



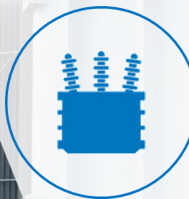
nortech

⚡ ENERGY
Product Catalog

The FISO Nortech Transformer Winding Hot Spot Temperature Monitoring System offers direct, real-time, and long-term monitoring of power transformers, allowing smarter dynamic substation and power grid management.



**MANAGE
TRANSFORMER
PERFORMANCE**



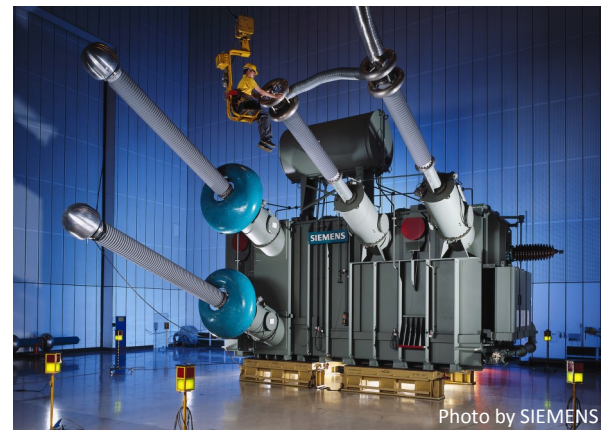
**IMPROVE
LIVE-LOADING
EFFICIENCY**



**EXTEND
TRANSFORMER
LIFETIME**

**The industry's most user-friendly
& cost-effective solution
for transformer hot-spot monitoring**

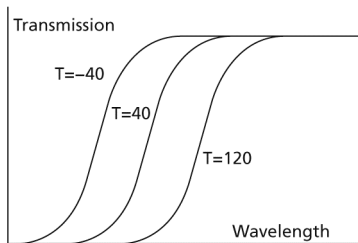




GaAs

THE PRINCIPLE

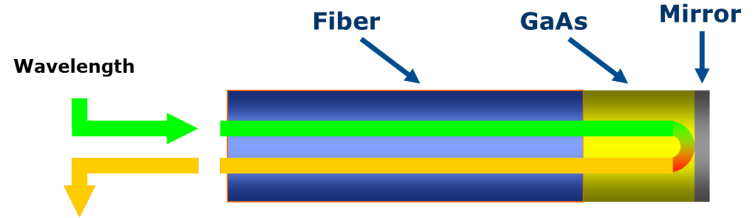
The measurement principle is based on white light absorption/transmission by a GaAs (gallium arsenide) semiconductor. The effects of temperature variations on this semiconductor are well known and predictable. As the temperature of the semiconductor changes, the semiconductor's transmission spectrum (i.e. the light that is not absorbed) shifts also. At any given temperature there will be a wavelength at which the transmission jumps from essentially 0% to 100%. This jump is called the absorption shift, and the relationship between the specific wavelength where the absorption shift takes place and temperature is predictable.



THE TEMPERATURE SENSOR

The sensor consists of a tiny GaAs semiconductor crystal bonded to one end of a well-polished optical fiber.

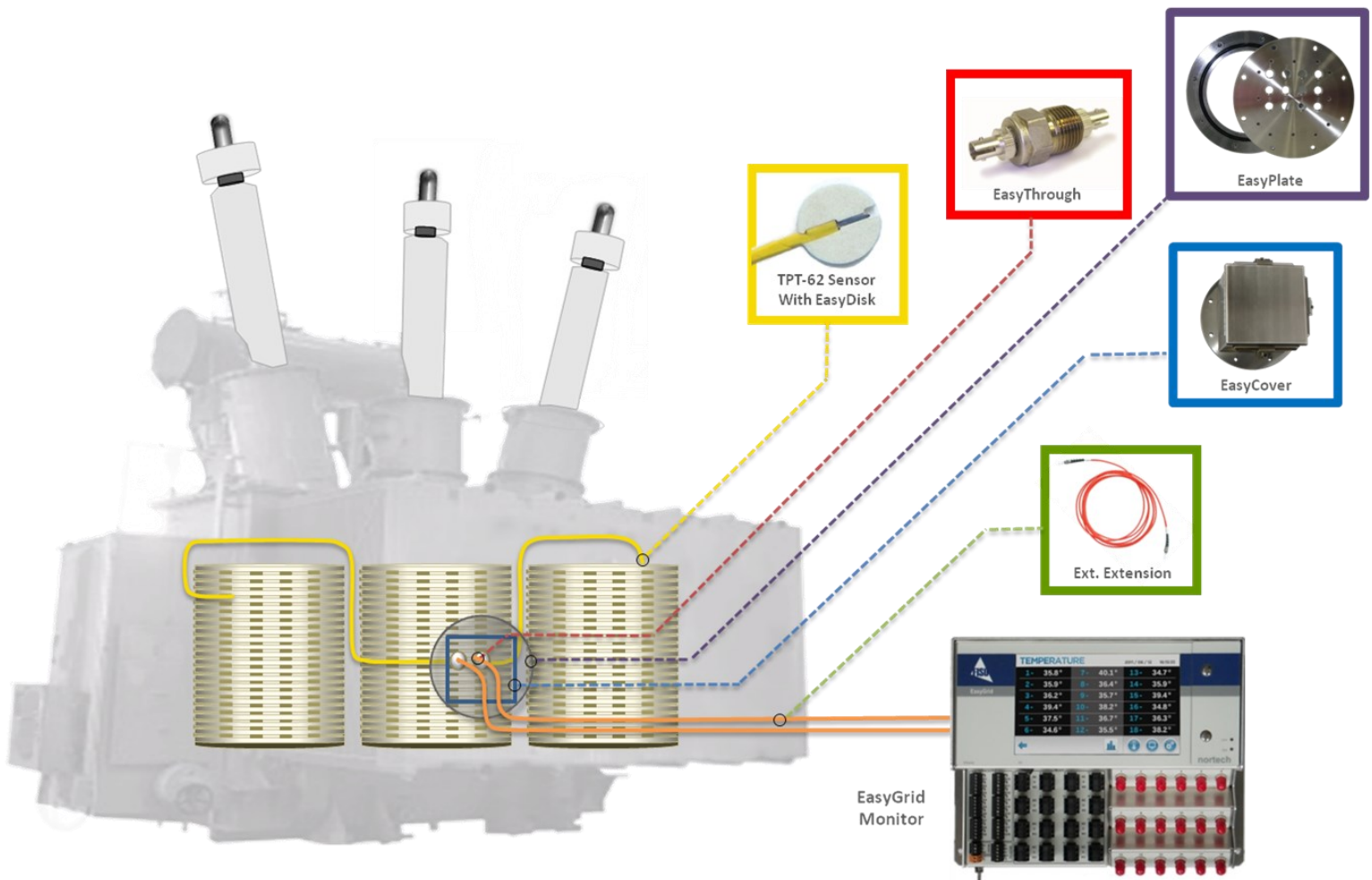
White light launched from the monitor into the optical fiber travels through to the GaAs crystal, passes through it while being partially absorbed, and then is reflected back to the monitor by a mirror at the very tip of the sensor. Light reflected back to the monitor is coupled into an optical spectrum analyzer which then measures the optical power transmission versus wavelength. The position of the absorption shift is determined by the monitor using a proprietary signal analysis algorithm and is then correlated to the temperature of the GaAs crystal.



