

SureSight™ Sensing Cable

SensorNet's SureSight™ permanent cable range is based on a pre-installed fixed cable construction providing the operator with a clear view of what is happening in the reservoir.

Benefits of Suresight™ Sensing Cable

Benefits of this unique construction include:

- Maximum mechanical protection to the sensing fiber
- Multiple layers to provide pressure barrier and prevent hydrogen ingress
- Latest generation of optical fibers with chemical composition and coatings to minimize effects of hydrogen darkening
- Pre-installed cable design gives ability to:
 - monitor the integrity of the DTS system during installation
 - provide diagnostic capability for completion and downhole tool integrity
 - provide understanding of stimulant/frac fluid placement



Suresight™ Temperature Range

The SureSight™ range of cables is available in three temperature bands:

Cable Name	Description	Temperature Range °C (°F)
SureSight™ LT	Low Temp	-40 to 85°C (-40 to 185°F)
SureSight™ MT	Medium Temp	-40 to 150°C (-40 to 300°F)
SureSight™ HT	High Temp	-40 to 300°C (-40 to 572°F)

Custom cables can be provided for temperature ranges between 150°C and 300 °C.

Sensor cable construction

The SureSight™ cables are based on a pre-installed fixed cable construction (as opposed to a pumped fibre installation). Hence, cable design is of huge importance to provide a robust cable, that is mechanically strong, able to resist corrosion and provide additional protection against hydrogen ingress where needed. The

construction of the SureSight™ cables is based on a dual-barrier design with two metal tubes.

The inner metal tube always includes two fibres enabling double ended measurements and redundancy with minimal material costs. A hydrogen scavenging gel is used within the tube and Sensornet ensures that the cable production line includes a cleaning station to remove manufacturing greases and oils from the innermost fibre tube and hence any potential hydrogen source.

For mechanical integrity and additional hydrogen protection an outer metal tube is welded around the first to either 1/8" or 1/4". Different alloys are used depending on well conditions. The selection of fibre type depends on the well conditions and temperature during operation.

Suresight™ Encapsulation and fillers

SureSight™ cables often include polymer fillers, to fill the space between the innermost metal tube and the outer 1/4" tube. Polymers are chosen according to the required temperature rating of the cable. The 1/4" outer tube will also be encapsulated using a polymer, normally to an outer diameter of 11mm. The encapsulation provides additional protection to the cable, particularly against abrasion during installation. Currently encapsulation polymers are available with an operating temperature up to 170°C. When a cable is required for a temperature rating above this, the cable will be constructed solely of metal.

Sensor cable fibre coatings & composition

One of the keys to the longevity of the SureSight™ cable is the chemical composition and coatings of the optical fibre itself. Optical fibre developments during just the last 12 months have offered considerable improvements over legacy fibre. The latest generation of optical fibres used in the SureSight™ cables achieve a carefully managed balance between eliminating dopants to prevent hydrogen darkening, whilst still maintaining optimum optical performance. The majority of SureSight™ fibres are multimode, but Sensornet is also able to provide pure core singlemode fibres, although it should be remembered that the DTS performance is significantly better on a multimode fibre than a singlemode fibre.

The fibre itself is then protected by one or more coatings, which ensure operation at a required temperature range and provide further protection against hydrogen ingress. Carbon coating is well established as a barrier against hydrogen for optical fibres, whilst coatings such as polyimide are used to provide high temperature protection to the fibres.

Downhole Component Technology

Sensornet has developed a unique downhole in-line splice technology for complex completions enabling the cable to pass through packers, safety valves and other in-well components. The SureSight™ cable does not need to be pre-terminated using

complex connector assemblies. The in-line splice, using Sensornet proprietary housing has been designed for rapid assembly and field installation to minimise rig downtime and can be deployed in any section of the completion. In case of accidental damage the cable can be repaired at the well site without any interruptions in operation. The in-line splice has been deployed successfully on a number of installations to date.

SureSight™ double ended capability

The Sensornet SureSight™ cables are designed for double ended measurement capability. In hydrogen rich, high temperature installations, single-ended measurements become susceptible to changes in the differential loss caused by hydrogen ingress, resulting in an incorrect temperature slope on the data.

A double ended measurement compensates for this effect by measuring both ways around the deployed loop of fibre. By combining these two measurements, the double ended algorithm is able to automatically calibrate for any changing non-uniformity in the fibres on each and every measurement taken.

A double ended installation and measurement should be used in any environment where there is the possibility of some change in the fibre performance over time. The double ended installation also gives the benefit of fibre redundancy and temperature event verification.

There are some occasions where a double ended measurement is not possible, such as where a single length of fibre has been pumped in, or deployed at some time in the past. In this situation Sensornet can offer the ReLight™ calibration service.