Product specification

Neutron detector CFUH08

Out-core fission chamber with integral cable

Application

- ✓ Detection of thermal neutrons in a wide flux range of 0.2 to $2x10^{12}$ $n.cm^{-2}.s^{-1}$

Features

- ✓ Wide range
- ✓ Two groups of electrodes:
  G1 for source and intermediate range
  G2 for current range

Nuclear characteristics at 20°C			
Sensitivity to thermal neutrons [1]:	Pulse mode (G1)	4	$c.s^{-1}/n.cm^{-2}.s^{-1}$
	Fluctuation mode (G1) [2]	$1.6x10^{-25}$	$A^2.Hz^{-1}/n.cm^{-2}.s^{-1}$
	Current mode (G2)	10^{-14}	$A/n.cm^{-2}.s^{-1}$
Neutron flux range:	Pulse mode [3]	0.2 - $2x10^5$	$n.cm^{-2}.s^{-1}$
	Fluctuation mode	$2x10^3$ - $7x10^{10}$	$n.cm^{-2}.s^{-1}$
	Current mode [4]	10^5 - $2x10^{12}$	$n.cm^{-2}.s^{-1}$
Gamma sensitivity:		$3.4x10^{-8}$	$A/Gy.h^{-1}$
Exposure limits:	Thermal neutrons [5]	max $2x10^{19}$	$n.cm^{-2}$
Gamma radiation:	Exposure	max 10^9	Gy
	Dose rate	max 10^4	$Gy.h^{-1}$

Electrical characteristics			
Insulating resistance at 600V [6]:	Nominal at 20°C	min 10^{12}	Ω
Operating voltage:	Nominal up to 250°C	600	V
	Maximum at 20°C	800	V
	Limit with no radiation	1300	V
Charge collection time [7]:		150	ns
Detector:	Capacitance	1200	pF
Cable:	Capacitance	170	pF
	Characteristics impedance	50	Ω
	Attenuation	0.34	dB/m

Mechanical and physical characteristics				
Detector:	Materials:	Case, electrodes	Aluminium	
		Insulator	Al_2O_3	
		Brazing	AgCu	
	Sensitive layer:	Uranium enriched in ^{235}U	>90%	
		Mass	G1: 1.8	$mg.cm^{-2}$
			G2: 0.5	$mg.cm^{-2}$
Filling gas [8] (pressure)			Argon + 4% nitrogen (at 250 kPa)	
Dimensions:	Nominal diameter		80	mm
	Detector length		410	mm
	Overall length, on request [9]		max 12	m
	Sensitive length		G1: 220	mm
			G2: 100	mm
Cable:	Type [10]: high immunity, mineral insulator		G1: 6 coax G2: 4 coax	
	External diameter		G1: 6mm G2: 4mm	
	Insulator		MgO	
	Curvature radius [11]		G1: min 60mm G2: min 40mm	
Connector:	Type [12]		Watertight, HN	
	CFUH08/F [9]		Female	
	CFUH08/M [9]		Male	
	Insulator		Al_2O_3	

Notes.

Unless otherwise stated, all characteristics are given at 20°C

[1] Values depending on the characteristics and the calibration of the measurement equipment. The pulse sensitivity is calculated from the (α–neutron) discrimination curve for a discriminating threshold corresponding to a counting rate of 1 $c.s^{-1}$.

[2] Fluctuation mode sensitivity is given for a 10 to 100 kHz pass band.

[3] Pulse mode operating range for a measurement equipment with a resolution shorter than the collection time of the detector.

[4] 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 + α-current). The upper limit is depending both on the detector and electronics (loss of linearity).

[5] Flux corresponding to a 1 % sensitivity loss of the detector.

[6] For sensible fission chambers (s > 0.1 $c.s^{-1}/n.cm^{-2}.s^{-1}$), the α-current is predominant in relation to the leakage current from the insulators. The insulating resistance is then measured by the ratio ΔU/ΔI of the I=f(U) curve determined without any ionizing radiation.

[7] Charge collection time: the measured value depends on the electronics and on the cable capacitance.

[8] The use of a gas mixture (Ar + N_2) increases the electron velocity and therefore favours a short collection time.

[9] The type of connector (male or female) as well as the overall length (detector+cable+connector) constitute the version code to be mentioned in the detector reference after the basic type number. For example CFUG08/F5 indicates a detector with a female connector and a 5 m overall length.