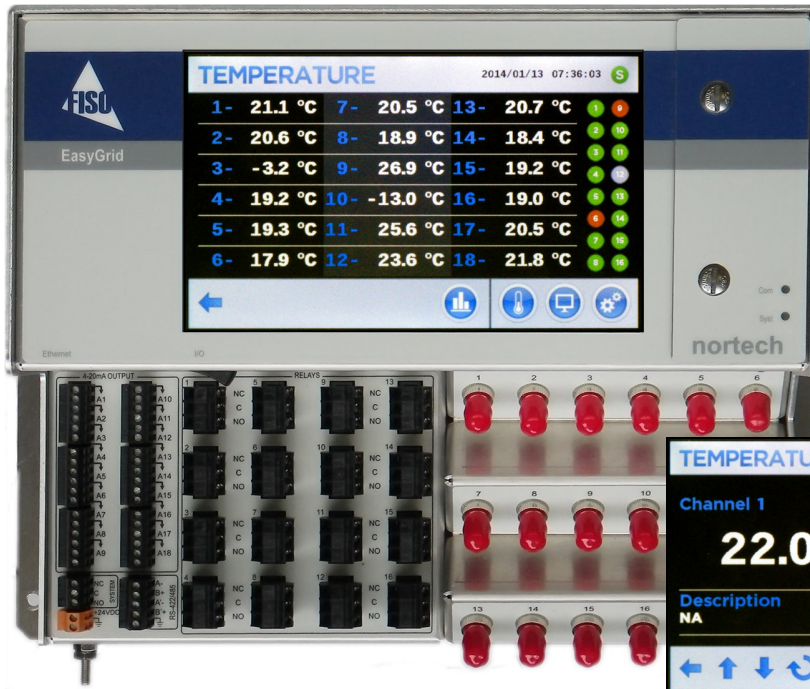
Furthermore, since the semiconductor will not change over time, all sensors are interchangeable with no need for calibration or entry of factors when swapping sensors. For the same reason monitors never need recalibration after they leave the factory, while used under normal operating conditions.

- ◇ All dielectric materials & complete immunity to EMI
- ◇ No sensor or monitor recalibration required
- ◇ Thermally, chemically, and mechanically compliant with transformer environments
- ◇ Not an intensity based measurement such as with competing fluorescence decay technology
- ◇ Cost-effective 62.5µm optical fiber design with tighter bend radius than 200µm alternatives

TYPICAL NORTECH SYSTEM



- ◇ **Reliable & Cost Effective Hot Spot Solution**
- ◇ **IEC Compliant EasyDisk Sensor Installation**
- ◇ **Leak-Free Tank Wall Optical Interface**
- ◇ **User-Friendly Installation and Operation**
- ◇ **Nortech Client PC Software Support**



**MULTI-CHANNEL FIBER-OPTIC
MONITOR / CONTROLLER
FOR ENERGY APPLICATIONS**



Accurate, Reliable & Cost Effective Winding Hot Spot Temperature Monitoring Solution for Transformers and Reactors

Description

The Nortech EasyGrid is the perfect complement to your Smart Grid. The fiber optic signal conditioner is designed for direct, accurate and real-time temperature monitoring to manage and maximize your transformer performance.

The EasyGrid provides critical information about the level of thermal stress and the management of the life cycle of any transformer or reactor. From an EHV/UHV, HVDC to a distribution transformer the cost-effective EasyGrid will meet the highest requirements.



A large 7" (800 x 480) Color Touch Screen LCD Display allows you to monitor and configure up to 18 channels and 16 form-C programmable relays. The graphical user interface makes it easy to customize to your needs.

The Nortech Client software allows full configuration and complete monitoring of your system. View all data logging information live on your PC without stopping the acquisition or downloading of any file.

For over 20 years, FISO has been the leader in the Fiber-Optic White-Light Technology. The EasyGrid is using the temperature dependent band gap shift of the GaAs crystal to provide a fast and accurate measurement. Inherent to the technology, the system will not drift nor require any recalibration and the monitor Auto-Correct feature continuously compensates for internal temperature effects.

Furthermore, internal monitor temperature data logging allows tracking of your control equipment during extreme environmental conditions.

Key Features

- Real-time Temperature Monitoring
- 4 to 18 Channels, 1 Analog Output / Channel
- Large 7" Color Touch Screen LCD (800x480)
- 0, 8 or 16 Form-C Programmable Relays
- 4 GB Data Storage
- Modbus, Modbus TCP-IP*, IEC 61850*, IEC 60870-5-104*, DNP3.0*
- No Calibration Required
- Easy Front Panel Wiring
- Light Source Good for the Life of the Transformer
- Auto-Diagnostic & Auto-Correct
- Robust design & 5 Year Warranty

* Optional

Applications

- Power Transformer Winding & Core Hot Spot
- Power Transformer Top & Bottom Oil
- All types of Transformers (MV, HV, EHV, UHV, HVDC)
- Reactors, Generators, Switchgear
- Load Tap Changers

Specifications

Number of channels	4, 6, 8, 9, 10, 12, 14, 16 or 18
Reading temperature range	-40 °C to 225 °C
Temperature accuracy	±1 °C
Resolution	0.1 °C
Sampling rate (per channel)	500 ms
Operating temperature	-20°C to 60°C
Storage temperature	-30°C to 85°C
Light source life	Life of the Transformer
Humidity	95% RH Non-Condensing
Display	Large 7" TFT Color display (800x480)
System Configuration	Touch Screen Panel or USB Remote
Security	Password Protection
Internal monitor temperature	CCD, Board & System Temperature Available with data logging

Communication ports	USB, RS-485, RS-422 & Ethernet (RJ45)*
Communication Protocols	Nortech, Modbus (ASCII / RTU), Modbus TCP-IP*, IEC 61850*, IEC 60870-5-104*, DNP3.0*.
Analog Output	4-20 mA, User Configurable
Relays	8 or 16 Form-C Relays, User Configurable Also Available without Relays
System fault relay	1 Dedicated System Fault Relay
System Status Indicator	LED
Memory	4 GB Memory & User configurable > 30 Years at 1 measurement/minute
Auto-Correct	Continuous Internal Temperature Compensation
Auto-Diagnostic	Light Level, Signal Level
Input Power	24 VDC
Power consumption	40W (maximum)
Surge Protection	4000V (IEEE C37.90.1 -2002)

