RaySensing

Yichang Raysensing Optoelectronics Technology Co., Ltd.

Ultra-Weak FBG DSS/DTS Analyzers

English Product Brochure

High-precision wavelength interrogation for distributed strain, temperature and low-frequency vibration monitoring.

Wavelength Demodulation | DSS/DTS Monitoring | Multi-Channel Expansion | SDK Integration

PRODUCT FAMILY	MODELS	VERSION	YEAR
RS-HFBGA	01-04	V2.1 Optimized Layout	2026

ENGLISH TRANSLATION + PRODUCT BROCHURE

Ultra-Weak FBG DSS/DTS Analyzers

Translated and redesigned for international technical communication. Layout optimized to prevent table overflow and page overlap.

TECHNOLOGY PLATFORM

Ultra-weak FBG wavelength interrogation based on pulsed near-infrared light, weak grating reflection and embedded ARM+FPGA signal processing.

MEASUREMENT TARGETS

Distributed strain, temperature and low-frequency vibration monitoring for dense multi-point sensing networks.

APPLICATION DOMAINS

Tunnels, bridges, piles, mines, highways, large venues, slopes and other civil infrastructure monitoring scenarios.

CUSTOMIZATION

Scan rate, sensing length, channel count, host configuration and remote operation options can be configured by project.

INSTALLATION FLEXIBILITY

Embedded module, rack-mount analyzer and portable analyzer formats support laboratory, cabinet and field deployment.

DOCUMENT SCOPE

This brochure covers English operating principles, applications, specifications and ordering structures for RS-HFBGA-01 to RS-HFBGA-04.

DOCUMENT INFORMATION

Version	Change summary	Prepared by	Date
V1.0	Initial release	Luo Zhihui	2022.04.21
V2.1	Layout, cover and contact information optimized	Raysensing	2026

Company: Yichang Raysensing Optoelectronics Technology Co., Ltd.

PORTFOLIO

Product Family Overview

A concise map of the product platform and application direction.

Model	English product name	Core sensing target	Form factor	Typical application focus
RS-HFBGA-01	Ultra-Weak FBG Wavelength Demodulation Module	Strain / temperature	Embedded module	General DSS/DTS field monitoring
RS-HFBGA-02	High-Resolution Wavelength Demodulation Module	High-density strain / temperature	Embedded module	0.1 m spatial-resolution applications
RS-HFBGA-03	3U Rack-Mount Wavelength Analyzer	Large-capacity DSS/DTS	3U rack instrument	Multi-channel remote monitoring systems
RS-HFBGA-04	Portable Wavelength Analyzer	Field DSS/DTS acquisition	Portable integrated analyzer	On-site data acquisition and diagnostics

PRODUCT VISUALS

RS-HFBGA-01

Ultra-Weak FBG Wavelength Demodulation Module

Embedded DSS/DTS interrogation module

OPERATING PRINCIPLE

RS-HFBGA-01 is an embedded ultra-weak FBG interrogation module. A near-infrared laser pulse is launched into the sensing fiber. As the pulse propagates along the fiber, each ultra-weak grating array partially reflects the signal back to a high-speed photoelectric acquisition unit for real-time detection and analysis. The built-in ARM+FPGA SoC resolves the position, wavelength, temperature and strain of each sensing point with high accuracy, high speed and low power consumption.

TYPICAL APPLICATIONS

- Field structural health monitoring for tunnels, piles, mines, highways and large venues
- Low-frequency vibration monitoring for bridges and perimeter systems below 40 Hz
- Experimental teaching and demonstration of fiber-optic sensing networks

TECHNICAL SPECIFICATIONS

Parameter	Typical specification
Strain accuracy	<= 2 microstrain
Temperature accuracy	<= 0.2 °C
Wavelength range / channels	1528 nm to 1568 nm, 4 channels (expandable)
Grating reflectivity	0.001% to 0.1%
Data refresh rate	<= 6 Hz over 40 nm; <= 40 Hz custom
Spatial resolution	>= 0.5 m (standard TDM + WDM)
Measurement length	<= 6 km; custom up to 20 km
Data interfaces	Gigabit Ethernet, RS232, Gigabit Ethernet
OS / application software	Windows 7/10, C#, SDK for secondary development
Operating temperature	0 °C to 50 °C
Power / rated consumption	12 V / 13 W
Dimensions	230 mm x 180 mm x 45 mm
Weight	1.8 kg

