framatome

EXCORE NEUTRON DETECTORS

For nuclear reactors

Introduction

For more than 50 years, Framatome has designed, manufactured, integrated, installed and maintained excore neutron detectors, as well as all the related electronics (processing and packaging) and accessories (connectors, coaxial and triaxial cables).

These detectors measure the neutron flux of all types of nuclear reactors, and continuously monitor the precise power of the reactor, as well as power fluctuations and power distribution in the core of the reactor.

Excore neutron detectors are therefore essential for the safety of nuclear reactors, throughout all operating phases.

To this end, Framatome uses different detector technologies, either designed and manufactured by its teams based in Grenoble in France, or embedded in its detector assemblies.

With references on more than 120 nuclear reactors of all types across the globe and more than 50 years of experience in this field, Framatome has access to unique operating experience related to the operation of these products.

This experience also paves the way for our teams to design specific products tailored to the requirements and specialized needs of our customers around the world.

Overview

Framatome excore neutron detectors are designed and manufactured to perform reliable measurements of the neutron flux of all types of nuclear reactors.

Nuclear Instrumentation System cabinets
Electronic cards and/or trains are used to supply the detectors, and to recover and process electrical signals from them

Electrical penetration
Not supplied by Framatome

Electrical building (BL) | **Reactor building (BR)**

Connecting plates or PPC
positioned above each well in which the detectors are located.
Plates used to connect reactor building extension cables to the detectors

Neutron detectors
Source range channels, intermediate range channels or power range channels, as required

Connection between the cabinets and electrical penetrations
Electrical building organic cable extensions used to route electrical signals (length can be defined upon request)

Connection between electrical penetration and reactor building extension cables
Organic or mineral extension cables used as a function of requirements to route electrical signals (length can be defined upon request)

The detectors supplied by Framatome cover the different neutron flux measurement ranges: source range, intermediate range and power range.

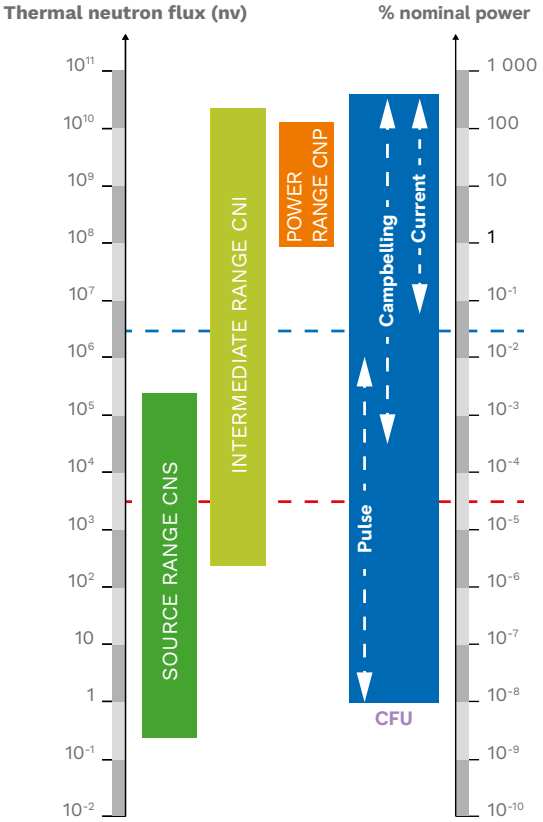
Depending on the measurement range, Framatome provides options for the integration of different types of excore neutron detectors:

- Boron-lined proportional counters (CPNB type), for source range measurements (low reactor power)
- Compensated boron-lined ionization chamber (CC type), for intermediate range measurements (average reactor power)
- Uncompensated boron-lined ionization chamber (CNC or CBL type), for power range measurements (full reactor power)
- Fission chamber (CFU type), for post-accident measurements

Our detectors can be adapted to all types of reactors (PWR, VVER, PHWR and research reactors). Several configurations are possible, depending on the type of reactor. Framatome has the expertise to define the most appropriate technical solution, in accordance with the requirements from the standards in force.

Framatome also designs and supplies all the qualified connections and accessories necessary for the optimal operation of the neutron detectors, from the extension cables to the connecting plates.

The different neutron flux measurement ranges



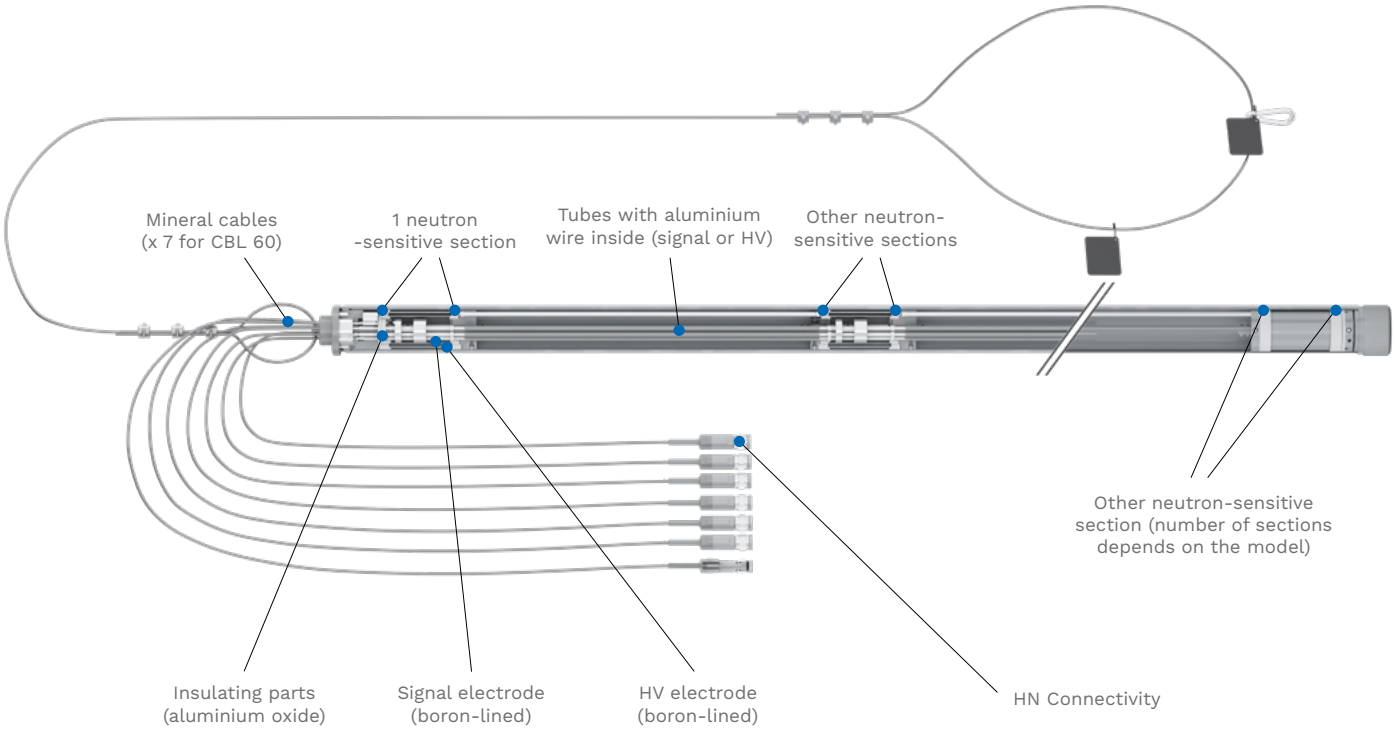
Several configuration options depending on customer requirements and needs.

