



## Fission chamber for out-of-core use with integral cable

### Application

- Detection of thermal neutrons in a wide flux range of 0.3 to  $10^{10}$  n.cm<sup>-2</sup>.s<sup>-1</sup>

### Features

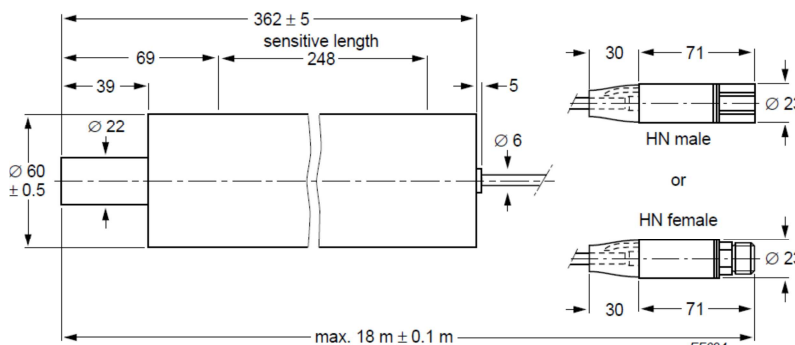
- High sensitivity
- Also available in a LOCA-proof (Loss Of Coolant Accident) version

Nuclear characteristic			
Sensitivity to thermal neutrons <sup>1</sup>	Pulse mode	3	c.s <sup>-1</sup> /n.cm <sup>-2</sup> .s <sup>-1</sup>
	Fluctuation mode	$1.2 \times 10^{-25}$	A <sup>2</sup> .Hz <sup>-1</sup> /n.cm <sup>-2</sup> .s <sup>-1</sup>
	Current mode	$6 \times 10^{-13}$	A/n.cm <sup>-2</sup> .s <sup>-1</sup>
Neutron flux ranges	Pulse mode <sup>2</sup>	0.3 – $3 \times 10^5$	n.cm <sup>-2</sup> .s <sup>-1</sup>
	Fluctuation mode <sup>3</sup>	$3 \times 10^4$ – $6 \times 10^8$	n.cm <sup>-2</sup> .s <sup>-1</sup>
	Current mode <sup>4</sup>	$10^5$ – $10^{10}$	n.cm <sup>-2</sup> .s <sup>-1</sup>
Gamma sensitivity		$2.1 \times 10^{-8}$	A/Gy.h <sup>-1</sup>
Exposure limits	Thermal neutrons <sup>5</sup>	max $2 \times 10^{19}$	n.cm <sup>-2</sup>
	Gamma exposure	max $10^9$	Gy
	Gamma dose rate	max $10^4$	Gy.h <sup>-1</sup>

Electrical characteristics			
Insulating resistance <sup>6</sup>	at 600 VDC	min $10^{12}$	Ohm
Operating voltage	Nominal up to 250°C	600	VDC
	Maximum at 20°C	800	VDC
	Limit with no radiation	1300	VDC
Charge collection time <sup>7</sup>		80	ns
Detector capacitance		700	pF
Cable capacitance		170	pF/m
Cable characteristic impedance		50	Ohm

Mechanical and physical characteristics		
Detector	Case, electrodes	Aluminum
	Insulators	Al <sub>2</sub> O <sub>3</sub>
	Sensitive layer	U > 90% enriched in <sup>235</sup> U
	Filling gas <sup>8</sup>	Ar + 4% N <sub>2</sub> at 250 kPa
Cable	Type	Coaxial, high immunity
	Insulator	MgO
	Curvature radius <sup>9</sup>	min 60 mm
Connector	Type <sup>10</sup>	Watertight HN
	Insulator	Al <sub>2</sub> O <sub>3</sub>

### Outline



### Notes.

- Values depending on the characteristics and the calibration of the measurement equipment. The pulse sensitivity is calculated from the (alpha, neutron) discrimination curve for a discriminating threshold corresponding to a counting rate of 1 c.s<sup>-1</sup>.
- Pulse mode operating range for a measurement equipment with a resolution shorter than the collection time of the detector.
- Fluctuation operating range measured on equipment with a 1 to 30 kHz band pass.
- Current mode operating range: the lower limit of the current mode operating range depends on the electronics (especially on the input amplifier) and on the signal / parasitic current ratio (parasitic current = leakage current + gamma current +  $\alpha$ -current). The upper limit is depending both on the detector and electronics (loss of linearity).
- Flux corresponding to a 1 % sensitivity loss of the detector.
- For sensible fission chambers ( $s > 0.1$  c.s<sup>-1</sup>/n.cm<sup>-2</sup>.s<sup>-1</sup>), the  $\alpha$ -current is predominant in relation to the leakage current from the insulators. The insulating resistance is then measured by the ratio  $\Delta U/\Delta I$  of the I=f(U) curve determined without any ionizing radiation.
- Charge collection time: the measured value depends on the electronics and on the cable capacitance.
- The use of a gas mixture (Ar + N<sub>2</sub>) increases the electron velocity and therefore favours a short collection time.
- This is the smallest irreversible curvature radius.
- In order to avoid humidity penetration during storage, the connector is closed with a cap to be removed just before use. As a general rule, prevent any humidity penetration at the connection level (refer to "Instructions for use and handling" in the package). Other connector types are possible on special request.

Max operating temperature of detector and cable: 250 °C

Unless otherwise stated, all characteristics are given at 20°C and dimensions in mm.