RaySensor
Yichang RaySensor Optoelectronic Technology Co., Ltd.

RaySensing

Special Sensing Cables

English Product Brochure

Rugged cable platforms for distributed strain, temperature and vibration monitoring in demanding field environments.

Strain Cables | Temperature Cables | DAS Cables | Composite Monitoring

PRODUCT FAMILY	MODELS	VERSION	YEAR
RS-CABLE	S1-S4 | T1-T2 | D1-D3	V2.0 English Layout	2025

ENGLISH TRANSLATION + PRODUCT BROCHURE

Special Sensing Cables

Translated and redesigned from the source Chinese product files for international technical communication.

TECHNOLOGY PLATFORM Ultra-weak FBG arrays integrated into cable structures for distributed strain, temperature and vibration monitoring.	**MEASUREMENT TARGETS** Structural strain, deformation, temperature field, fire warning, micro-vibration and composite strain-vibration sensing.	**APPLICATION DOMAINS** Tunnels, bridges, steel structures, slopes, ground settlement, petrochemical facilities, battery storage and perimeter security.
CUSTOMIZATION Grating spacing, wavelength, cable diameter, coating, reinforcement and jacket materials can be configured by project.	**INSTALLATION FLEXIBILITY** Surface bonding, slot embedding, underground laying, concrete embedding, aerial pipeline mounting and direct field deployment.	**DOCUMENT SCOPE** This brochure covers English principles, applications, specifications and ordering structures for RS-CABLE-S/T/D series products.

DOCUMENT INFORMATION

Version	Change summary	Prepared by	Date
V1.0	Initial release	Luo Zhihui	2022.04.21
V2.0	Content update	Wang Huilan	2025.03.31

Company: Yichang RaySensor Optoelectronic Technology Co., Ltd.

PORTFOLIO

Product Family Overview

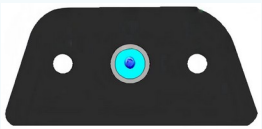
A concise map of the product platform and application direction.

Model	English product name	Core sensing target	Cable / package	Typical application focus
RS-CABLE-S1	Internal Fixed-Point Strain Cable	Strain	3.0 mm cable	Convergence, cracks, inclinometer tubes
RS-CABLE-S2	External Fixed-Point Strain Cable	Strain	5.0 mm cable with nodes	Soil/structure coupling and settlement
RS-CABLE-S3	Pre-Stressed Strain Cable	Strain	5.0 mm pre-loaded cable	Axial strain with reduced blind zones
RS-CABLE-S4	Distributed Strain Cable	Strain	5.0 mm reinforced cable	Concrete deformation and load monitoring
RS-CABLE-T1	Stainless-Steel Temperature Cable	Temperature	1.8/3.0 mm metal package	Fast thermal response and fire warning
RS-CABLE-T2	Temperature Sensing Cable	Temperature	3.0 mm PBT / steel cable	Soil, pipeline and facility temperature
RS-CABLE-D1	Buried Vibration Cable	DAS vibration	3.0 mm armored cable	Buried and concrete vibration monitoring
RS-CABLE-D2	High-Sensitivity Vibration Cable	DAS vibration	3.0 mm sensitive cable	Surface vibration monitoring
RS-CABLE-D3	Strain-Vibration Composite Cable	Strain + vibration	Flat composite cable	Roadway, tunnel and rail monitoring

PRODUCT VISUALS







RS-CABLE-S1

Internal Fixed-Point Strain Cable

Ultra-weak FBG strain sensing cable

OPERATING PRINCIPLE

RS-CABLE-S1 is an internal fixed-point ultra-weak FBG strain sensing cable. It integrates a 0.9 mm Hytrel tight-buffered ultra-weak FBG array, followed by metal armoring, braiding and outer sheathing. A single cable can multiplex tens of thousands of gratings with 0.01% to 0.1% reflectivity. A patented structure improves force transfer between the fiber and sheath, enabling high sensitivity and convenient engineering installation.