Advantages for the customer

Framatome excore neutron detectors use proven and reliable technologies, specifically designed for all types of nuclear reactors.

The main advantages of our excore neutron detectors are:

- A comprehensive solution, including neutron detectors; connections including cables, connectors and connecting plates, as well as signal conditioning and processing electronics, using Spinline technology
- 50-years' experience in design, expert assessment and in-operation analysis, manufacturing, qualification, installation and maintenance of neutron detectors
- Unique operating experience stemming from the operation of our detectors
- Extended lifespan of our detectors
- A solution that is tailored to customer needs thanks to our ability to design and manufacture specific solutions (detector type, cable lengths, etc.)
- Provision of long-term support for the detectors, throughout their lifespan, through diagnostics, maintenance, repair and obsolescence management solutions
- Long-term support contracts signed with our main customers, which ensure that our skills and production resources are maintained



CBL60 uncompensated boron-lined ionization chamber - cross-section view

References

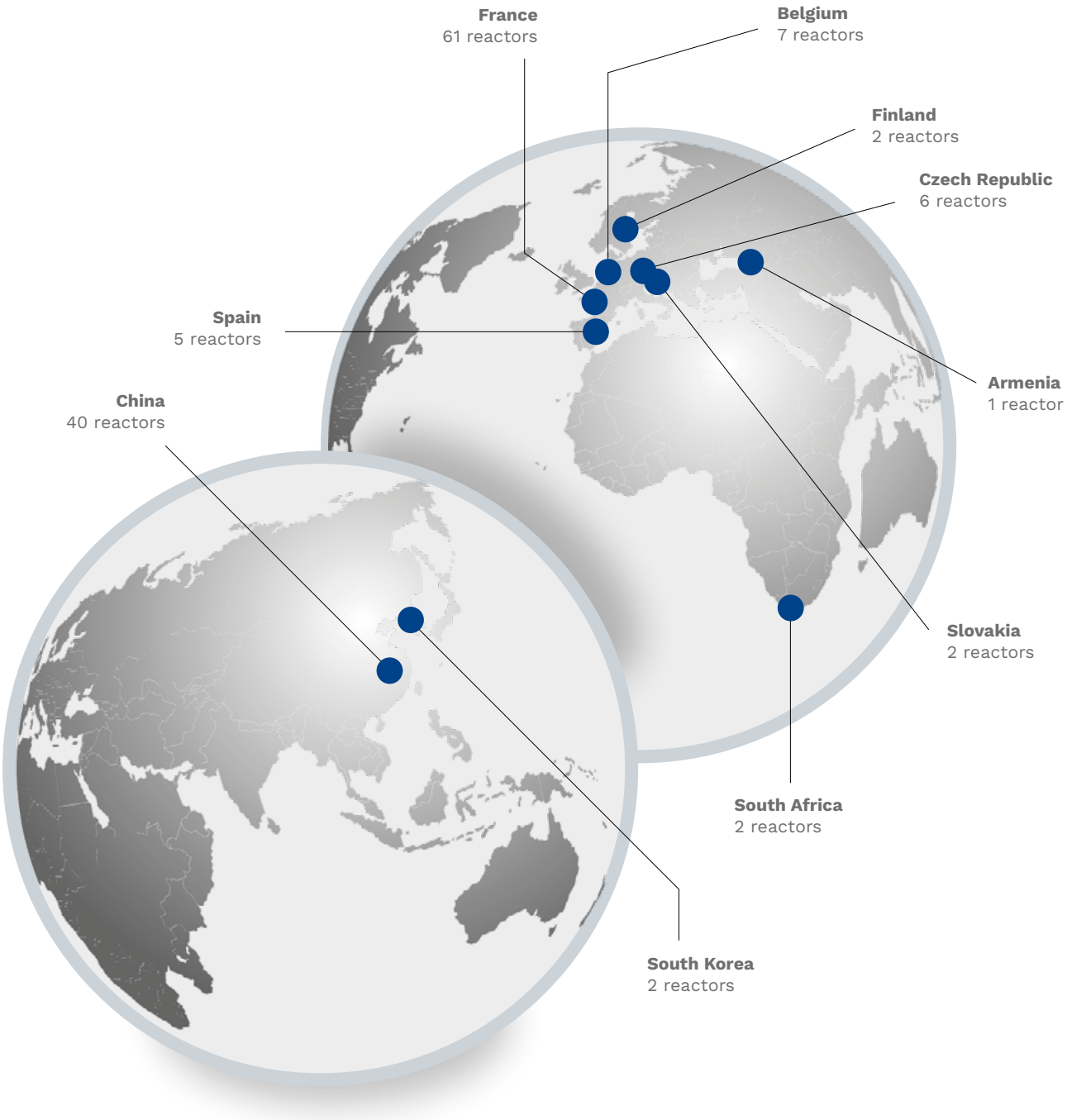
Our excore neutron detectors are installed on more than 120 reactors worldwide.

Over the years, Framatome has installed its excore neutron detectors on more than 120 nuclear reactors of all types in 10 different countries, thereby ensuring the safety and operation of many reactors.

For more than 50 years, our detectors have been installed in PWR, VVER, RBMK reactors and in research reactors.

They are installed throughout the French nuclear fleet managed by EDF and on the majority of nuclear reactors in China.

This unique experience in the nuclear industry makes Framatome the ideal partner.



Source/intermediate range neutron detector assemblies (CCA type)

Description

CCA-type assemblies, designed and manufactured by Framatome, are designed to accommodate one or more source or intermediate range neutron detectors, for the detection of source range or intermediate range thermal neutrons.

As such, they may include:

- Proportional counters (CPNB)
- Compensated ionization chambers (CC)
- Fission chambers (CFU), requiring specific studies

Our CCA assemblies provide up to three functions:

- The detectors and their cables are positioned in front of the core
- The detector's housing is electrically insulated from the mechanical earthing of the reactor, using insulating blocks at each end of the container
- The thermalization of incident neutrons, depending on the models

Main characteristics of generic references of source/intermediate range neutron detector containers

Reference	Diameter	Height	Max. temperature (excluding accident situations)	Special features
CCA-12	172 mm	3373 mm	80°C continuous/ 156°C in accident conditions	Insert to guide and shape the cables. Cable exit from the top of the container. Handling using lifting cable. With thermalizer and insulation. Source channel: CPNB-44 Intermediate channel: CC-80
CCA-30	200 mm	4100 mm	80°C continuous/ 156°C in accident conditions	Insert to guide and shape the cables. Cable exit from the top of the container. Handling using lifting rings. With thermalizer and insulation. Source channel: CPNB-44 Intermediate channel: CC-80
CCA-60	90 mm	491.4 mm	80°C continuous/ 156°C in accident conditions	Cable exit using lights. Handling strap. With insulation - Without thermalizer. Has a single detector: CC-83 VV
CCA-61	90 mm	932 mm	80°C continuous/ 156°C in accident conditions	Cable exit using lights. Handling strap. With insulation - Without thermalizer. Has a single detector: CPNB-44

General technical characteristics		
Material	Metal parts	High-purity aluminium
	Insulators	Aluminium oxide or high-density polythene depending on the model
Electrical	Isolation resistance under 500 VDC	$\geq 10^6$ Ω
Lifting & Handling	Weight of equipped CCA	6 to 128Kg depending on the product
Environmental	Max. pressure (Containment tightness test)	7 bar

Framatome also designs customized solutions, tailored to your needs.
Feel free to contact us for any specific requirements!

