framatome

Components & Services
Techno bricks





Solutions Portfolio

Framatome’s overview





Framatome is an international leader in nuclear energy, recognized for its innovative and digital solutions, as well as its high value-added technologies for the global nuclear fleet. With worldwide expertise and strong references in terms of reliability and performance, the company designs, maintains, and installs components and fuels, as well as control-command systems for nuclear power plants. All of its employees enable Framatome's clients every day to provide an increasingly cleaner, safer, and more economical low-carbon energy mix.

Our organization supports the entire equipment lifecycle, from component replacement to performance optimization and technical assistance. By combining engineering capability, qualified manufacturing networks and strict quality management processes, we ensure high standards of safety, traceability and operational reliability.

Serving demanding industries such as power generation, oil & gas and heavy industry, we are committed to delivering cost-effective, flexible and technically sound solutions tailored to our customers' operational requirements. Our missions are to be a trusted long-term partner, offering competitive lead times, technical responsiveness and sustainable lifecycle support.

Framatome provides non-Original Equipment Manufacturer* products for new-build projects and obsolescence management, helping reduce reliance on single-source suppliers and enabling access to state-of-the-art technologies when OEM solutions are unavailable or not fit for purpose. Leveraging Framatome’s available industrial capacity, we supply fully compatible, qualified alternatives that support long-term operation, enhance plant availability and targeted modernization, and optimize lifecycle costs, all within a robust and diversified supply chain built on proven engineering and nuclear-grade quality.

* original manufacturer who designs, qualifies and supplies the equipment or component in its reference version.

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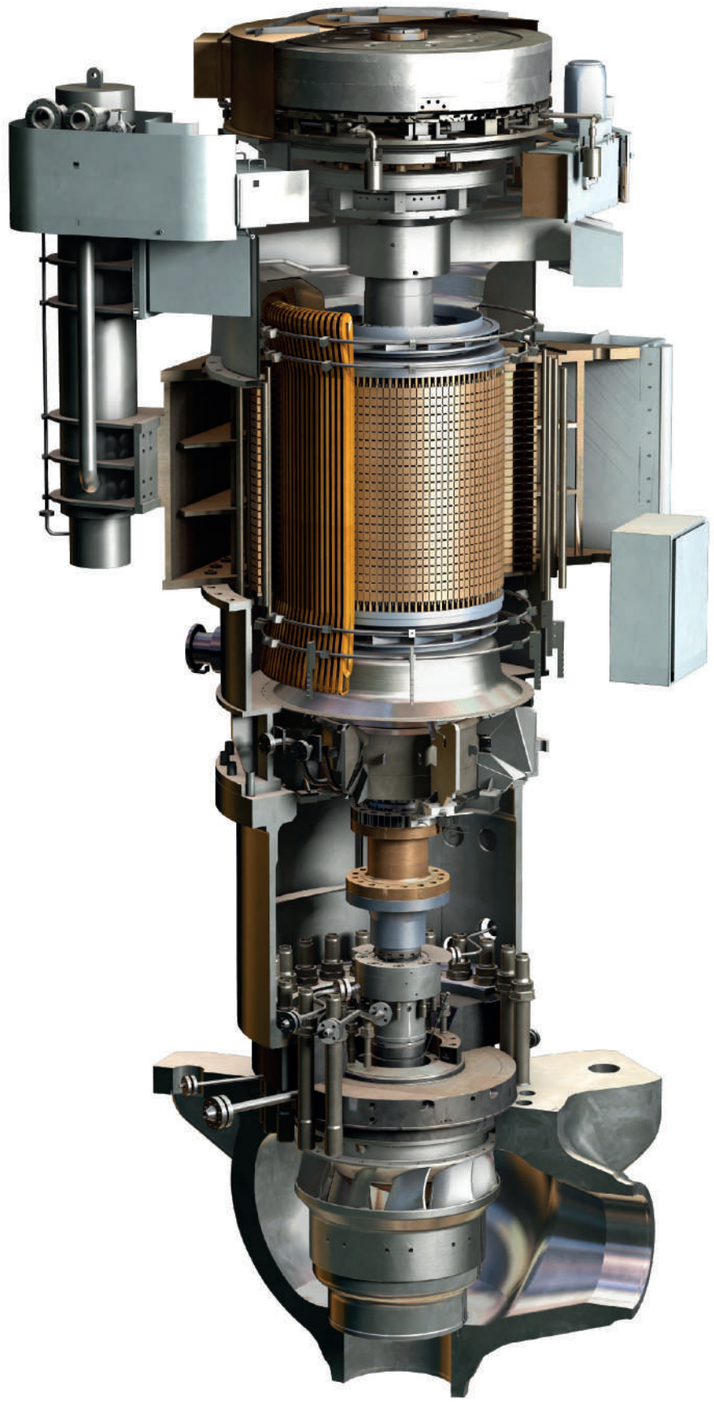
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Reactor coolant pump - *RCP*