[10] Our "6 coax" cable is the 1 Zs FCAc 60 referenced cable from Thermocoax. The "4 coax" cable is the 1 Zs FCAc 40 referenced cable from Thermocoax.

[11] This is the smallest curvature radius allowing one reversible deformation.

[12] 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.

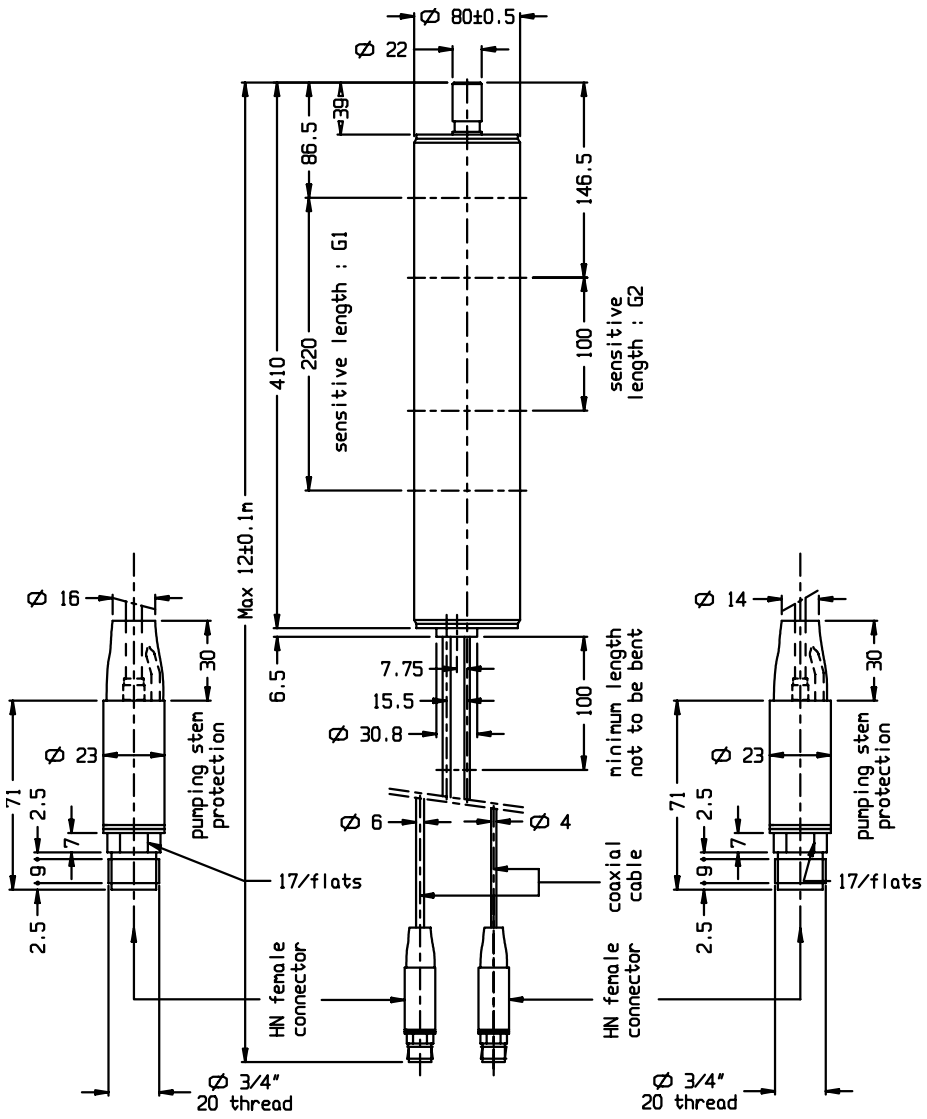
[13] Including temperature increase due to gamma radiation (effective above 10^4 $Gy.h^{-1}$). The maximum operating temperature is indicated for pulse operating mode. The leakage current in the cable increases rapidly with temperature. It is therefore necessary to take into account this characteristic, which limits the maximum temperature so that the ratio of wanted signal/parasitic signal remains acceptable.

[14] Vibration test conditions: frequency 60 Hz, amplitude ± 1.5 mm.

Neutron detector

CFUH08

Outline (dimensions in mm)



Limiting values	Max
Operating temperature [13]	250 °C
Vibration (any axis) [14]	200 $m.s^{-2}$
Shock (perpendicular axis)	500 $m.s^{-2}$