East Building, PHH-23
1200 New Jersey Ave, SE
Washington, D.C. 20590

U.S. Department of Transportation

Pipeline and Hazardous Materials Safety Administration

COMPETENT AUTHORITY CERTIFICATION FOR A TYPE B(U) RADIOACTIVE MATERIALS PACKAGE DESIGN CERTIFICATE USA/0825/B(U)-96, REVISION 1

REVALIDATION OF FRENCH COMPETENT AUTHORITY CERTIFICATE F/410/B(U)-96

The Competent Authority of the United States certifies that the radioactive material package design described in this certificate satisfies the regulatory requirements for a Type B(U) package as prescribed in the regulations of the International Atomic Energy Agency[1] and the United States of America[2] The package design is approved for use within the United States for import and export shipments made in accordance with applicable international and domestic transport regulations.

1. Package Identification - MANON.

2. Package Description and Authorized Radioactive Contents - as described in French Certificate of Competent Authority F/410/B(U)-96, Revision Ag (attached). Authorized contents are limited to an External Enclosure Assembly (EDCE) containing a Marguerite 20 enclosing strontium 90 sources as described in Appendix 3 of the French certificate.

3. General Conditions -

   a. Each user of this certificate must have in his possession a copy of this certificate and all documents necessary to properly prepare the package for transportation. The user shall prepare the package for shipment in accordance with the documentation and applicable regulations.

   b. Each user of this certificate, other than the original petitioner, shall register his identity in writing to the Office of Engineering and Research, (PHH-23), Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation, Washington D.C. 20590-0001.

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[1] "Regulations for the Safe Transport of Radioactive Material, 2012 Edition, No. SSR-6" published by the International Atomic Energy Agency (IAEA), Vienna, Austria.

[2] Title 49, Code of Federal Regulations, Parts 100-199, United States of America.

c. This certificate does not relieve any consignor or carrier from compliance with any requirement of the Government of any country through or into which the package is to be transported.

d. Records of Management System activities required by Paragraph 306 of the IAEA regulations[1] shall be maintained and made available to the authorized officials for at least three years after the last shipment authorized by this certificate. Consignors in the United States exporting shipments under this certificate shall satisfy the applicable requirements of Subpart H of 10 CFR 71.

4. Special Conditions -

a. The Marguerite 20 radioisotopic thermal generator must contain 10 cm of lead surrounding the Sr-90 source on the sides and bottom. Above the source, the Marguerite 20 must have enough copper, steel and air to be equivalent to 18 cm of lead. The Marguerite 20 must further have 1.5 mm of steel surrounding the source on all sides.

5. Marking and Labeling - The package shall bear the marking USA/0825/B(U)-96 in addition to other required markings and labeling.

6. Expiration Date - This certificate expires on November 30, 2020. Previous editions which have not reached their expiration date may continue to be used.

CERTIFICATE USA/0825/B(U)-96, REVISION 1

This certificate is issued in accordance with paragraph(s) 810 of the IAEA Regulations and Section 173.473 of Title 49 of the Code of Federal Regulations, in response to the April 28, 2020 petition by TN Americas LLC, Columbia, MD, and in consideration of other information on file in this Office.

Certified By:

William Schoonover
Associate Administrator for Hazardous Materials Safety

May 13, 2020
(DATE)

Revision 1 - Issued to endorse the French Certificate of Approval F/410/B(U)-96, Revision Ag, with content limited to an External Enclosure Assembly (EDCE) containing a Marguerite 20 enclosing strontium 90 sources as described in Appendix 3 of the French certificate.

FRENCH NUCLEAR SAFETY AUTHORITY

TRANSPORT AND SOURCES DEPARTMENT

PACKAGE MODEL APPROVAL CERTIFICATE

The Competent French Authority,

Pursuant to the request presented by the **Commissariat à l'énergie atomique et aux énergies alternatives** (Atomic energy and alternative energy commission), by letter DSSN DIR 2020-125 - dated 28 February 2020;

Pursuant to Safety Analysis Report DS LME50291001 rev. B - dated 13 July 2012, supplemented by note DSN/STMR/LEPE/S-MANON/NOT 0219 Rev. 01 - dated 15 February 2017, note DSN/STMR/LEPE/S-MANON/NOT 0226 Rev. 02 - dated 30 March 2017, mail CEA/DEN/CAD/DSN/STMR DO 465 - dated 20 June 2017 and mail CEA/DEN/CAD/DSN/STMR DO 472 - dated 23 June 2017,

Hereby certifies that:

the package model, comprising the **MANON** casing, described below in appendix 0 rev. d, and:

- loaded with:
  - a modified SV34 packaging, containing cobalt 60 or caesium 137 sources, as described in appendix 1 rev. c;
  - a modified SV69 packaging, containing cobalt 60 or caesium 137 sources, as described in appendix 2 rev. d;
  - an External Enclosure (EDCE), containing non-removable equipment (AI) holding strontium 90 sources, as described in appendix 3 rev. c;

  is compliant as a **type B(U)** package model;

- when emptied, contaminated or not, equipped with its internal fittings or not, is compliant as a **type B(U)** package model;

with the provisions of the regulations, agreements and recommendations listed below:

- International Atomic Energy Agency (IAEA) regulation for the safe transport of radioactive material, Safety series No. SSR-6, 2012 edition;
- European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR);
- International Maritime Dangerous Goods Code (IMDG code of the IMO);
- French Order of 29 May 2009, as amended, on the carriage of dangerous goods by road ("TMD" order).
- decision of 23 November 1987 (modified) concerning the safety of ships.

www.asn.fr
15, rue Louis Lejeune • CS 70013 • 92541 Montrouge CEDEX, France
Telephone +33 (0)1 46 16 40 00 • Fax +33 (0)1 46 16 40 16

This certificate does not exempt the consignor from the requirement to comply with the regulations established by the authorities of the countries through or towards which the package will be transported.

This certificate expires on: **30 November 2020**

Registration number: **CODEP-DTS-2020-022456**

Montrouge, 25 March 2020

On behalf of the President of the French Nuclear Safety Authority (ASN), and by delegation, the Director of Transport and Sources,

Fabien FÉRON

SUMMARY OF CERTIFICATE ISSUES

Issued on	Expiry date	Issue type and amendments	Authority	Certificate number	Revision							
					body	t	0	1	2	3	4	5
24/03/2015	31/03/2020	New approval	ASN	F/410/B(U)-96	Aa	-	a	a	a	a	-	-
06/10/2017	31/03/2020	Extension to approval (Content 4)	ASN	F/410/B(U)-96	Ab	-	b	-	-	-	b	-
06/10/2017	31/03/2020	Extension to approval for maritime transport	ASN	F/410/B(U)-96	Ac	-	c	c	c	c	-	-
06/11/2017	31/03/2020	Extension to approval	ASN	F/410/B(U)-96	Ad	-	d	c	d	c	-	-
04/11/2019	31/03/2020	Extension to approval Combination of revisions (Ab) and (Ad) and discontinuation of the EDCI dip tube	ASN	F/410/B(U)-96	Ae	-	e	e	d	e	e	-
18/02/2020	31/03/2020	Extension to approval (Content 5)	ASN	F/410/B(U)F-96	Af	-	f	-	-	-	-	f
25/03/2020	30/11/2020	Administrative extension to the certificate, revision (Ad)	ASN	F/410/B(U)-96	Ag	-	d	c	d	c	-	-

APPENDIX 0

MANON CASING

1. CASING DEFINITION

The casing is designed, manufactured, inspected, tested, maintained and used in compliance with safety analysis report DS-LME50291001 - rev. B - dated 13 July 2012.

The casing, of a generally cylindrical form, is presented in Figure 0.1.

The concept drawing of the casing and its associated packings is RSu LME50291001 rev. E - dated 14 May 2012.

The overall external dimensions of the casing are:

- height: 2,570 mm;
- outer diameter: 2,550 mm.

The usable dimensions of the casing are:

- height: 1,704 mm;
- inner diameter: 1,800 mm.

The maximum permissible weight of the casing during transport is:

- 5,487 kg empty (see Figure 0.1);
- 13,385 kg when loaded with the modified SV34 packaging + EDCI and its packing (see Figure 0.2);
- 15,597 kg when loaded with the SV69 packaging and its packing (see Figure 0.3);
- 7,635 kg when loaded with the EDCE (see Figure 0.4).

The casing is made up of the principal sub-assemblies described below.

1.1 Body

The shell is made up of two cylindrical half-shells made of austenitic stainless steel, each one a welded shell with an inner diameter of 1800 mm and a thickness of 20 mm. Each one of these is then welded to a disk, 20 mm thick, which forms the bottom, and a closing flange. Cut-outs are created in the bases, in order to allow air to flow.

The upper half-shell has a strengthening belt made of austenitic stainless steel, onto which are welded 4 tie-down lugs.

