

# **NETWORK** group SPECIAL FIBER OPTICS

## **COMPACT FBG INTERROGATOR** **Type: STATIC**

User manual



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- The manual contains all important information about the device.
- Technical changes, misspellings and mistakes are reserved.

Brno, 19. 10. 2017

## General information

The interrogation unit is designed for measuring, evaluating and logging of static or slow events measured by FBG (Fiber Bragg Grating) optical sensors. The unit has unique hardware solution that allows compact dimensions and high accuracy and measurement stability. Producer declares the correct functionality of the device only with the sensors supplied by the device producer.

### Key properties:

- Compact measuring system with the unique hardware solution.
- Evaluation of the static/slow events.
- High accuracy, stability and repeatability.
- Real-time data display and parallel data logging.

## Important notice

- Please read this manual before turning on the device.
- Familiarize with the device and its control.
- Follow the safety instructions in this manual.
- Always attach the manual with the device.

## General safety instructions

- The device may be operated only by trained person.
- The laser device is class 1M (according to ČSN EN 60825-1 ed. 3, date of issue 1. 4. 2015). Watching the optical output with optical aids such as a telescope, microscope etc. may lead to a risk of eye damage and therefore the user should not aim the optical beam into the area where the optical instruments are likely to be used.
- Radiation is not visible! Do not look directly into the optical output.
- Make sure that the optical adapter (7) is not without covers while the device is running. The optical adapter must be covered or an optical sensor must be connected.
- Do not disassemble the device, in the case of any problem, please, contact the producer.
- Keep away from children!



- The safety label is located on the bottom of the device, next to the type label.
- Class 1M laser radiation.
- Avoid any eye contact with the laser beam.
- Classified according to ČSN EN 60825-1 ed. 3, date of issue 1. 4. 2015.
- Invisible infrared radiation at 1550 nm.
- Maximum output optical power 2 mW/channel.
- Optical Beam divergence  $\sim 9.6^\circ$ .
- Pulse duration  $\sim 1$  sec.
- Measurement period  $\sim 3.5$  s.

## Before switching up

- If you manipulate with the device before turning it on, let it acclimates for a few minutes. The high-accuracy mode (HI-AC) is ready in about 30 minutes.
- Connect the power adapter with the interrogation unit, and then connect the power supply cord to the 230 V supply before turning the device on.
- Ensure that the area around the aluminum heatsink is suitable for adequate heat removal.
- Make sure the optical connectors of the sensors are connected to the adapter, the unused sockets must be covered with caps.

## Use by purpose

- The interrogation unit is designed to measure and evaluate signals from the optical sensors, which together form a complex sensory system.
- Use the device only with the supplied sensors and only for the intended purpose - measurement of temperature, strain, etc. The device is only compatible with the sensors supplied by the device producer.
- Use only the supplied accessories otherwise the unit can be damaged.
- Always respect all warnings and safety instructions mentioned in this manual.

# Device description

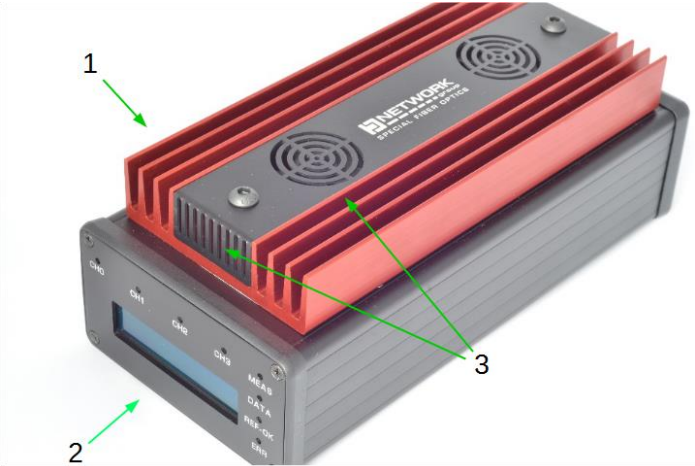


Figure 1: Front/side view of the device.



