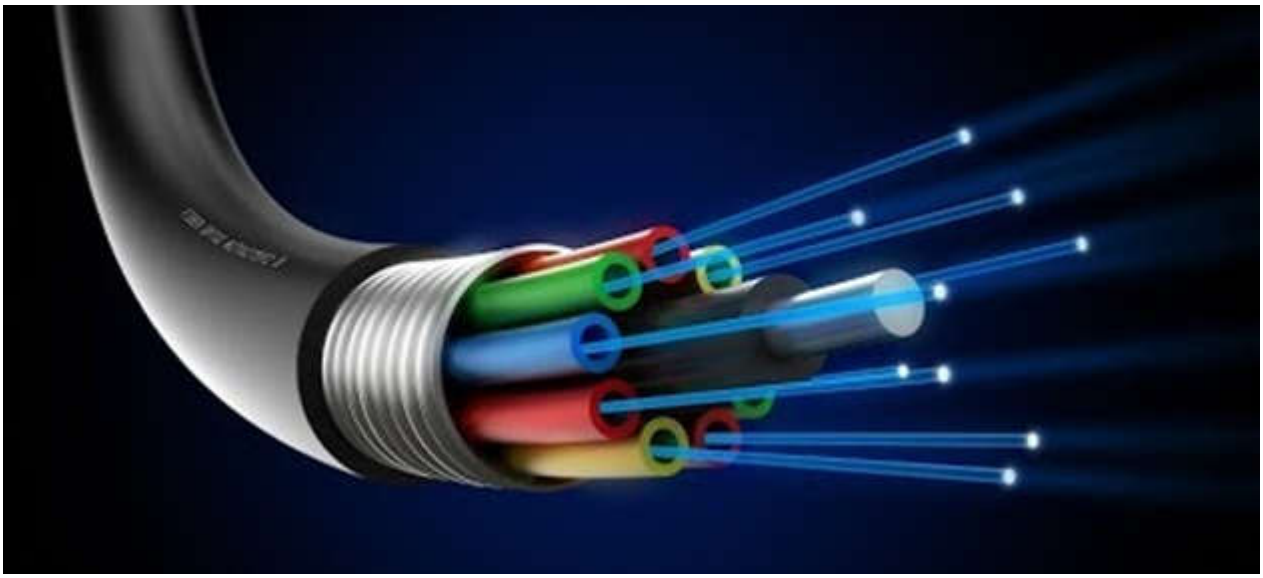
SENSING CABLE TEMPERATURE SPECIFICATION

The purpose of this guidance note is to explain the different options available for fiber optic sensing cables for both Distributed Acoustic Sensing (DAS) and Distributed Temperature Sensing (DTS)



Below is a summary table of some of the more common requests of cable models experience by Bandweaver.

Temperature Rating		**Fiber type**	**BW Cable Models**	**Applications**
Short term (90 mins)	*Long term*			
150°C	85°C	• Acrylate fiber	• FireFiber TT & AT • CovertLine (Horizon DAS) • FenceLine (FenceSentry DAS)	• Power cable • Fire Detection – Linear Heat Detection • Security (PIDS, pipeline, border)
750°C	85°C	• Acrylate fiber	• FireFiber survival cable	• Specialist fire applications
150°C	150°C	• Polyimide fiber	• FireFiber extreme 150	• High temperature environments (e.g. industrial process plants…..)
300°C	300°C	• Polyimide/carbon fiber	• Custom cable only	• Downhole oil and gas • Furnace applications
>300°C	>300°C	• Specialist fiber	• Not supported	• Various

Principle of Temperature Rating

The fiber optic itself melts at temperatures in excess of 1000°C (melting temperature of glass > 1400°C). However, if the glass is exposed to air then cracks will propagate and the fiber will fail. Therefore the temperature rating of the cable/fiber is defined by the outer coating

Standard telecoms acrylate fiber

Wherever possible Bandweaver recommends the use of standard telecoms fiber (generally single mode for DAS and multimode for DTS). The main reason is that it is readily available to a high standard and is very economical. For continuous operation the fiber optic is rated to 85°C. However depending on the cable construction it can last longer for short durations (1-3 hours) and in some cases as high as 750C.

Higher rating for Linear Heat Detection (LHD) applications

Bandweaver sometimes gets requests for higher rating for linear heat detection (LHD) applications. Sometimes this is to 150°C and sometimes even to 750°C.

However, generally when the end users investigate further it is discovered there is not a need for a higher temperature rating. It has typically been specified due to guidance from advisors who have not fully understood the need vs the cost implications.

Typically a 750°C short term rating cable is 5 times the price of standard cable. Also the 750°C is only a short term rating (90 minutes). Generally for LHD applications the DTS will detect temperatures in the range of 40-65°C and sound the alarm well before the temperature exceeds 85°C. While in some cases there is some benefit for having the DTS run for longer (e.g. extended data analysis, controlling ventilation fans….) in most cases it is of limited value. In addition if the cable temperature reaches anything approaching 750°C it will inevitably need to be replaced along with most of the surrounding environment.

Continuous Higher rating for Linear Heat Detection applications

For continuous operation of temperatures above 85°C a speciality fiber type will be employed. For temperatures up to 300°C typically some type of poyimide/carbon coated fiber will be used. However, a lot of care must be taken to ensure that the correct cable construction and fiber type is selected. You can experience issues both with thermal expansion/fatigue and also potentially hydrogen darkening and so having the correct cable selection is critical.