1.2 Closing system

The flanges on the two half-shells are made of austenitic stainless steel. The upper flange, with a diameter of 2,066 mm and a thickness of 32 mm, is fixed to the lower flange (thickness 30 mm) by 30 x H M30x120 class 10.9 screws, tightened to a torque of 850 Nm. A centring hole, 10 mm deep, in the body flange, is used to mutually position the two sections.

1.3 Shock-absorbing systems

The shock absorbing systems of both half-shells are identical. They are made up of phenolic foam DL NU280h, with an axial thickness of 397 mm and a radial thickness of 350 mm, protected by 3 mm thick stainless steel plating, welded onto the half-shells. Their outer casing is cylindrical, with a diameter of 2,550 mm.

The shock absorbers are generally in the shape of a ring, into which a recess is machined in order to create an overlapping zone for the protective casing. Passages (notches at 25°, and 300 mm deep) are created in the covers, in order to allow air to flow. An additional block of foam, independent of the ring, is located within the central axial section. This block is welded onto a 20 mm thick stainless steel puncture protection plate, 150 mm offset from the enclosure bottom plating. This overlaps the cut-outs in the bottom of the half-shells.

1.4 Handling and tie-down elements

The casing is handled (straight lift) by attaching slings to the 3 studs (to which M36 rings are screwed, with a unit capacity of 7,500 kg, during handling phases) welded around the edge of the puncture protection plate on the upper half-shell.

For road or sea transport, the casing is tied-down using straps or flexible turnbuckles, connecting the vehicle to the four tie-down lugs (made of X2 CrNiMoN 22-5-3 stainless steel), welded onto the upper half-shell. The tie-down operation, presented in the drawing in Figure 0.5, is completed in accordance with the applicable version of Standard NF EN 12195-1 and, for maritime transport, the CTU code.
The tilt of the tie-down slings is such that they form an angle of:

- 37° with the longitudinal axis of the frame;
- 56.5° with the horizontal axis.

An anti-slip mat, with a coefficient of friction of 0.6, is placed on the vehicle platform, and under the packaging for maritime transport.

The minimum mechanical properties of the steels used in the upper half shell body and lugs, at a temperature of 83°C, are:

- a yield strength of 450 MPa for the lugs and 349 MPa for the upper half shell body;
- an ultimate tensile strength of 650 MPa for the lugs and upper half shell body.

1.5 Safety functions and features important for safety

The main safety functions and features important for safety are:

- **impact protection** mainly provided by the shielding on the casing and the phenolic foam blocks in the covers;
- **internal power dissipation** provided by the notches and ventilation openings;
- **fire protection** mainly provided by the phenolic foam blocks in the casing, and the insulating materials in the contents (see Appendices);
- **radiological protection** provided by the shielding of the contents (see Appendices);
- **containment** provided by the enclosure around the contents (see Appendices).

2. ACTION TO BE TAKEN BY THE CONSIGNOR PRIOR TO SHIPPING THE PACKAGE

The packaging is used in accordance with the procedures in the instructions for use, in Chapter 05-01 of the safety analysis report.
This is combined with:

- a visual inspection to ensure that there are no foreign objects in the content cavity ;
- an inspection, at thermal equilibrium, of the maximum surface temperature of the casing, in order to make sure that this surface temperature nowhere exceeds ambient temperature plus 10°C;
- for maritime transport, a verification that the anti-slip mat, placed on the platform of the vehicle, is not worn.

3. MAINTENANCE PROGRAMME

The packaging is maintained in accordance with the procedures in the instructions in chapter 05-01 of the safety analysis report.
This programme is combined with a leak test on the plug fuses, prior to the first transport operation and during periodic maintenance.

4. NOTIFICATION AND RECORDING OF SERIAL NUMBERS

Any packaging being retired from service or whose ownership changes, must be reported to the competent authorities. Accordingly, an owner transferring packaging must provide the name of the new owner.

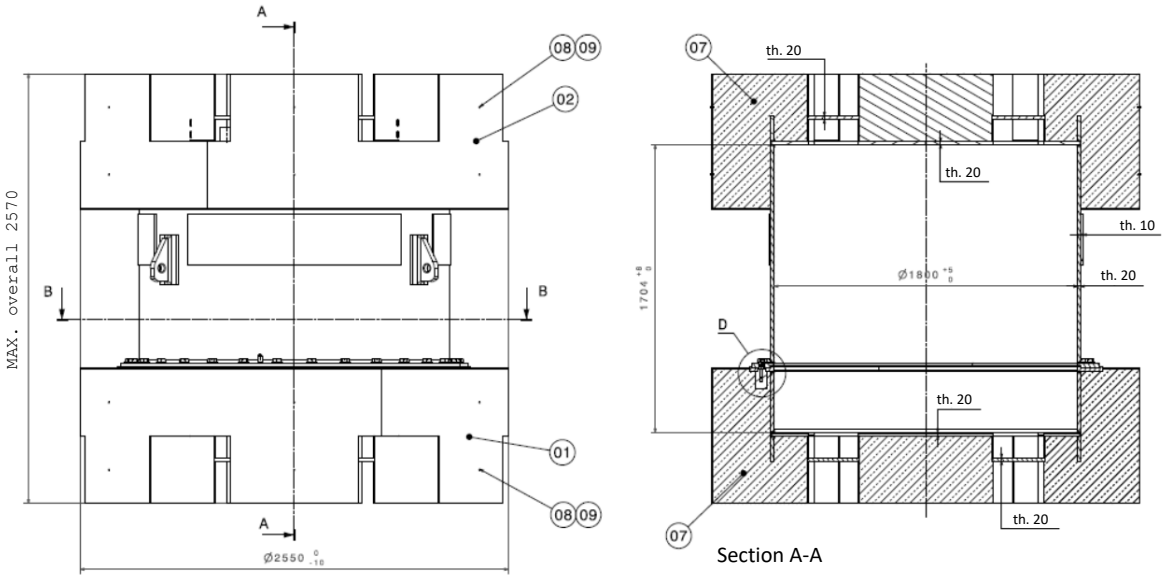
5. QUALITY ASSURANCE

The quality assurance principles applied during the design, manufacturing, inspection, testing, maintenance and use of the package must comply with those described in chapter 05-02 of the safety analysis report.

6. ADDITIONAL REQUIREMENTS FOR CONTAINED TRANSPORT

If the thermal power of the contents is less than 410 W, transportation within a contained means of transport is authorised.
If the thermal power of the contents is greater than 410W, contained transport is not permitted unless otherwise authorised by the Competent Authority.

