



Hardware Performance and Features

September 2025
Version No. 3.1



Industry Leading Distributed Acoustic Sensing (DAS) System

ONYX *peta* is the flagship Distributed Fiber Sensing platform from Sintela. It provides quantitative distributed acoustic measurements over long fiber lengths with industry leading sensitivity and high spatial resolution in a compact, low power unit.

With inbuilt processing able to process over a petabyte of acquired data per day, and user definable processing workflows, it also provides a flexible DAS edge processing capability.



A new approach to Distributed Fiber Optic Sensing

Our mission is to provide the highest performing Distributed Fiber-Optic Sensing solutions and built on our ONYX platform, ONYX *peta* is our flagship, high performance, long-range, fiber-optic Distributed Acoustic Sensing (DAS) system.

The ONYX *peta* Sensing Unit (OSU) has been developed to provide users with fully flexible acquisition setup enabling them to achieve the highest quality DAS data, and addresses the limitations commonly found in other DAS systems, namely:

Integrated Design: A single OSU combines the optical sensing components and functions of processing hardware and engineering displays into a single 3U rack mount or bench-top deployment. This considerably reduces the space, power, and heat dispersion requirements.

Dual fiber: As standard, the OSU is configured for dual fiber operation with each fiber being independent and able to be configured with their own Gauge Length and Sample Interval. A single fiber option is also available.

Long range: Each OSU contains two optical modules, simultaneously interrogating separate sensing fibers – out to and beyond 65 km (130 km from a single OSU). Alternatively, a single fiber can be used to interrogate a fiber over 150 km resulting in significantly less equipment being required and a lower cost per kilometre of monitoring.

Quantitative Measurements: ONYX *peta* makes phase based-quantitative measurements of vibroacoustic signals. The resultant high fidelity and repeatable measurements enable the implementation of sophisticated signal processing techniques – significantly improving the detection and classification of events, thereby improving the probability of detection whilst reducing the nuisance alarm rate. This also allows machine learning algorithms to be used reliably on the system.

Low frequency, Low Noise Response: Using proprietary optical processing algorithms the ONYX *peta* provides industry leading broadband low noise performance down to milli-Hertz or less.

Distributed Architecture: Administration and control functions are distributed across OSUs when configured in a network. This provides a high degree of fault tolerance with no single point-of-failure, minimizing downtime and increasing system availability.

Class 1 Laser Safety: Class 1 lasers are eye-safe under all operating conditions, which makes ONYX *peta* Sensing Units inherently safe for use, lowers the HSE burden for end clients, and increases the life span of the optical components. This also eliminates the need for costly interlock safety switches and physical keys to operate the equipment.

Automatic Setup with integrated fiber characterization: ONYX *peta* Sensing Unit features automated setup and built-in fiber characterization (OTDR), streamlining installation, testing, and commissioning. This reduces manpower needs, simplifies support by local engineers, and minimizes reliance on specialists. Continuous fiber health monitoring helps detect and mitigate faults from external interference or engineering works.

High Reliability: Passive cooling removes the need for fans and creates a sealed unit which requires minimal maintenance and has a very high mean time between failure providing a safety performance level of SIL2.

Sensing fiber requirement	
Standard fiber types	• Single Mode Fiber (SMF): ITU-T G.652, G.654 or G.65 • Multimode Fiber (MMF): ITU-T G651.1 etc. (NB: Range limited to ~8 km for MMF) • Engineered fiber: Continuous scatter enhanced type ^[1]
Fiber attenuation for given specs	0.2 dB.km ⁻¹ at 1550 nm
Maximum acceptable one-way loss budget	34 dB per fiber
Maximum acceptable back reflection	< 3 %

