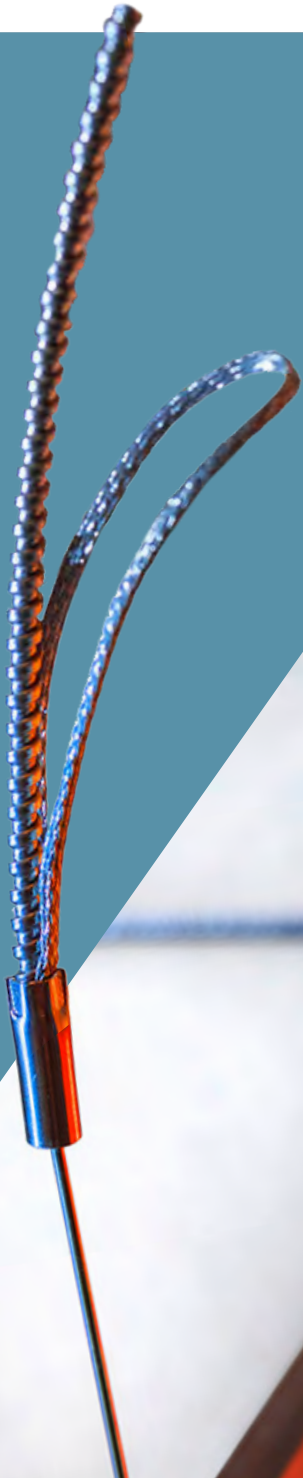


MOULD TEMPERATURE MONITORING

HIGH RESOLUTION WITH
FBG TECHNOLOGY





Optical fibres are inserted into the mould to obtain high-resolution temperature measurements.

MOULD TEMPERATURE MONITORING

In the production of steel, mould systems have made much progress towards the adoption of high tech solutions to optimise the casting process. These new technologies, such as FBG (Fibre Bragg Grating Systems) temperature monitoring, provide a much better insight and understanding of the complex solidification process occurring in the mould. FBG technology works hand-in-hand with KME's optimised cooling designs to achieve the high quality steel products needed today.

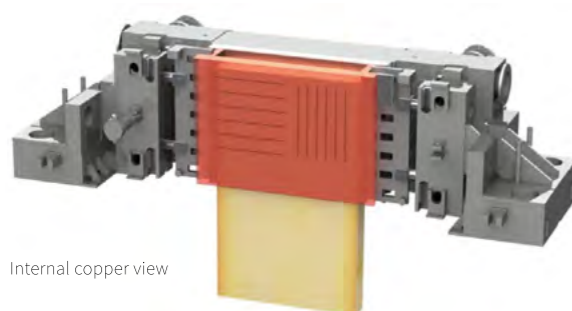
KME has the know-how to supply either conventional thermocouples or the new FBG optical temperature measurement technologies for mould temperature monitoring.

Fibre Bragg Grating Systems

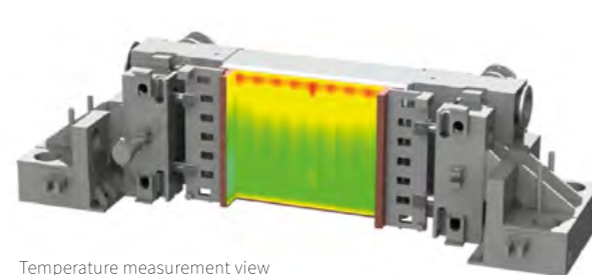
A deeper process insight is possible using innovative temperature measurements based on fibre optic technology embedded with bragg-gratings.

Thermocouple Systems

In conventional casting operations the use of thermocouples is the most common technology for temperature measurement and sticker detection.



Internal copper view



Temperature measurement view

STRENGTHS OF FIBRE BRAGG GRATING SYSTEM



- **High resolution monitoring:** Measuring point spacing as close as 10 mm and sampling rates of up to 500 Hz possible.
- Fibres in the mould can be **customised** to the process demands.
- If copper reworking is necessary, the sensors can remain in the mould.

NEW OPPORTUNITIES

By using a test configuration with 42 fibres, consisting of 26 measuring points each fibre, a resolution with 1092 measuring points allows a **deep insight** into the casting process. This results:



- Optimisation of the SEN fluid flow pattern, casting powder and NF taper adjustment possible as different casting powders.
- **Crack detection, Breakout detection, Process parameter analysis** and much more.

WHAT WE OFFER



- **Entire project planning** including conceptioning, designing and launching.
- The difficult deep-hole-drilling (up to 2200 mm depth and **1.1 mm diameter**) both horizontally and vertically **for all types of moulds**.
- Freely selectable temperature measuring points.
- Most complicated geometries such as in the funnel area FBG sensors can be installed.
- In addition to **mould plates** (narrow face and broad face) the FBG Temperature measurement system can also be used with **mould tubes** and **beam blank profiles**.

SYSTEM CONFIGURATION

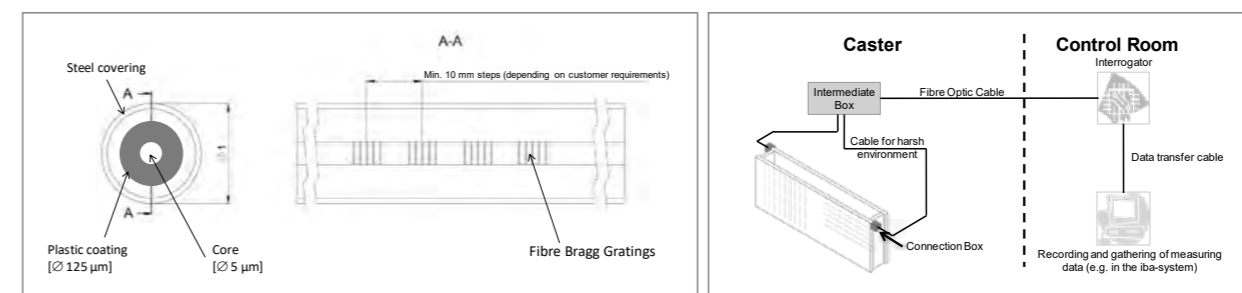


- All optical fibres are brought together in a **connection box** and are forwarded in a single cable.
- The cables of several connection boxes are combined in an **Intermediate Box**.
- The cable with the FBG sensors is read out.
- The measuring signals are **directly converted** via the interrogator and can be transmitted to a process data acquisition and analysis software such as the iba-system.

FUNCTIONAL PRINCIPLE: FIBRE BRAGG GRATINGS



- Periodic Fibre Bragg Gratings (Minimum distance: 10 mm) are introduced into **optical fibres**.
- Each grating reflects a certain amount of light at a different Bragg wavelength (detection of the position).
- Due to **thermal effects** the grating spacing and the refractive index changes, which leads to a shift of the reflected light.



System Set-Up

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