

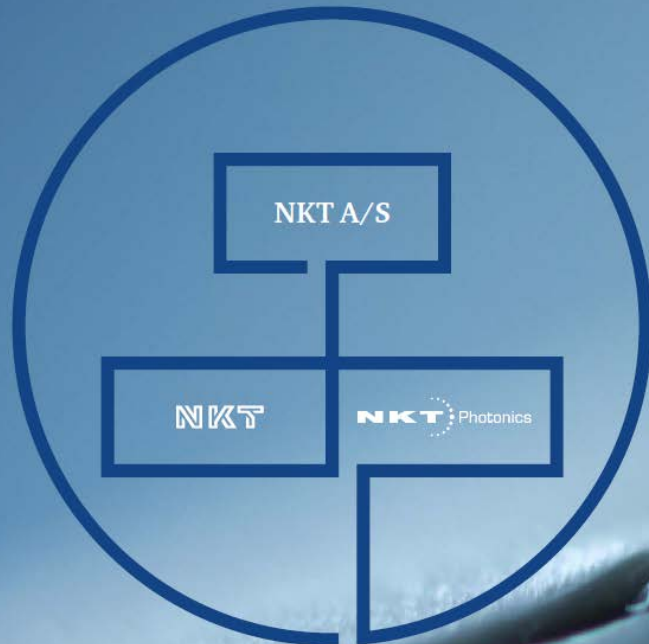
EPIC Online Technology Meeting

Photonics Sensors for Safer and Intelligent Oil & Gas Producers – March 22nd, 2021

Martin Laging

Company structure of NKT A/S

NKT A/S was founded in 1891 and has been listed on the Danish stock exchange since 1898. Today, it consists of two standalone companies: NKT, a leading provider of power cable solutions, and NKT Photonics, a leading supplier of fiber lasers and photonic crystal fibers. Both companies are headquartered in Denmark and have operations across the world.



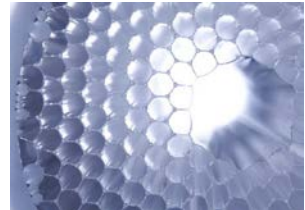
NKT

2020 Revenue: EUR 1,087 m
Employees: 3,886



NKT Photonics

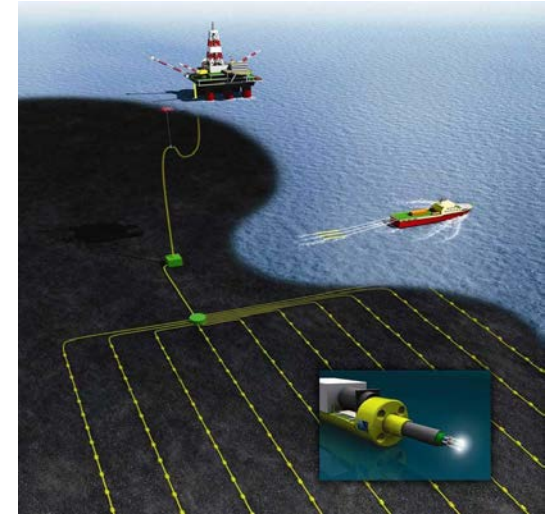
2020 Revenue: EUR 69.9 m
Employees: 417



Fiber sensing: DAS in Oil & Gas

Permanent reservoir monitoring (PRM)

- Highest demand in **sensitivity** and **range**
- Detection of low frequencies
- Multiple-wavelength systems to monitor several km²
- All subsea components 100% optical



Downhole monitoring

- Highest demand in **sensitivity**
(often in combination with temperature sensing/DTS systems).

Pipeline monitoring

- Highest demand in **range**



Industry-grade Koheras Lasers



- Inherently **single frequency**, mode-hop free
- **Ultra low phase noise** & narrow linewidth (**Hz level**)
- Low vibration & acoustic sensitivity
- Ultra long-term wavelength stability ($\sim 0.1 \text{ pm}/^\circ\text{C}$)
- Wide wavelength **tuning** range (1000 pm)
- Fast **wavelength modulation** (20 kHz)
- Optional: **PM output** ($>23 \text{ dB}$)
- Wide range of **wavelengths** ($1030\text{-}1120 \text{ nm}$ & $1535\text{-}1580 \text{ nm}$)
- Multi-wavelength systems **up to 16 channels**
- Serviceable, **remote laser control & diagnostics**
- All-fiber based, **low cost of ownership**
- **+20.000** lasers delivered

Koheras line for DAS applications



Technical parameter

Wavelength range

Output power

Linewidth

Phase noise @ 20 kHz

Phase noise @ 100 Hz

RIN

PER

Thermal tuning range

Wavelength stability

Power consumption

Size

Koheras BASIK MIKRO E15

1535 - 1580 nm (ITU, custom)

40 mW

<0.1kHz

-130 dB (rad/√Hz/m)

-120 dB (rad/√Hz/m)

< -135 dBc/Hz @ 10 MHz

> 23 dB

1000 pm

< 0.2 pm/°C (case temp.)

< 3 W (at nominal temperature)

7 x 2 x 15 cm³

Koheras BASIK X15

same

30 mW

same

same

-135 dB(rad/√Hz/m)

same

same

350 pm

< 0.05 pm/°C (case temp.)

< 4 W (at nominal temperature)

11 x 2.25 x 22 cm³

Koheras BOOSTIK

1545 – 1565 nm

2 W

-

-

-

-

same

-

-

< 20 W (at nominal temperature)

11 x 4.5 x 22 cm³

What can you do for us?

Challenge us, let's talk about:

- **Your visions**
- **Your demands**
 - New applications in Oil & Gas Fiber Sensing
 - Specifications you might need
 - Additional amplification tasks
 - Volumes, Upscaling, Service, Certification

What can we do for you?

- **Provide you with most reliable lasers for your most demanding solutions**

The Koheras "Ultra-Precise" Laser

Lowest
Noise
In the Industry

Martin Laging, PhD

Senior Sales Manager, Koheras OEM

NKT Photonics

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