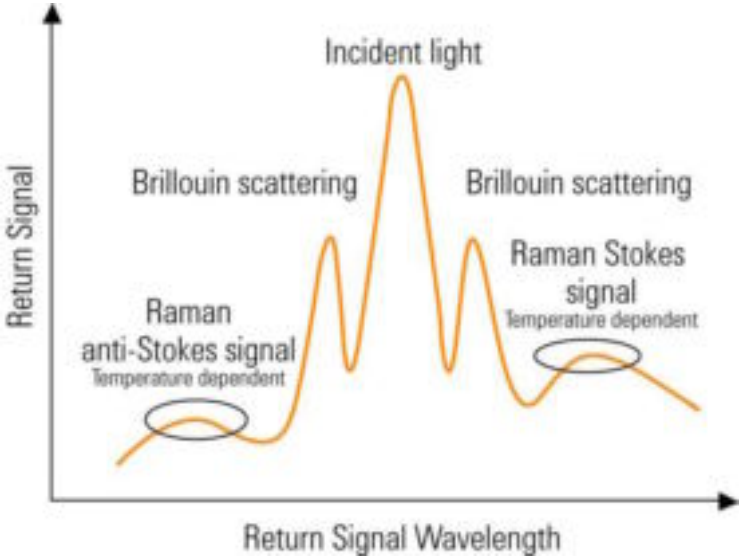
Brugg Kabel AG

DTS – Distributed Temperature Sensing

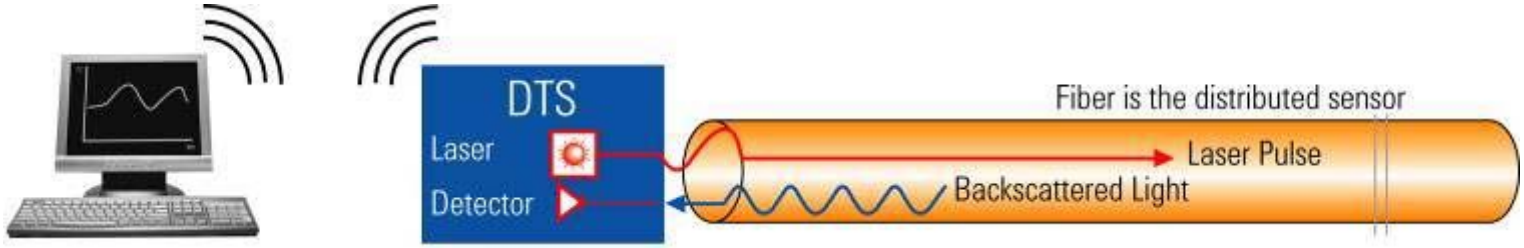
Distributed Temperature Sensing Measurement Principle

The distributed measurement is based on the proven **Raman-Optical Time-Domain-Reflectometry** technique. An optical laser pulse propagating through the fiber **gets scattered light back** to the transmitting end, where it is analyzed. The intensity of the Raman scatter is **a measure for the temperature** along the fiber.



The backscattered light is spread across a range of wavelengths. Some of these wavelengths are affected by temperature changes while others are immune. By very accurately measuring **the difference in the signal intensity** of the backscattered light an accurate temperature measurement can be made.

The position of the temperature reading is determined by measuring **the arrival timing** of the returning light pulse **similar to a radar echo** showing the distance of a car or plane.



Advantages of Fiber Based Distributed Temperature Sensing over Electrical Probes

Gain insights into a variety of application areas and **increase productivity** by using an optical fiber as a sensing element. The **fiber is the only sensing solution** that leaves **no area unmonitored** and is intrinsically safe (EMI).

- Worry-free permanent monitoring
- Reduced cost of operation
- Increased efficiency

Key differentiators

1. Reliability:

We are using a semiconductor laser with a life time expectation of > 60 years

2. Operating Conditions:

We are first to offer a true outdoor version, operating temp. range (-10 to 60°C / 14 to 140°F), rain, dust resistant and low power consumption (15 W).

3. Cost effective:

No extra building or cooling required, extended life time, easy to integrate into communication infrastructure and competitive price point for the instrument.

4. Ease of use:

Very simple to use. Intelligence is in the instrument and user can set up measurements without extra trainings.

N4385/6A DTS
Next generation of Distributed Temperature Sensing

Performance Characteristic (preliminary):

- Spatial resolution: 1 meter / 3 foot
- Measurement temp. range: -250 to 400°C
  -400 to 750°F (sensor dependent)
- Operating temperature: -10 to 60°C / 14 to 140°F
- Supply voltage: 10 to 30 V DC
- Power: 15 W at room temperature
- Number of sensor channels: 1, 2 or 4
- Relay board: 20 out- / 4 inputs
- Free definable zones and alarm conditions
- Autonomous acquisition system
- USB / Ethernet
- Indoor 19” / outdoor IP66 (~ NEMA 4)
- Laser Class 1M

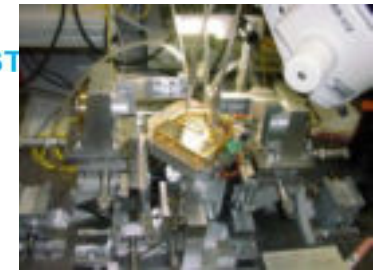
Temperature Resolution:

at 1.5 meter spatial:

	20 sec	1 min	10 min
8 km	3,55 K	2,05 K	0,65 K
6 km	1,61 K	0,93 K	0,29 K
4 km	0,82 K	0,47 K	0,15 K
2 km	0,46 K	0,27 K	0,08 K

at 3 meter spatial:

	20 sec.	1 min	10 min
8 km	1,50 K	0,87 K	0,27 K
6 km	0,74 K	0,43 K	0,14 K
4 km	0,41 K	0,24 K	0,08 K
2 km	0,25 K	0,14 K	0,04 K



Innovations
Next generation of Distributed Temperature Sensing

DTS Architecture:	Benefits:
▶ Proprietary code correlation technique	▶ Driving high temp. resolution by meeting 1M Laser Class requirements
▶ Highly integrated optical building block, hermetically sealed and filled with inert gas	▶ Enabling extended operating conditions, preventing condensation of optical components
▶ Single receiver design	▶ Long-term measurement stability, eliminating tracking issues
▶ Temperature reference design & temperature stabilized opto-electonics	▶ Insensitive to changing operating condition and high measurement repeatability
▶ Outdoor series	▶ Withstands rain, dust, heat, shock, vibration
▶ Low power consumption	▶ Allows solar panel powering
▶ Incorporated switch, trace memory, inside alarm analysis	▶ Reduces cost per channel, enables cost effective network solutions

Enabling **fast**, **reliable** and **cost-effective** sensing through highly integrated optical measurement systems.