Guarantying coolant water circulation and sealing for the primary loop

Framatome designs, customizes & qualifies RCP models. Available to SMR/PWR designers & operators.

Challenge

- Guarantee integrity, pressure control and ensure nuclear safety through circulating coolant for PWR reactors.
- Ensure both cooling of nuclear reactivity while securing long-lasting reliability.
- Design and manufacture according to the applicable instruction codes (ASME & RCC-M).

Solution

- Design a cartridge structure for enhanced inspection of hydraulic parts.
- Delivery with our 3 stage Hydrodynamic Shaft seal:longerlifetime(almosttwiceversusexisting technologies), easier to install, safer.
- Custom design adaptation can be proposed according to reactor operating conditions.
- Robust and reliable supply chain of manufacturing capacities.
- Expertise available for operating environments such as: BWR & PWR including SMR & VVER, CANDU.
- ISO certified, Framatome supports international regulations: ISO 17025, ISO 19943, ASME III d1.
- Service and maintenance ensured for decades.

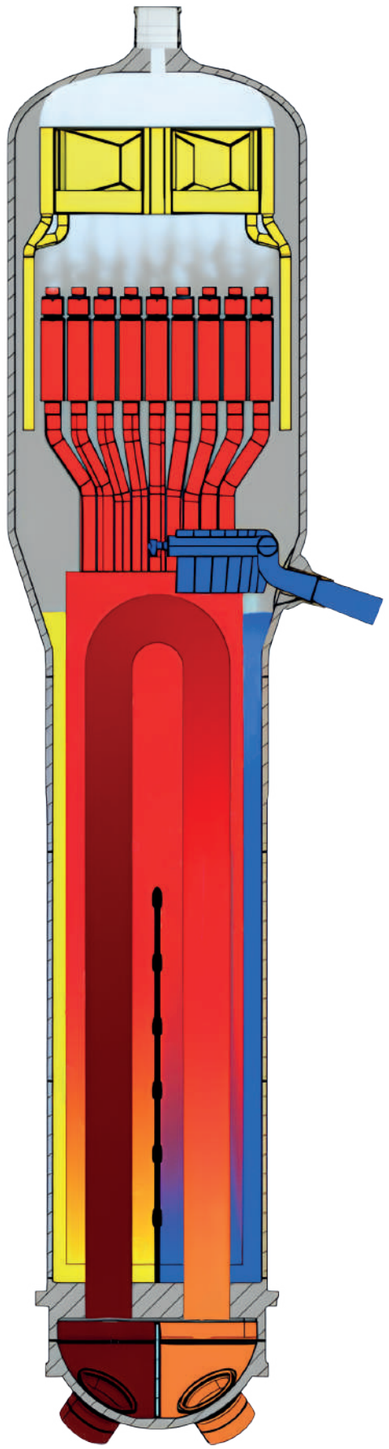
RCP	FJ1 serie	FJ2
Rating	300°C / 155 bars	1500 rpm
Flowrate	14 000m^3/hr | -26 000 m^3/hr	28 000 m^3/hr | -30 000m^3/hr
Pump efficiency	Up to 84%	Up to 80%
Bearings	3	4
Power	4-8 MW	8-11 MW
Casing	Molded -> FJ1-24 | Forged -> FJ1-28	Molted
Weight	<120 tons	122 tons
Height	<9,2m	9,3m

