

Distributed FO strain and temperature measurements

The distributed fibre optic measuring systems consist of an interrogator and fibre optic measuring cables with a coating adapted to the installation technology on the structure. Depending on the interrogator, the distance between the measuring points can range from less than one millimetre to several metres. The length of the optical measuring cables can be several kilometres. The advantages of fibre optic cables are the low intensity of interference and their insensitivity to electromagnetic fields. The interrogators use different measurement methods based on the scattering of the light emitted into the optical fibre: Rayleigh and Brillouin scattering, which react to temperature and deformation; Raman scattering, which only reacts to temperature.

Highly accurate strain/temperature measurements

Solexperts performs high-precision, temperature-corrected fibre optic strain measurements and offers a complete service that includes the assembly, installation and connection of measuring cables as well as data acquisition and data processing.

The appropriate fibre optic measurement cables are selected for each application, prepared in our workshops, calibrated and installed on site by our teams (integrated into concrete structures, bonded to steel surfaces, installed in boreholes, etc.). They are then connected to the interrogator, which may be located far away.



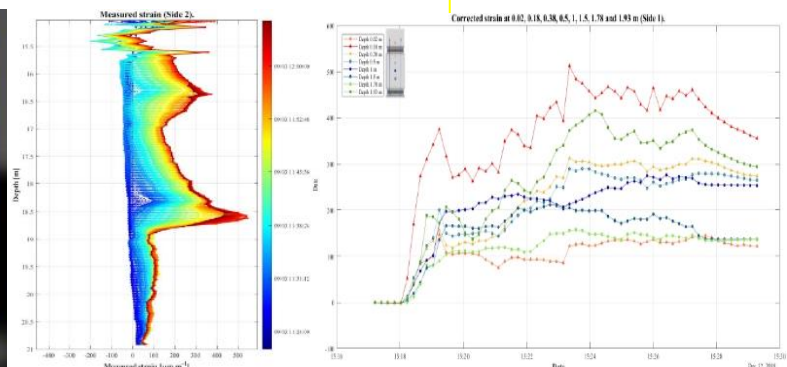
Preparation/calibration of the cables in the workshop, installation on the structure, connection to the interrogator

Swiss Precision Geomonitoring

Solexperts has two state-of-the-art interrogators that complement each other perfectly:

- Neubrescope NBX-7031 (Rayleigh TW-COTDR and Brillouin PPP-BOTDA technology); the measuring system has both a higher spatial resolution (up to 2 cm) with a very high accuracy ($10\text{n}\epsilon/0.001^\circ\text{C}$) and a greater range (27 km) compared to commercially available devices.
- Luna ODiSI-6108 (Rayleigh-OFDR technology) with 8 measuring channels. The measuring system has a spatial resolution in the millimetre range and is also suitable for dynamic measurements (measuring frequency of up to ~ 100 Hz over a length of 50 m) with a possible offset of several hundred metres and a resolution of $0.1 \mu\epsilon$.

The measurements can be carried out selectively or periodically and are adapted to the requirements of the respective project. The raw data is further processed using our proprietary software.

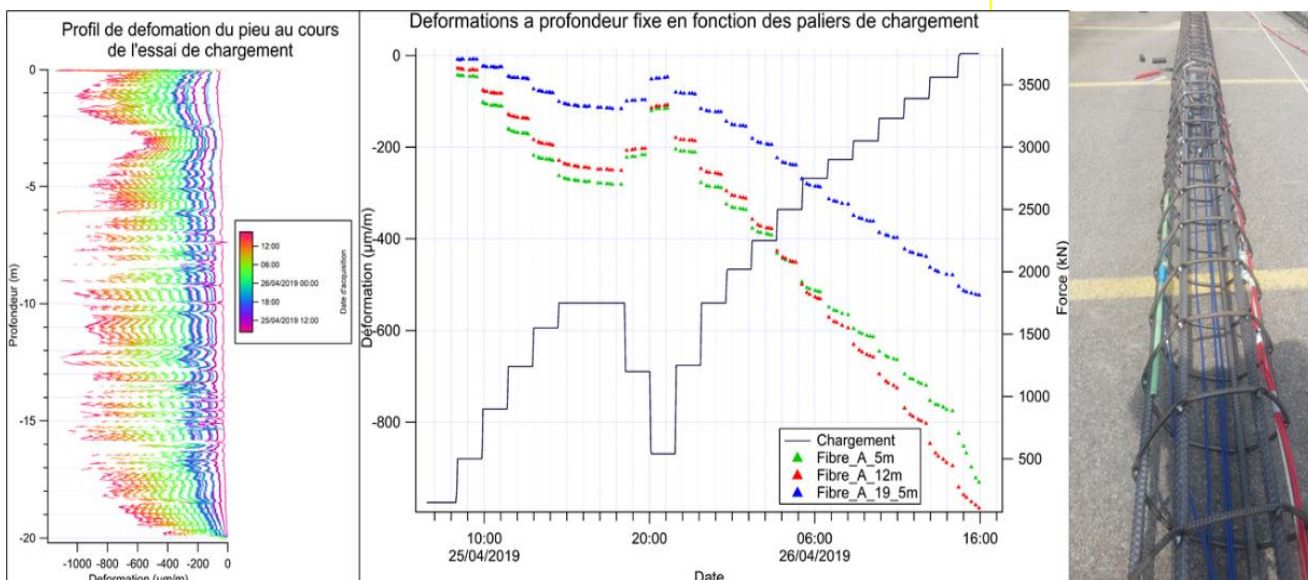


NBX-7031 Hybrid Rayleigh TW-COTDR and Brillouin PPP-BOTDA Interrogator / Data processing and formatting



