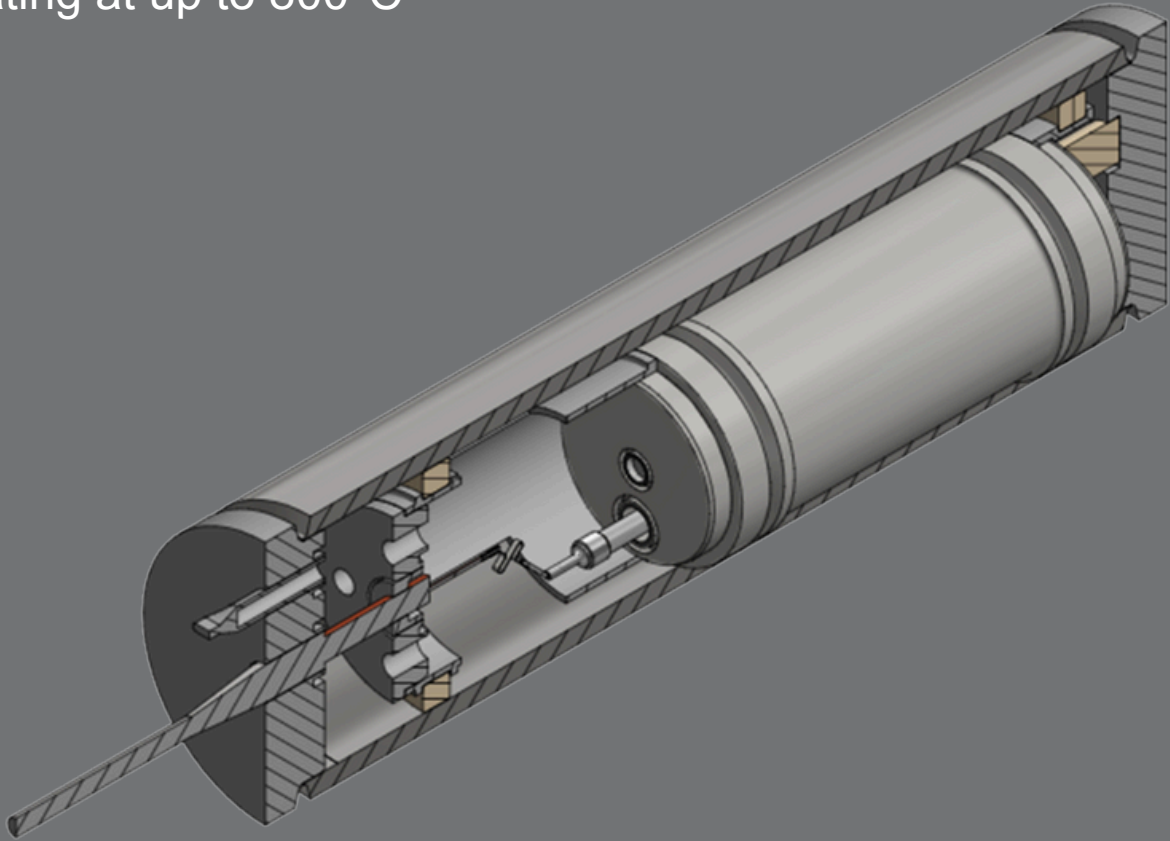


# High temperature fission chamber

Operating at up to 800°C



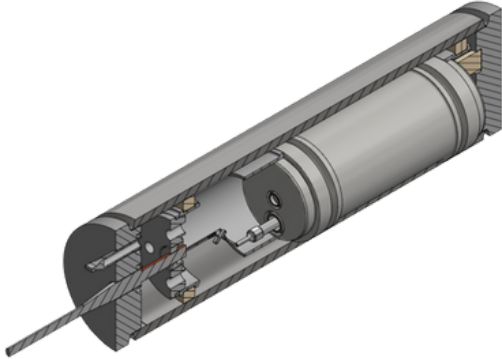
## Overview

This device is a fission chamber that has been designed for use in the hostile environments anticipated in Generation IV reactors and has been proven for use at temperatures of up to 800°C in the laboratory.

## Key features

- High temperature fission chamber, capable of operating at temperatures up to 800°C
- Sensitivity is adjustable by increasing the length and sensitive area of the device
- Single cable variant operates in pulse and Campbell modes
- Integrated Mineral Insulated (MI) cable and termination, which can also be used as a pressure boundary

# Technical specifications



## Variants

The single cable device is designed for operation in pulse and Campbell modes, which will cover start up and intermediate power ranges.

A variant that deploys multiple cables is in development, which will optimise operation of the device in pulse, Campbell and DC modes. This will reduce the number of sensors required to ensure safe operation of a Generation IV or Small Modular Reactor (SMR).

## Materials

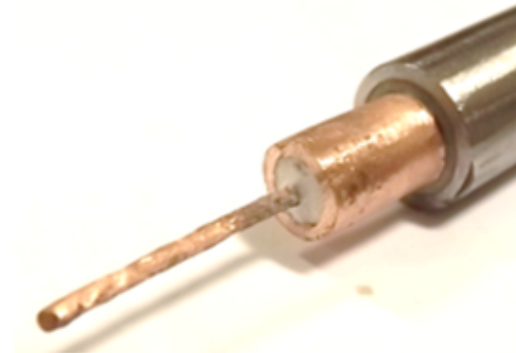
The detector utilises Inconel in its construction in order to be compatible with both temperatures and environmental conditions in molten salt, high temperature gas and liquid metal type reactors.

Ceramics in the form of both aluminium oxide and magnesium oxide are used in the manufacture of this device.

## Cabling

MI cabling is used to transport the signal from the detector and through reactor coolant to a location where a soft cable can be connected for transmission over longer distances in less hostile conditions.

Cabling is either triaxial or coaxial. Triaxial cable is optimised for pulse and DC mode transfer, whilst the coaxial cable uses a laminate screen with multiple layers to improve noise rejection at lower frequencies, which improves signal to noise ratio for Campbell mode operation.



# Performance specifications

High temperature fission chamber performance specifications	
Dimensions	<ul style="list-style-type: none"><li>• Length 253 mm</li><li>• Outer diameter (OD) 70 mm</li><li>• MI cable length (triaxial) <math>\leq 22</math> m</li><li>• MI cable OD (triaxial) 4.75 mm (nominal)</li><li>• MI cable length (coaxial) <math>\leq 24</math> m</li><li>• MI cable OD (coaxial) 5.4 mm (nominal)</li><li>• MI cable termination length 230 mm (nominal)</li><li>• MI cable termination OD 25 mm</li><li>• Sensitive length 60 mm</li></ul>
Nucleonic performance	<p>Values can be adjusted to suit application - there may be a device dimension impact for larger sensitivity requirements:</p> <ul style="list-style-type: none"><li>• Pulse mode sensitivity 0.033 cps/nv</li><li>• Campbell mode sensitivity <math>2.40 \times 10^{-27}</math> A<sup>2</sup>/Hz/nv</li><li>• DC mode sensitivity <math>7.67 \times 10^{-15}</math> A/nv</li></ul>
Materials	<ul style="list-style-type: none"><li>• Inconel 600 series</li><li>• Stainless steel 300 series</li><li>• Alloy 42</li><li>• Nickel</li><li>• Copper (OFHC)</li><li>• Aluminium oxide ceramic</li><li>• Magnesium oxide ceramic</li></ul>

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