FIGURE 0.1
DIAGRAM OF THE CASING



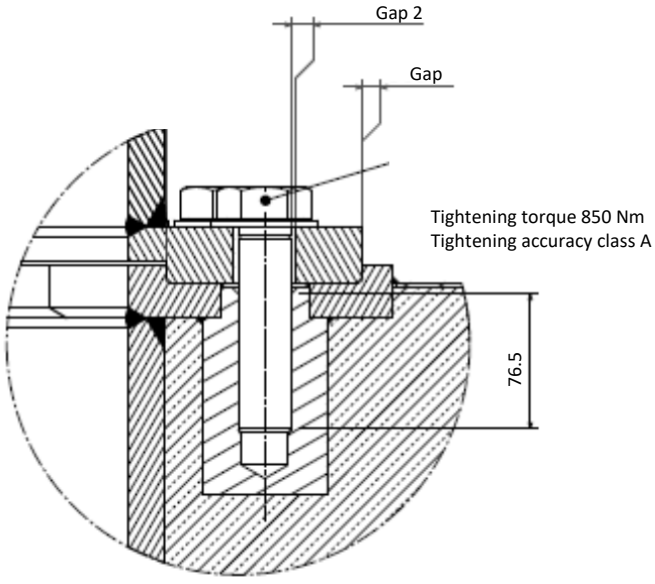


FIGURE 0.2
DIAGRAM OF THE CASING, LOADED WITH A MODIFIED SV34 PACKAGING

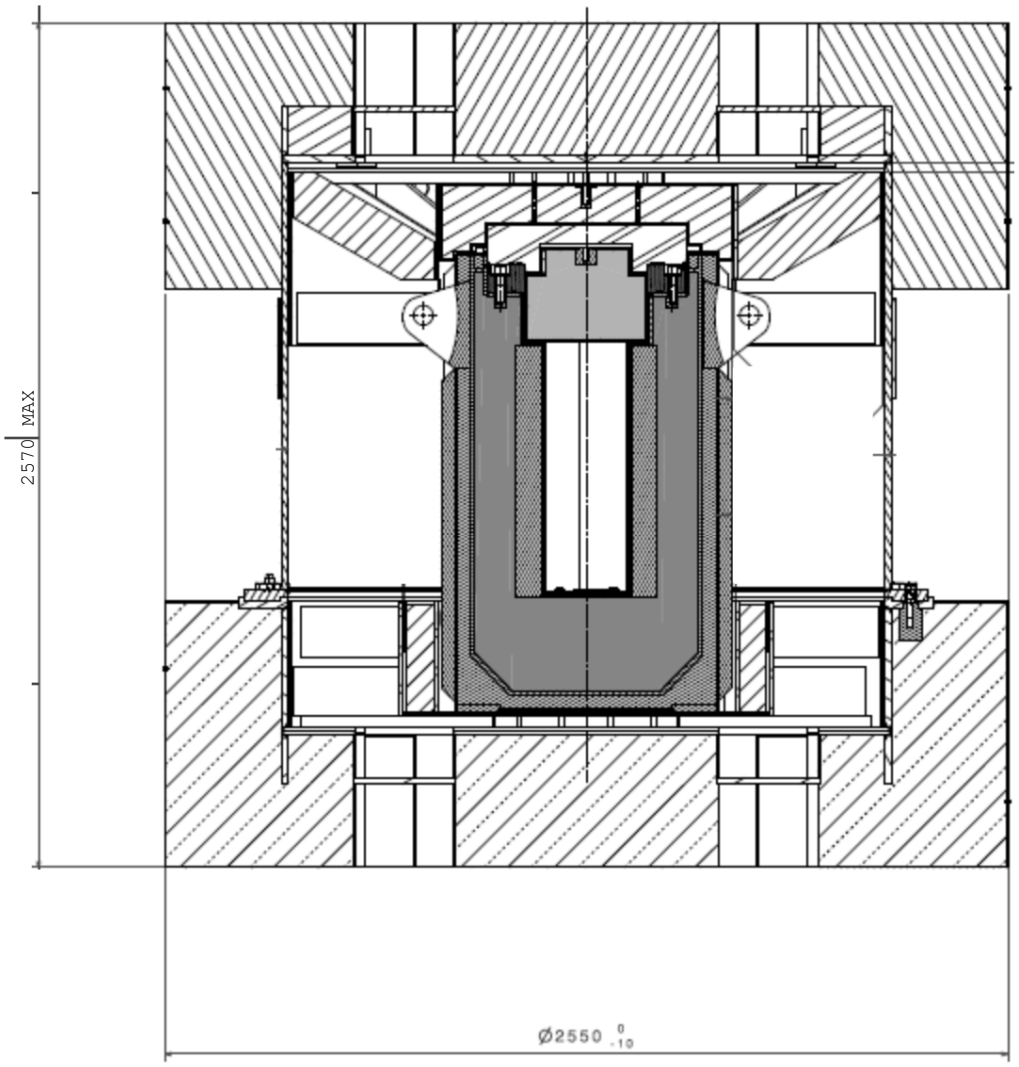


FIGURE 0.3
DIAGRAM OF THE CASING, LOADED WITH AN SV69 PACKAGING

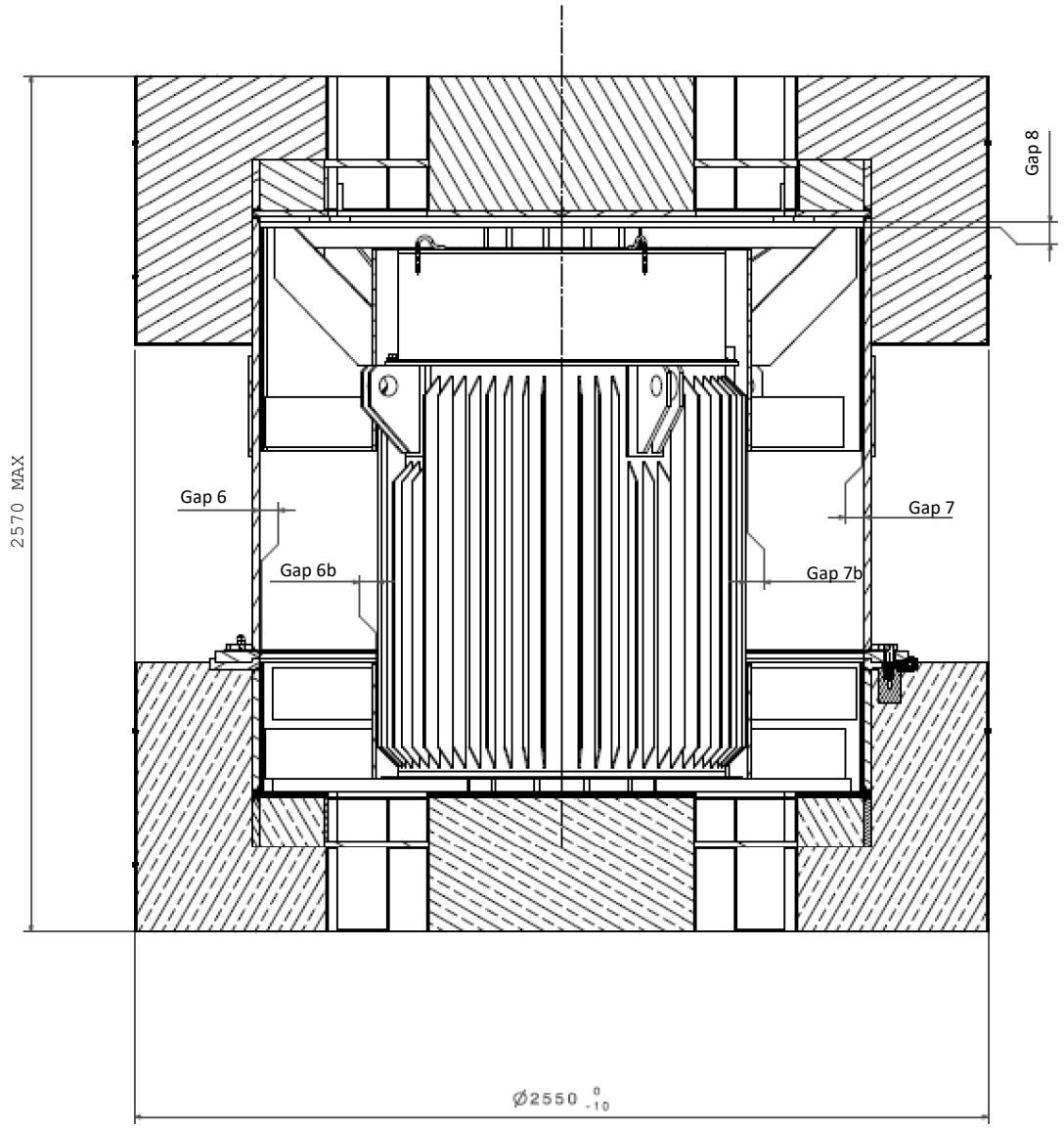


FIGURE 0.4
DIAGRAM OF THE CASING, LOADED WITH AN EMPTY EDCE

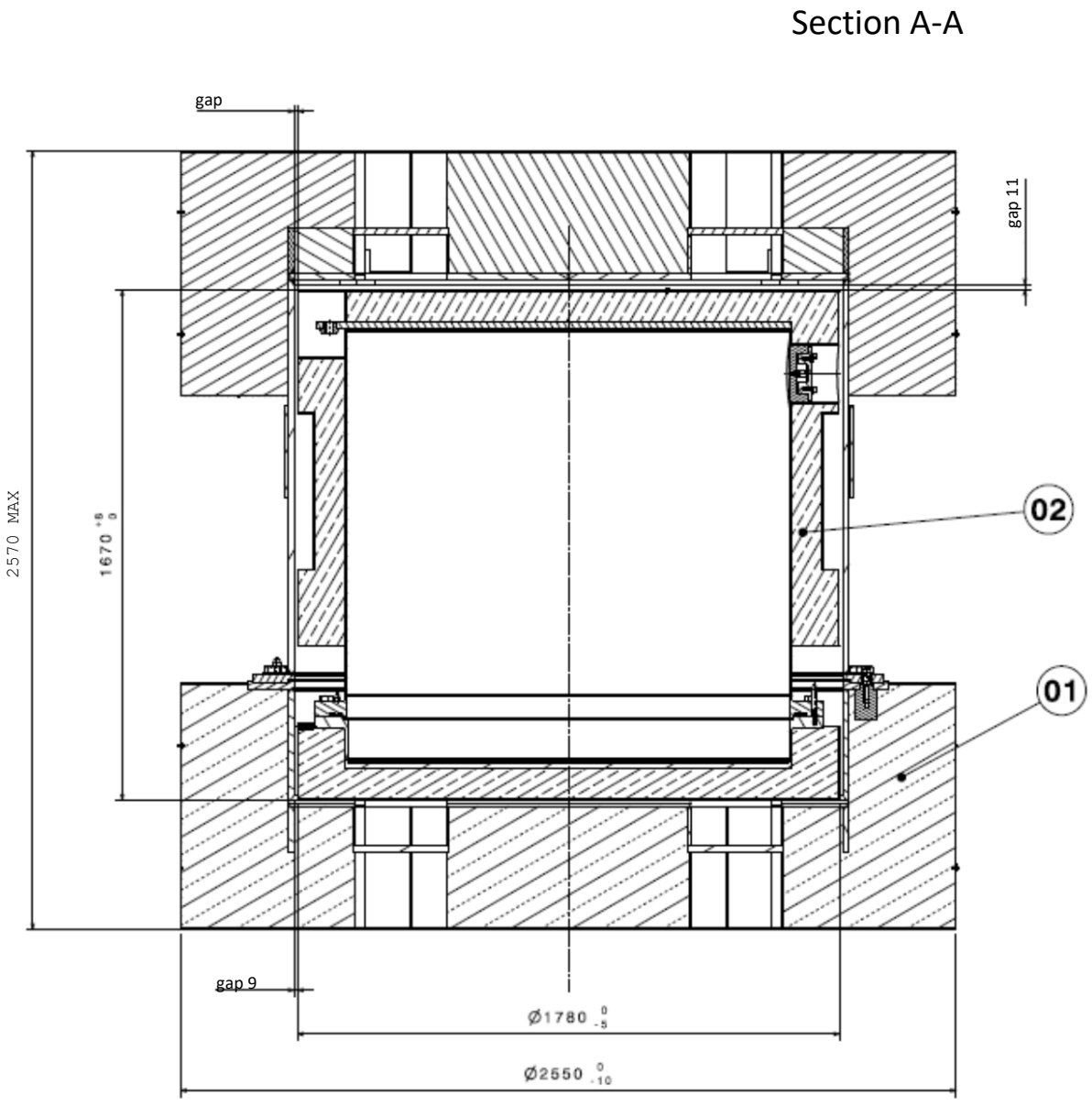
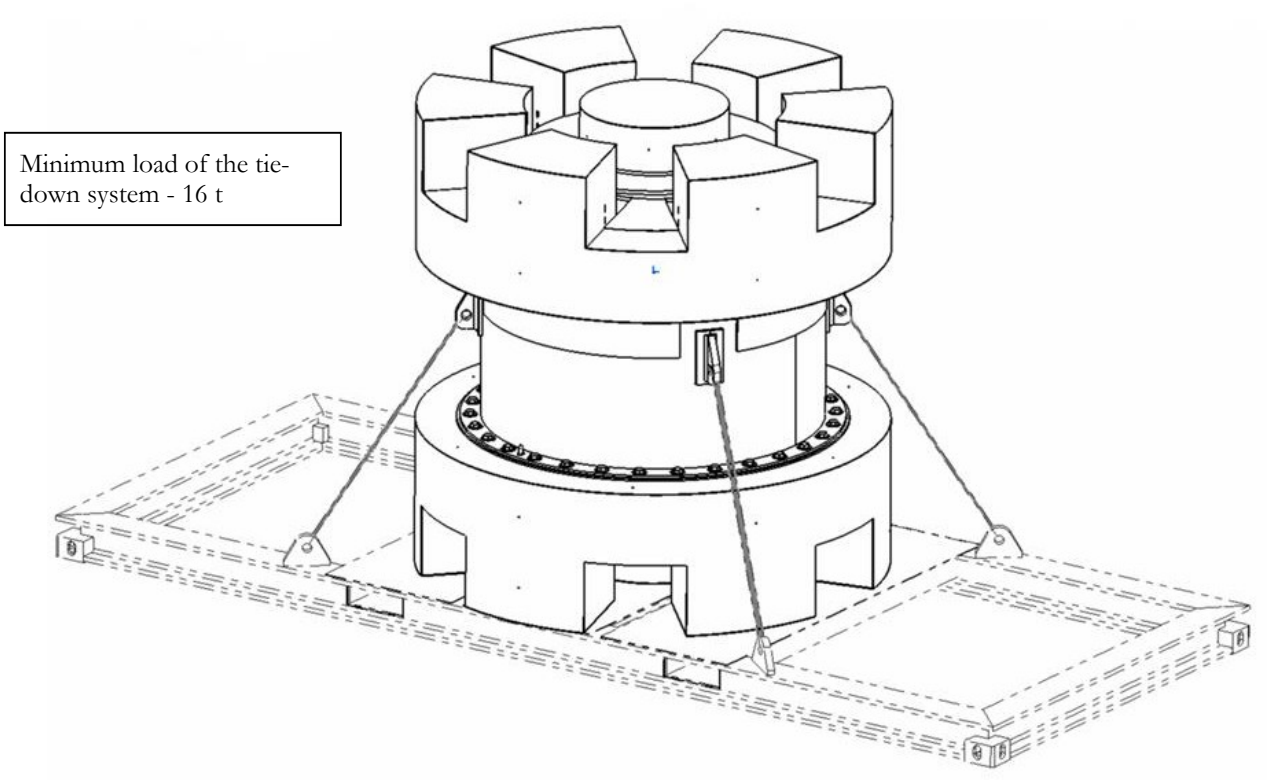


FIGURE 0.5
TIE-DOWN DIAGRAM FOR THE CASING



(Optional frame)

APPENDIX 3

EXTERNAL ENCLOSURE LOADED WITH NON-REMOVABLE EQUIPMENT

The safety analysis report justifying this content has the reference DS-LME50291001 rev. B - dated 13 July 2012.

1. DEFINITION OF AUTHORISED CONTENT

The authorised radioactive content, as described in Chapters 2 and 3 of the safety analysis report, comprises an external enclosure (EDCE), loaded with one of the following non-removable items of equipment:

- Marguerite 20 (see Figure 3.3);
- Marguerite 2 (see Figure 3.4);
- Geter 2B (see Figure 3.5);
- GSM 15 (see Figure 3.6);
- Gisete 4 (see Figure 3.7);
- Gisete 5 (see Figure 3.8);
- Isotaaf 1 (see Figure 3.9).

The non-removable equipment encloses strontium 90 sources.

1.1 EDCE DESCRIPTION

The EDCE has been designed, manufactured, inspected, tested, maintained and used in compliance with safety analysis report DS-LME50291001 - rev. B - dated 13 July 2012. This is combined with the requirement to replace the containment gaskets every 3 years, or every 30 rotations, depending on which one is the more conservative.

The concept drawing for the EDCE has the reference 1ME50291050 Rev. C. A diagram of the EDCE is shown in Figure 3.1.The diagrams of these containment systems are presented in Figure 3.2.

The containment enclosure is cylindrical and made up of two stainless steel half-shells, an upper and a lower. Each half-shell is made up of a cylindrical body welded at the bottom to a 20 mm thick plate, and at the top to a flange. The two flanges are fastened together by 18 x H M24x100 class 12.9 screws. Two trapezoidal grooves are machined into the upper flange, to hold two EPDM o-ring gaskets.