LUNA ODiSI-6108 Rayleigh OFDR Interrogator / Measurements with high frequency and high spatial resolution

Application: Pile load test



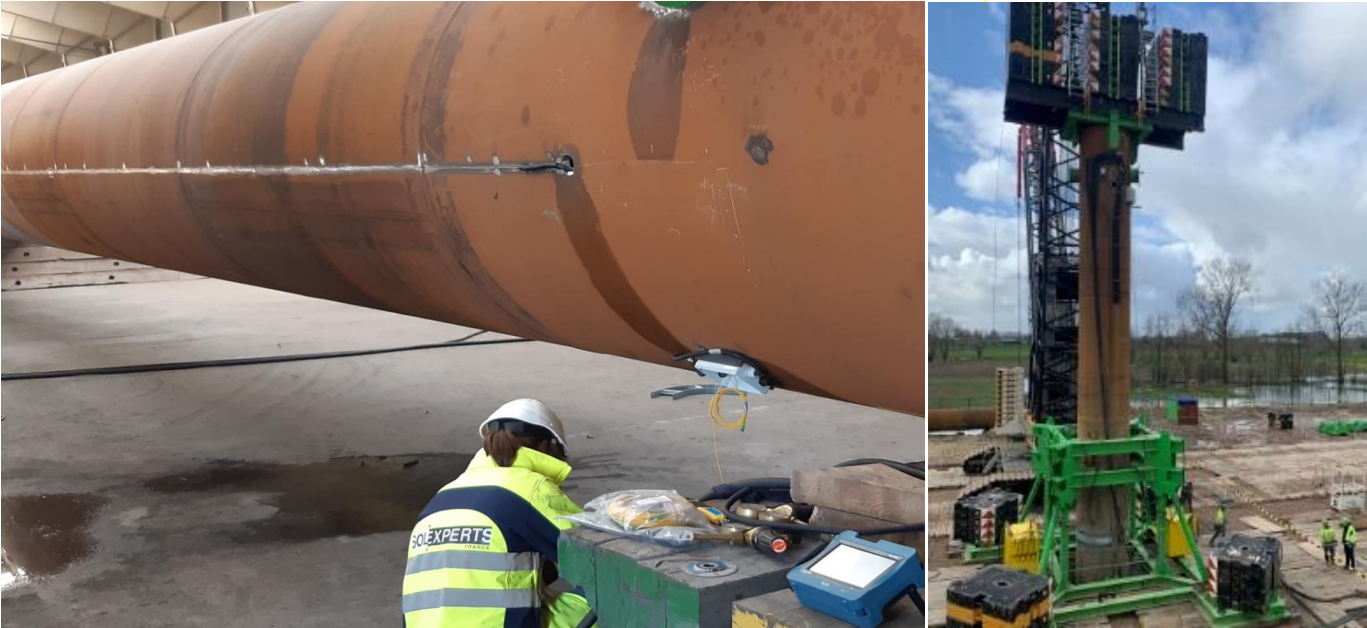
Deformation measurements carried out during the pile load test on various glass fibres installed in the reinforcement, Ecublens (CH)



Deformation measurements during load tests of three piles with several fibre optic cables installed in the reinforcement, Bilten (CH)