Power range assemblies (EPC)

Description

Power range assemblies (EPC), designed and manufactured by Framatome, are designed to accommodate power range neutron detectors (CBL) for the detection of thermal neutrons during power operations. They can contain up to the equivalent of six uncompensated ionization chambers.

Our EPC power range assemblies provide three functions:

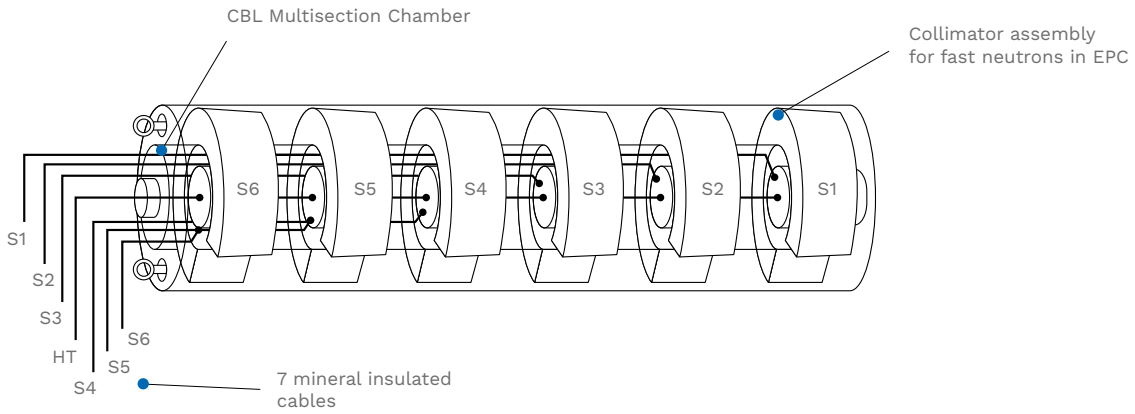
- The positioning of sensitive sections in front of the core
- The electrical insulation of the detector's housing from the mechanical earthing of the reactor
- The thermalization and collimation of incident neutrons

Our power range assemblies EPC make it possible to thermalize, detect fast neutrons coming from the core and stopping those coming from another direction (collimator).

This principle improves the image of the axial power distribution.

Main characteristics of generic references of power range assemblies (EPC)

Reference	Diameter	Height	Max. temperature	Use
EPC-15	200 mm	3573 mm	120°C	Equipment dedicated to Power Range Channels
EPC-60	200 mm	3960 mm	120°C	Collimation of fast neutrons coming from the core Thermalizer Insulator
EPC-26	180 mm	3444 mm	120°C	Handling using lifting ring



Assembly of an EPC collimator

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Uncompensated boron-lined ionization chambers multi-section (CBL type)

Thermal neutron flux measurement in power range.

Description

The uncompensated boron lined ionization multi-section chambers are designed and manufactured by Framatome for the measurement of thermal neutron flux at power range on large reactor cores.

Power range detectors (CBL) are ionization chambers that typically have two or six sections sensitive to thermal neutrons

Each section consists of two concentric electrodes lined with a boron coating sensitive to neutrons

Several cables are integrated in our CBL detectors:

- A cable for high-voltage polarization
- The other cables to transmit the current from each of the sensitive sections (between two and six cables according to the model, one per section)

Our detectors may be fitted with a lifting sling for handling purposes.

They can be integrated into EPC-type assemblies for power range measurements.

Main characteristics of generic references of uncompensated ionization chambers multi-section (CBL)

Reference	Diameter	Height	Max. temperature (excluding accident conditions)
CBL-15	80 mm	3443 mm	120°C
CBL-60	80 mm	3853 mm	120°C
CBL-16	80 mm	3193 mm	120°C
CBL-26	80 mm	3353 mm	120°C
CBL-41	80 mm	2839 mm	120°C

All chambers are equipped with integrated mineral insulated cables.

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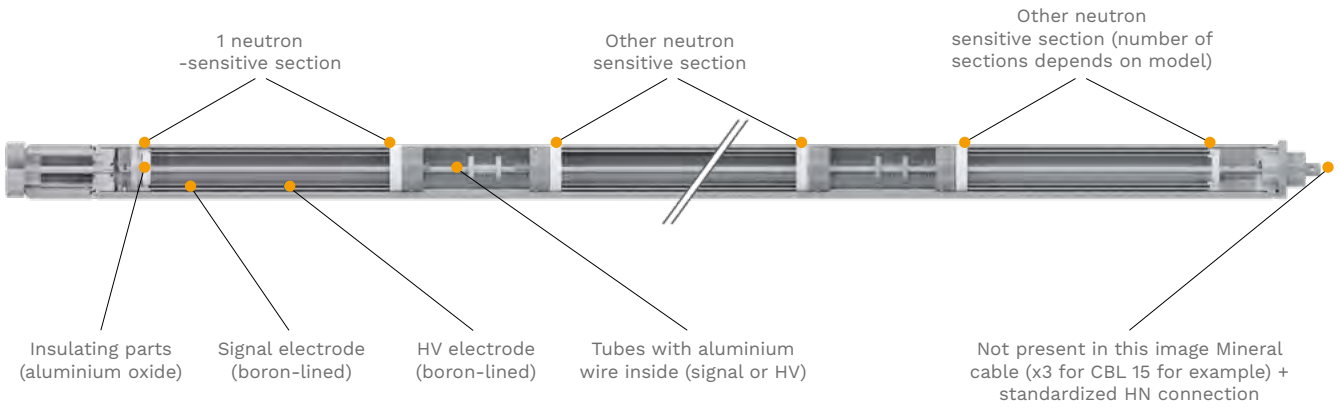
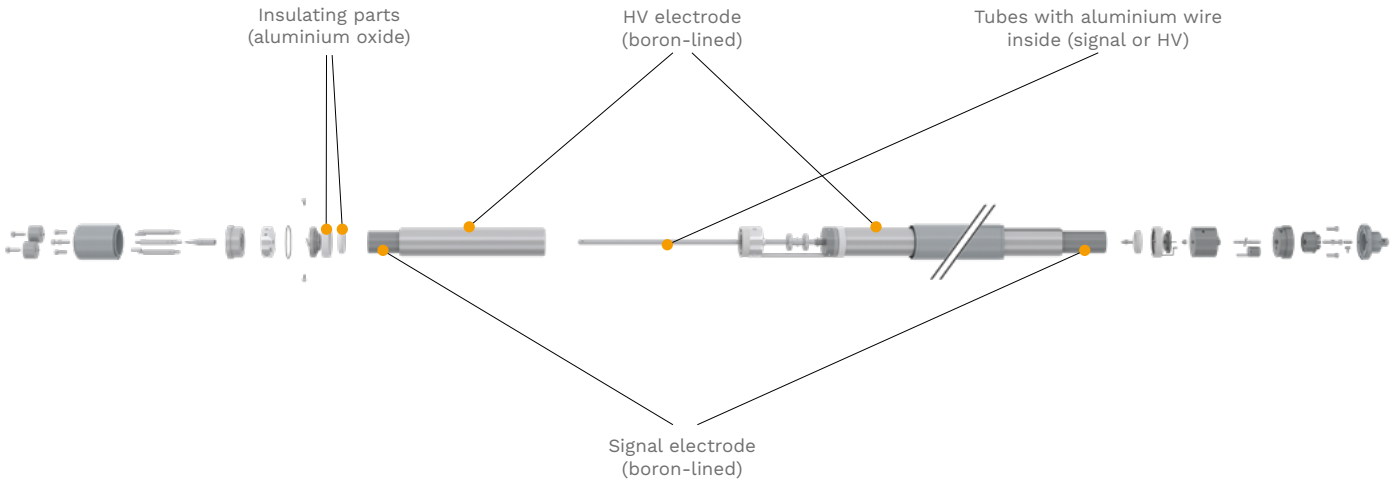
Uncompensated boron-lined ionization chambers multi-section (CBL type)

Thermal neutron flux measurement in power range.