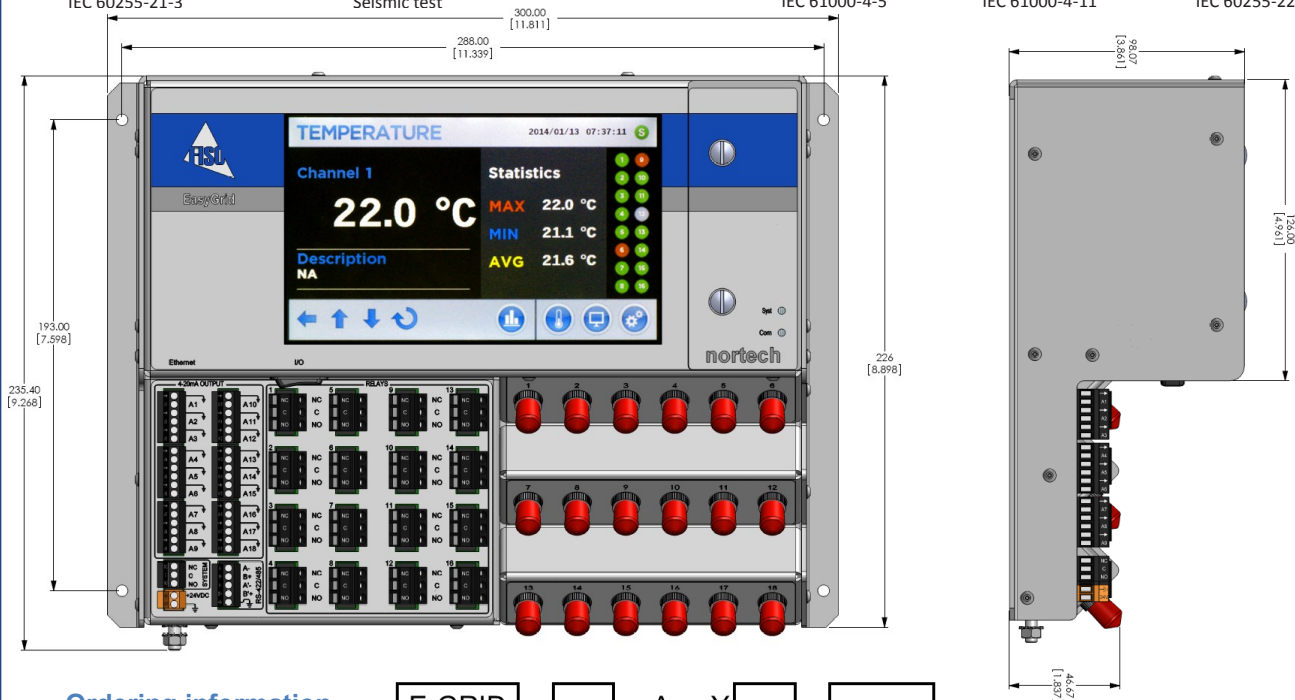
* Optional

Environmental standards

MIL-STD-810G	Transport vibrations
IEC 60255-21-1	Vibration: response , endurance
IEC 60255-21-2	Shock
IEC 60255-21-3	Seismic test

Immunity standards

IEC 61000-4-2	IEC 61000-4-6	IEC 60255-22-3
IEC 61000-4-3	IEC 61000-4-8	IEC 60255-22-6
IEC 61000-4-4	IEC 61000-4-9	IEC 60255-5
IEC 61000-4-5	IEC 61000-4-11	IEC 60255-22-1



Ordering information

E-GRID - - **A** - **Y** -

Number of Channels
04, 06, 08, 09, 10, 12, 14, 16 or 18

Number of Relays
00: 1 System Fault Relay
08: 1 System Fault Relay + 8 Programmable Relays
16: 1 System Fault Relay + 16 Programmable Relays

Communication Options
STND: Standard
DNP3: DNP 3.0
I850: IEC 61850
I870: IEC 60870-5-104
MTCP: MODBUS TCP-IP



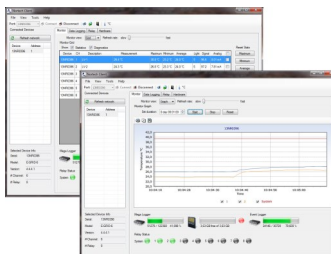
New Monitor
Flexible & Cost Effective
Fits your Requirements

**MULTI-CHANNEL FIBER-OPTIC
MONITOR / CONTROLLER
FOR ENERGY APPLICATIONS**

**Accurate, Reliable & Cost Effective Winding Hot Spot
Temperature Monitoring Solution for Transformers and Reactors**

Description

The Nortech EasyGrid LT is a cost effective, flexible, multi-channel fiber optic signal conditioner designed for direct, accurate and real-time temperature monitoring.



The Nortech Client Software allows full configuration and monitoring of your system.

It is now possible to consult the data logging information live on your computer without downloading the complete file.

The EasyGrid LT is available as a full-featured monitor to match your requirements and it offers on-board auto-diagnostic for easier system installation.

Select the relay option and use it as a fully configurable controller with complete communication capabilities.

For over 20 years, FISO has been the leader in Fiber-Optic White-Light Technology. The EasyGrid LT is using the temperature dependent band gap shift of the GaAs crystal to provide a fast and accurate measurement. Inherent to the technology, the system will not drift nor require any recalibration and the monitor Auto-Correct feature continuously compensates for internal temperature effects.

Furthermore, internal monitor temperature data logging allows tracking of your control equipment during extreme environmental conditions.

Key Features

- Real-time Temperature Monitoring
 - 2 to 8 Channels, 1 Analog Output / Channel
 - Large LCD Screen
 - 0 or 8 Form-C Programmable Relays
 - Internal Memory
 - Modbus, Modbus TCP-IP*, IEC 61850*, IEC 60870-5-104*, DNP3.0*
 - No Calibration Required
 - Easy Front Panel Wiring
 - Light Source Good for the Life of the Transformer
 - Auto-Diagnostic & Auto-Correct
 - Robust Design & 5 Year Warranty
- * Optional

Applications

- Power Transformer Winding & Core Hot Spot
- Power Transformer Top & Bottom Oil
- All types of Transformers (MV, HV, EHV, UHV, HVDC)
- Reactors, Generators, Switchgear
- Load Tap Changers

Specifications

Number of channels	2, 4, 6 or 8
Reading temperature range	-40 °C to 225 °C
Temperature accuracy	±1 °C
Resolution	0.1 °C
Sampling rate (per channel)	500 ms
Operating temperature	-20°C to 60°C
Storage temperature	-30°C to 85°C
Light source life	Life of the Transformer
Humidity	95% RH Non-Condensing
Display	Large LCD
Internal monitor temperature	CCD, Board & System Temperature Available with data logging