TYPICAL APPLICATIONS

- Tunnel convergence, crack and inclinometer-tube monitoring
- Surface bonding on large steel structures
- Underground monitoring for slopes and ground settlement

TECHNICAL SPECIFICATIONS

arameter	Typical specification
Center wavelength	1528 nm to 1568 nm
Center wavelength tolerance	+/- 0.5 nm
Grating length	10 mm
Reflectivity	0.01% to 0.1%
Bandwidth @ -3 dB	<= 0.30 nm
Side-mode suppression ratio	>= 15 dB
Fiber loss	<= 0.3 dB/km
Typical grating spacing	0.5 m, 1 m, 2 m, 5 m; others customizable
Cable weight	12 kg/km
Cable diameter	3.0 mm internal fixed-point
Mechanical properties	Tensile >= 5 N; crush 1000 N/10 cm
Strain range	>= 12000 microstrain
Strain sensitivity	1.15 pm/microstrain
Operating temperature	-20 °C to 90 °C

ORDERING INFORMATION

Company	Product family	Variant	Fiber type	Spacing	Wavelength	Diameter	Temp. rating	Notes
RS	CABLE	S1	1: G.657A2 2: G.652D	1: 1 m 2: 2 m 3: 0.5 m 4: Other	1: 1536 2: 1536,1548 3: 1530,1542,1554 4: Other	1: 3 mm 2: 5 mm 3: Other	1: -20 to 90 °C 2: Other	O: Other

RS-CABLE-S2

External Fixed-Point Strain Cable

Externally indexed ultra-weak FBG strain cable

OPERATING PRINCIPLE

RS-CABLE-S2 is an external fixed-point ultra-weak FBG strain cable. The cable contains a 0.9 mm Hytrel tight-buffered ultra-weak FBG array, metal armoring and braided protection, followed by molded fixed-point rings. A single cable can multiplex tens of thousands of weak-grating sensors. The structural design enhances mechanical transfer between the fiber and sheath, improving medium coupling and simplifying field installation.

TYPICAL APPLICATIONS

- Civil engineering strain monitoring such as tunnel convergence, piles, cracks and ground settlement
- Deep settlement monitoring
- Ground displacement monitoring

TECHNICAL SPECIFICATIONS

arameter	Typical specification
Center wavelength	1528 nm to 1568 nm
Center wavelength tolerance	+/- 0.5 nm
Grating length	10 mm
Reflectivity	0.01% to 0.1%
Bandwidth @ -3 dB	<= 0.30 nm
Side-mode suppression ratio	>= 15 dB
Fiber loss	<= 0.3 dB/km
Typical grating spacing	0.5 m, 1 m, 2 m, 5 m; others customizable
Cable weight	36 kg/km
Cable diameter	5.0 mm; node diameter 10 mm
Mechanical properties	Tensile >= 100 N; crush 2000 N/10 cm
Strain range	>= 12000 microstrain
Strain sensitivity	1.15 pm/microstrain
Operating temperature	-20 °C to 90 °C

ORDERING INFORMATION

Company	Product family	Variant	Fiber type	Spacing	Wavelength	Diameter	Temp. rating	Notes
RS	CABLE	S2	1: G.657A2 2: G.652D	1: 1 m 2: 2 m 3: 0.5 m 4: Other	1: 1536 2: 1536,1548 3: 1530,1542,1554 4: Other	1: 5 mm 2: Other	1: -20 to 90 °C 2: Other	L: Spiral armor O: Other

RS-CABLE-S3

Pre-Stressed Strain Cable

Pre-loaded internal fixed-point strain cable

OPERATING PRINCIPLE

RS-CABLE-S3 is a pre-stressed internal fixed-point ultra-weak FBG strain cable. It integrates a 0.9 mm Hytrel tight-buffered ultra-weak FBG array with metal armoring and pre-stressed stranding. The cable is pre-loaded to approximately 3000 microstrain, so no initial tension is required during deployment. It enables axial strain sensing with reduced blind zones, high strength, simple processing and convenient installation.

TYPICAL APPLICATIONS

- Tunnel convergence, pile, crack and ground settlement monitoring
- Deep settlement monitoring
- Field landslide monitoring

TECHNICAL SPECIFICATIONS

arameter	Typical specification
Center wavelength	1528 nm to 1568 nm
Center wavelength tolerance	+/- 0.5 nm
Reflectivity	0.01% to 0.1%
Bandwidth @ -3 dB	<= 0.30 nm
Side-mode suppression ratio	>= 15 dB
Fiber loss	<= 0.3 dB/km
Typical grating spacing	0.5 m, 1 m, 2 m, 5 m; others customizable
Cable weight	50 kg/km
Cable diameter	5.0 mm
Mechanical properties	Tensile >= 200 N; crush 1000 N/10 cm
Strain range	>= 12000 microstrain
Strain sensitivity	1.05 pm/microstrain
Operating temperature	-20 °C to 90 °C

ORDERING INFORMATION

Company	Product family	Variant	Fiber type	Spacing	Wavelength	Diameter	Temp. rating	Notes
RS	CABLE	S3	1: G.657A2 2: G.652D	1: 1 m 2: 2 m 3: 0.5 m 4: Other	1: 1536 2: 1536,1548 3: 1530,1542,1554 4: Other	1: 5 mm 2: 8 mm 3: Other	1: -20 to 90 °C 2: -40 to 120 °C	G: Steel rope O: Other