Figure 2: Front panel

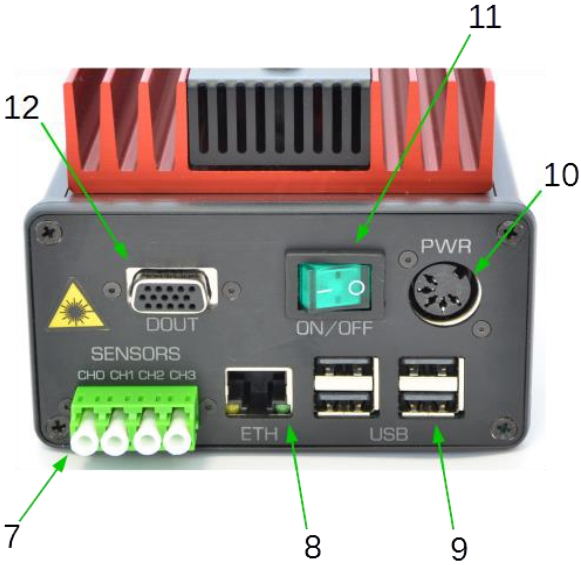


Figure 3: Back panel

#### Legend:

1. Aluminum heatsink.
2. Front panel.
3. Air inlet/outlet.
4. Indicating LEDs.
5. Status display.
6. Status LEDs.
7. Optical adapter - input/output.
8. Ethernet port.
9. USB ports.
10. Power DIN connector.
11. Power switch.
12. Digital output.

Note: The type and safety label is located on the bottom of the unit.

## Commissioning

- If you have done all of the operations described in the previous sections you can turn the device the power on using switch on the back panel (11).
- After switching on the device the unit will heat up itself up to operating temperature and start self-calibration. This process is indicated on the status display (5). For the highest measurement accuracy, we recommend to wait for 30 minutes before measurement. The switching between low and high accuracy mode (LO-AC and HI-AC) can occur during self-calibration process.
- The correct operation of the device is signaled by the status LEDs (6) "MEAS" and the "DATA" flashing in successive sequence. If the device is in high accuracy mode, the "HI-AC" LED lights up. In the case of error the red LED (ERR) lights up.
- The device measures in high accuracy mode when optimal temperature conditions are observed, see table with technical parameters.
- When the sensor is connected to the optical adapter (7) the LED of the corresponding channel (4) will be lighted up.
- Connect the interrogation unit to your computer via Ethernet port (8) or other interfaces according to device configuration (USB (9), CAN (12)). If the CAN connector (12) is used the data cable must not be longer than 2 m!
- You can process real-time measured data on your PC or read measured and stored data from your device at the required intervals with supplied software.

## Package contents

- Interrogation unit COMPACT FBG INTERROGATOR - STATIC.
- Power adapter 230 V / 12+5V.
- Power cord.
- UTP cable.
- Flash-disk with software and user manual.

## Handling

- The device contains components that are sensitive to sudden changes in temperature, therefore do not expose the device to rapid temperature changes and operate it only within the specified temperature range.
- The device contains components that are sensitive to vibrations. Therefore do not expose the device to these influences, otherwise the measurement results may be distorted or the device may get damaged.
- Do not cover the heatsink of the device (1) or air inlets/outlets (3).
- Clean the optical adapters (7) only when the device is switched off and use special cleaning tools.
- Use only LC/APC connectors.
- Never plug in active optical fibers from another device, otherwise it may damage the device.

## Maintenance

- Keep the device clean.
- Clean the heatsink area with fans (3) with compressed air every ½ year.
- If there is a decrease in the detected power that can be monitored on the status display (5), clean the optical adapter using special tools (cleaning pen, stick, etc.). It is also necessary to clean the sensor connectors.
- Clean the optical adapters only when the device is switched off.
- Do not disassemble the device or perform any operations other than those described above.
- If the ERR LED (6) light on, turn off the device and switch it on again in 5 minutes. If the error LED is still on, contact the device producer.