CBL15 uncompensated boron-lined ionization chamber - Cross-section view and exploded view

Uncompensated boron-lined ionization chambers single-section (CNC type)

Thermal neutron flux measurement in environments with low gamma contribution.

Description

Uncompensated ionization chambers single-section (CNC) are designed and manufactured by Framatome for measuring thermal neutron flux at power range on small reactor cores

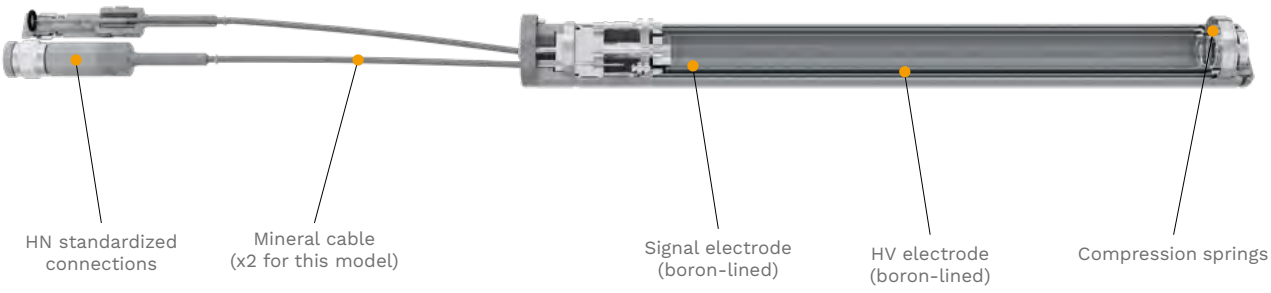
They consist of two concentric electrodes with surfaces lined with a neutron-sensitive boron coating.

Two cables are included in our detectors:

- A cable for high-voltage polarisation
- A cable to transmit the current collected by the signal electrode

Main characteristics of generic references of uncompensated ionization chambers CNC-50

Reference	Diameter	Height	Max. temperature (excluding accident conditions)
CNC-50	49 mm	476 mm	120°C



Uncompensated boron-lined ionization chamber CNC50 - cross-section view

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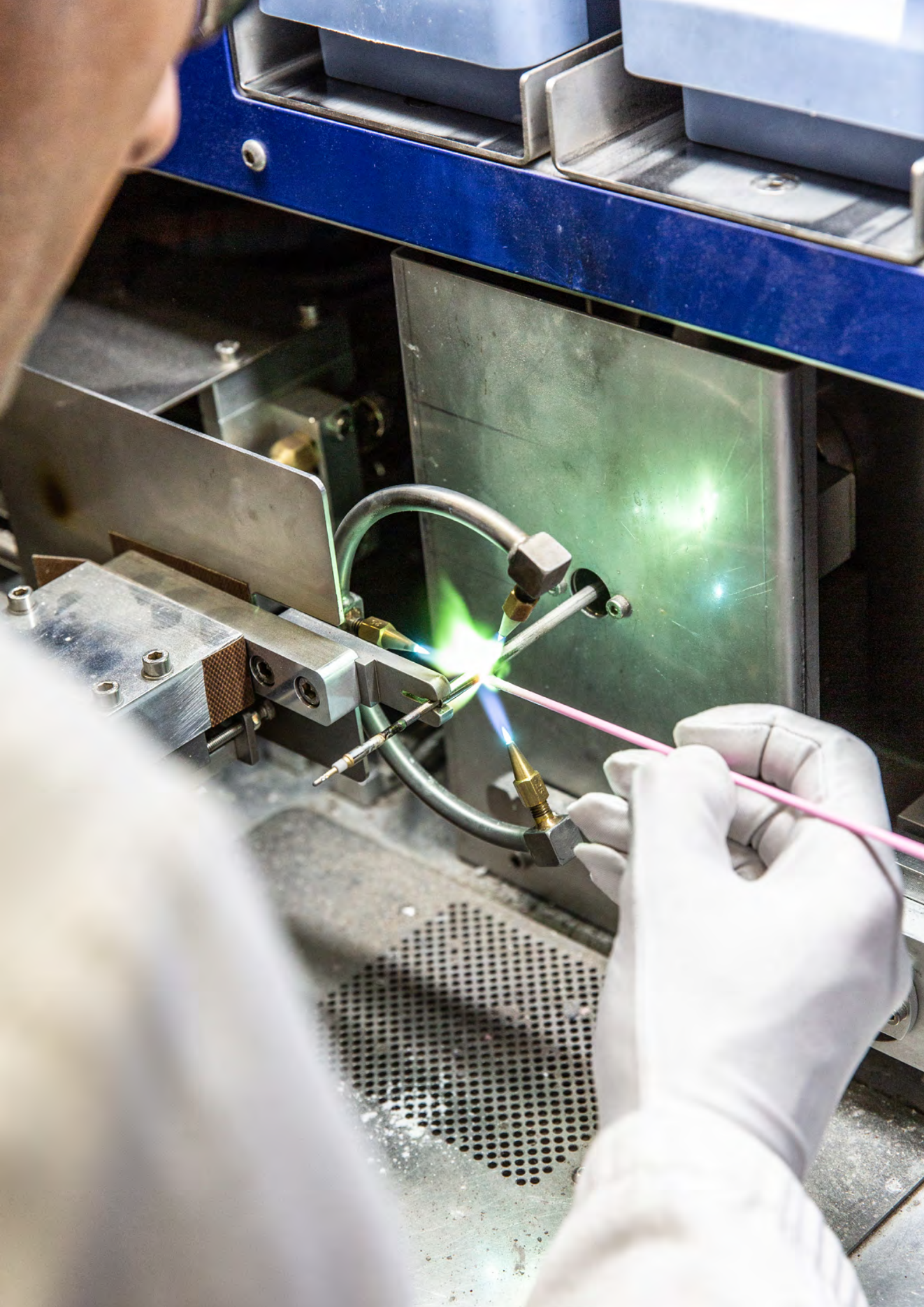

Compensated ionization chamber (CC type)

Thermal neutron flux measurement with compensation for gamma background noise.

Description

Boron coated compensated ionization chambers are designed and manufactured by Framatome for the measurement of thermal neutron flux with gamma background compensation. They are used at the intermediate power range and deliver a signal for a thermal neutron flux typically in the range of 10^2 to 1010 n/cm²/s.

The detector is made up of three electrodes forming two separate ionization chambers, with a common electrode to collect the charges. The surfaces of the first chamber are coated with a boron coating, it is sensitive to thermal neutrons and gamma rays. The surfaces of the second chamber have no coating, it is only sensitive to gamma radiation.

