PRODUCT SUPPORT LETTER

HANDLING OF RADIOACTIVE SPARK GAPS USED IN UNISON IGNITION UNITS

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Jacksonville, FL 32256
www.unisonaviation.com

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Revision 11
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Hazardous Material Shipping Guidance
USA DOMESTIC Ground

Product Name: Spark Gaps containing 4 microcuries of Krypton-85 (with no other hazmat in box)	Hazardous Properties: Contains Krypton-85 Krypton Gas (radioactive)
Manufacturer: Unison Industries	

DOCUMENTATION:
- No Hazmat Bill of Lading required.

TYPE OF PACKAGING:
- Use Manufacturer's original packaging or similar packaging such as a strong fibreboard box

REQUIRED PACKAGE MARKINGS:
- Print UN Number on box (See Figure 3): UN2911

COMMENTS:
- Exciter boxes containing spark gaps are shipped in the same manner as the spark gaps. The hanging tag pictured on the Exciter box is marked "Radioactive Krypton 85" in the same way the plastic sleeve is marked (See Figure 1 and Figure 2).

Figure 1

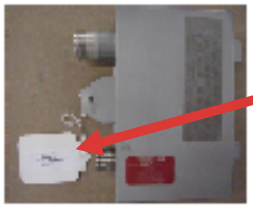


Figure 2

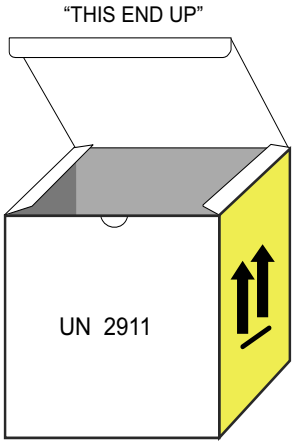


Figure 3

49CFR173.424, 173.422, 173.410, 173.443(e) Current as of September 21, 2010

Disclaimer: The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and reflects the manner in which spark gaps/exciters are shipped by Unison Industries. This document is intended only as a guide for use by a properly trained individual. Shippers should refer to applicable laws and regulations to confirm current packing and shipping requirements.

APPENDIX A
Shipping Requirements

Hazardous Material Shipping Guidance
International Air

Product Name: Spark Gaps containing 4 microcuries of Krypton-85 (with no other hazmat in box)	**Hazardous Properties**: Contains Krypton-85 Krypton Gas (radioactive)
Manufacturer: Unison Industries	

TYPE OF PACKAGING:
- Use Manufacturer's original packaging or similar packaging such as a strong fibreboard box

DOCUMENTATION:
- **No Dangerous Goods Shipper's Declaration Required**
- On the Air Waybill, the following endorsement is required in the "Nature and Quantity of Goods" box and include the number of packages. For example, if shipping 1 package:
  Exciter:
  Radioactive material, excepted package – instruments, UN2911, 1 Package
  or
  Spark Gaps:
  Radioactive material, excepted package – articles, UN2911, 1 Package

Figure 1

Figure 2

REQUIRED PACKAGE MARKINGS AND LABELS:
- UN Number on "Radioactive Material – Excepted Package" Handing Label (see Figure 3)
  UN2911

COMMENTS:
- Exciter boxes containing spark gaps are shipped in the same manner as the spark gaps. The hanging tag pictured on the Exciter box is marked "Radioactive Krypton 85" in the same way the plastic sleeve is marked (See Figure 1 and Figure 2)

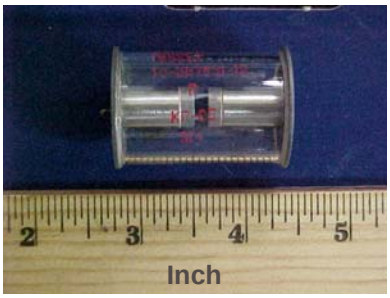
Figure 3

49CFR173.424, 173.422, 173.410

Current as of September 21, 2010

Disclaimer: The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and reflects the manner in which spark gaps/exciters are shipped by Unison Industries. This document is intended only as a guide for use by a properly trained individual. Shippers should refer to applicable laws and regulations to confirm current packing and shipping requirements.