## Technical parameters

<b>OPTICAL PARAMETERS</b>	
Measurement range	~ 7 nm/channel
Measurement period	~ 3.5 s
Pulse duration	~ 1 s
Wavelength band	C-band, ~ 1550 nm
Number of physical channels	4
Maximum number of sensors per channel	4*
Maximum number of sensors	16*
Maximum optical power per channel	2 mW
Beam divergence	9.6°
Resolution	0.1 pm
Absolute accuracy in high accuracy (HI-AC) mode	± 1 pm
Absolute accuracy in low accuracy mode	± 5 pm
Accuracy class	0.05
Optical connectors	LC/APC
Laser class (classified by IEC 60825-1 ed.3)	1M
Operating temperature range	10 – 40 °C

\* Depending on sensors type and range.

<b>ELECTRICAL PARAMETERS</b>	
Power supply	230 V AC / 50 Hz
Power consumption	Max. 42 W
Interface	Ethernet, USB 2.0**, I2C**, UART**, CAN**
Software	Calibration, According to specific application

\*\* Optionally

<b>MECHANICAL PARAMETERS</b>	
Dimensions	230 x 115 x 80 mm
Weight	1,5 kg



# Declaration of Conformity

Declaration of conformity with ES

NETWORK GROUP, s.r.o.

Olomoucka 91

627 00 Brno, Czech Republic

VAT: CZ60750430

HEREBY IS DECLARED THAT ON THE PRODUCT BELOW

DESCRIPTION: COMPACT FBG INTERROGATOR, Type: STATIC

ARE APPLIED TECHNICAL STANDARDS AND SPECIFICATIONS:

EN 61326; EN 60825

The Declaration of Conformity loses its validity if there are any changes made on the device not approved by producer.

In Brno, 19. 10. 2017

**sfo.nwg.cz**

## Installation and use

The interrogation unit is a device for simultaneous measurement of up to 16 fiber optic sensors. The unit includes an optical source and a set of optical detectors, a module for data acquisition and evaluating the measured optical signals and their conversion to required physical quantities (such as temperature).

The use of the unit is user-friendly. Front panel is designed to display status information, back panel is intended for hardware connection interface.

### Back panel description



**PWR** – power supply connection +12V/5V (power adapter included).

**ON/OFF** – power switch.

**DOUT** – input/output digital interface (I2C, UART, TTL outputs, etc.) *Only modules designed, supplied or approved by the device producer may be connected to this connector. In case of connection of unapproved devices to this interface, the unit could be damaged, such damage is not covered by warranty! The maximum length of the cable connected to this device is 2 m.*

**CH0 – CH3** – optical channels for sensor connection, 4x LC/APC connector. *Beware, these outputs are source of invisible infrared optical radiation.*

**USB** – connection with communication devices (e.g. USB <-> RS232).

**ETH** – standard Ethernet interface RJ45 for connection to the PC network.

### Front panel description

The front panel is designed to display status information of the sensors connected to individual channels. After turning on the unit, "FBG Interrogator" and firmware version appears on the display. After the system is booted (about 1 minute after switching on) this information is replaced by the status information of the each channel.



- H■ 4 sensors are detected, but second sensor has too high signal amplitude. It is not possible to detect and evaluate it.
- 2 sensors are defined and 2 sensors are detected (everything is in all right), the rectangle level corresponds to signal amplitude from each FBG sensor.
- X 2 sensors are detected, but the different number of the sensors per channel is defined.
- L 3 sensors are detected, but one of them has too low signal amplitude.
- X This character may mean 2 states depending on unit setting – Either 4 sensors / channel are set, but only 3 sensors are detected, or 3 sensors / channel are set, but 4 sensors are detected.

The front panel is equipped with display and set of status and indicate LEDs. The status LEDs is located above the display (CH0 – CH3) and is switched on when sensors are connected to the respective channels, the channels are active and are not in the error state. The indicate LEDs show the following operating states:

**MEAS** – it is switched on while the measurement is running (i.e. the laser is active).

**DATA** – communication status, unit is switched on while the data is being sent.

**HI-AC** – it is switched on when the device is in high accuracy mode. If the LED is off, the device is in low-accuracy mode.

**ERR** – unit function error. It lights up in case of operating error (overheating, communication faults, etc.). If the LED is light on or flashing, it is recommended to turn off the device and contact the producer.