These two chambers are polarized with opposite voltages so that the common electrode delivers a current equal to the subtraction of the currents of the two chambers. By adjusting the compensation voltage on the gamma chamber, a large part of the signal induced by the gamma radiation is suppressed.

Three cables are incorporated into the detector:

- Two cables for high-voltage polarization
- A cable to transmit the collected current

A compensated ionization chamber can be integrated in a CCA-type assembly.

Main characteristics of generic references of compensated ionization chambers

Reference	Diameter	Height	Max. temperature (excluding accident conditions)
CC-80	80 mm	573 mm	120°C
CC-83 VV	84 mm	302.5 mm	120°C

For all our references, the cable lengths can be customized.

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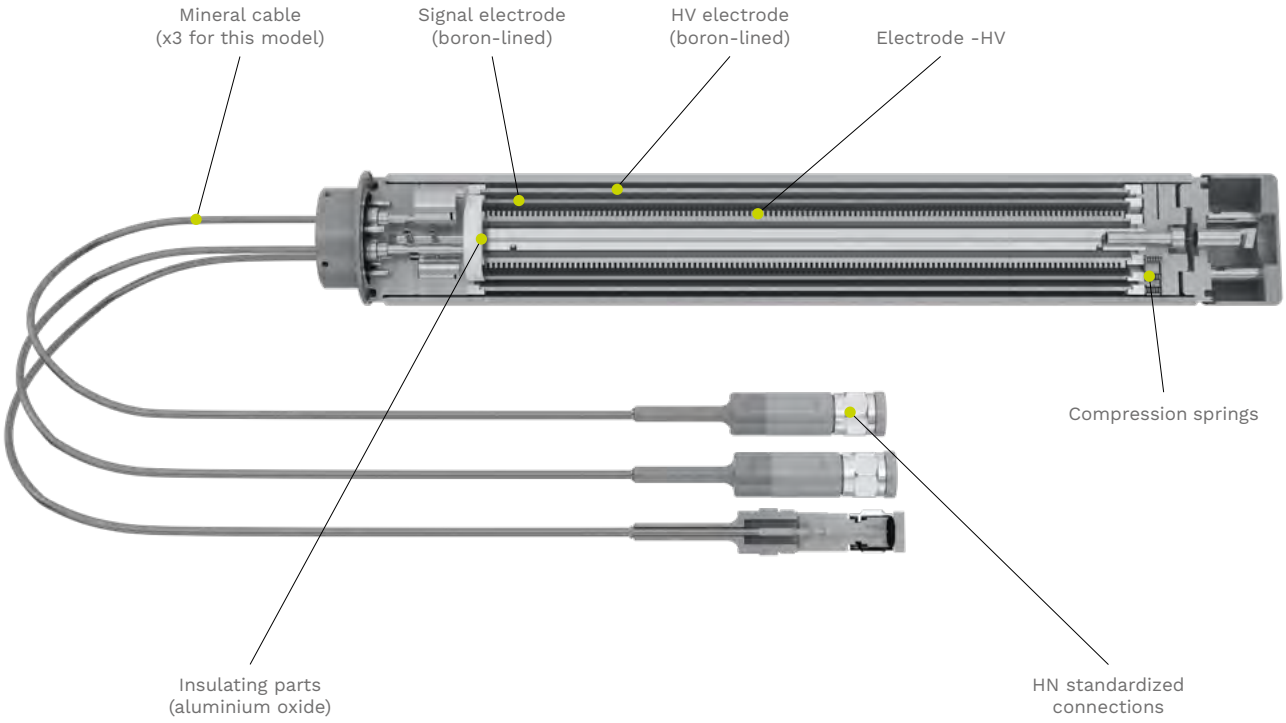
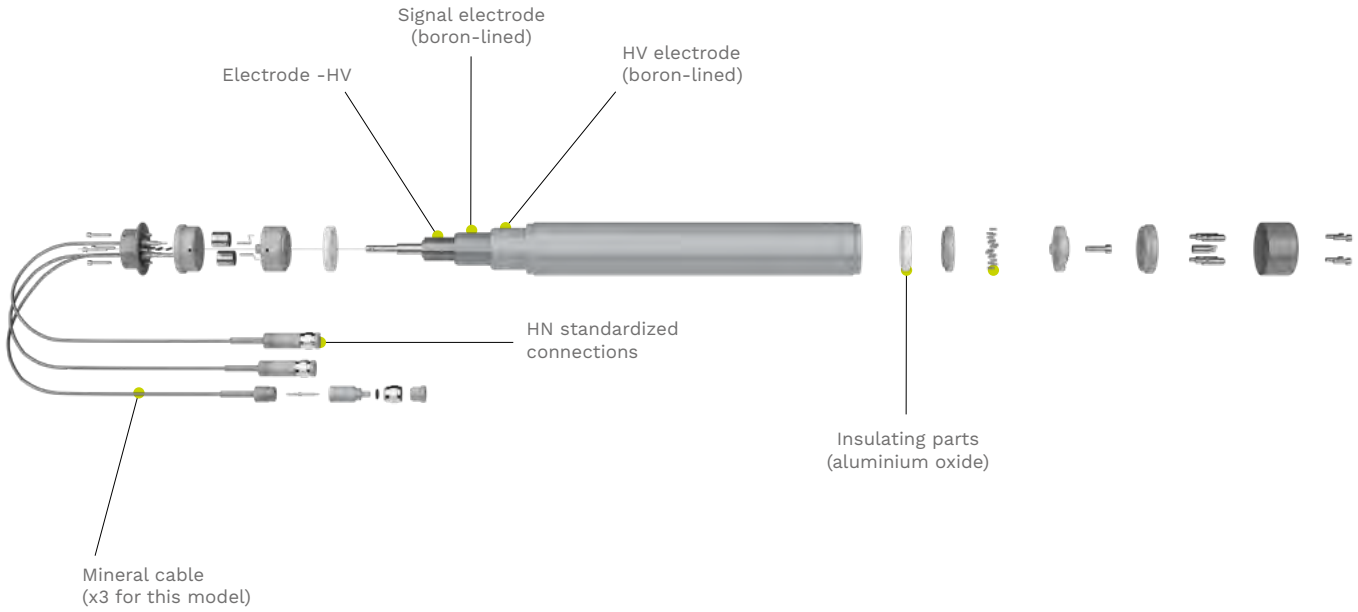
Compensated ionization chamber (CC type)

Thermal neutron flux measurement with compensation for gamma background noise.





Boron-lined ionization chamber, compensated CC80 - Cross-section view and exploded view

Boron coated proportional counter (CPNB type)

Measurement of thermal neutron flux in the presence of a limited gamma dose rate.

Description

Proportional counters are neutron detectors, consisting of a cathode, an anode and neutron-sensitive material.