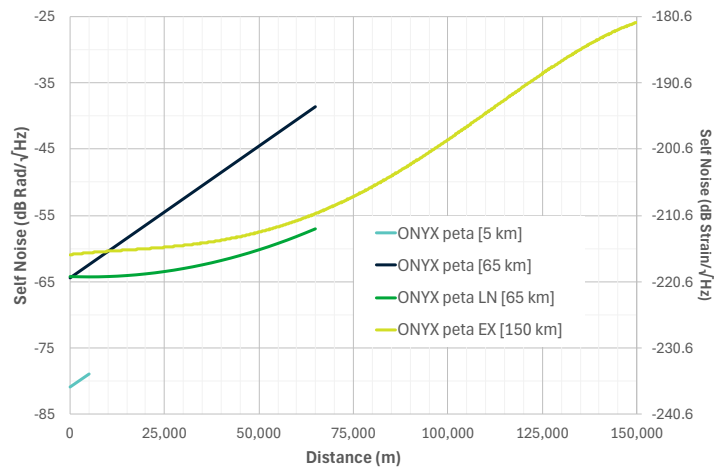
Operating Modes:	ONYX <i>peta</i>	ONYX <i>peta LN</i>	ONYX <i>peta EX</i>
Description	Dual Channel, Standard Range Performance	Dual Channel, Low Noise, Standard Range Performance	Single Channel, EXtended Range Performance
Measurement type	Quantitative ^[3] phase-based DAS using coherent detection technique	Quantitative ^[3] phase-based DAS using coherent spread spectrum technique	
Number of fibers	Two (Independent, 100% duty cycle [not multiplexed])		One
Sensing range @ 6.4 m Gauge Length ^[5]	Standard range up to 65 km (40 miles) per fiber		Standard range up to 150 km (93 miles)
PW – Pulse Width Length			
Min	7.0 ns 0.70 m	22 ns 2.2 m	
Max	192.7 ns 19.70 m	22 ns 2.2 m	
Step	0.43 ns 0.044 m	Not Applicable	
GL – Gauge Width Length			
Min	10.4 ns 1.06 m	30.2 ns 3.18 m	
Max	234.4 ns 23.93 m	234.4 ns 23.93 m	
Step	5.2 ns 0.53 m	5.2 ns 0.53 m	
SP – Sample Interval Pitch ^[6]			
Min	5.2 ns 0.53 m		
Max	161.5 ns 16.49 m		
Step	5.2 ns 0.53 m		

Noise Floor Measurements [2]

System self-noise verses distance plot for standard dual channel and an extended range single channel configuration.

SEAFOM MSP-02 test results measured at a spot frequency of 100 Hz with a gauge length of 6.4 m on:

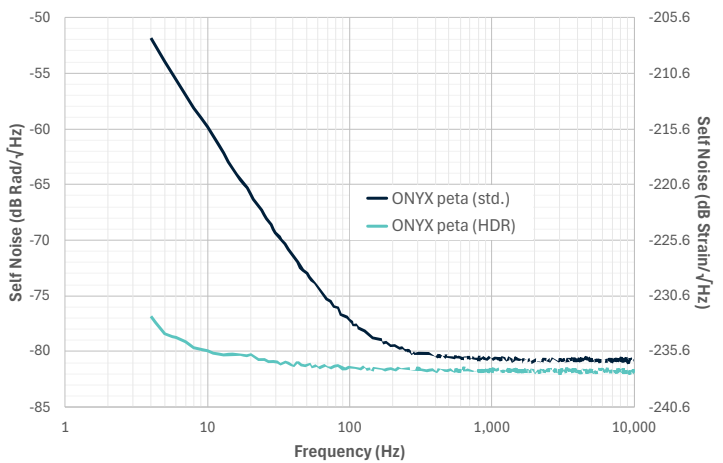
- 5 km fiber using a 20 kHz sample rate;
- 65 km fiber using a 1 kHz sample rate; and
- 150 km using a 500 Hz sample rate.



Sintela provides a High Dynamic Range (HDR) response mode at low frequencies.

Plot shows ONYX *peta* system self-noise verses frequency for a standard mode and the HDR mode.