Description



General – Spark gaps (also called "electron tubes") manufactured by Unison Industries are hermetically sealed, gas-filled switches with breakdown voltages ranging from 0.9 to 5.0 kVDC. The spark gap consists of a glass tube, metal end plates containing sparking electrodes, a filler gas, and the radioactive source Krypton 85 (^{85}Kr), which is mixed with the filler gas. By incorporating a very small quantity of ^{85}Kr within these spark gaps, consistent ionization and de-ionization levels can be obtained, resulting in stable operation of the ignition units. It is not possible to achieve consistent ionization/de-ionization levels or the desired life expectancy with air gaps. Each spark gap is marked on the glass tube with "UNISON", "59501" (the company's Commercial and Government Entity (CAGE) Code), the part number plus revision letter, "KR-85" and the manufacturing date code.

Most ignition exciters contain one, two, or three spark gaps (not all ignition exciters contain spark gaps). Different spark gap part numbers contain unique amounts of radioactivity. The gaps are manufactured using gas compositions controlled by engineering specifications where the required specific activity of ^{85}Kr is specified as millicuries per liter of gas mixture. This, along with the spark gap volume and gas mixture pressure determines the radioactivity of the spark gap. The radioactive concentration of ^{85}Kr in the spark gap filler gas is greater than 100 kilo-becquerel per gram (kBq/g) for all spark gaps manufactured by Unison Industries. All spark gaps currently manufactured by Unison Industries have ^{85}Kr radioactivity ranging from 1.4 kBq (0.04 microcurie) to 161.6 kBq (4.37 microcurie).

Design/Qualification – Ignition exciters designed by Unison Industries are subjected to environmental substantiation testing to verify that the spark gap will remain intact and that the byproduct material will not be released to the environment under the most severe environmental conditions likely to be encountered in normal use of the product.

Spark gaps have demonstrated acceptable performance with ignition exciter qualification testing to the following typical aviation and industrial environmental requirements:

Temperature: -100 °F (-73 °C) to +468 °F (+242 °C)

Pressure: 0.5 psi (3.5 kPa) to 40 psi (275 kPa) absolute

Impact: 20 g terminal peak saw tooth with 11 ms duration

Vibration: RTCA DO160D (Environmental Conditions and Test Procedures for Airborne Equipment), Curve W as follows:

0.1 Peak-to-Peak Displacement (5 – 14 Hz);
1 g Peak (14 – 24 Hz);
0.036 Peak-to-Peak Displacement (24 – 74 Hz);
10 g Peak (74 – 141 Hz);
0.01 Peak-to-Peak Displacement (141 – 200 Hz);
20 g Peak (200 – 2000 Hz)

Manufacturing – Quality control procedures employed in the fabrication and testing of production-released spark gaps are in accordance with Quality Standard AS9100.

Authorization to Distribute – The authorized use per USNRC license 09-23745-01E (Unison Industries is the licensee) is as follows: "Pursuant to Section 32.14, 10 CFR Part 32, "Specific Domestic Licenses to Manufacture or Transfer Certain Items Containing Byproduct Material"; the licensee is authorized to distribute electron and spark gap tubes containing not greater than 30 microcuries of ^{85}Kr to persons exempt from the requirements for a license pursuant to Section 30.15, 10 CFR Part 30, or equivalent provisions of the regulations of any Agreement State."

Transportation - Spark gaps (and ignition exciters containing spark gaps) shall be shipped in accordance with 49 CFR 173 requirements.

Material Safety Data Sheets (MSDS) - Unison Industries does not produce Material Safety Data Sheets (MSDS) for their articles. Per 29CFR, Standard 1910.1200, MSDS are not required for "articles." The code defines "article" as: *"a manufactured item other than a fluid or particle: (i) which is formed to a specific shape or design during manufacture; (ii) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and (iii) which under normal conditions of use does not release more than very small quantities, e.g., minute or trace amounts of a hazardous chemical (as determined under paragraph (d) of this section), and does not pose a physical hazard or health risk to employees."* This Product Support Letter contains all the information necessary for the safe handling of spark gaps and associated ignition exciters.