Inside each half-shell, both axially and radially, there is a layer of phenolic foam DL NU280h, with a minimum thickness of 100 mm, providing both mechanical and thermal protection. The foam is protected by stainless steel plating.

A stainless steel closure plate protects the EDCE venting self-closing coupling (radially positioned on the upper half-shell). It is attached to the EDCE by 4 x CHC M10x35 class 10.9 screws. Two trapezoidal grooves are machined into the closure plate, to hold two EPDM o-ring gaskets.

The EDCE is handled (straight lift) by attaching slings to 3 handling studs (to which M24 rings are screwed, with a unit capacity of 3,500 kg during handling phases) on the upper half-shell.

The main dimensions of the EDCE are as follows:

- usable diameter: 1,450 mm;
- usable height: 1,428 mm;
- overall diameter: 1,780 mm;
- overall height: 1,672 mm.

The maximum weight of the empty EDCE is 2,148 kg.

The containment of the EDCE, loaded with non-removable equipment, is provided by its enclosure, made up of:

- the two half-shells of the EDCE, their flange, welds and internal EPDM gasket of grade 48DRL13 by STACEM, or EP8517 by Joint Français for the upper shell;
- the protective closure plate for the self-closing coupling and its internal EPDM gasket - grade: 48DRL13 from STACEM or EP8517 from Joint Français.

1.2 Description of non-removable equipment and radioactive sources

The geometries of the "non-removable" equipment vary, comprising a steel and lead protective cask enclosing one or more strontium 90 sources (in the form of sintered pellets). The following non-removable equipment can be loaded into the EDCE; their activity levels and thermal power at the moment of transportation must not exceed the 2006 estimated value given in the table below:

Identification of non-removable equipment	Overall base (mm)	Overall height (mm)	Maximum mass (kg)	Activity as of 01/09/06 (TBq)	Thermal power in 2006 (W)
Marguerite 20	Ø 1,100	1,330	4,000	1,699.4	309
Marguerite 2	Ø 950	1,100	450	10.4	2
Geter 2B	Ø 810	800	1,965	36.0	7
GSM 15	Ø 380	660	600	25.9	5
Gisete 4	Ø 853	865	2,270	202.7	37
Gisete 5	Ø 690	1,100	1,670	1,022.3	186
Isotaaf 1	790 x 790	817	212	23.3	4

The GETER 2B non-removable equipment is transported without its trolley.