RS-CABLE-S4

Distributed Strain Cable

Fully distributed ultra-weak FBG strain cable

OPERATING PRINCIPLE

RS-CABLE-S4 is a fully distributed ultra-weak FBG strain sensing cable. It integrates a 1.0 mm FRP grating array with a central twisted steel rope and extruded sheath. A single cable can multiplex tens of thousands of 0.01% to 0.1% reflective grating sensors. Grating spacing can be customized; automated cable processing provides high tensile performance, efficient strain transfer and good temperature stability.

TYPICAL APPLICATIONS

- Civil engineering strain monitoring including tunnel convergence, piles, cracks and ground settlement
- Field landslide monitoring
- Concrete-structure deformation and load monitoring

TECHNICAL SPECIFICATIONS

arameter	Typical specification
Center wavelength	1528 nm to 1568 nm
Center wavelength tolerance	+/- 0.5 nm
Grating length	10 mm
Reflectivity	0.01% to 0.1%
Bandwidth @ -3 dB	<= 0.30 nm
Side-mode suppression ratio	>= 15 dB
Fiber loss	<= 0.3 dB/km
Typical grating spacing	0.20 m, 0.5 m, 1 m, 2 m, 5 m; others customizable
Cable weight	52 kg/km
Cable diameter	5.0 mm
Mechanical properties	Tensile >= 1500 N; crush 3000 N/10 cm
Strain range	>= 12000 microstrain
Strain sensitivity	1.0 pm/microstrain
Operating temperature	-20 °C to 90 °C

ORDERING INFORMATION

Company	Product family	Variant	Fiber type	Spacing	Wavelength	Diameter	Temp. rating	Notes
RS	CABLE	S4	1: G.657A2 2: G.652D	1: 1 m 2: 2 m 3: 0.5 m 4: Other	1: 1536 2: 1536,1548 3: 1530,1542,1554 4: Other	1: 5 mm 2: 8 mm 3: Other	1: -20 to 90 °C 2: -40 to 120 °C	L: Steel wire G: Steel rope O: Other

RS-CABLE-T1

Stainless-Steel Temperature Cable

Metal-packaged ultra-weak FBG temperature sensing cable

OPERATING PRINCIPLE

RS-CABLE-T1 is a stainless-steel packaged ultra-weak FBG temperature sensing cable available in 1.8 mm and 3.0 mm specifications. It uses Kevlar/bare fiber, a steel tube and twisted stainless-steel wire structure. Stress-free packaging reduces spool-induced effects and provides high mechanical strength, fast thermal conduction and easy field installation for rapid temperature response and special temperature-field monitoring.

TYPICAL APPLICATIONS

- Distributed fire alarm systems for tunnels, metros and petrochemical facilities
- Real-time temperature-field analysis and alarm for large facilities such as warehouses, observatories and lithium-battery storage areas

TECHNICAL SPECIFICATIONS

arameter	Typical specification
Center wavelength	1528 nm to 1568 nm
Center wavelength tolerance	+/- 0.5 nm
Grating length	10 mm
Reflectivity	0.01% to 0.1%
Bandwidth @ -3 dB	<= 0.30 nm
Side-mode suppression ratio	>= 15 dB
Fiber loss	<= 0.3 dB/km
Typical grating spacing	0.20 m, 0.5 m, 1 m, 2 m, 5 m; others customizable
Cable weight	52 kg/km with steel-rope reinforcement
Cable diameter	1.8 mm stainless-steel tube / 3.0 mm armored braided cable
Mechanical performance	Steel tube package >= 20 N; stranded cable >= 1000 N
Temperature sensitivity	10.02 pm/°C
Linearity	> 0.999
Operating temperature	-20 °C to 90 °C

ORDERING INFORMATION

Company	Product family	Variant	Fiber type	Spacing	Wavelength	Diameter	Temp. rating	Notes
RS	CABLE	T1	1: G.657A2 2: G.652D	1: 1 m 2: 2 m 3: 0.5 m 4: Other	1: 1536 2: 1536,1548 3: 1530,1542,1554 4: Other	1: 3 mm 2: 5 mm 3: Other	1: -20 to 90 °C 2: -40 to 120 °C 3: -200 to 200 °C	L: Steel rope G: Steel wire O: Other

RS-CABLE-T2

Temperature Sensing Cable

Steel-rope reinforced ultra-weak FBG temperature cable

OPERATING PRINCIPLE

RS-CABLE-T2 is an ultra-weak FBG temperature sensing cable with built-in steel-rope reinforcement. It uses a bare fiber + PBT + metal braid/steel rope + outer sheath structure. Stress-free packaging and steel-rope reinforcement improve tensile performance while maintaining simple field installation, making it suitable for temperature measurement in soil, overhead pipelines and special environments.