ORDERING CONFIGURATION

Company RS	**Product family** HFBGA	**Variant** 01
Model type G: Standard R: Enhanced	**Rate** 1: 3 Hz 2: 20 Hz 3: 40 Hz 4: Other	**Distance** 1: 2 km 2: 5 km 3: 10 km 4: Custom
Channels 1: 1 ch 2: 4 ch 3: 8 ch 4: 16 ch 5: 32 ch	**Host config.** 1: Bare unit 2: IPC 3: ARM 4: Server	**Option** K: 1U KVM B: Laptop O: None

RS-HFBGA-02

High-Resolution Wavelength Demodulation Module

High-density ultra-weak FBG interrogation module

OPERATING PRINCIPLE

RS-HFBGA-02 is a high-resolution ultra-weak FBG demodulation module. The module launches near-infrared pulses into a serially connected ultra-weak FBG array, receives the reflected signals along the same fiber and analyzes them in real time through a high-speed photoelectric acquisition card. Its ARM+FPGA SoC resolves each sensor position and its temperature or strain value, providing high spatial resolution, high accuracy and low power consumption.

TYPICAL APPLICATIONS

- Field structural health monitoring for tunnels, piles, mines, highways and large venues
- Deformation inversion and strain-field monitoring for typical structures
- Experimental teaching and demonstration of fiber-optic sensing networks

TECHNICAL SPECIFICATIONS

Parameter	Typical specification
Strain accuracy	<= 2 microstrain
Temperature accuracy	<= 0.2 °C
Wavelength range / channels	1528 nm to 1568 nm, 4 channels (expandable)
Grating reflectivity	0.001% to 0.1%
Data refresh rate	<= 1 Hz over 40 nm
Spatial resolution	>= 0.1 m (WDM + TDM)
Measurement length	<= 2 km
Data interfaces	Gigabit Ethernet, RS232, Gigabit Ethernet
OS / application software	Windows 7/10, C#, SDK for secondary development
Operating temperature	0 °C to 50 °C
Power / rated consumption	12 V / 21 W
Dimensions	230 mm x 180 mm x 45 mm
Weight	1.8 kg

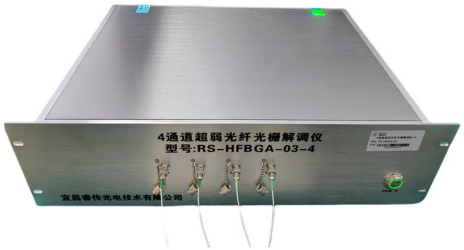
ORDERING CONFIGURATION

Company RS	**Product family** HFBGA	**Variant** 02
Model type H: High-density O: Custom	**Rate** 1: 1 Hz 2: Custom	**Distance** 1: 2 km 2: Custom
Channels 1: 1 ch 2: 4 ch 3: 8 ch 4: 16 ch	**Host config.** 1: Bare unit 2: IPC 3: Server	**Option** K: 1U KVM B: Laptop O: None

RS-HFBGA-03

3U Rack-Mount Wavelength Analyzer

High-capacity rack-mount DSS/DTS analyzer



OPERATING PRINCIPLE

RS-HFBGA-03 is a standard 3U rack-mount, high-capacity ultra-weak FBG analyzer. It integrates ultra-weak FBG wavelength demodulation modules to detect and analyze each sensor position and corresponding temperature or strain values in real time. The instrument can be configured with an industrial computer and UPS, supports expansion up to 32 channels, remote operation/configuration, automatic power-on startup and Ethernet or Wi-Fi data transmission.