Customers benefits

- Proven 60 years lifetime.
- Spare parts available on demand : seald, impeller, diffuser, shaft & motor available.
- RCP's tested on Framatome's dedicated onsite testloop.
- Numerical models to manage RCP performance.

330
RCP manufactured and delivered since 1970

85
nuclear power plants equipped worldwide



Steam Generators

Holding pressure & safely transferring nuclear heat for Large & Small modular Reactors

Framatome designs, qualifies & manufactures several sizes of Steam Generator.

Challenge

The Steam Generator is a High integrity and Nuclear safety related component, which meets the requirements of applicable construction codes, such as ASME & RCC-M, and regulations as well (ESPN, YVL...). Conformity is demonstrated at each step of the manufacturing process, as per ISO 19443 requirements.

Solution

Framatome has continuously designed and manufactured several Steam Generators for Pressurized Water Reactors, successfully supporting its customers in ensuring either Lifetime Extension or Power Uprate of the operator's Nuclear Plant. Framatome Steam Generators are manufactured with 19.05mm 690TT Inconel tubes (except model F-47 with 22.22mm tubes) and all operate in primary conditions of 155 & up to 330°C. Framatome successfully manufactured OTSG* designed steam generators.

SG	F-33	F-47	F-55	F-60	F-67	F-74	F-79	F-86
Tube arrangement | AE = with Axial Economizer	Square	Square	Square	Triangle	Triangle (AE)	Square	Triangle (AE)	Triangle
Power per loop (MWth)	650	887-928	928	1.022	1.100	954	1.154	1.517
Achieved Power Uprate	+15%	Not done	Not done	+10%	+18%	+8%	+10%	+11%
Operating Outlet Pressure (bar)	56	56	62	62	66	69	77 (AE)	61
Outlet steam flow rate (kg/s)	353	504	505	564	572	580	650	760
Exchange surface (m^2)	3,346	4,707	5,574	6,035	6,729	7,442	7,997	8,599
Dry Weight (tons)	212	330	321	325	334	485	519	456
Height (m)	18	21	20,9	20,7	20,5	22,4	24,7	19
Upper & lower shell (m)	3.8-3	4.5-3.5	4.5-3.4	4.5-3.5	4.5-3.5	5.4-3.9	5.2-3.8	6-4.2

Customers benefits

- Safety & Quality conformity up to 60 years lifetime.
- Internationally trusted supplier in nuclear industry.
- Complete process managed at the plant engineering.
- Power uprate option: Framatome's Axial Economizer.

* A steam generator in which the feedwater passes through the heat exchanger only once and exits directly as steam.

45

Years of experience in manufacturing of heavy components for nuclear industry

330

Steam Generators manufactured and delivered by Framatome since 1975



Control Rod Drive Mechanisms

Holding pressure & controlling nuclear reactivity for Large and Small Modular Reactors.

Framatome designs, customizes & qualifies CRDM models.

Challenge

- Guarantee nuclear safety and integrity of PWR reactors.
- Ensure both control of nuclear reactivity and pressure holding while securing long-lasting reliability.
- Design and manufacture according to the applicable construction codes (ASME & RCC-M).

Solution

- Framatome provides control rod drive mechanisms with the highest level of safety & quality standards.
- ISO certified, Framatome supports international regulations: ISO 17025, ISO 19443, ASME III d1.
- 3 models of CRDM's fixture onto Reactor Pressure Vessel.
- Custom design adaptation can be proposed according to reactor operating conditions.
- Heads (RPVH) are available.
- Service and maintenance ensured for decades.
- Robust and reliable supply chain of manufacturing capacities.

