators together with measurement data for further data analysis. Fiber breaks are also detected and accurately located in a couple of seconds.

DATA MANAGEMENT AND VERSATILITY

The configurations and complete measurement data, including measurement settings and quality indicators, are stored in a dedicated database format enabling reliable data storage and easy retrieval for data interpretation.

Multiple measurement profiles can be compared, allowing the identification of the smallest relative deviations compared to predefined baseline or reference measurement. The GUI integrates advanced visualization tools for data sorting/filtering, advanced measurement analysis and measurement evolution as a function of time. Measurement data can be exported to various format types including text files, Excel files, bitmap image of graphical plot.

The DITEST STA-R Series was designed for efficient data communication with third party systems as well as other DITEST instruments and solutions. Modbus TCP/IP for status and event communication is integrated, while full measurement data can be automatically broadcasted to registered computers using selectable data formats.

The DITEST STA-R Series features complete remote control capabilities enabling instrument configuration, event diagnostic and maintenance through a TCP/IP connection.

Every project has its own specificity and the best performance is obtained by a careful selection of the sensing fiber cable and its integration. Omnisens provides customer support and assistance in the definition of the appropriate monitoring solution with respect to application requirements.

Application oriented solutions based on DITEST measuring technique have been developed aiming at offering turn-key solutions to specific industry problems such as:

DITEST-AIM : Asset Integrity Monitoring
DITEST-LTM : Long distance range Temperature Monitoring
DITEST-SHM : Structural Health Monitoring

Contact us for more information.

DITEST STA-R FEATURES & PERFORMANCE

Performance	Number of channels	2 independent and selectable channels (standard) Compatible with up to 20 channel external switches - model SO-N (option)		
	Sensor configuration	Two fibers (loop) or single fiber (mirror-ended)** configuration		
	Sensing fiber	Standard single mode fibers		
	Distance range	50 km		
	Spatial resolution * <i>Typical</i>	0.5 to 20 m (by increment of 0.1 m) 1 m at 20 km / 2 m at 30 km / 3 m at 50 km		
	Distance resolution	0.1 m		
	Number of distance points	100'000		
	Dynamic range	10 dB (with no effect on performance) Up to 20dB for distance up to 6 km, with 1 m spatial resolution		
	Measured variables	Strain, Brillouin Frequency shift, Brillouin gain and width		
		Brillouin Freq. Shift	Temperature	Strain
	Resolution	0.1 MHz	0.1°C	2 µε
	Range	10 GHz to 13 GHz	-273°C to 700°C limited by optical fiber	-3 % compression to 3 % elongation
	Acquisition time	>10 seconds 1-2 minutes typical 5-10 minutes for high resolution measurements		
Technical Data	Graphical interface	SVGA 300 mm (12") color screen (1024x768)		
	Communication and Connectors	Ethernet port, USB, RS232, SPST output relays (alarm and system status)		
	Data storage	Internal hard disk (160 GB or more)		
	Data format	Database, text files, MS Excel, bitmap plot		
	Optical connectors	E-2000 / APC		
	Operating temperature	0-40°C		
	Dimensions (W x D x H)	449 x 500 x 266 mm (19" rack)		
	Weight	21 kg		
	Power supply	100-240 VAC / 50-60Hz / <200 VA		
Features	Measurement modes	Manual or automatic unattended measurements		
	Configuration	Automatic measurement configuration (self adjusting to varying conditions)		
	Data analysis	Measurement analysis, multiple trace comparison with respect to selectable baseline, measurement trends and time evolution, analysis at fixed distances, ...		
	Remote operation	Remote control, configuration and maintenance via TCP/IP		
	Watch dog	Long term operation 24/7 guaranteed by automatic recovery and continuous self diagnosis.		
	System Monitoring	Continuous system monitoring including system status, measurement quality, fiber break detection and location		
	Laser safety	Omnisens DITEST products emit invisible infra-red radiation in the 1550 nm wavelength range classified to EN 60825-1(2001-03) as Class 1M laser products.		

* Spatial resolution defines the smallest detectable event along the optical fiber

** Longest distance range in single fiber configuration is reduced to 15 km

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