The radiological protection for the non-removable equipment is provided by its steel and lead radial and axial thicknesses .

2. LOADING CONDITIONS

The loading operation is carried out in accordance with Chapter 05-01 of the safety analysis report DS LME50291001. The container is designed to be handled, loaded and transported in a vertical position.

2.1 Before loading

The consignor:

- ensures that the container has been correctly maintained in accordance with the inspection and maintenance programme detailed in Chapter 05-01 of safety analysis report DS LME50291001;

- checks the conformity of the contents with the current approval certificate;
- checks the general good condition of the EDCE container, in particular:
  - the 18 x H M24x100 class 12.9 screws attaching the half-shells, and the associated tapped holes;
  - the 4 x CHC M10x35 class 10.9 screws attaching the closure plate, and the associated tapped holes;
  - the 2 flange and closure plate orifice plugs and associated tapped holes;
  - the mating surfaces of the flange gaskets and orifice plugs;
  - mechanical and thermal protection;
  - the container lifting attachments;
- replaces the flange gaskets and orifice plugs every 3 years, or every 30 rotations, depending on which one is the more conservative.

2.2 After loading

The consignor:

- checks the leakage of the EDCE container (standard permissible leak rate of 6.2×10^{-4} Pa m^3 s^{-1} SLR) from the inter-gasket space, by decreasing or increasing pressure;
- checks the tightening of the screws:
  - the 18 x H M24x100 - class 12.9 screws, used to attach the flanges, to a torque of 760 Nm, with accuracy class A, as per Std NF E25-030;
  - the 4 x CHC M10x35 - class 10.9 screws, used to attach the closure plate, to a torque of 35 Nm, with accuracy class A, as per Std NF E25-030;
  - the 2 flange and closure plate orifice plugs.

2.3 During installation in the casing

The consignor:

- checks for the absence of the lower cage in the lower half-shell;
- after fitting the EDCE container, checks the tightening of the 30 x H M30x120 - class 10.9 screws attaching the two half-shells to a torque of 850 Nm and accuracy class A, as per Std NF E25-030;
- checks the fitting of the safety seals.

3. INTERNAL FITTINGS

Internal fittings are described in Chapter 2 of the safety analysis report. The EDCE does not have a packing system inside the casing.
There is a separate packing system for each type of non-removable equipment. They are manufactured from X2 Cr Ni 19-11 stainless steel. For each type of packing system, the assembly comprises an upper part and a lower part.

Non-removable equipment packing	Outside diameter	Cavity diameter	Maximum mass	Associated drawing
K2 packing (Marguerite 20)	1,440 mm	1,120 mm	290 kg	1ME50291520 rev. D
K7 packing (Marguerite 2)	1,440 mm	970 mm	476 kg	1ME50291570 rev. D
K4 packing (Geter 2B)	1,440 mm	597 mm	702 kg	1ME50291540 rev. D
K6 packing (GSM 15)	1,440 mm	398 mm	670 kg	1ME50291560 rev. D
K3 packing (Gisete 4)	1,440 mm	874 mm	373 kg	1ME50291530 rev. D
K5 packing (Gisete 5)	1,440 mm	708 mm	537 kg	1ME50291550 rev. C
K8 packing (Isotaaf 1)	1,440 mm	800 mm	763 kg	1ME50291580 rev. D

FIGURE 3.1
EDCE DIAGRAM

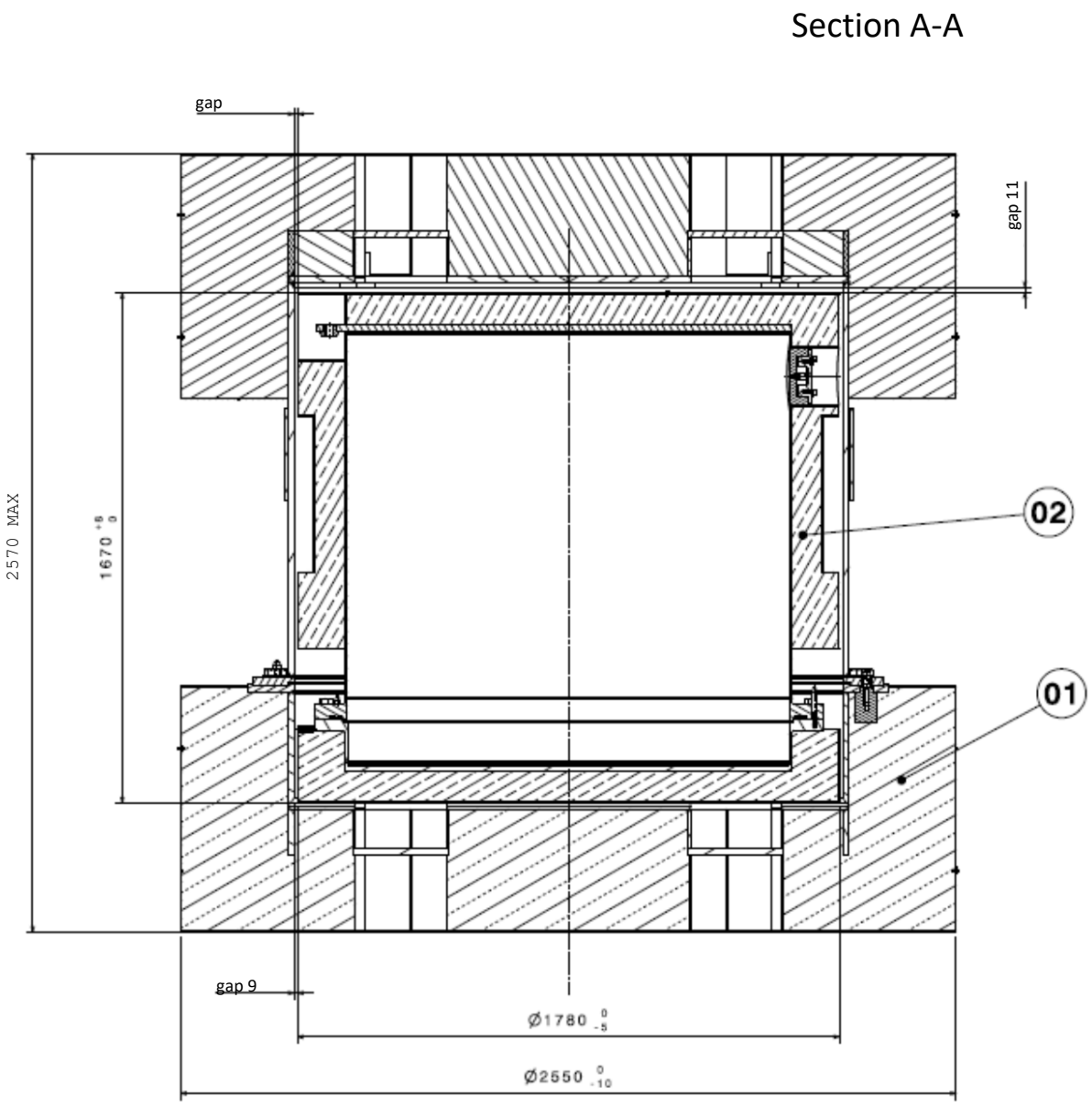
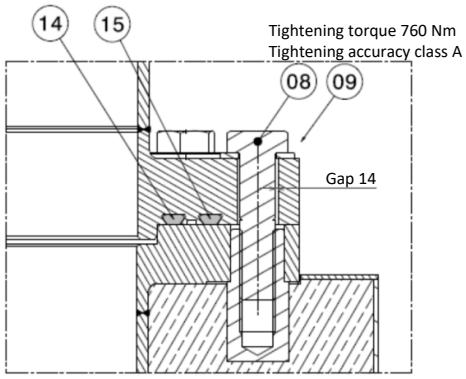
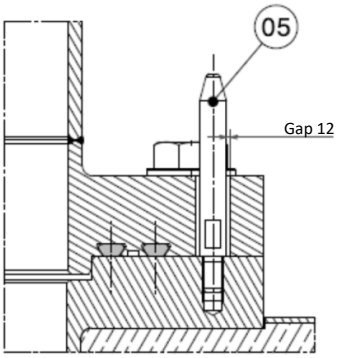