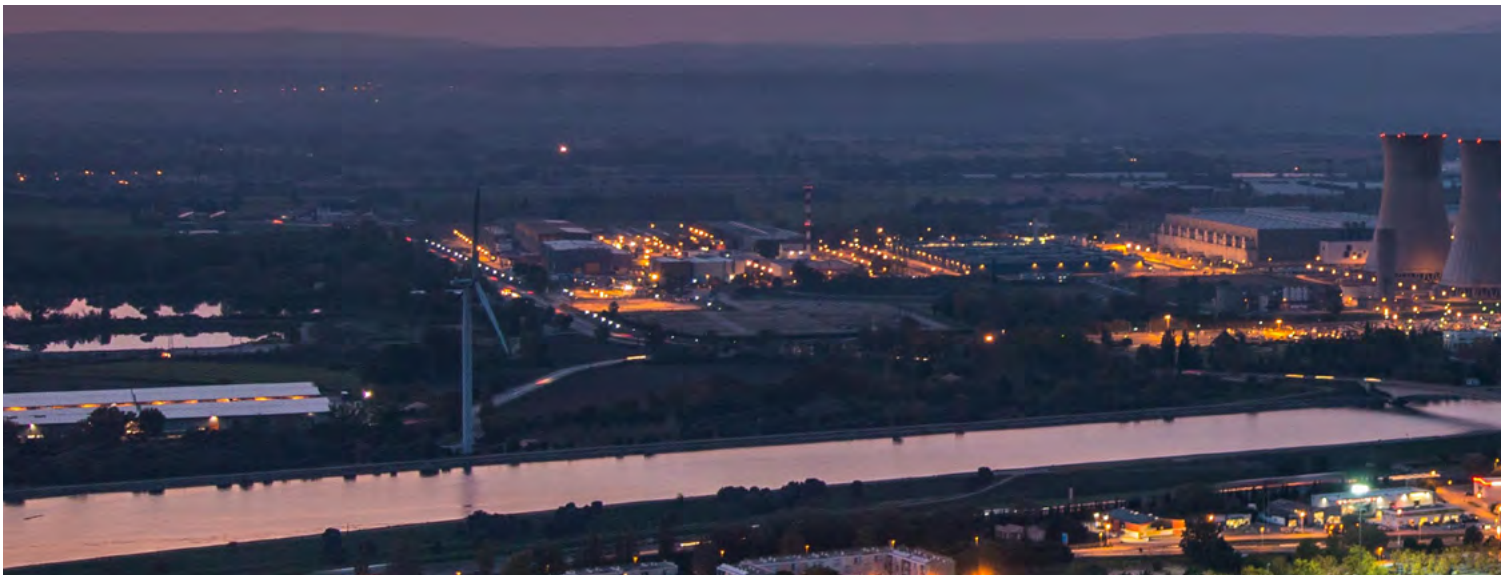
Boron deposition proportional counters have a good neutron sensitivity and have good gamma radiation influenceability characteristics. They are used at the source level.

Proportional counter

Range of proportional counter characteristics, integrated into our CCA type containers

Reference	Diameter	Height	Max. temperature (excluding accident conditions)
Boron-lined proportional counter range	from 25.4 mm to 76.5 mm	from 394 mm to 761 mm	200°C

Upon request, Framatome can conduct studies for their integration into CCA-type containers for neutron measurement at source level.



Fission chambers (CFU-Type)

Multi-mode neutron flux measurement in normal and post-accident conditions.

Description

Fission chambers are ionization chambers coated with enriched uranium. They can measure the neutron flux over a wide range by delivering signals in three forms: pulses, current and campbelling. They can be used at three ranges of power: source, intermediate and power.

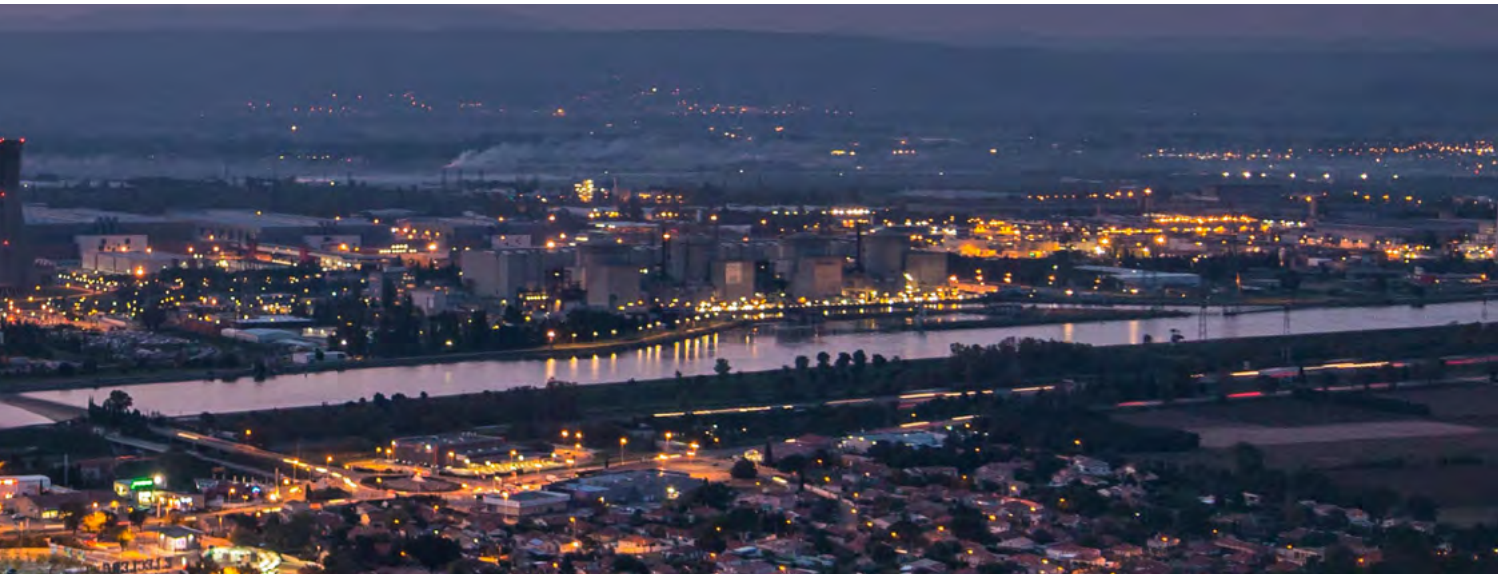
They are caracterized by their small influenceability to gamma radiation and therfore have a remarkable ability to operate under normal, accidental and post-accidental conditions. They easily discriminate between neutrons and gammas, in pulse and campbelling mode

Fission chamber

Range of fission chamber characteristics, integrated into our CCA type containers

Reference	Diameter	Height	Max. temperature (excluding accident conditions)
FC range	from 6.2 mm to 89 mm	from 45.5 mm to 700 mm	from 140°C to +550°C

Upon specific request, Framatome can conduct studies for their integration into CCA-type containers for neutron measurement at source level.



Connection and accessories

A set of qualified connections and accessories for optimal operation of neutron detectors.