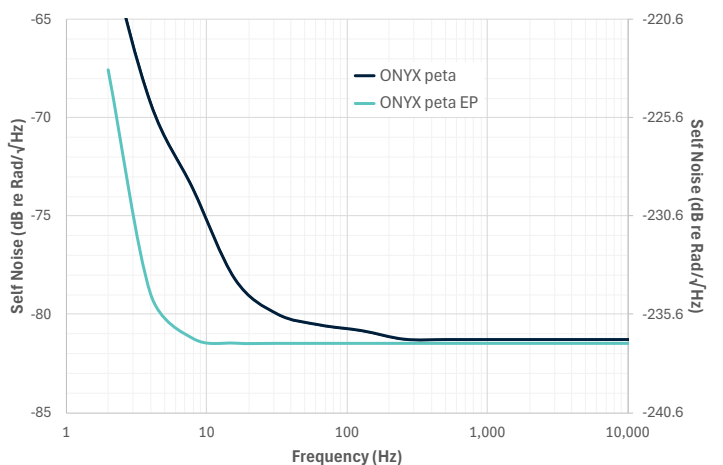
SEAFOM MSP-02 test results measured at the front of a 5 km fiber sampled at 20 kHz with a gauge length of 6.4 m.



Sintela offers the option to fit an Ultra Low Noise laser in any of the ONYX *peta* variants to provide additional Enhanced Performance (EP) at low frequencies.

Plot showing HDR self-noise comparison between a standard ONYX *peta* and an ONYX *peta* EP upgraded with an ultra-low phase noise laser.

SEAFOM MSP-02 test results measured at the front of a 5 km fiber sampled at 20 kHz with a gauge length of 6.4 m.

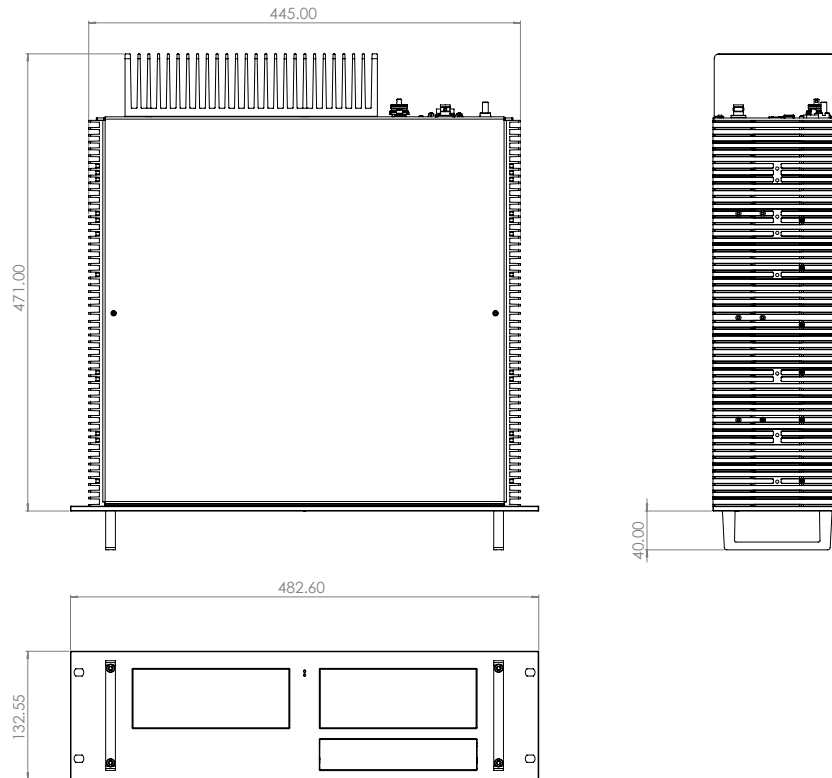


Common Performance ^[2]			
Standard operating wavelength ^[4]	1550.12 nm 193,400 GHz ITU Ch.34 [L-Band option at 1572.06 nm (ITU Ch.7) is also available]		
Laser module options	L: Low phase noise fiber laser U: Ultra-low phase noise fiber laser		
SR – Sample Rate [Min Max]	250 Hz $\equiv$ 408 km	80 kHz ^[7] $\equiv$ 1.25 km	
Acoustic Frequency Range [Min Max]	< 1 mHz (Arbitrarily selectable)	Nyquist of Sample Rate	
Dynamic range (front of 5 km fiber, using 20 kHz SR, 6.4 m GL) = largest linear signal / noise floor	115 dB @ 100 Hz	135 dB @ 10 Hz	155 dB @ 1 Hz
Linearity	Harmonic distortion typ. < -40 dB		
Crosstalk isolation	> 75 dB		