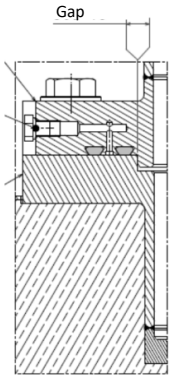
FIGURE 3.2
DIAGRAMS OF THE EDCE CONTAINMENT SYSTEM

EDCE flange





Detail D



EDCE Closure Plate

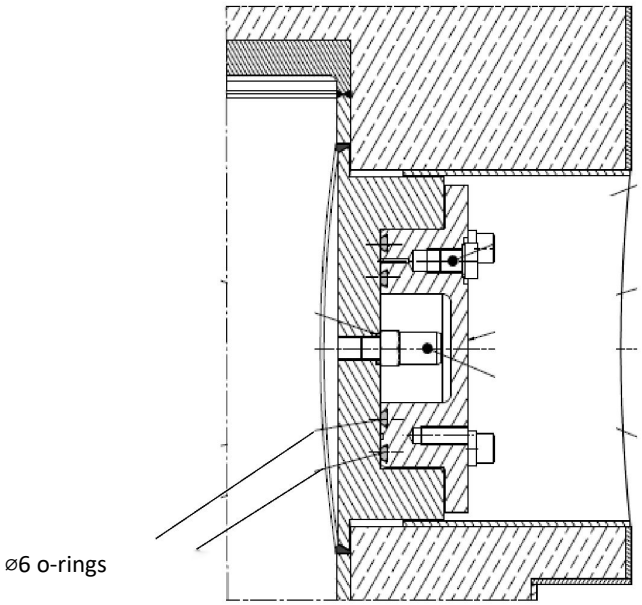
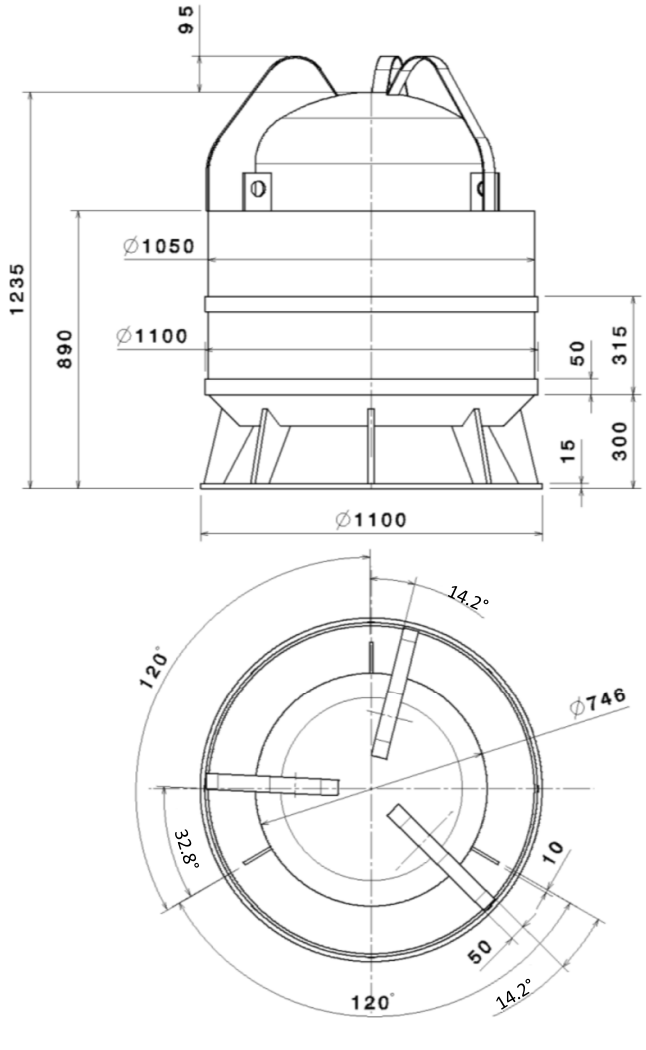

⌀6 o-rings

FIGURE 3.3
DIAGRAM OF THE MARGUERITE 20 NON-REMOVABLE EQUIPMENT



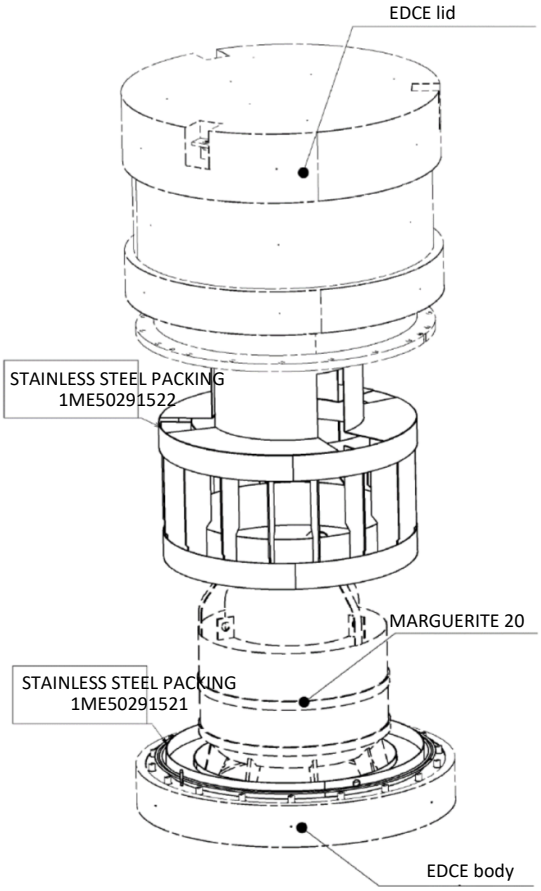
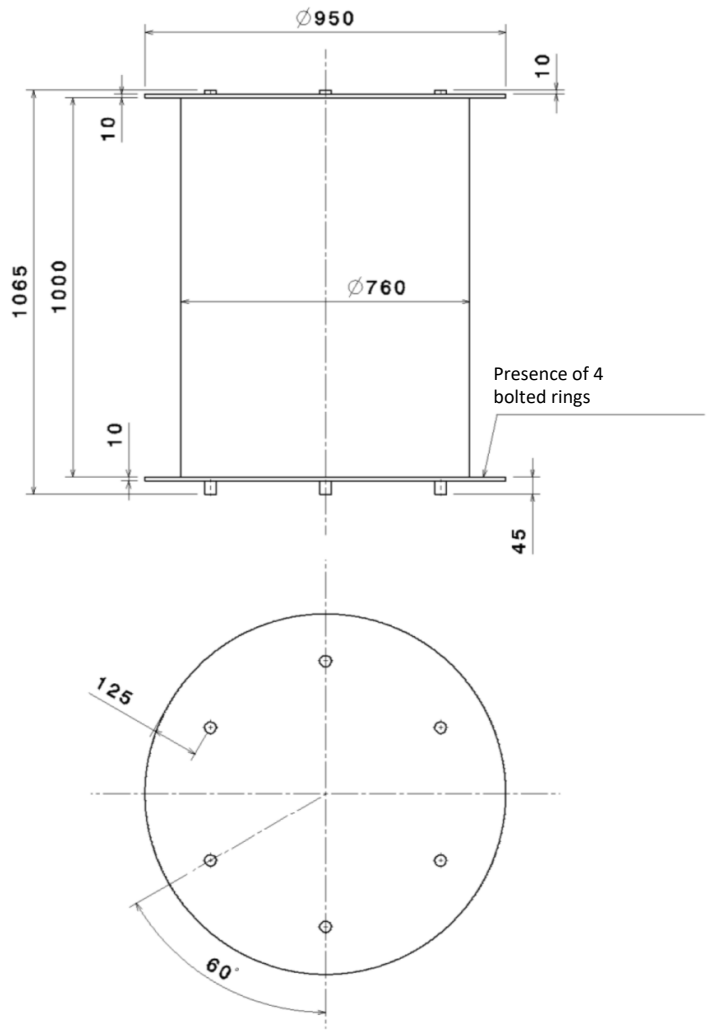