Description

Framatome studies, designs and supplies all connection accessories used to connect our excore neutron detectors to the measuring electronics, whether they are:

- Integrated cables
- Connecting plates (PPC)
- Mineral, coaxial or triaxial cables, or organic cables for reactor building signals
- Organic cables to transmit signals to the cabinets in the electrical building

Separate equipment available

Type of equipment	Use	Characteristics
Connection plate	To secure the cables and collect neutron detector signals at the top of the reactor pit	Dimensions in accordance with customer's request Cable clamp of any diameter Insulating flanges
Connectors and penetrations	For reactor building and electrical building connections	Male or female Option: leaktight connection
Tool box	For the maintenance of detectors and cables	Tools dedicated to connector assembly Tools for removing the seals
Consumables	For the maintenance of detectors and cables	Tape and insulating ducts

Standard configurations

<table>
<tr><th rowspan="2">Type of train</th><th>Detector</th><th>Connecting plates (PPC)</th><th>Male connector</th><th>Reactor building extension cable</th><th>Male connector</th><th colspan="4">If auxitrol penetration</th><th>Female penetration (cabinet level)</th><th>Strap (internal cabinet)</th></tr>
<tr><th>Standard</th><th>Specific</th><th>Standard</th><th>Standard</th><th>Standard</th><th>Electric penetration</th><th>Male connector</th><th>Electrical building extension</th><th>Male connector</th><th>Standard</th><th>Standard</th></tr>
<tr><td rowspan="3">CNS</td><td rowspan="3">CPNB44</td><td rowspan="3">Triax PPC
Coax PPC
ELSA PPC</td><td colspan="3">Triax extension cable for source range channel with connectors</td><td rowspan="12">Not provided</td><td rowspan="3">6-side coax connector</td><td rowspan="3">Organic impulse Coax connector</td><td rowspan="3">6-side coax connector</td><td rowspan="3">Leaktight female penetration HN</td><td rowspan="3">6-side impulse strap</td></tr>
<tr><td colspan="3">Mineral coax source range channel incorporating connectors</td></tr>
<tr><td>6-side coax connector</td><td>Organic impulse Coax connector</td><td>6-side coax connector</td></tr>
<tr><td rowspan="3">Intermediate range channel</td><td>CC80</td><td rowspan="3">Triax PPC
Coax PPC
ELSA PPC</td><td colspan="3">Triax current extension with connectors</td><td rowspan="3">6-side coax connector</td><td rowspan="3">Coax organic current</td><td rowspan="3">6-side coax connector</td><td rowspan="3">Leaktight female penetration HN</td><td rowspan="3">6-side current strap</td></tr>
<tr><td>CC83</td><td colspan="3">Mineral coax current with connectors</td></tr>
<tr><td>CC54</td><td>6-side coax connector</td><td>Coax organic current</td><td>6-side coax connector</td></tr>
<tr><td rowspan="3">Power range channel</td><td>CBL60</td><td rowspan="3">Triax PPC
Coax PPC
ELSA PPC</td><td colspan="3">Mineral coax current with connectors</td><td rowspan="3">6-side coax connector</td><td rowspan="3">Coax organic current</td><td rowspan="3">6-side coax connector</td><td rowspan="3">Leaktight female penetration HN</td><td rowspan="3">6-side current strap</td></tr>
<tr><td>CBL15</td><td colspan="3">Triax current extension with connectors</td></tr>
<tr><td>CBL26</td><td>6-side coax connector</td><td>Coax organic current</td><td>6-side coax connector</td></tr>
</table>

Framatome also designs customized solutions, tailored to your needs.
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Connection and accessories

Connection plate (PPC): To hold the neutron detector cables and ensure their connection at the top of the reactor pit.

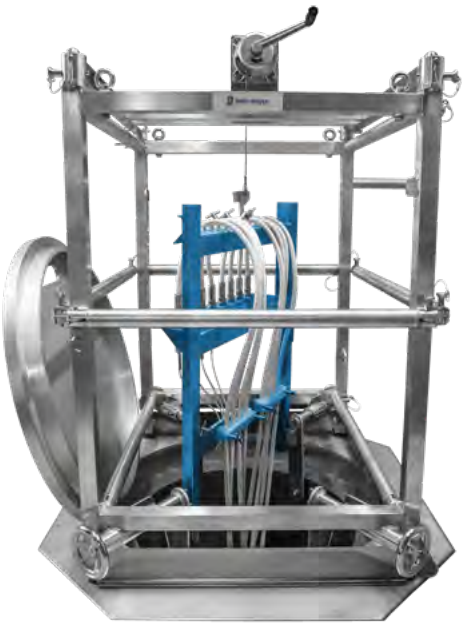
Description

The connection plate ensures the connection between the integrated cables in the excore neutron detector and the cables used to exit the reactor building, as well as their mechanical maintenance in the pit.

Depending on the type of detectors and the type of plant, the connecting plates differ in general size and the number of HN penetrations.

Technical characteristics of connecting plates (coaxial / triaxial), for power channel (EPC type) and for source/intermediate channels (CCA type)

General technical characteristics		
Material	Frame - Mechanical structure	Stainless steel
	Clamp - Metal parts	Stainless steel
	Clamp - Insulating	Epoxy resin
	Connector - Metal parts	Stainless steel
	Connector - Insulating	Aluminium oxide
Mechanical	Outline dimensions	Depending on the pits on plant
	Weight	Between 8Kg and 18Kg
	Type of leak-tight connection	Female HN
	Number of connections	Depending on the type of detector
Electrical	Cable core/shielding isolation (on HN penetration) under 500 VD	$\geq 10^{12}$ Ω
	Isolation of shielding/earth under 500 VDC	$\geq 10^{10}$ Ω
Environmental	Max. temperature in continuous operation	80°C
	Max. occasional temperature	120°C
	Max. pressure (Containment tightness test	7 bar
	max gamma flux	1000 Gy/h
	Max gamma exposure	10^9 Gy



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PPC connection plate, with SWIT tools

Connection and accessories

Coaxial, minerals/organic extension cables.

Description

Our excore neutron detectors are connected to the measuring electronics through their integrated cables, mineral cables used to take signals out of the reactor building to the cabinets and organic cables to transmit the signals in the electrical building to the cabinets.

Depending on their length, the extension cables:

- Cross the entire reactor building, from the connection plate to the containment penetration
- Cross the conduit at the reactor pit exit. They facilitate maintenance in areas with high temperatures and radiation conditions

Our coaxial mineral extension cables:

- Are free of organic material and therefore have exceptional resistance to temperature and radiation
- Are used for signal output, regardless of whether they are impulse or current signals

They are designed and supplied by Framatome as a kit or pre-assembled.

Main characteristics of generic references of coaxial extension cables, organic or mineral,

Reference	Cable type	Max. temperature (excluding accident conditions)	Use
CP-597	Coaxial organic cable Antimicrophonic Non flame propagation	80°C	Transmission of signals from neutron detectors in the electrical building
CP-711	Coaxial organic cable High resistance to disturbances Non flame propagation	80°C	Transmission of signals from neutron detectors in the electrical building
CZ-23	Coaxial organic cable Antimicrophonic Non flame propagation Irradiation qualified	80°C	Transmission of signals from neutron detectors in the reactor building
CZ-24	Coaxial organic cable Antimicrophonic Non flame propagation Irradiation qualified	80°C	Transmission of signals from neutron detectors in the reactor building
Mineral extension cable 1ZsAcCAc40	Extended coaxial cable with mineral insulation	80°C	Extension cable for high dose rate areas in the reactor building Recommended for Intermediate and Power range neutron detectors
Mineral extension cable 1CCFAc40	Extended coaxial cable with mineral insulation	80°C	Extension cable for high dose rate areas in the reactor building Recommended for Source range neutron detectors
Mineral extension cable 1ZsAcCAc40	Coaxial transmission cable with mineral insulation, long length	80°C	Transmission of signals from Intermediate and Power range Channel from the reactor pit to the electrical building
Mineral extension cable 1CCFAc40	Coaxial transmission cable with mineral insulation, long length	80°C	Transmission of signals from the Source Range Channels, from the reactor pit to the electrical building

Connection and accessories

Extension cable, triaxial minerals.