Processing capability	
Built-in processing (For acoustic signal processing and automated event detection, location, and classification)	AI Performance: 275 Terra OPS GPU: 2048 core Ampere with 64 Tensor Cores CPU: 12 core ARM v8.2 64 bit Memory: 64 GB 204.8 GB/s DL Accelerator: 2 x NVDLA Engines
Data storage	1x 256 GB NVMe SSD (Internal – fixed) Standard: 2 x 2 TB SSD (removable) Optional: 2 x 8 TB SSD (removable)

Network requirements	
Minimum recommended upload bandwidth	2 Mbps ^[8]

Interfaces			
Optical connections	2 x E2000-PS APC (or user defined)		
Data Interfacing	Electrical or Optical	QSFP28	
		2 x SFP+	1x 10GBASE and 1x 1GBASE copper supplied as standard
			10 MbE to 10 GbE available. Either copper or fiber
Data accessibility	Removable SSDs, 2x USB-C, TCP-IP over Ethernet		
Real time data storage formats	Raw Binary, Protobuf, SEG-Y, HDF5, PRODML		
Timing synchronization	GNSS (Global Navigation Satellite System) ^[9] synchronization of internal reference clock. Providing approx. ± 100 ns timing accuracy		
	NTP and PTP synchronization, Providing approx. ± 10 μ s timing accuracy		
External Time Break input	TB input via BNC connector (Software selectable level)		



Size and Weight		
Size	Format	19-inch 3U Enclosure
	Height	132.5 mm 5.22 in
	Width	482.6 mm 19 in
	Depth	471 mm 18.5 in
Weight		16.5 kg 37 lbs
Mounting		Telescopic rackmount rails

Power		
Power supply	Option 1	110 / 230 VAC nominal (85 - 264 VAC) at 50 – 60 Hz Dual redundant power supplies and cables
	Option 2	24 / 48 VDC nominal (16.8 – 62.4 VDC) Dual redundant power supplies and cables
Power consumption		120 W
Current rating		1.5 Amp @ 100-240 VAC; 6.3 A @ 24-48 VDC

Environmental	
Heat management	Passive cooling (for high reliability)
Storage temperature range [°C °F]	-40° C to +70° C -40° F to +158° F
Operating temperature range [°C °F]	-5° C to +50° C 23° F to +122° F
Operating humidity [Max]	95% non-condensing
Ingress Protection	IP50 (Protected against dust)

Reliability ^[10]	
Mean Time Between Failures [MTBF]	>10 years (95,400 Hours)
Failures in Time (FIT) per 10 ⁹ hours	<10,482 FIT
Mean Time to Repair (MTTR)	20 minutes (unit replacement), 1 hr (module replacement)
Safety Integrity Level (SIL)	SIL2 compliant (with respect to hardware failures according to IEC 61508 – certificate available on request)

Declaration of Conformity	
Cybersecurity	CIS Benchmark compliant
Electromagnetic compatibility (EMC)	USA (FCC): 47 CFR Part 15 B Canada: ICES-003 2020 2013/30/EU: EN55032:2015+A11:2020, EN55035:2017+A11:2020, EN301 489-1 V2.2.3, EN301 489-19 V2.1.1 UK: SI 2016/1091 and amendments Test Specifications: CISPR 22/32, EN55022/32, EN/IEC61000-4-11, EN/IEC61000-4-2, EN/IEC61000-4-29, EN/IEC61000-4-4, EN/IEC61000-4-3, EN/IEC61000-4-6, EN/IEC61000-4-5
Electrical Safety Compliance	USA: UL 62368-1 2014/35/EU: EN 62368-1: 2018/COR1:2020 UK: SI 2016/1101 and amendments
RoHS (Restriction of Hazardous Substances)	2011/65/EU and Amending Directive, 2015/863
Laser Safety	CLASS 1 LASER PRODUCT (Also compliant with CLASS 1M) Complies with IEC 60825 : 2014+A11 : 2021, Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed 3, as described in Laser Notice No. 56, dated May 8, 2019 FDA Product Code: 95R - - HY, FDA Accession Number: 2530584-000
Management System	ISO 9001:2015 Certified