FIGURE 3.4
DIAGRAM OF THE MARGUERITE 2 NON-REMOVABLE EQUIPMENT



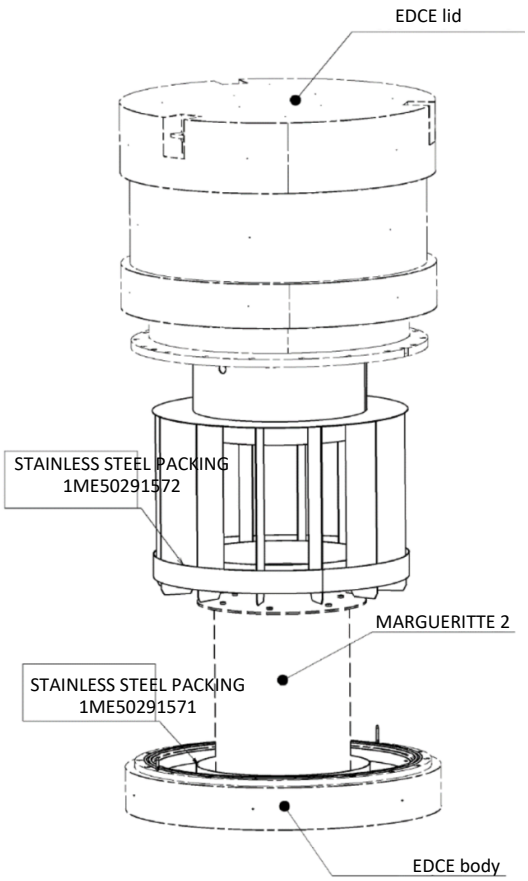


FIGURE 3.5
DIAGRAM OF THE GETER 2B NON-REMOVABLE EQUIPMENT

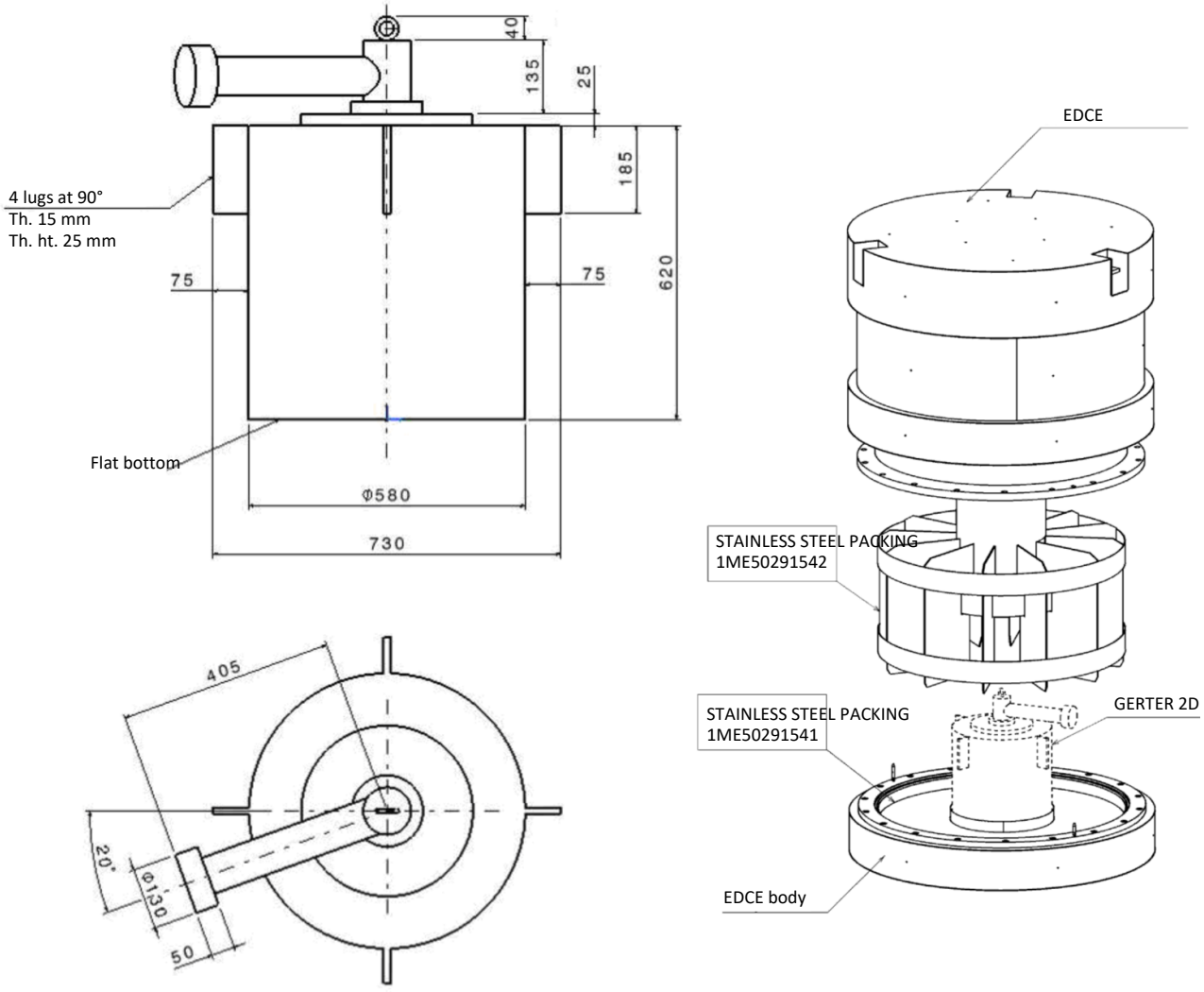
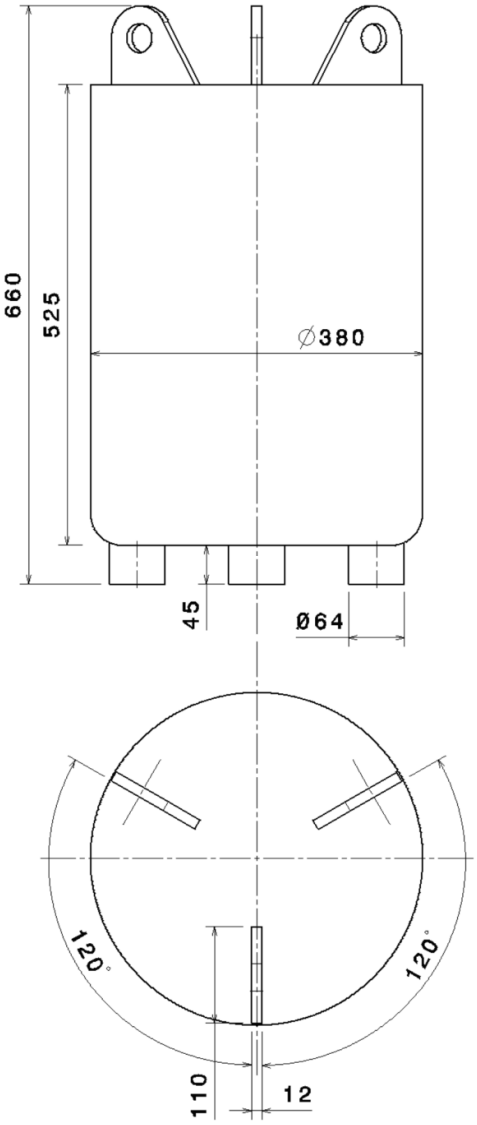


FIGURE 3.6
DIAGRAM OF THE GSM 15 NON-REMOVABLE EQUIPMENT



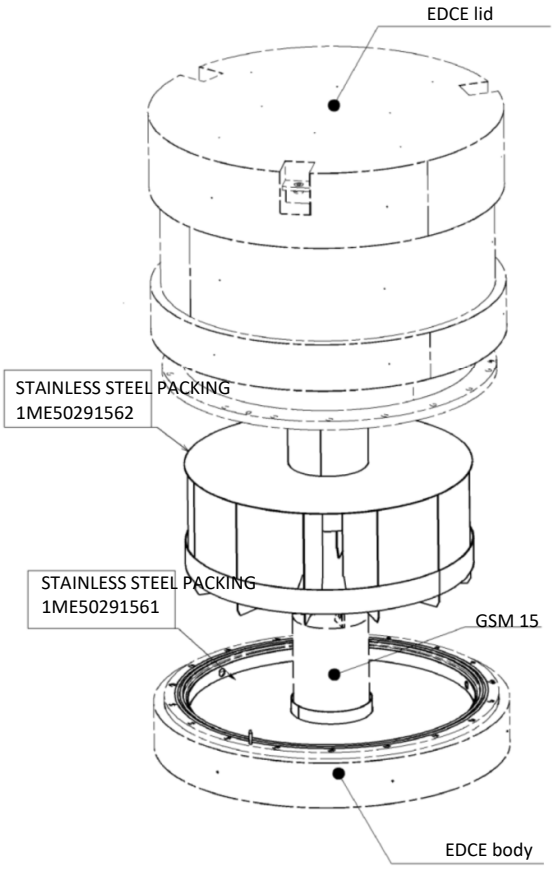
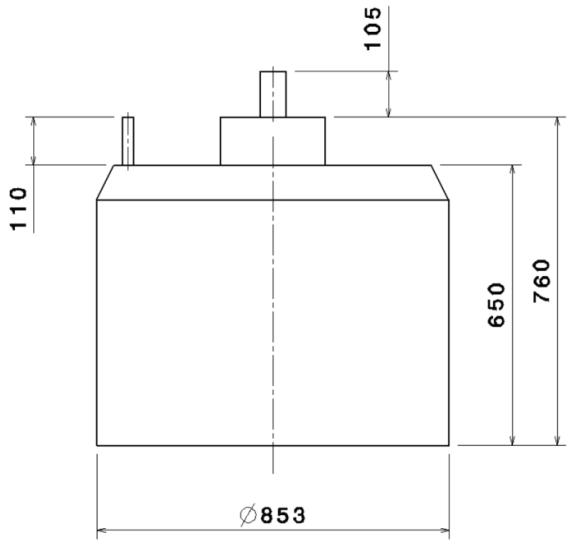
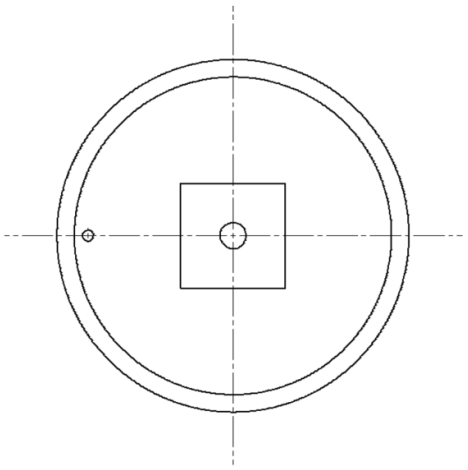