TYPICAL APPLICATIONS

- Distributed fire alarm systems for tunnels, metros and petrochemical facilities
- Real-time temperature-field analysis and alarm for large facilities such as warehouses and observatories
- Temperature monitoring in lithium-battery warehouses

TECHNICAL SPECIFICATIONS

arameter	Typical specification
Center wavelength	1528 nm to 1568 nm
Center wavelength tolerance	+/- 0.5 nm
Grating length	10 mm
Reflectivity	0.01% to 0.1%
Bandwidth @ -3 dB	<= 0.30 nm
Side-mode suppression ratio	>= 15 dB
Fiber loss	<= 0.3 dB/km
Typical grating spacing	0.20 m, 0.5 m, 1 m, 2 m, 5 m; others customizable
Cable weight	18 kg/km
Cable diameter	3.0 mm with PBT and braided layer
Mechanical performance	Tensile >= 200 N; crush 1000 N/10 cm
Temperature sensitivity	10.02 pm/°C
Linearity	> 0.999
Operating temperature	-20 °C to 90 °C

ORDERING INFORMATION

Company	Product family	Variant	Fiber type	Spacing	Wavelength	Diameter	Temp. rating	Notes
RS	CABLE	T2	1: G.657A2 2: G.652D	1: 1 m 2: 2 m 3: 0.5 m 4: Other	1: 1536 2: 1536,1548 3: 1530,1542,1554 4: Other	1: 2 mm 2: 3 mm 3: 5 mm 4: Other	1: -20 to 90 °C 2: -40 to 120 °C 3: -200 to 200 °C	L: Spiral armor G: Steel rope O: Other

RS-CABLE-D1

Buried Vibration Cable

Embedded micro-vibration DAS sensing cable

OPERATING PRINCIPLE

RS-CABLE-D1 is a buried micro-vibration DAS sensing cable. It uses a bare fiber + PBT + steel rope + outer sheath structure and integrates equally spaced ultra-weak grating arrays with bandwidth greater than 5 nm @ 3 dB to enhance scattering signal strength. The grating spacing can be customized. With small diameter, good tensile performance and high mechanical strength, it is suitable for concrete embedding and direct ground deployment.

TYPICAL APPLICATIONS

- Tunnel and building surface vibration monitoring
- Oil well logging
- Pipeline leakage and perimeter security

TECHNICAL SPECIFICATIONS

arameter	Typical specification
Center wavelength	1550.12 nm
Center wavelength tolerance	+/- 0.5 nm
Grating length	10 mm
Reflectivity	0.01%
Bandwidth @ -3 dB	>= 4.9 nm @ G.652D; >= 22 nm @ G.657A2
Side-mode suppression ratio	>= 15 dB
Fiber loss	<= 0.3 dB/km
Typical grating spacing	5 m typical; others customizable
Cable weight	50 kg/km
Cable diameter	3.0 mm with metal armor and braided layer
Mechanical performance	Tensile >= 1000 N; crush 2000 N/10 cm
Temperature sensitivity	10.02 pm/°C
Operating temperature	-20 °C to 90 °C

ORDERING INFORMATION

Company	Product family	Variant	Fiber type	Spacing	Wavelength	Diameter	Temp. rating	Notes
RS	CABLE	D1	1: G.657A2 2: G.652D	1: 2 m 2: 5 m 3: Other	1: 1550.12 nm 4: Other	1: 5 mm 2: Other	1: -20 to 90 °C 2: -40 to 120 °C 3: Other	G: Steel rope O: Other

RS-CABLE-D2

High-Sensitivity Vibration Cable

High-sensitivity ultra-weak FBG vibration cable

OPERATING PRINCIPLE

RS-CABLE-D2 is a high-sensitivity ultra-weak FBG vibration sensing cable. It uses a bare fiber + spiral armor/steel rope + outer sheath structure and integrates equally spaced ultra-weak FBG arrays with bandwidth greater than 5 nm @ 3 dB to enhance scattering signal strength. By reducing the sheath structure, the cable achieves higher sensitivity, simple processing and convenient installation for vibration monitoring on well-conditioned structural surfaces.