Export Conditions	
Export Control Classification Number (ECCN)	EAR99
Harmonized Tariff Schedule (HTS)	9027500000 (UK) 9027504060 (US) 90278990 (India)

Notes	
1	Contact Sintela for details of compatible 'Engineered' fiber
2	Measurements based upon recommended measurement procedures described in the 'SEAFOM MSP-02_V2 – DAS Parameter Definitions and Tests' document and are available upon request
3	Coherent in phase and amplitude across all channels
4	Other wavelengths available upon request
5	All lengths calculated assuming a single mode fiber with an effective refractive index of 1.4685
6	Raw data can be extracted at up to 1.74 ns / 0.18 m sample interval, but data rate would be 25 TB/Hr [Pending software implementation]
7	ONYX <i>peta</i> platform is capable of sampling up to 480 kHz
8	Full access and control can be achieved over a 4G mobile phone connection
9	Requires the connection of a GNSS antenna via SMA connector
10	Based on actual field data

Additional Hardware Features	
Front panel touch screen	2x 6.8 in diagonal, 1280x480 resolution color touch screens for display of key information such as instrument IP and status for fast setup as well as standalone monitoring and control.
Auto optical setup	With optimization checking and auditable storage of the system settings
Auto fault recovery	On detection of a fault the optical sensing unit can be remotely reset
Built-in fiber characterization	Like an OTDR, this offline feature is used for setup and for monitoring damage and long-term degradation to the sensing fibers
Fiber cut tolerance	The system will continue to function on a fiber which has been cut. Performance on the fiber up to that cut will not be affected.
Vibration logging at runtime	Vibration logger included to detect excessive vibration events
Cloud storage of events	If either a single or network of ONYX <i>peta</i> Sensing Units is connected to the internet, alert data can be sent to cloud storage for remote access. In systems on a local intranet a similar approach can be taken using local Network Attached Storage (NAS).

Software Features	
Remote configuration	Web interface for full remote configuration and operation, including software and firmware updates, over the internet.
Web User Interface	For real-time monitoring of the acquisition, recording and export of data. Light and Dark modes available.
Acoustic output	Acoustic output from any user selected real-time or recorded channel.
Data visualization	User selectable colourmap for the display of time versus distance waterfall plots.
Signal analysis	Analysis window provides real-time temporal and spectral analysis of acquired data.
Data Formatting	Data output configurable in continuous or triggered Raw Binary, Protobuf, SEG-Y, HDF5 and / or PRODML formats.
Recorders	Intuitive recorder manager to configure user selected data streams to internal or external recording media.
Processing	Flexible, user configurable signal processing set-up via an intuitive graphical based processing chain.
Status diagnostics	Full system logging with remote monitoring of all the key operational parameters including internal temperatures, currents, voltages, and data rates.
Cybersecurity	Cybersecurity compliance to CIS Benchmarks. SAML authentication.
Workflow management	Step-by step interface for simplified setup.
UI for linear asset monitoring	Map based GIS with full event management workflow covering multiple ONyx Sensing Units.
UI for well monitoring	Well monitoring software displaying well diagram next to waterfall of acquired data.
Detection algorithms	Toolbox of heuristic rule and machine learning based detection algorithms. Detection algorithms include, but are not limited to: - o Fiber break and anomaly detection. - o Movement detection and classification of people and vehicles, manual / mechanical digging, fence climbing / cutting, etc. - o Pipeline leak detection and Pig tracking. - o Real-time microseismic detection.
Zone management	Zone and schedule management of algorithms.
Interface support	MODBUS, OPC UA, Dry Contact, SMS via cloud, SMS via modem, Email interface.
Camera integration	Support for control and display of ONVIF compatible cameras.
Reporting	Activity and alert reporting for operational staff and management.
Application Programming Interface (API)	gRPC Protobuf – Secure authentication via mTLS REST commands via gRPC gateway – Swagger Definition
Offline data replay and reprocessing	Docker image of ONyx Software available for Cloud and on-prem data replay, analysis and experimentation. Command tools available for off-line data reformatting and post processing.