TYPICAL APPLICATIONS

- Health monitoring of tunnels, bridges, piles, mines, highways and large venues
- Prediction and alarm for landslides, debris flows and dangerous rock cracks
- Deformation inversion and strain-field monitoring of typical structures

TECHNICAL SPECIFICATIONS

Parameter	Typical specification
Strain accuracy	<= 2 microstrain
Temperature accuracy	<= 0.2 °C
Wavelength range / channels	1528 nm to 1568 nm, 4 channels; custom 8/16/32 channels
Grating reflectivity	0.001% to 0.1%
Data refresh rate	<= 40 Hz single-channel; typical 1 Hz
Spatial resolution	>= 0.5 m (TDM + WDM); custom >= 0.1 m
Measurement length	<= 10 km typical; enhanced/custom versions available
Display / output interfaces	HDMI, USB, Gigabit Ethernet
OS / application software	Windows 7/10, C#, SDK for secondary development
Operating temperature	0 °C to 50 °C
Power / consumption	220 V / 50 Hz, 45 W
Dimensions	482 mm x 328 mm x 132 mm
Weight	6.5 kg

ORDERING CONFIGURATION

Company RS	**Product family** HFBGA	**Variant** 03
Model type G: Standard H: High-density R: Enhanced	**Rate** 1: 3 Hz 2: 20 Hz 3: 40 Hz 4: Other	**Distance** 1: 2 km 2: 5 km 3: 10 km 4: Custom
Channels 1: 1 ch 2: 4 ch 3: 8 ch 4: 16 ch 5: 32 ch	**Host config.** 1: No host 2: IPC 3: Server 4: Other	**Option** K: KVM O: None

RS-HFBGA-04

Portable Wavelength Analyzer

Portable high-capacity ultra-weak FBG analyzer

OPERATING PRINCIPLE

RS-HFBGA-04 is a portable high-capacity ultra-weak FBG analyzer. It integrates an ultra-weak FBG wavelength demodulation module, computer host, keyboard, touchpad and lithium battery for on-site or remote operation, configuration and data acquisition. Advanced demodulation algorithms accurately recover each sensor position and its temperature or strain value.

TYPICAL APPLICATIONS

- Health monitoring of tunnels, bridges, piles, mines, highways and large venues
- Prediction and alarm for landslides, debris flows and dangerous rock cracks
- Deformation inversion and strain-field monitoring of typical structures

TECHNICAL SPECIFICATIONS

Parameter	Typical specification
Strain accuracy	<= 2 microstrain
Temperature accuracy	<= 0.2 °C
Wavelength range / channels	1528 nm to 1568 nm, 4 channels typical
Grating reflectivity	0.001% to 0.1%
Data refresh rate	<= 6 Hz single-channel; typical 1 Hz
Spatial resolution	>= 0.5 m (TDM + WDM); custom >= 0.1 m
Measurement length	<= 10 km typical; enhanced custom versions available
Data output interfaces	USB, Gigabit Ethernet
OS / application software	Windows 7/10, C#
Operating temperature	0 °C to 50 °C
Power / consumption	AC 220 V / 50 Hz or DC 24 V, 45 W
Dimensions	390 mm x 280 mm x 115 mm
Weight	6 kg

ORDERING CONFIGURATION

Company RS	**Product family** HFBGA	**Variant** 04
Model type M: Metal P: Plastic	**Rate** 1: 3 Hz 2: Other	**Distance** 1: 2 km 2: 5 km 3: Custom
Channels 1: 1 ch 2: 4 ch 3: Custom	**Host config.** 1: IPC 2: Server 3: Other	**Option** L: External control K: Battery display O: None

RaySensing

Ultra-Weak FBG Sensing Platform

Built for Dense, Long-Distance Sensing Networks

RaySensing DSS/DTS analyzers combine ultra-weak FBG sensing arrays, high-speed optoelectronic acquisition and embedded ARM+FPGA processing for field-ready distributed measurement systems.

DSS/DTS PLATFORM

Distributed strain and temperature monitoring with configurable sensing distance and spatial resolution.

EMBEDDED PROCESSING

Real-time position, wavelength, strain and temperature outputs through industrial interfaces.

SYSTEM OPTIONS

Embedded modules, 3U rack instruments and portable field analyzers.

INTEGRATION READY

Ethernet/RS232 interfaces and SDK support for customer software platforms.

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