* Optional

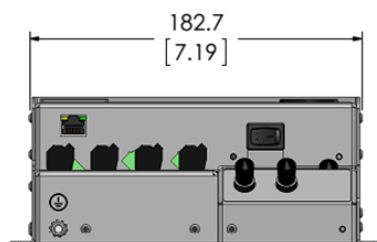
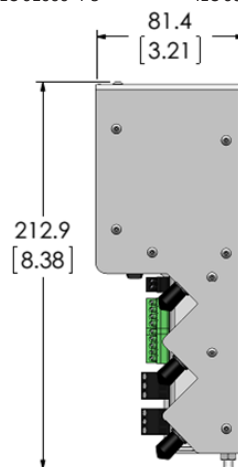
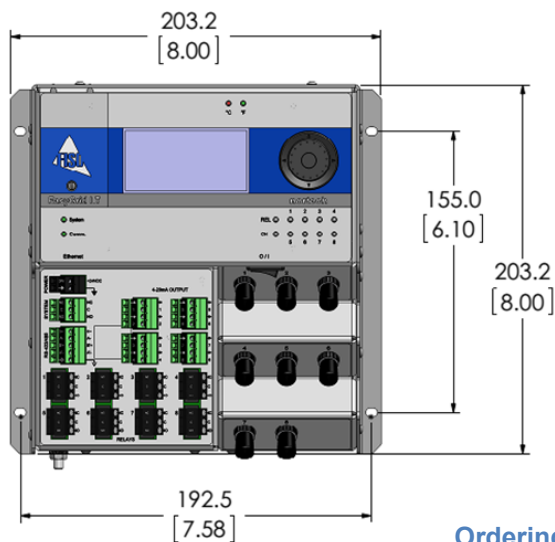
Communication ports	USB, RS-485, RS-422 & Ethernet (RJ45)*
Communication Protocols	Nortech, Modbus (ASCII / RTU), Modbus TCP-IP*, IEC 61850*,
Analog Output	4 -20 mA, User Configurable
Relays	8 Form-C Relays, User Configurable
System fault relay	1 Dedicated System Fault Relay
System Status Indicator	LED
Memory	> 1.8 Years at 1 Measurement / 1 Min.
Auto-Correct	Continuous Internal Temperature Compensation
Auto-Diagnostic	Light Level, Signal Level
Input Power	24 VDC
Power consumption	15W (maximum)
Surge Protection	4000V (IEEE C37.90.1 -2002)

Environmental standards

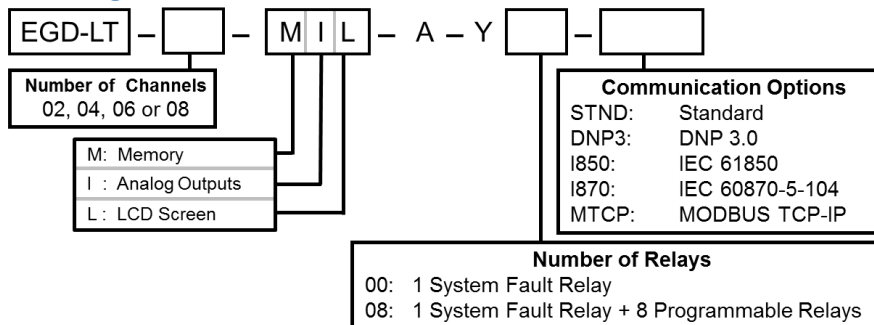
MIL-STD-810G	Transport vibrations
IEC 60255-21-1	Vibration: response , endurance
IEC 60255-21-2	Shock
IEC 60255-21-3	Seismic test

Immunity standards

EN 61326	IEC 61000-4-6	IEC 60255-22-3
EN 55011	IEC 61000-4-8	IEC 60255-22-4
IEC 61000-4-2	IEC 61000-4-9	IEC 60255-22-5
IEC 61000-4-3	IEC 61000-4-11	IEC 60255-22-6
IEC 61000-4-4	IEC 61000-4-18	IEC 60255-5
IEC 61000-4-5	IEC 60255-22-2	IEC 60255-22-1



Ordering Information





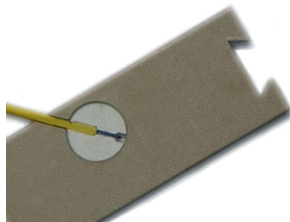
With EasyDisk*
Optimal Sensor Location
Increased Protection
Easier Installation
**Patent Pending*

TEMPERATURE SENSOR FOR OIL-FILLED TRANSFORMERS

Robust & Cost effective Fiber Optic Sensor for Energy Temperature Monitoring solutions

Description

The FISO heavy duty TPT-62 fiber optic temperature sensor is specifically designed for permanent installation in oil-filled transformers. It clearly demonstrates FISO's experience and leading edge technology in direct winding temperature measurement.



Offered at no extra cost, the EasyDisk allows quick and secured spacer instrumentation without any adhesive.

It ensures optimal sensor tip positioning on the conductor to allow reliable and accurate temperature measurements. The EasyDisk provides the best protection during all transformer manufacturing steps including winding compression.

The Nomex™ EasyDisk also locks the PTFE Spiral-Wrap sheathing in the spacer to ease optical cable routing.

The TPT-62 double PTFE oil permeable sheathing, with transversal slits, is designed to withstand installation stresses, harsh testing conditions such as kerosene vapour, heat runs and induced vibration during the overall lifetime of the transformer.

The TPT-62 can be used with all Nortech 62.5µm monitors (Sentinel II, EasyGrid, EasyGrid LT). Neither the signal conditioner nor the TPT will require any calibration for the life of the transformer.

Key Features

- Robust Design
- -40°C to 225°C
- Nomex™ EasyDisk (Patent Pending)
- Direct Contact
- RFI/EMI Immune
- High Dielectric Constant
- No Calibration Required

Applications

- Power Transformer Winding & Core Hot Spot
- Power Transformer Top & Bottom Oil
- All types of Transformers (MV, HV, EHV, UHV, HVDC)
- Reactors, Generators, Switchgear
- Load Tap Changers

Specifications

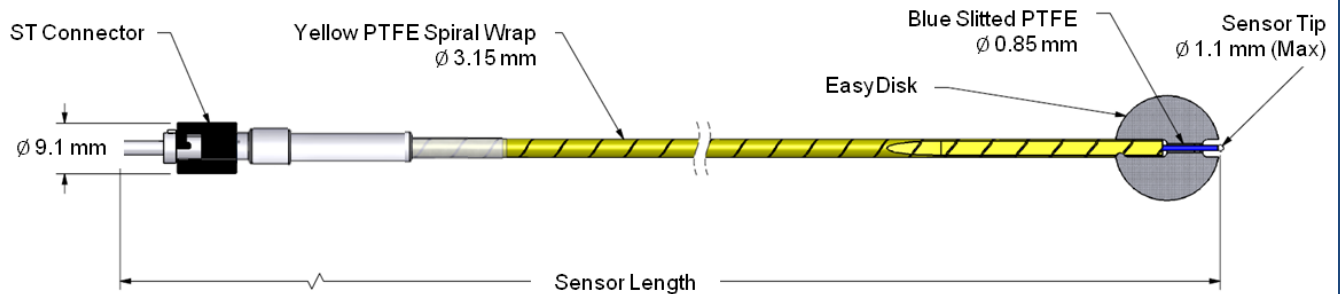
Temperature Range	-40°C to 225°C
Resolution	0.1°C
Accuracy	±1°C
Fiber Type	62.5 μm Silica Fiber
Cable Sheathing	Double PTFE Sheathing <ul style="list-style-type: none"> 0.85 mm PTFE Cable with Slits for Oil Permeability 3.15 mm PTFE Spiral Wrap
Available Sensor Length	2 to 15 Meters (1m Increment)
Connector Type	ST Connector