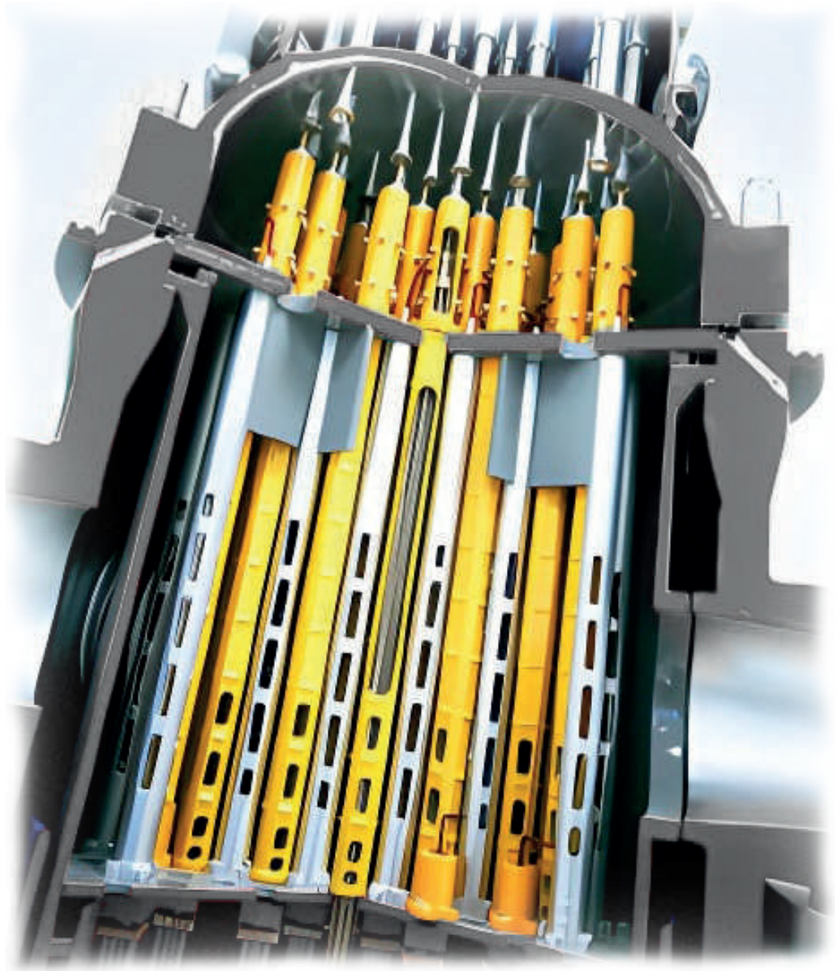
CRDM	F-900	F-1300	F-1650
Rating	350°C & 175 bars	350°C & 175 bars	350°C & 175 bars
Qualified	8.10^6 steps	8.10^6 steps	6.10^6 steps
Speed	1.14m/min	1.14m/min	0.75m/min
Stroke	3.6mm	4.3mm	4.2mm
Force (kg)	>160	>180	>110
Length (m)	5.5	6.4	5.2
Width	Square : 275mm	Square : 275mm	Round : 280mm
Weight (kg)	680	690	456
Power (max)	125V / 38A	110V / 40A	220V / 9A
Cooling	Forced	Forced	Natural

Customers benefits

- Worldwide proven 40 years lifetime without repair or replacement.
- Spare parts available on demand.
- Cold & hot pressure tests performed in house Framatome.
- Numerical models to compute drop time.

7500
CRDM manufactured & delivered since 1970

85
Nuclear power plants equipped worldwide



Control Rod Guiding Assemblies

A safety essential structural component for Large and Small Modular Reactors

Framatome designs and qualifies CRGA for SMR/PWR designers and operators.

Challenge

- Make a structure for the Upper Reactor Pressure Vessel Internals.
- Join upper support plate and upper core plate together.
- Designed and manufactured according to applicable construction codes (ASME & RCC-M).