FIGURE 3.7
DRAWING OF THE GISETE 4 NON-REMOVABLE EQUIPMENT





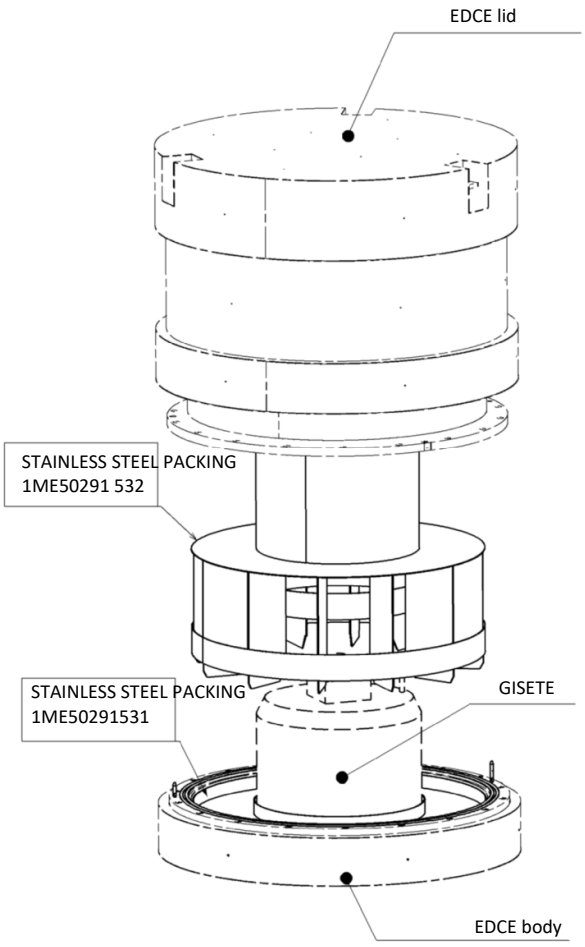


FIGURE 3.8
DRAWING OF THE GISETE 5 NON-REMOVABLE EQUIPMENT

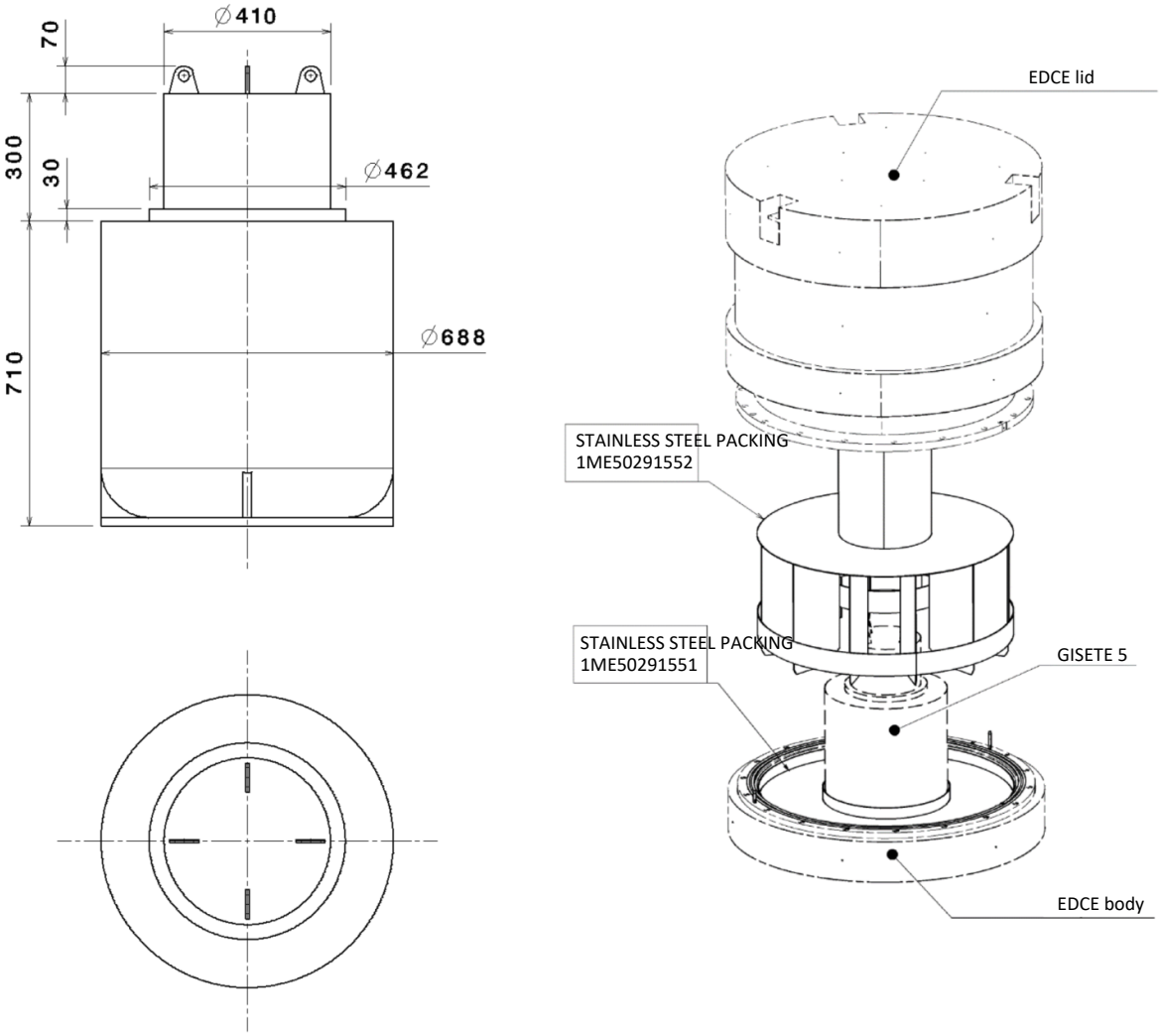
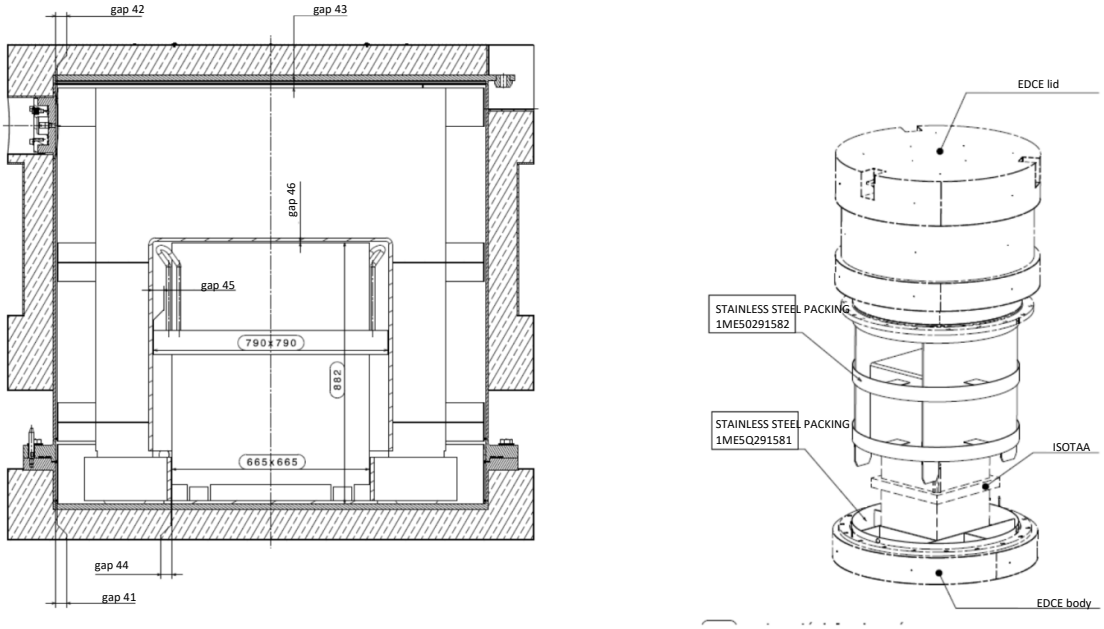


FIGURE 3.9
DIAGRAM OF THE ISOTAAF 1 NON-REMOVABLE EQUIPMENT



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**Pipeline and
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