RF & EMI Susceptibility	Completely Immune
Chemical Resistance	Compatible with Most Aggressive Chemicals such as Hot Kerosene Vapor
Tip Termination	EasyDisk Ø 18.55 mm (Standard) MiniDisk Ø 6.2 mm (Optional) Bare Tip / No Disk (Optional) Glued Tip / No Disk (Optional)

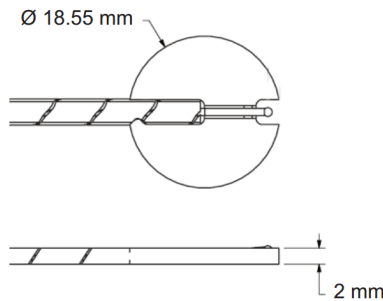
Sensor Certification

ASTM D-3426
ASTM D-149

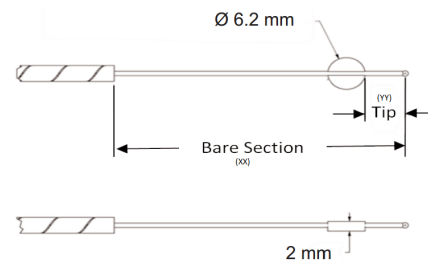
TPT-62



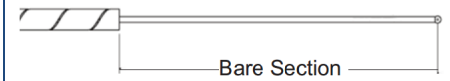
EasyDisk (Standard)



MiniDisk (Optional)



Bare/Glued Tip (Optional)



TPT-62 Ordering Information

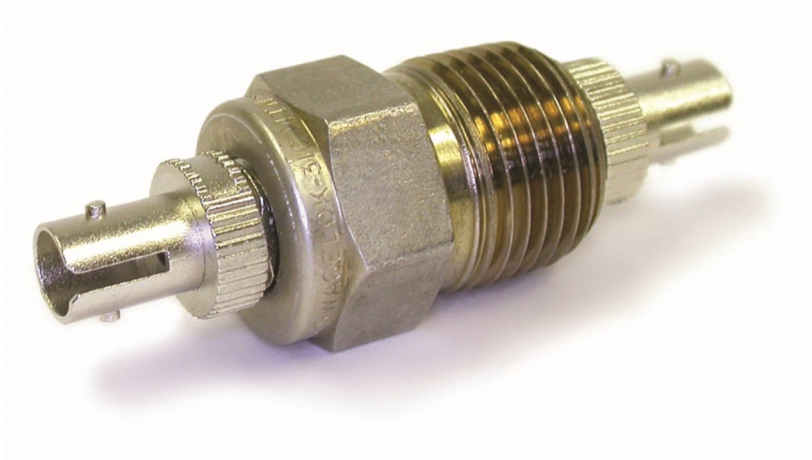
TPT - 62 - - C7 - F2 - M - R1 - ST

Sensor Tip Options	
ED :	EasyDisk (Recommended)
MDXTTY :	MiniDisk (Spiral wrap glued at XX mm) (Disk to tip TYY mm)
BA :	Bare Standard (Spiral wrap at 50 mm)
BAXX :	Bare XX mm (Spiral wrap at XX mm)
GL :	Glued Standard (Spiral wrap glued at 50 mm)
GLXX :	Glued XX mm (Spiral wrap glued at XX mm)

Sensor Tip Options	
XX :	Sensor length in meters (From 2 to 15 meters)

Knockout Punch Kit for Spacers (SEN-ESD-KIT)





**ST-ST OPTICAL
FEEDTHROUGH MATING**

ST-ST Sealed Fiber Optic Mating for Oil Filled Transformer Applications

Description

The Fiso EasyThrough is designed to be installed on the oil filled transformer tank wall or any other sealed environment.

Its simple and proven design efficiently conveys optical signals between a Nortech monitor and fiber optic temperature sensors for reliable and accurate measurements.

This ST-ST fiber optic connector will sustain temperature up to 200°C and pressure of 20 BAR / 2000 kPa / 290 PSI.

The EasyThrough offers long term reliability and excellent chemical resistance to oil, kerosene, etc. FISO's EasyThrough is manufactured using a glass to metal solder bonding technology which ensures that no oil can possibly leak from the feed-through over time.

The 3/8 NPT ANSI EasyThrough can easily be mounted on the EasyPlate or directly on the tank wall.