Main characteristics of extension, minerals, triaxial cables

General technical characteristics		
Material	Cable - Outdoor duct	Stainless steel
	Cable joint - Metal parts	Stainless steel
	Cable joint - Insulating	Aluminium oxide
	Connectors - Metal parts	Stainless steel
	Connector - Insulating	Aluminium oxide
Mechanical	Leaktight connection	Male HN or female HN
	Minimum static bend radius.	50 mm
	Maximum 30° bend area from the front end of the connector	250 mm
	Weight	150 gr/m
Electrical	Insulation resistance between the conductor and the coaxial shield under 500 VDC	$\geq 10^{12}$ Ω
	Insulation resistance between the coaxial shield and the triaxial shield under 500 VDC	$\geq 10^{6}$ Ω
Current	Line resistance	< 0,2 Ω/m
	Linear capacity	160 pF/m
	Impedance	30 Ω
Pulse	Line resistance	< 0,1 Ω.m
	Linear capacity	106 pF/m
	Impedance	50 Ω
Geometric	Triaxial shielding diameter	5 mm
	Minimum length	1 M
	Maximum length	80 M
	Diameter on cable joints	12 mm
Environmental	Maximum temperature in continuous operation	80°C
	Maximum occasional temperature	120°C
	Maximum pressure (Containment tightness test)	7 bar
	Maximum gamma dose rate	1000 Gy/h
	Maximum gamma dose	10^{9} Gy
	Maximum relative humidity	100% with runoff
	Resistance to borated water run-off	Very good
	Accident conditions (current only)	K1 profile (24h)

Nuclear qualification

All our detectors are designed to meet the qualification requirements in accordance with international standards and the required operating conditions.

Our detectors have been approved by the safety authorities of various countries, such as Belgium, Bulgaria, China, the Czech Republic, France, India, South Africa, South Korea and Spain.

Standards

Our neutron detectors comply with the following standards:

- RCC-E: Rules for the design and construction of electrical equipment for nuclear islands
- IEEE 323: IEEE standard for the qualification of IE-class electrical equipment for nuclear power plants
- IEEE 344: IEEE procedure recommended for seismic qualification of class 1E equipment for nuclear power plants
- IEC Standards: Basic climatic and mechanical robustness tests (IEC 60068-1, IEC 60068-2-2, IEC 60068-2, IEC 60068- 2-6, IEC-60780-323, IEC-60980-344, IEC-60515)

Qualification displayed (RCCE)

- All products outside reactor building: K3
- All products inside reactor building: K2 mini
- All intermediate range channel-related products in the reactor building: K1-24h

Safety classification

All products conducting a signal/voltage: IPS-1E.

Triaxial extension cables

They are qualified according to RCC-E 2005 and according to standards IEC 60068-2-2, IEC 60068-2-6, IEC 60068-2-30.

The extensions dedicated to current transmission are qualified K1 or K2 (RCCE). The extensions dedicated to transmission in impulse mode are also qualified K2 (RCCE).

Quality management

Our neutron detectors are manufactured as part of a quality management system in accordance with the standards below.

- Quality management system (ISO9001):
  - IAEA GS-R-3: plant and activity management system - safety specifications
  - NRC 10CFR part 50 Appendix B - quality assurance criteria for nuclear power plants and fuel removal
  - NRC 10 CFR part 21 - information on non-conformities and defects
  - ANSI/ ASME NQA-1: quality assurance program requirements for nuclear plants
  - AFCEN RCC series- A5000: quality assurance
  - NQSA NSQ-100: Nuclear safety and quality management system - requirements
- Environment:
  - ISO 14001: environmental management system - requirements
- Radiation protection:
  - CEFRI SPE-E-0400 - CEFRI specification "E" relating to companies employing category A or B personnel working in nuclear plants

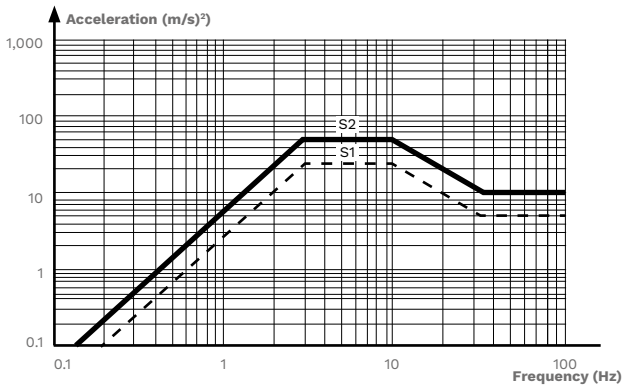
Framatome is able to carry out qualifications and justifications adapted to your needs. Do not hesitate to contact us for your specific needs.

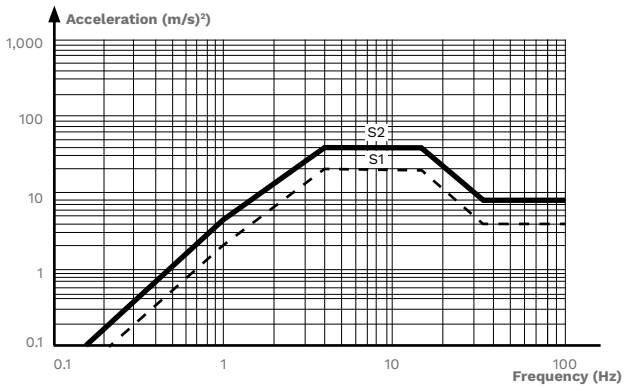
Seismic tests

Example of tests carried out on our neutron detectors:

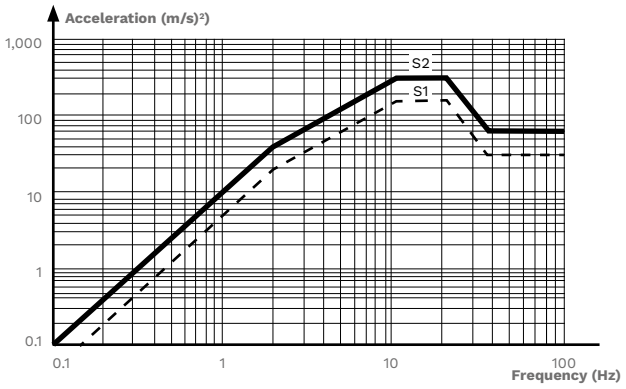
- Five cycles on S1 (seismic spectrum for any project - horizontal spectra): biaxial test on horizontal OX/OZ and vertical OX/OY axes
- One cycle on S2 (seismic spectrum of any project - vertical spectra): biaxial test on horizontal OX/OZ and vertical OX/OY axes

Tests are performed according to seismic spectra of components or seismic spectra of any project.





Seismic spectra for any project - horizontal Required Response Spectrum (RRS) spectra at S1 and S2 levels at 5% damping
Seismic spectra for any project - RRS vertical spectra at level S1 and S2 at 5% damping



Seismic spectra of components - horizontal and vertical spectra

Framatome is an international leader in nuclear energy recognized for its innovative, digital and value added solutions for the global nuclear fleet. With worldwide expertise and a proven track record for reliability and performance, the company designs, services and installs components, fuel, and instrumentation and control systems for nuclear power plants. Its more than 16,000 employees work every day to help Framatome's customers supply ever cleaner, safer and more economical low-carbon energy.

Visit us at www.framatome.com, and follow us on Twitter and LinkedIn.

Framatome is owned by the EDF Group (75.5%), Mitsubishi Heavy Industries (MHI – 19.5%) and Assystem (5%).

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