

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES  
SAFETY EVALUATION OF DEVICE

NO.: NR-1112-S-103-S      DATE: December 14, 2016      PAGE: 1 of 5

SOURCE TYPE:      Gamma Gauge Source, X-Ray Fluorescence Source

MODELS:      GBa3 Series, XCd9 Series, XFe5 Series

DISTRIBUTOR:                      SEE CO. Inc.  
5255 Edina Industrial Blvd.  
Edina, MN 55439

MANUFACTURER:                      RITVERC Gmbh  
10 Kurchatova Street  
194223 St. Petersburg, Russia

<u>ISOTOPE:</u>	<u>MAXIMUM ACTIVITY:</u>
Barium-133	1.11 GBq (30 mCi)
Cadmium-109	3.7 GBq (100 mCi)
Iron-55	18.5 GBq (500 mCi)

LEAK TEST FREQUENCY:              6 Months

PRINCIPAL USE CODE:                      (D) Gamma Gauges  
(U) X-Ray Fluorescence

CUSTOM SOURCE:                       Yes       No

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DESCRIPTION:

The sealed source capsules, XCd9 series, XFe5 series, and GBa3 series consist of a cylindrical capsules made of Monel metal, which is sealed by laser welding a cap to the top. The beryllium window at the bottom is sealed using silver brazing alloy. Additional spacers made of stainless steel, cadmium, copper or tungsten alloy fix the active parts of the sources. The overall dimensions of the source capsules are 5 mm height, 8 mm to 22 mm diameter, with an active window diameter from 4.3 mm to 18.5 mm.

The XCd9 series are a low-energy x-ray source consisting of Cd-109 with a maximum activity of 3.7 GBq (100 mCi). The Cd-109 is incorporated in a light ceramic. The XCd9 series is composed of models XCd9.06, XCd9.07, and XCd9.08.

The XFe5 series sources are low-energy x-radiation disk source for XRF analyzers consisting of Fe-55 with maximum activity 18.5 GBq (500 mCi). The source consists of Fe-55 electrodeposited on a Copper backing. The XFe5 series is composed of models XFe5.21, XFe5.22, XFe5.23, and XFe5.24.

The GBa3 series sources are x-ray and gamma radiation source consisting of Ba-133 with a maximum activity of 1.11 GBq (30 mCi). The Ba-133 is incorporated in a ceramic matrix and sealed by laser welding in a Monel capsule. The GBa3 series is composed of models XBa3.06 and GBa3.06(061.4).

LABELING:

The source capsules are labeled by laser or mechanical engraved. The minimum character height is 1.5 mm. Label is located on cylindrical side surface of the capsule. The label contains the trefoil symbol, the Ritverc logo, the radioactive chemical symbol and the atomic mass, the serial number, and manufacturing year.

DIAGRAM:

See attachment 1 and 2.

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 (CORRECTED PAGES 3,4, and ATTACHMENT 2 - JANUARY 13, 2017)

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CONDITIONS OF NORMAL USE:

The source capsules are designed to be used as radioactive sources in x-ray analysis, density meters and flow meters. The sources have been tested to perform satisfactorily under the following conditions:

Temperature	-60°C to +90°C
Humidity	98% at +40°C
Pressure	25 to 500 kPa
Impact	150 m/s <sup>2</sup> at 30 ms
Vibration	5 to <b>150</b> m/s <sup>2</sup> , 5 to 500 Hz

The estimated and recommended working life of the sources is 15 years. At the end of the working life, the sources may be returned to the manufacturer for disposal.

PROTOTYPE TESTING:

The sources were subjected to tests to demonstrate **that** the sources will maintain their integrity under stresses of use and accidental that may occur. The sources have achieved the classification shown in the Table 1.

Table 1. Source ANSI Classification

Source Model Number	Source Classification (ANSI N43.6-1997/ISO 2919:2012)
GBa3.06 (061.4)	C65344
XBa3.06	C65344
XCd9.06	C65344
XCd9.07	C65343
XCd9.08	C65343
XFe5.21	C64343
XFe5.22	C64343
XFe5.23	C64343
XFe5.24	C64343

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EXTERNAL RADIATION LEVELS:

The licensee provided the calculated radiation profiles for the models in the XCd9 and XGa3 series. The values for the models in series XFe5 were measured and extrapolated. The values are listed in Table 2.

Table 2. Calculated dose rates

Source Type	Capsule Code	Maximum Activity (MBq)	Dose Rate 5 cm (µSv/hour)	Dose Rate 30 cm (µSv/hour)	Dose Rate 100 cm (µSv/hour)
XBa3, GBa3	<b>06</b>	1100	3.32E+04	9.80E+02	8.82E+01
	<b>07</b>	1480	2.86E+04	7.95E+02	7.20E+01
		2220	4.29E+04	1.20E+03	<b>1.08E+02</b>
XFe5	<b>08</b>	3700	7.15E+04	1.99E+03	1.80E+02
	21	2200	7.82E+04	1.13E+03	1.60E+01
	22	5550	1.95E+05	2.83E+03	4.10E+01
	23	9250	3.26E+05	4.71E+03	6.80E+01
	24	18500	6.51E+05	9.42E+03	1.35E+02

QUALITY ASSURANCE AND CONTROL:

SEE CO. maintains a quality assurance and control program, which has been deemed acceptable for licensing purposes by the NRC. A Copy of the program is on file with the NRC.