Ensure Rod cluster control assembly (RCCA) seamless movement to :

- Have perfect control of nuclear reactivity, enabling load follow.
- Ensure permanently safe drop time thanks to long-lasting reliability.

Solution

Framatome designs and qualifies on test loops to deliver Control Rod Guiding Assemblies with the highest level of safety & quality standards, while addressing all nuclear safety concerns.
Continuous guidance is the key feature. Framatome CRGA avoids stress track corrosion & loose components thanks to latest generation of locking pins and nitride surface coated guiding pins to:

- Reduce drastically the risks of cracking / crushing of smaller fixing items.
- Ensure repeatedly through time alignment of internals components.

CRGA	F-900 125"	F-900 96"	F-1300 96"	F-1650 96"
Qualified with: **• Fuel** **• CRDM**	• AFA 3G 900 • F-900	• AFA 3G 900 • F-900	• AFA 3G 1300 • F-1300	• AFA 3GLE 1600 • F-1650
Lengths: **• Upper cover (m)** **• Lower Cover (m)**	4,1m • 0,9m • 3,2m	4,05m • 1,6m • 2,5m	4,4m • 1,9m • 2,5m	4,5m • 1,6m • 2,9m
Weight (kg)	282	296	312	241
Square flange largest side (mm)	254	254	254	280