TYPICAL APPLICATIONS

- Tunnel and building surface vibration monitoring
- Oil well logging
- Pipeline leakage and perimeter security

TECHNICAL SPECIFICATIONS

arameter	Typical specification
Center wavelength	1550.12 nm
Center wavelength tolerance	+/- 0.5 nm
Grating length	10 mm
Reflectivity	0.01%
Bandwidth @ -3 dB	>= 4.9 nm @ G.652D; >= 22 nm @ G.657A2
Side-mode suppression ratio	>= 15 dB
Fiber loss	<= 0.3 dB/km
Typical grating spacing	5 m typical; others customizable
Cable weight	16 kg/km
Cable diameter	3.0 mm with metal armor and braided layer
Mechanical performance	Tensile >= 100 N; crush 1000 N/10 cm
Temperature sensitivity	10.02 pm/°C
Operating temperature	-20 °C to 90 °C

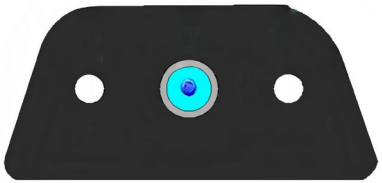
ORDERING INFORMATION

Company	Product family	Variant	Fiber type	Spacing	Wavelength	Diameter	Temp. rating	Notes
RS	CABLE	D2	1: G.657A2 2: G.652D	1: 2 m 2: 5 m 3: Other	1: 1550.12 nm 2: Other	1: 3 mm 2: Other	1: -20 to 90 °C 2: -40 to 120 °C 3: -200 to 200 °C	G: Steel rope O: Other

RS-CABLE-D3

Strain-Vibration Composite Cable

Composite cable for simultaneous strain and vibration monitoring



OPERATING PRINCIPLE

RS-CABLE-D3 is a composite sensing cable integrating ultra-weak FBG vibration and strain fibers. The flat structure places a vibration grating array with bandwidth greater than 5 nm @ 3 dB in the center, with one FRP strain fiber and one FRP reinforcement on the sides. This design simplifies cable structure and installation while enabling simultaneous vibration and strain monitoring.

TYPICAL APPLICATIONS

- Roadway vibration analysis
- Tunnel surface-mounted monitoring
- Rail transit vibration monitoring

TECHNICAL SPECIFICATIONS

arameter	Typical specification
Center wavelength	1550.12 nm for vibration; 1528 nm to 1568 nm for strain
Center wavelength tolerance	+/- 0.5 nm
Grating length	10 mm
Reflectivity	0.01% for vibration; 0.01% to 0.1% for strain
Bandwidth @ -3 dB	>= 22 nm @ G.657A2; <= 0.30 nm for strain
Side-mode suppression ratio	>= 15 dB
Fiber loss	<= 0.3 dB/km; <= 0.37 dB/km
Typical grating spacing	5 m typical for vibration; 0.5 m, 1 m, 2 m, 5 m for strain
Internal structure size	φ1.5 mm / φ1.0 mm
Cable weight	43 kg/km
Cable size	3.5 x 7.5 x 9.0 mm (+/- 0.2 mm)
Mechanical performance	Tensile >= 1400 N; crush 1000 N/10 cm
Operating temperature	-20 °C to 70 °C
Reference standard	GB/T 7424.2-2008

ORDERING INFORMATION

Company	Product family	Variant	Fiber type	Spacing	Wavelength	Diameter	Temp. rating	Notes
RS	CABLE	D3	1: G.657A2 2: G.652D	1: 2 m 2: 3 m 3: Other	1: Custom	1: Custom	1: -20 to 90 °C 2: -40 to 120 °C 3: -200 to 200 °C	O: Custom

RaySensor

Ultra-Weak FBG Sensing Platform

Rugged Cables for Structural and Environmental Sensing

RaySensor special sensing cables package ultra-weak FBG arrays into engineered cable structures for surface bonding, slot embedding, underground installation, fire warning and vibration monitoring.

STRAIN CABLE SERIES

Internal/external fixed-point, pre-stressed and fully distributed strain sensing cables.

TEMPERATURE CABLE SERIES

Stress-free temperature sensing cables with stainless-steel or PBT structures.

DAS CABLE SERIES

Weak-grating enhanced vibration cables for buried, surface and composite sensing applications.

PROJECT CUSTOMIZATION

Spacing, wavelength, diameter, jacket, reinforcement and temperature rating can be configured.

Yichang RaySensor Optoelectronic Technology Co., Ltd.

English product brochure | Specifications are subject to project configuration and final quotation.

www.ray-sensor.com

RaySensing

2025