Key Features

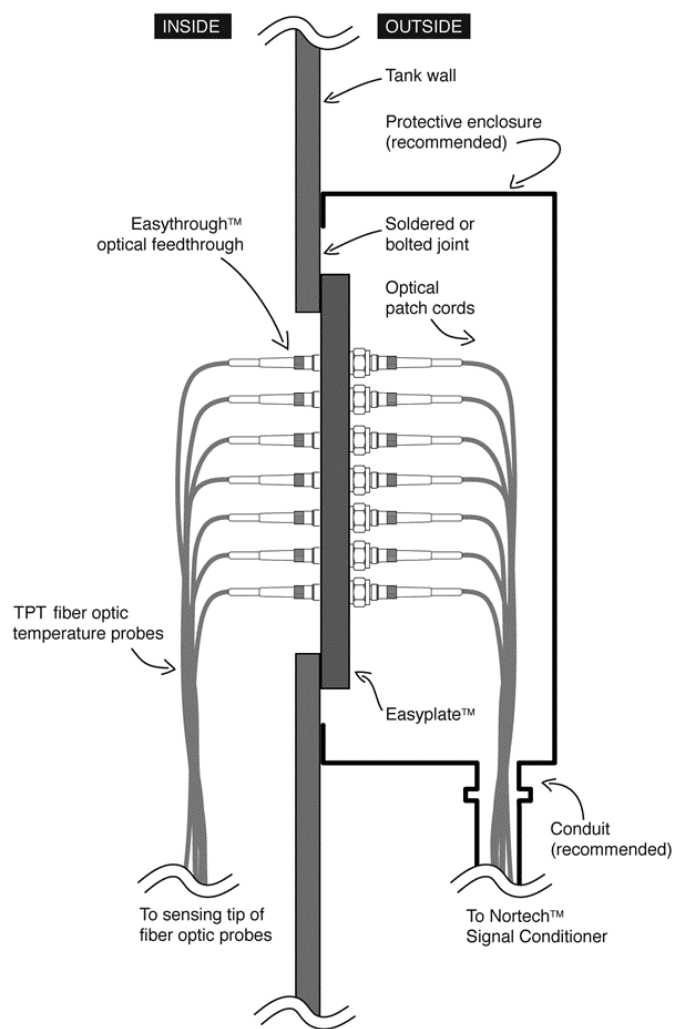
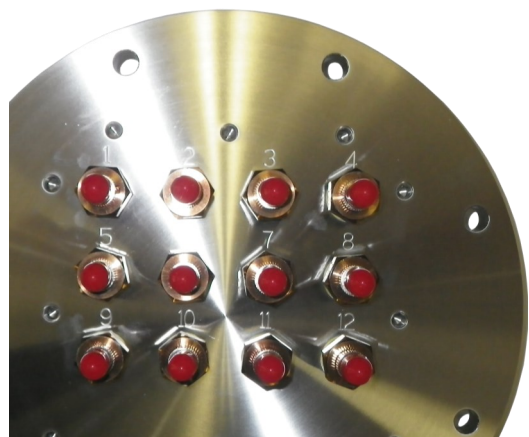
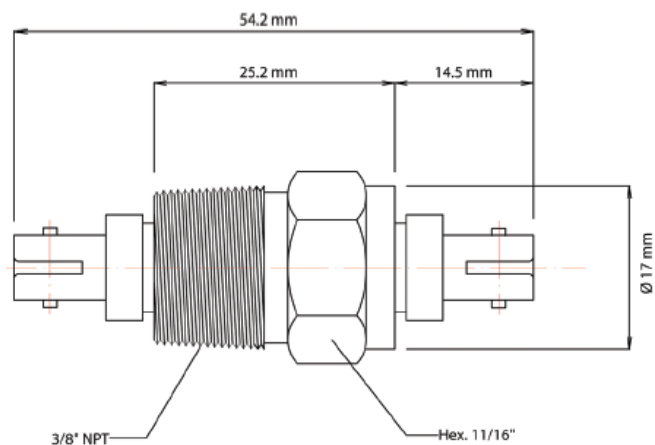
- Long Term Reliability
- Leakproof
- Support Vacuum or Pressure
- Maximum Pressure 20 BAR / 2000 kPa / 290 PSI
- Glass to Metal Bonding
- No O-Ring
- Chemically Resistant
- Quick and Easy Installation

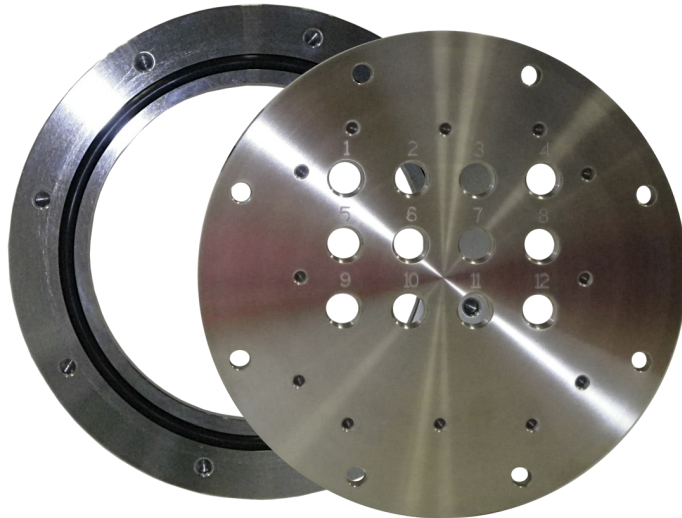
Applications

- Oil filled Transformers
- Sealed Environments

Specifications

Temperature Range	-40°C to 200°C
Maximum Pressure	20 BAR / 2000 kPA / 290 PSI
Thread	3/8 NPT 60° Thread Angle Taper Angle of 1°47' Truncation of Root and Crest are Flat ANSI / ASME B1.20.1
Material	Stainless Steel
Connector Type	ST Connector
Ordering Code	SEN-EST (62.5m) NOR-EST (200m)





**EASYPLATE DESIGNED
FOR OPTICAL EASYTHROUGHS**

**Tank Wall Plate Specifically Designed
For Oil Filled Transformer Applications**

Description

The FISO EasyPlate is designed to be installed on the tank wall of oil filled transformers.

FISO's EasyPlate is a stainless steel customized circular plate that completes the integration of Nortech's fiber optic direct winding temperature measurement and monitoring system.

Specifically designed to mate with FISO's optical EasyThrough, the 316L stainless steel EasyPlate is mounted on the transformer tank wall by bolting or welding it on. An optional EasyRing is offered to ease installation on rough surfaces.

The 3/8" NPT ANSI EasyThrough can be easily mounted on the EasyPlate, one per hole, allowing the optical signal to pass through the tank wall.

One EasyPlate can fit as many as 18 EasyThroughs. Each NPT hole is numbered on each side of the EasyPlate. The resulting setup is completely leakproof and provides long term reliability.

Key Features

- Long Term Reliability
- Leakproof
- 316L Stainless Steel
- Up to 18 EasyThroughs
- Trouble Free Installation