Product/Operational Hazards

Radioactivity – Spark gaps contain a small quantity of radioactive krypton gas (^{85}Kr). ^{85}Kr emits a 0.67 MeV beta particle (E_{max}) with a 99+ percent yield and a 0.514 MeV gamma ray with a 0.4 percent yield. In addition, a small amount (approximately 10^{-4} to 10^{-3}) of X-rays are produced via the bremsstrahlung process. Thus, the dose-rate due to ^{85}Kr is primarily (approximately 98 percent) beta radiation. The radioactive emissions are effectively contained within the spark gap, presenting no hazard during handling.

The following quantities of radioactivity and radiation level for each spark gap are not exceeded: 149.1 kBq (4.03 microcurie) ^{85}Kr, and an absorbed dose rate of 0.0036 milligray (mGy)/h (0.36 millirad/h) at 1 centimeter from any surface when measured through 7 mg/cm^2 of absorber. In addition, the radiation level at 10 cm from any point on the external surface of the ignition exciter is no greater than the naturally occurring background, 0.1 microsievert (µSv)/h. Reports documenting the abovementioned spark gap dose rate and ignition exciter radiation are on file at Unison Industries' Radiation Safety Office.

High Voltage – Spark gaps operate at high voltages but pose no shock hazard when operating within an enclosed ignition exciter.

Transportation Hazards

Radioactivity – Spark gaps and ignition exciters containing spark gaps may be transported under exception (Radioactive Material - Excepted Package) providing the total consignment does not have a radioactivity level greater than 10 gigabecquerels (0.27 curies). Since each spark gap has a maximum radioactivity of 161.6 kBq (4.37 microcurie), up to 61000 spark gaps may be transported in a single consignment providing no other radioactive materials are included therein. At the spark gap level, the item is identified as "Radioactive material, excepted package - article, UN2911." When shipped as an exciter containing a spark gap, the item is identified as "Radioactive material, excepted package - instrument, UN2911." No Dangerous Goods shipping declaration is required when Unison Industries ships these items to destinations outside the United States.

Radiation level at package surface will not exceed 0.5 mrem/hr and the level at 10 cm from unpackaged exciter or spark gap will not exceed 10 mrem/hr. No surface contamination is expected.

Due to the ultimate use of the exciter in the rigorous environment of an engine, the spark gap is installed inside the exciter in a very protective environment. The spark gap installed inside the exciter meets at least an equivalent level of safety for withstanding conditions normally incident to transportation.

Decommissioning/Disposal

Spark gaps are replaceable components of the electrical circuit for repairable ignition exciters. Instruction for the proper removal/replacement of the spark gap is outlined in the applicable exciter-specific Maintenance Manual.

There are no additional hazards associated with decommissioning beyond possible cut hazards due to glass breakage. The spark gap contains a glass tube that may be broken if dropped or stressed during installation or removal. If the tube is broken, sharp glass shards will be present. Used spark gaps should be placed in a suitable container to reduce the risk of breakage prior to being removed to a disposal facility. In the event of breakage, the gas will dissipate rapidly and will not expose persons in the vicinity to a hazardous level of radiation. The remaining material from a broken spark gap is not radioactive and may be disposed of as regular electronic waste.

To aid in disposing the spark gap in accordance with environmental regulations, Table 1 provides the approximate chemical composition:

Table 1
Approximate Composition of a Unison Industries Spark Gap, weight percent.

Borosilicate Glass	Tungsten	Iron	Nickel	Cobalt	Copper	Carbon
27.5	14.7	31.1	16.7	9.8	0.1	< 0.1

Unison takes pride in the quality of the products we sell and offering great customer service is our top priority. If you have spark gaps that require decommissioning, please see the letter at the end of this appendix.