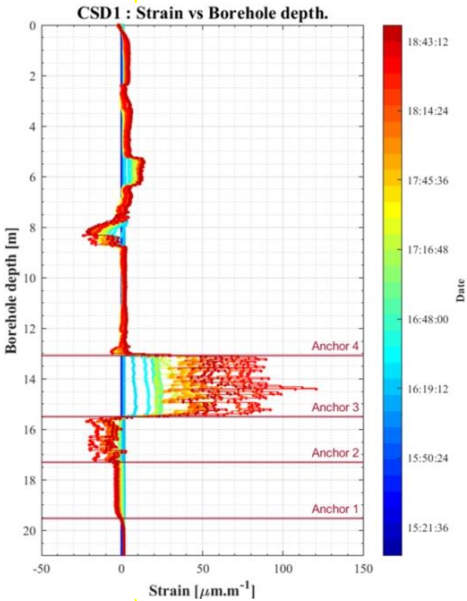
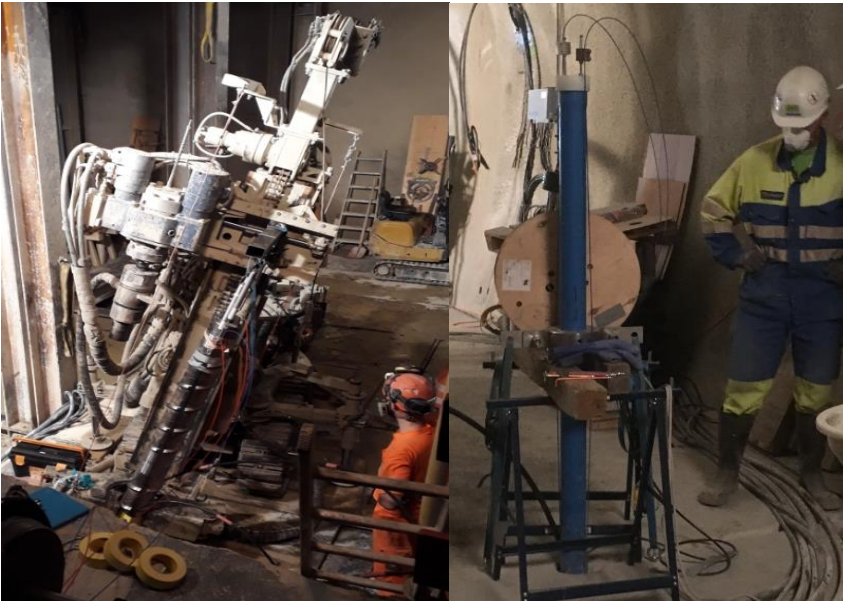
Swiss Precision Geomonitoring

Application: Monitoring the deformation of a steel structure



Temperature-corrected deformation measurements with glass fibres bonded to piles of a wind turbine (NL/BE)

Application: Deformation measurements in boreholes



Deformation measurements in boreholes with glass fibres, Bern railway station (CH), MT Terri research laboratory (CH)

Monitoring with FO deformation/temperature measurements

Solexperts also offers FO measurements as part of automatic monitoring:

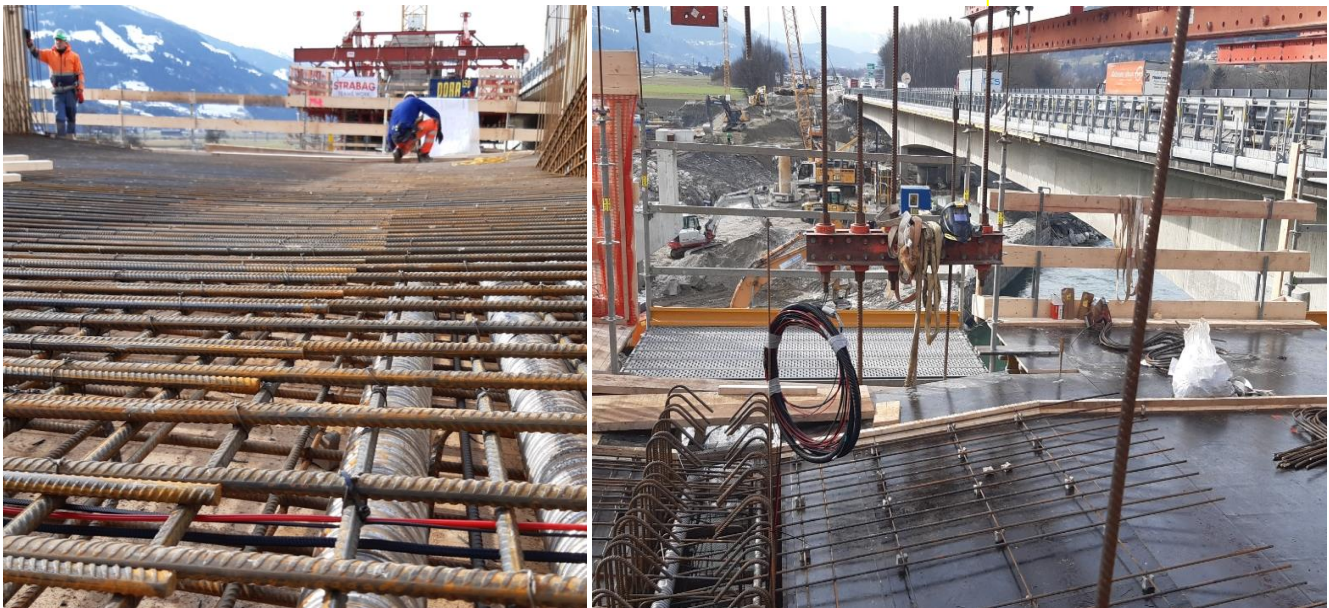
- Deformation using a standard Brillouin BOTDA/BOTDR interrogator
- temperature with the aid of a Raman interrogator.

Application: Automated convergence monitoring of a concrete lining of a tunnel



Convergence measurements with optical fibres in the concrete shell of a gallery in the ANDRA field laboratory CHMH(FR)

Application: Automated monitoring of the structure of a bridge



Temperature and deformation measurements with optical fibres in a bridge structure, Terferner Bridge (AT)