Availability of capabilities and features: Unless otherwise expressly indicated in writing, Sintela products and data sheets relating thereto are subject to change without notice. Users should check for and obtain the latest relevant information and verify that such information is current and complete before placing orders for Sintela products.

Ordering Information

ONYX *peta* - -

No. of channels

- 1: Single Ch.
- 2: Dual Ch.

Power Supply

- AC: 110 / 230 VAC at 50 – 60 Hz
- DC: 24 / 48 VDC

Fitted Laser

- L: Low noise laser
- U: Ultra-low noise laser

Wavelength

- C: C-Band (1550.12 nm)
- L: L-Band (1570.42 nm)
- O: Other (please specify)

Optical Connectors

- E: E2000 PS APC
- O: Other (please specify)

Removable storage

- 04: 2x 2TBytes
- 16: 2x 8TBytes

SFP Data Interfacing

- 1: Copper - 1x 10GbE + 1x 1GbE
- 2: Optical - 1x 10GbE + 1x 1GbE
- 3: Other (please specify)

Example: ONYX *peta* 2ACUC-E161

For more information contact:

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Sintela.com



Hardware Performance and Features

August 2025
Version No. 5.1



High Performance, short-range Distributed Acoustic Sensing (DAS) system

ONYX™ *nano* is the high performance, short-range Distributed Fiber Sensing platform from Sintela. It provides quantitative distributed acoustic measurements along 5, 10 or 20 km of fiber in a compact, low power unit.

With inbuilt processing, and user definable processing workflows it also provides a flexible DAS edge processing capability.

ONYX™ *nano* makes phase based-quantitative measurements of sound and vibration. The resultant high fidelity and repeatable measurements enable the implementation of sophisticated signal processing techniques.

These techniques provide a very high probability of detection with an industry leading low nuisance alarm rate.



Sensing fiber requirement	
Standard fiber types	- Single Mode Fiber (SMF): ITU-T G.652, G.654 or G.65 - Multimode Fiber (MMF): ITU-T G651.1 etc. (NB: range limited to 8 km for MMF)
Maximum fiber attenuation for given specs	0.2 dB.km ⁻¹ at 1550 nm
Maximum acceptable loss budget	12 dB
Maximum acceptable back reflection	< 3 %

Performance			
Measurement type	Quantitative – Heterodyne optical phase measurement as a proxy for strain, vibration, and temperature		
Number of fibers	Single channel as standard. Cut resilient option available – 2 fibers around one perimeter. Dual redundant option available – 2 fibers with full fiber cut resilience and hardware redundancy.		
Standard operating wavelength	1550.12 nm 193,400 GHz ITU CH34		
Sensing range options	Up to 2 km, 5 km, 10 km or 20 km		
Corresponding Sample Rates (max.)	50 kHz, 20 kHz, 10 km and 2 kHz		
Spatial Resolution	3 - 10 m		
Acoustic Frequency Range	Min	< 0.1Hz [Arbitrarily selectable]	
	Max	50 kHz @ 1 km	5 kHz @ 10 km
Noise Floor @ 100 Hz Measured at front end of fiber	5 km @ 20 kHz Using 5 m GL		10 km @ 10 kHz Using 10 m GL
	-65 dB Rad.Hz ^{-½}		-65 dB Rad.Hz ^{-½}
Linearity	Harmonic distortion typ. < -40 dB		
Crosstalk isolation	> 70 dB		

Processing capability	
Built-in processing [For acoustic signal processing and automated event detection, location, and classification]	AI Performance : 40 Terra OPS GPU : 1024 core Ampere with 32 Tensor Cores Memory : 8 GB

Network requirements	
Minimum recommended bandwidth	2 Mbits/s

Interfaces	
Optical connections	LC/APC or SC/APC (Other connection types available upon request)
Data Interfacing	1GBASE-T, copper
Data accessibility	USB-C, TCP-IP over Ethernet
Timing synchronization	NTP synchronization, Providing approx. $\pm 10 \mu\text{s}$ timing accuracy
	Optional: GNSS (Global Navigation Satellite System) synchronization of internal reference clock. Providing approx. $\pm 100 \text{ ns}$ timing accuracy