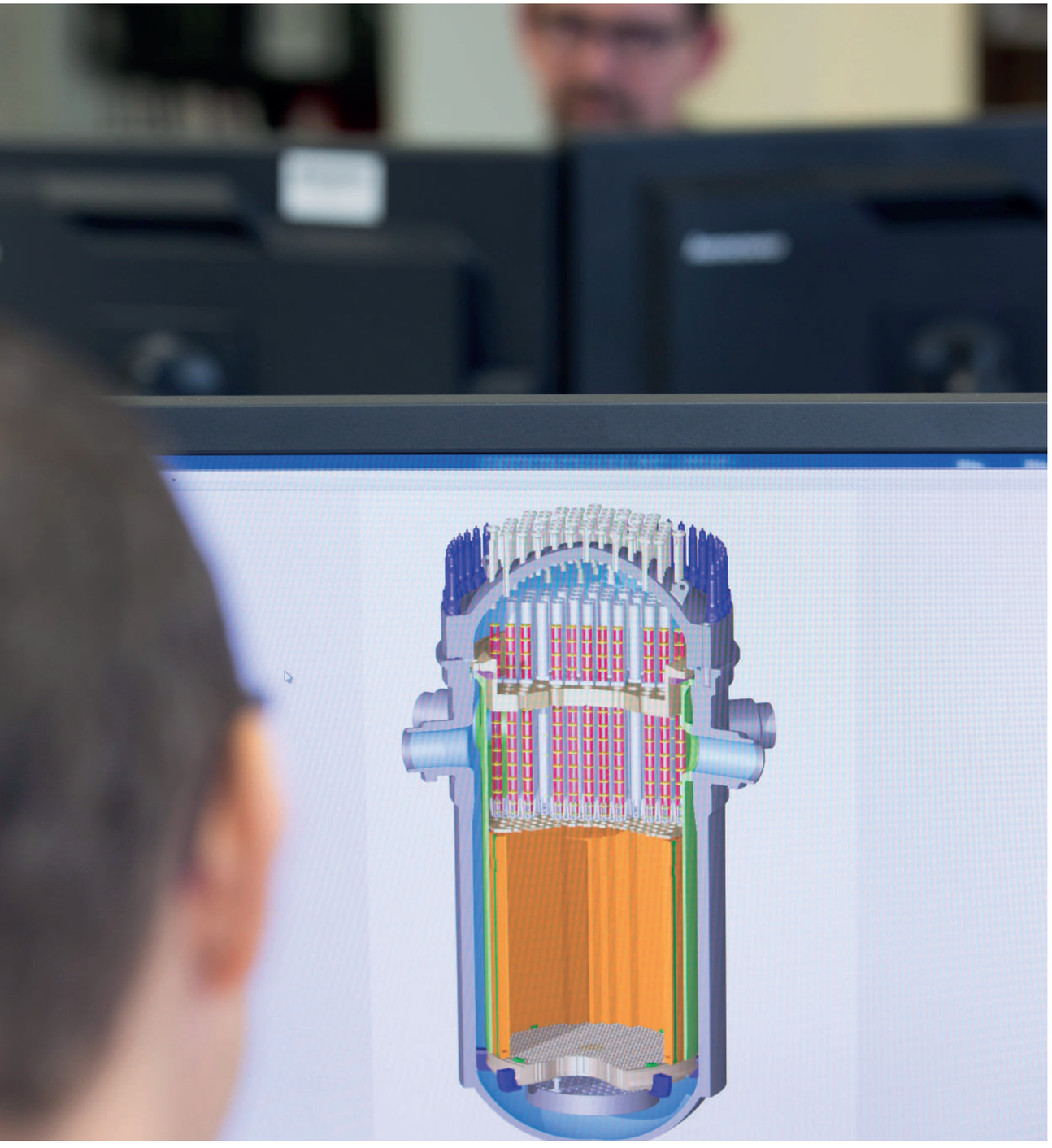
Customers benefits

- Extensive qualification (>40 years) to ensure safe Control Rod Drive System.
- Compute drop time available with CIGAL digital solution model.

7500
CRDA designed & delivered since 1970

85
NPPs equipped worldwide

Build To Print services to non-OEM



Industrialization of non-OEM nuclear components

Turn Non OEM concept and products design into reality

Taking advantage of proven enhanced manufacturing technologies for Non OEM.

Challenge

Industrialize and qualify a procurement supply chain for small modular reactor components, meetings codes and standards of nuclear industry.

Solution

Framatome manufactures components for nuclear power plants with the highest level of safety and quality standards. Framatome is a unique qualified partner for small modular reactor industrialization projects, mastering the whole value chain :

- Manufacturing engineering: design to cost.
- Qualifications and management of sub-contractors and suppliers.
- Framatome implements the most cost effective and up to date manufacturing technologies for all small modular reactor projects.
- In-house manufacturing and inspection (UT, X-Ray, pressure test).
- Worldwide transportation.
- Process manufacturing R&D.

Technical information

- Engineering Department with more than 110 skilled people, including 18 experts and 52 key processes specialists.
- ISO, ASME and RCCM certified Quality Assurance System.
- Certified ISO 17025 Laboratory.

Customers benefits

- Available qualified sub-contractors and suppliers.
- Safety and Quality Conformity.
- Internationally trusted supplier with proven experience in nuclear industry.
- Experienced teams to manage industrial projects (engineering, procurement, manufacturing, transportation and after-sales).
- Best-in class manufacturing technologies to optimize costs and lead-times.

45

Years of experience in manufacturing of heavy components for nuclear industry

686

Heavy components manufactured and delivered to customers since 1975



Main coolant lines

Manufacturing of piping for operating plants and new nuclear projects.

Framatome is the manufacturer of reference for the Primary Loop Components.

Challenge

Main Coolant Lines are high integrity and Nuclear safety related component and must comply with the requirements of applicable construction codes and regulations The conformity has to be demonstrated at each step of manufacturing.

Solution

Located in Burgundy, Framatome's plants manufacture forged Main Coolant Lines (hot, cold, crossover legs) in stainless steel with the highest level of safety and quality standards. Full scope of responsibility:

- Design Engineering, Mechanical calculation and Licensing.
- In-house manufacturing and inspection (UT, X-Ray, pressure test).
- Management of sub-contractors and suppliers.
- Worldwide transportation.
- Prototyping and serial production.
- Manufacturing Engineering.