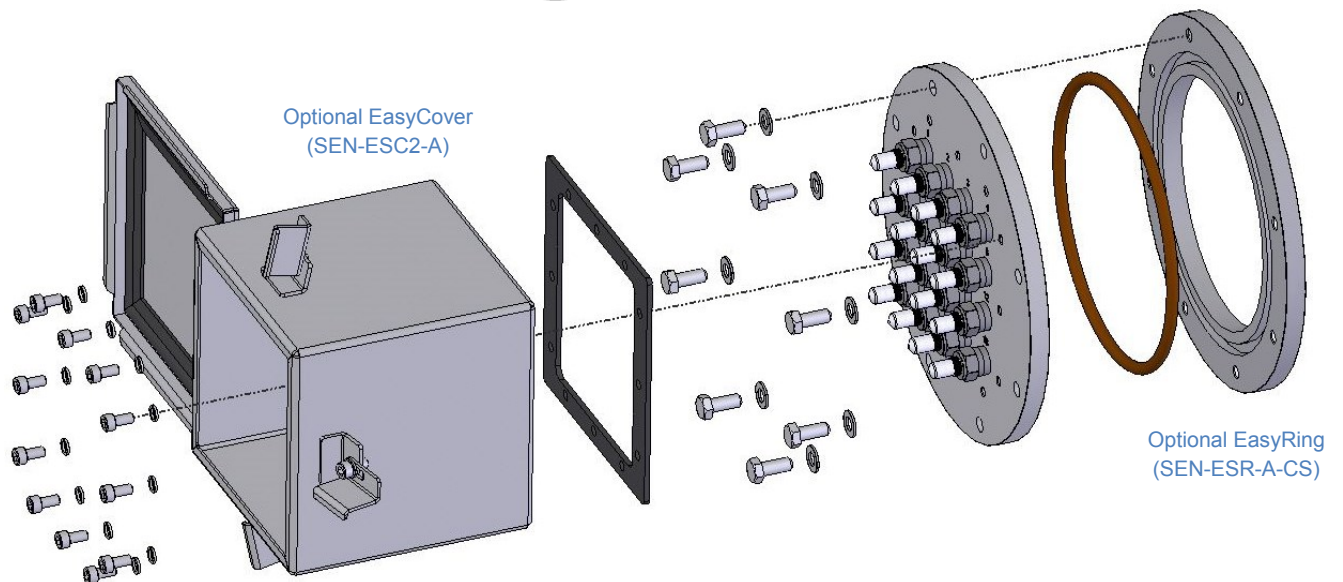
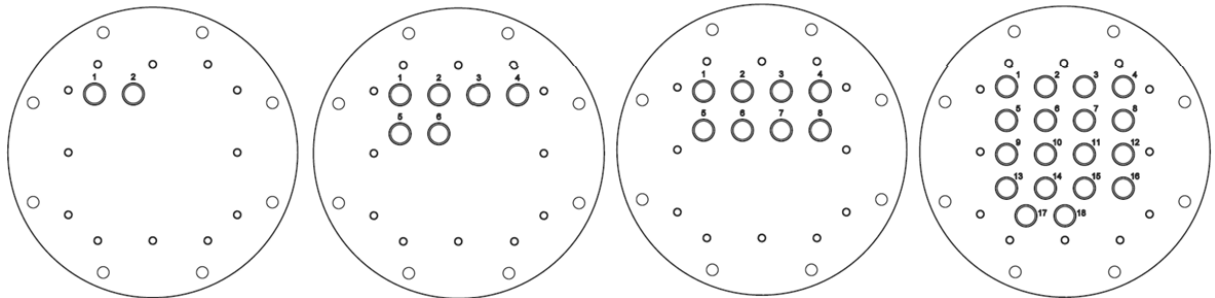
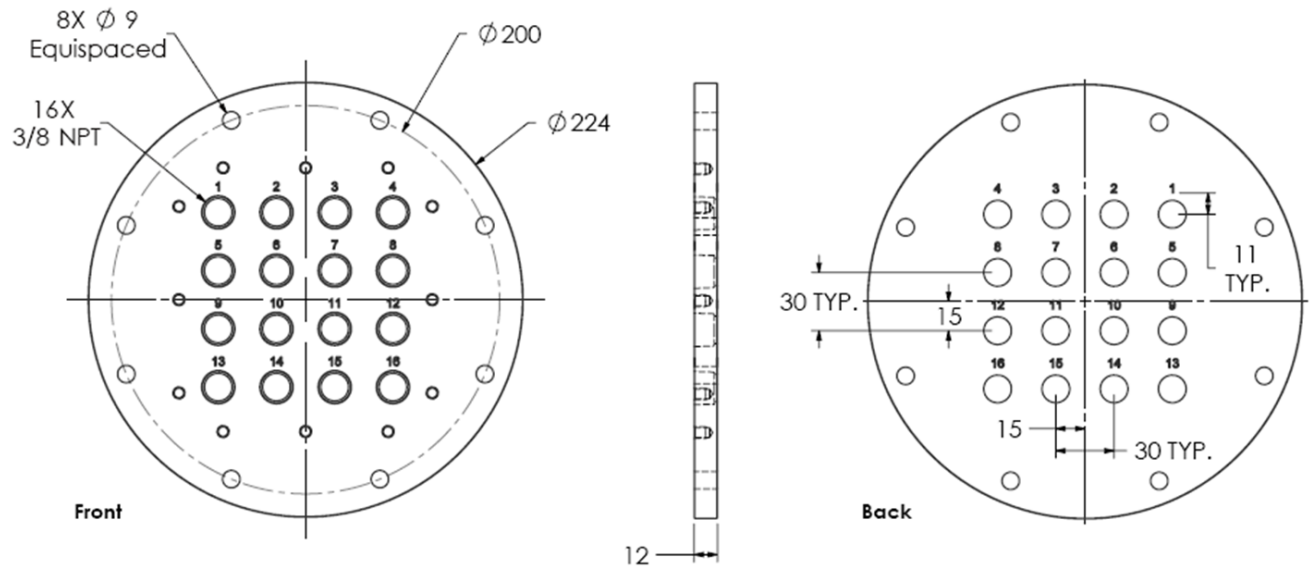
Applications

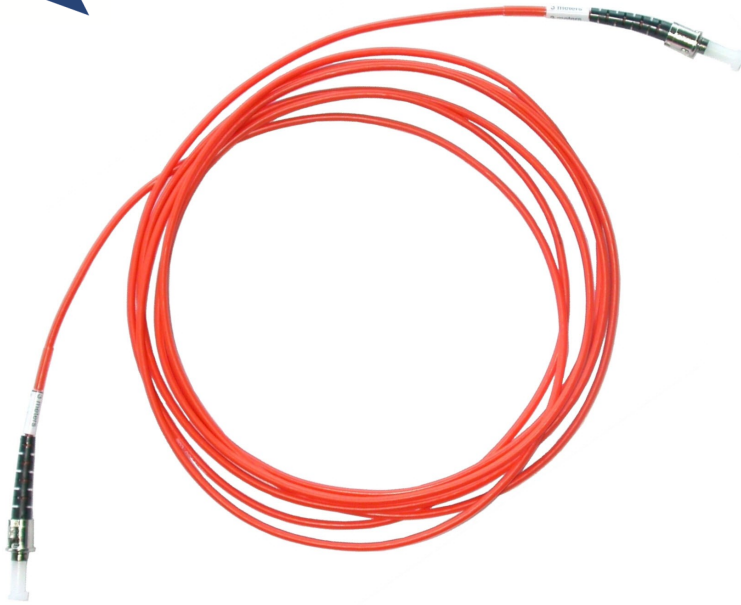
- Oil filled Transformers
- Sealed Environments

Specifications

Diameter	224 mm (8.82 in)
Thickness	12 mm (0.47 in)
Material	316L Stainless Steel
Bolts	8 x SS M8 HEX Head (Not Included)

EasyThrough Holes	1 to 18
EasyThrough Thread	3/8" NPT Pipe Thread
Ordering Code	SEN-ESP2-A-SS-XX XX = # of FeedThrough Holes





62.5µm Multimode
ST-ST External Extension Cable

Robust & Cost Effective 62.5 micron External Extension for Energy Temperature Monitoring Solutions

Description

The FISO External Extension Cable provides a very robust and cost effective link between the transformer tank wall plate and the Fiber Optic Monitor.