Size and Weight		
Size	Format	19-inch 1U Enclosure
	Height	44.5 mm 1.75 in
	Width	482.6 mm 19 in
	Depth	295 mm 11.6 in
Weight		6 kg 13.2 lbs
Mounting		Rackmount fittings supplied

Power		
Power supply	Option 1	100-240 V AC via 65 W AC/DC Converter (Supplied)
	Option 2	24 VDC nominal (12 – 32 VDC) Field Terminable Connector (Supplied)
	Option 3	48 VDC nominal (16.8 – 62.4 VDC) Field Terminable Connector (Supplied)
Power consumption		40 W
Current rating		5 Amp @ 12 VDC

Environmental	
Heat management	Passive cooling (for high reliability)
Storage temperature range	-40° C to +70° C -40° F to +158° F
Operating temperature range	-5° C to +50° C 23° F to +122° F
Operating humidity (max)	95% non-condensing
Ingress Protection	IP50 [Protected against dust]

Reliability	
Mean Time Between Failures [MTBF]	>10 years [95,400 Hours]
Failures in Time (FIT) per 10 ⁹ hours	<10,482 FIT
Mean Time to Repair (MTTR)	20 minutes to bring back to working state, assuming repair by unit replacement. 1 hour assuming module replacement

Declaration of Conformity	
Cybersecurity	CIS Benchmark compliant
Electromagnetic compatibility (EMC) Compliance	USA (FCC): 47 CFR Part 15 B Canada: ICES-003 2012 EU: CE compliant - 2014/30/EU
Electrical Safety Compliance	USA: UL 62368-1 EU: CE Compliant - 2014/35/EU
RoHS (Restriction of Hazardous Substances) Compliance	2011/65/EU and Amending Directive, 2015/863
Laser Safety	Class 1 LASER PRODUCT Complies with IEC 60825: 2014, 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed 3, as described in Laser Notice No. 56, dated May 8, 2019
Management System	ISO 9001:2015 Certified

Export Conditions	
Export Control Classification Number (ECCN)	ONYX™ Sensing Unit: EAR99
Harmonized Tariff Schedule (HTS)	90275000

Additional Hardware Features	
Auto optical setup	With optimization checking and auditable storage of the systems setting
Auto fault recovery	On detection of a fault the optical sensing unit can be remotely reset
Built-in fiber characterization	Like an OTDR, this offline feature is used for setup and for monitoring damage and long-term degradation to the sensing fibers
Fiber cut tolerance (Dual Version Only)	The system will continue to function on a fiber which has been cut. Performance on the fiber up to that cut will not be affected.
Cloud storage of events	If either a single or network of ONYX™ nano Sensing Units is connected to the internet, alert data can be sent to cloud storage for remote access. In systems on a local intranet a similar approach can be taken using local Network Attached Storage (NAS).

Software Features	
Remote configuration	Web interface for full remote configuration and operation, including software and firmware updates, over the internet.
Web User Interface	For real-time monitoring of the acquisition, recording and export of data. Light and Dark modes available.
Acoustic output	Acoustic output from any user selected real-time or recorded channel.
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UI for linear asset monitoring	Map based GIS with full event management workflow covering multiple Onyx™ Sensing Units.
Detection algorithms	Toolbox of heuristic rule and machine learning based detection algorithms. Detection algorithms include, but are not limited to: - o Fiber break - o Third Party Intrusion (walking, manual digging, mechanical digging, fence climbing, fence cutting, etc) - o Leak detection
Zone management	Zone and schedule management of algorithms.
Interface support	SMS via cloud, SMS via modem, Email interface.
Camera integration	Support for control and display of ONVIV cameras.
Reporting	Activity and alert reporting for operational staff and management.

Availability of capabilities and features: Unless otherwise expressly indicated in writing, Sintela products and data sheets relating thereto are subject to change without notice. Users should check for and obtain the latest relevant information and verify that such information is current and complete before placing orders for Sintela products.

Ordering Information

ONYX nano - -

Range	
Configuration	
Power Supply	
Optical Connector	
GPS Time Synchronization	

Example: ONYX nano 05SD2-LY

For more information contact:

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