Technical information

Material : Stainless steel

Length :
- Hot leg : 6890mm
- Cold leg: 7310mm
- Crossover leg : 9360mm

Weight :
- Hot leg : 12,4 tons
- Cold leg: 13,6 tons
- Crossover leg : 16 tons

Diameter :
- ø EXT : 932mm
- ø EXT : 780mm

Construction codes: RCC, ASME, AFNOR, GHOST, SAE, ASTM

Pressure : 150 bars

temperature : 350°C

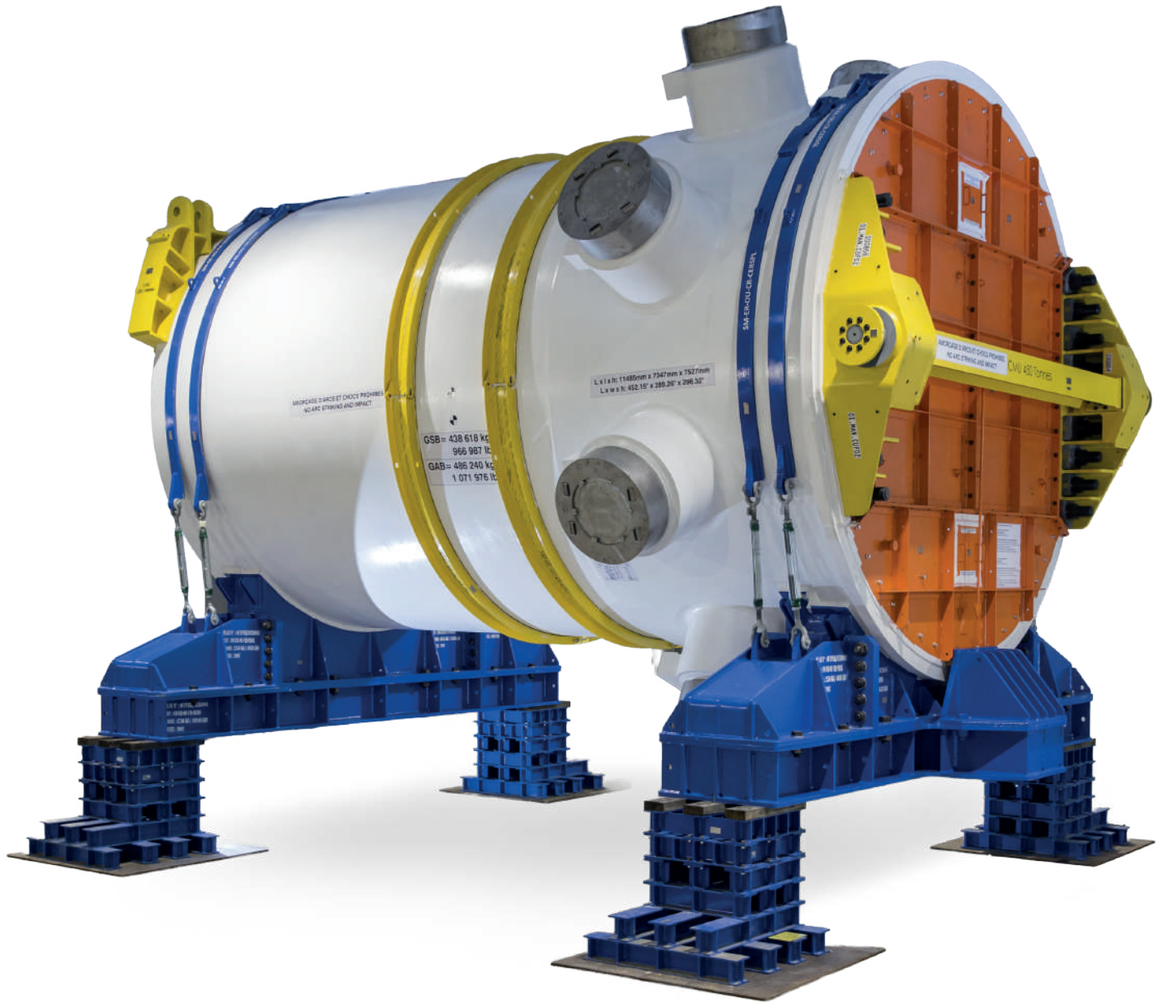
International Regulations

Customers benefits

- Safety and Quality Conformity.
- Internationally trusted supplier with a proven experience.
- Specific workshop for stainless steel components.
- A plant managing the whole process (engineering, procurement, manufacturing and transportation).