The Extension Cable uses a multimode 62.5 micron pure silica fiber built with a chemically and thermally resistant 3mm O.D. Polyurethane outer jacket. It is designed to support a temperature range of - 55°C to 85°C.

The FISO CFO-C12 is terminated with PC polished ST connectors with strain relief at both ends.

Specifically designed to mate with the Nortech system and its accessories like the EasyThrough, the patch cord can be placed in harsh environments without compromising performance.

Key Features

- Pure silica fiber 62.5 micron
- ST-ST connectors
- PC Polish
- Robust Design
- -55°C to 85°C
- Compatible with all Nortech 62.5µm components

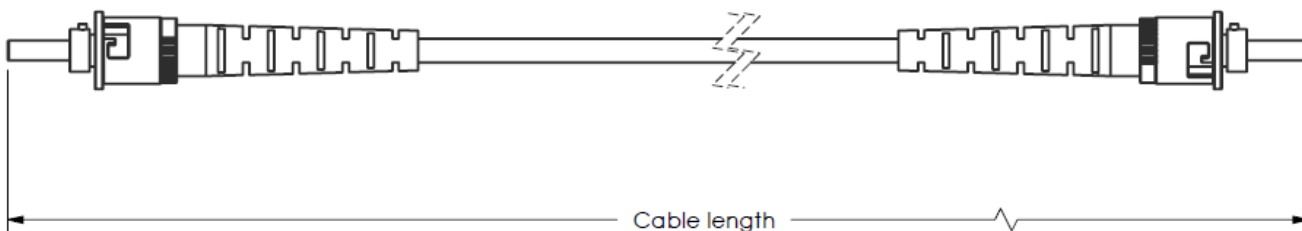
Applications

- Power Transformer Winding & Core Hot Spot
- Power Transformer Top & Bottom oil
- All types of Transformers (MV, HV, EHV, UHV, HVDC)
- Reactors, Generators, Switchgear
- Load Tap Changers

Specifications

Fiber Type	62.5 μm Silica Fiber
Cable diameter	3 mm O.D.
Cable Sheathing	Polyurethane
Reinforcement	Kevlar
Connector Type	ST-ST Connectors PC Polish
Temperature Range	-55°C to 85°C
Standard Lengths	3, 6, 8, 10, 15 meters
Available Extension Length	Up to 1 000 meters (Custom)

CFO-C12

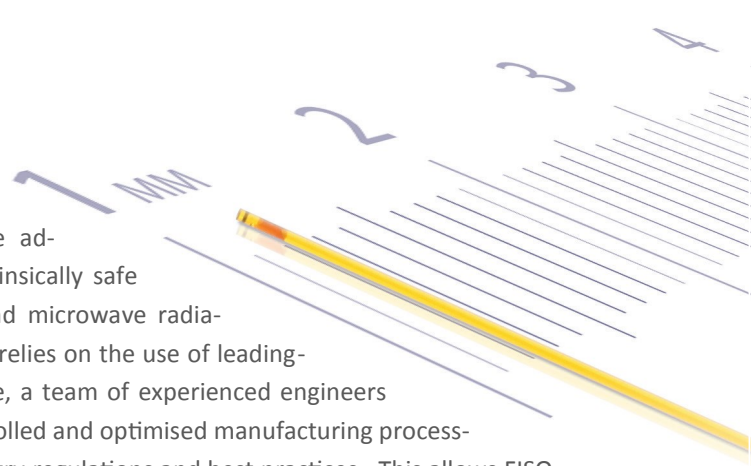


CFO-C12 Ordering Information

CFO-C12-F2-M -ST-ST

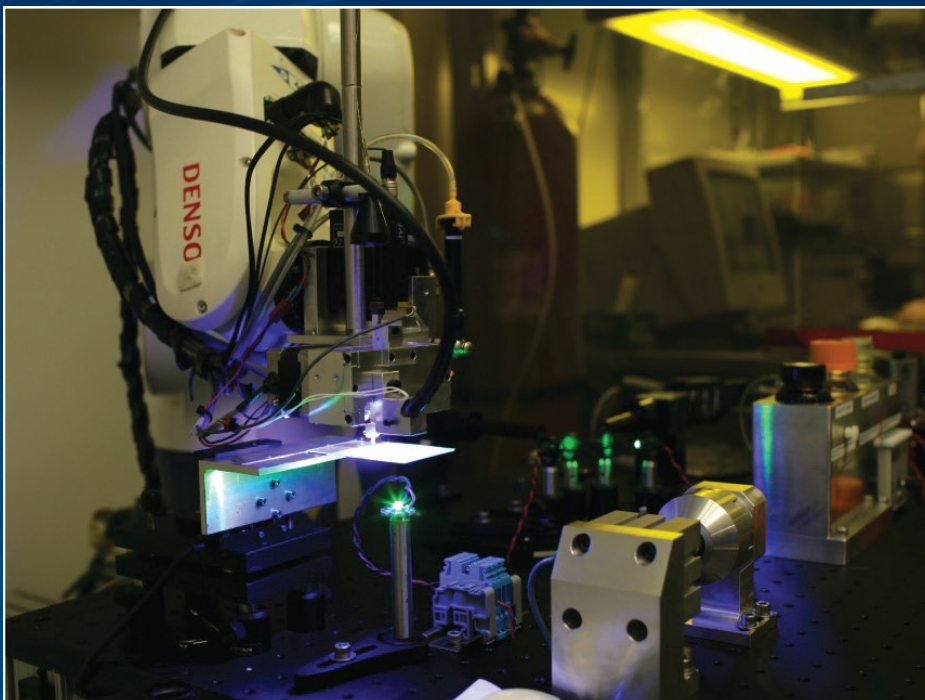
Cable Length	
XX :	Cable length in meters 1m increment for < 15m extension 5m increment for > 15m extension

FISO Technologies Inc., a leading developer and manufacturer of fiber optic sensors and signal conditioners, is worldly recognized for its unparalleled range of fiber optic solutions. Besides being extremely small, thus minimally invasive, the advantages of fiber optic sensors are that they are highly precise, intrinsically safe and immune to radio frequencies, electromagnetic interferences and microwave radiations. The secret to FISO's position as a leader in its field of expertise relies on the use of leading-edge technology, combined with the quality of its technical expertise, a team of experienced engineers and technicians, its product development capabilities, the highly controlled and optimised manufacturing processes and facilities, overseen by stringent Quality Control based on industry regulations and best practices . This allows FISO to meet the needs of every client, whatever challenging or demanding environments they work in.



Founded in 1994, FISO is part of the Roctest Group, a Nova Metrix company. Its products are sold in more than 75 countries through a network of representatives and distributors. Since 2003, FISO Technologies meets the requirements of the ISO 9001:2008 and ISO 13485:2003 certifications. The company is assessed and certified by the BSI Group and strictly applies its quality policy day after day.

FISO is the largest fiber optic sensor company in the world with hundreds of thousands of sensors shipped annually and continuing to grow year after year.



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