LIMITATIONS AND/OR OTHER CONSIDERATIONS OF USE:

- The source shall be distributed to persons specifically licensed by the NRC or an Agreement State.
- Handling, storage, use, transfer, and disposal: To be determine by the licensing authority.
- The source shall be leak tested at intervals not to exceed 6 months using techniques capable of detecting 185 Bq (0.005 µCi) of removable contamination.

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LIMITATIONS AND/OR OTHER CONSIDERATIONS OF USE (Cont.):

- The sources shall not be subjected to conditions that exceed its ANSI 43.6-1997 or ISO 2919:2012 classification as shown in Table 1.
- This registration certificate sheet and the information contained within the references shall not be changed without the written consent of the NRC.

SAFETY ANALYSIS SUMMARY:

Based on the review of the GBa3 Series, XCd9 Series, and XFe5 Series sealed source models, its ANSI classification, and the information and test data cited below, we conclude that the sources are acceptable for licensing purposes.

Furthermore, we conclude that the sources would be expected to maintain its containment integrity for normal conditions of use and accidental condition, which might occur during uses specified in this certificate.

ISSUING AGENCY:

U.S. Nuclear Regulatory Commission

Date: December 14, 2016

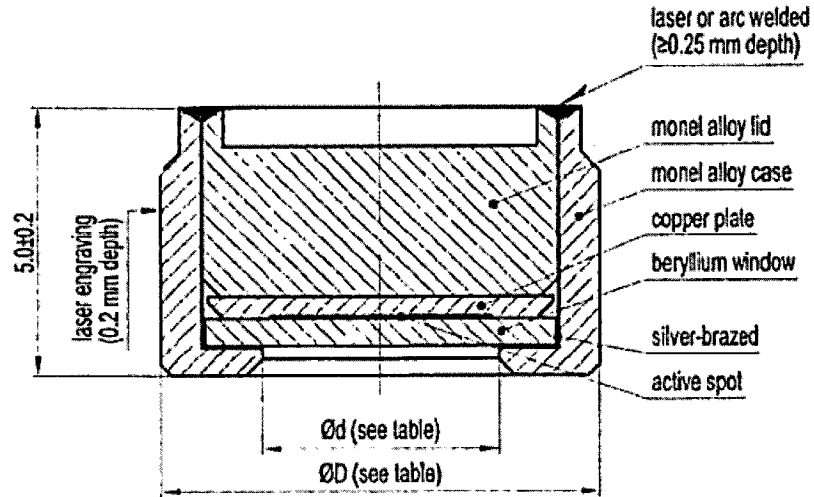
Reviewer:   
Lymari Sepulveda

Date: December 14, 2016

Concurrence:   
Tomas Herrera

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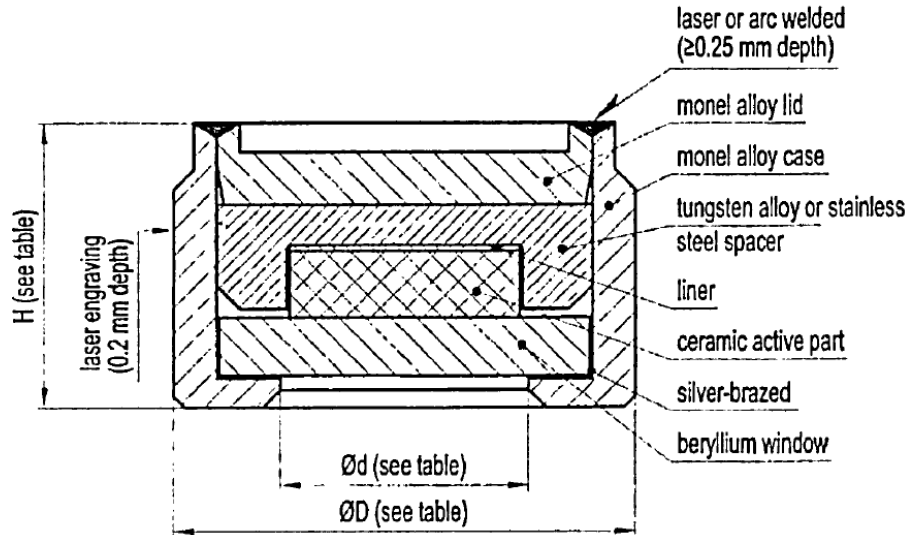
XFe5 Series

Dimensions of the source capsule

Source Model Number	Height (mm)	Outer Diameter (mm)
XFe5.21	5 <sub>±0.2</sub>	8 <sub>-0.06</sub>
XFe5.22	5 <sub>±0.2</sub>	10.8 <sub>-0.06</sub>
XFe5.23	5 <sub>±0.2</sub>	15 <sub>-0.07</sub>
XFe5.24	5 <sub>±0.2</sub>	22 <sub>-0.1</sub>

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XGa3 Series and XCd9 Series

Dimension of the source capsules

Source Model Number	Height (mm)	Outer Diameter (mm)
GBa3.06 (061.4)	5 <sub>-0.12</sub>	8 <sub>-0.09</sub>
XBa3.06	5 <sub>±0.2</sub>	8 <sub>-0.09</sub>
XCd9.06	5 <sub>±0.2</sub>	8 <sub>-0.09</sub>
XCd9.07	5 <sub>±0.2</sub>	10.8 <sub>-0.11</sub>
XCd9.08	5 <sub>±0.2</sub>	15 <sub>-0.11</sub>