45
Years of experience in manufacturing of heavy components for nuclear industry

2.230m²
Dedicated workshop at Framatome plant



Reactor Pressure Vessel

Manufacturing of Reactor Pressure Vessel for Nuclear Power Plant

Framatome is the manufacturer of reference for the Primary Loop Components.

Challenge

Reactor Pressure Vessel including its Cover Head is a high integrity and nuclear safety related component which meets the requirements of applicable construction codes and regulations. The conformity has to be demonstrated at each step of manufacturing.

Solution

Framatome manufactures primary loop components with the highest level of safety and quality standards. From design specifications to delivery all over the world, Framatome serves nuclear Power Plants of all sizes. Capacities are able for defense and navy activities.

- Large industrial capacity of workshops.
- ISO and ASME certified Quality Assurance System.
- Manufacturing Engineering.
- Efficient Supply Chain with a large panel of qualified subcontractors and suppliers.
- In-house production of forged parts.
- Expertise in key competences and qualified staff.
- Certified ISO 17025 Laboratory.
- Expertise in worldwide shipment.

Technical information

Reactor Pressure Vessels for a wide range of Nuclear Power Plants from 900MWe to 1650MWe.

Height : 12m - 13m
Diameter : 4m - 5,5m
Weight : 310t - 530t

Construction codes : RCC, ASME
Regulations : ESPN, YVL

Pressure : 150bars
Temperature : 350°C

Customers benefits

- Safety and Quality Conformity.
- Internationally trusted supplier with a proven experience.
- Flexible and large industrial capacity dedicated to Reactor Pressure Vessels.
- A plant managing the whole process (engineering, procurement, manufacturing and transportation).

45
Years of experience in manufacturing of heavy components for nuclear industry

76
Reactors Pressure Vessels manufactured and delivered by Framatome since 1975



Pressurizer

Manufacturing of pressurizers for operating plants and new nuclear projetcs

Framatome is the manufacturer of reference for the Primary Loop Components.

Challenge

Pressurizer is a high integrity and nuclear related component which meets the requirements of applicable construction codes and regulations. The conformity has to be demonstrated at each step of manufacturing.

Solution

Framatome manufactures primary loop components with the highest level of safety and quality. From design specifications to delivery all over the world, Framatome serves Nuclear Power Plants of all sizes. Capacities are able for defense and navy activities. Full scope of responsibility :

- Design Engineering, Mechanical calculation and Licensing.
- Manufacturing Engineering.
- Prototyping and serial production.
- In-house production manufacturing and inspection (UT, X-Ray, pressure test).
- Worldwide transportation.
- Management of sub-contractors and suppliers.

Framatome relies on :

- Large industrial capacity of workshops.
- ISO and ASME certified Quality Assurance System.
- Certified ISO 17025 Laboratory.

Technical information

Pressurizers for a wide range of Nuclear Power Plants, 900MWe to 1650MWe.

Height : 11m - 13,5m
Diameter : 2,3m - 2,9m
Weight : 79tons - 146tons

Pressure : 150bars
Temperature : 350°C

Customers benefits

- Safety and Quality Conformity.
- Component ready for commissioning.
- Internationally trusted supplier with a proven experience.
- Flexible and large industrial capacity.
- A plant managing the whole process (engineering, procurement, manufacturing, transportation and after sales).

45
Years of experience in manufacturing of heavy components for nuclear industry

77
Pressurizers manufactured and delivered to customers by Framatome since 1975.

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