NOTE

Spark gaps manufactured before 1974 were produced with Cesium-137 (^{137}Cs) fused as a solid to the inside of the glass envelope. These can be identified by the magenta-colored radiation symbol or the label “CS-137” printed on the spark gap. A large quantity of these gaps stored together can yield a radiation dose in excess of 0.02 milligray (mGy)/h (2 millirad/h) at the surface of the storage container. Therefore, it is recommended that a person handle no more than six ^{137}Cs spark gaps at one time unless they are shielded by radiation absorbing material. In the event that a ^{137}Cs spark gap breaks, care must be taken to avoid contact with or dispersion of the radioactive material. The radiation emission described herein refers to individual spark gaps. Physical separation of the spark gaps inside exciter units, and absorption of radiation by the exciter components, reduces the dose rate at the exciter surface to a level well below the maximum permissible exposure no matter how many units are stored together.

Physical separation of the spark gaps inside exciter units, and absorption of radiation by the exciter components, reduces the dose rate at the exciter surface to a level well below the maximum permissible exposure no matter how many units are stored together.

Certification Statement

I certify that the statements made in this information sheet are true, complete, and correct to the best of my knowledge.

Signature on file

Bruce D. Markert
Consulting Engineer/Radiation Safety Officer
bruce.markert@unisonindustries.com

7575 Baymeadows Way
Jacksonville, FL 32256
Telephone: 904 739-4000
Facsimile: 904 739-4093
www.unisonindustries.com

Date: 9 April 2015

To Whom It May Concern:

Unison Industries, LLC will support, in compliance with applicable U.S. laws and regulations, the decommissioning process for spark gaps containing Krypton 85 that are used in Ignition Exciter Units originally manufactured and sold by Unison Industries, LLC.

Where the spark gap is bonded into the exciter housing and not normally removable, this take back and disposal service will extend to the complete exciter unit with the bonded spark gaps.

Unison Industries, LLC must be contacted regarding the take back of specific spark gaps or, as applicable, the Ignition Exciter units with bonded spark gaps prior to a site readying the spark gaps or units for shipment. The return to Unison Industries, LLC for disposal or recycling will be governed by the Unison Industries Return Merchandise Authorization (RMA) process.

Direct return will be made, following the Unison Industries RMA process to: Unison Industries, LLC, 7575 Baymeadows Way, Jacksonville, FL 32256 USA.

All parties should review, and are responsible for, any applicable local, state, regional, national and international laws and regulations regarding the return.

Unison Industries, LLC is not responsible for any shipping, insurance or similar related costs related to the return to our facility of any spark gaps or, as applicable, the Ignition Exciter units with bonded spark gaps and may charge a processing fee for compliant take back and decommissioning.

Sincerely,

Benjamin Ritter

Benjamin Ritter
Ignition Systems Product Line Manager
Unison Industries, LLC

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U.S. NUCLEAR REGULATORY COMMISSION Amendment No. 05

MATERIALS LICENSE

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 36, 39, 40, and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

Licensee	
1. Unison Industries, Inc.	In accordance with letter received November 25, 2014
2. 7575 Baymeadows Way Jacksonville, Florida 32256	3. License number 09-23745-01E is amended in its entirety to read as follows: 4. Expiration date February 28, 2025 5. Docket No. 030-31066 Reference No. 31-15292-01E

6. Byproduct, source, and/or special nuclear material	7. Chemical and/or physical form	8. Maximum amount that licensee may possess at any one time under this license
A. Krypton-85	A. Gas	A. Not applicable (See Condition 10)

9. Authorized use:

In accordance with Section 32.14, 10 CFR Part 32, "Specific Domestic Licenses to Manufacture or Transfer Certain Items Containing Byproduct Material," the licensee is authorized to distribute electron and spark gas tubes, containing not more than 30 microcuries of krypton-85, to persons exempt from the requirement for a license under 10 CFR 30.15, or equivalent provisions of any Agreement State.

CONDITIONS

10. This license does not authorize possession or use of licensed material.

11. The licensee is authorized to distribute only from its facility located at 7575 Baymeadows Way, Jacksonville, Florida and 5345 State Highway 12, Norwich, New York.

12. The licensee shall submit periodic material transfer reports as specified in 10 CFR 32.16.

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MATERIALS LICENSE SUPPLEMENTARY SHEET	License Number 09-23745-01E
	Docket or Reference Number 030-31066
	Amendment No. 05

13. Except as specifically provided otherwise by this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents, including any enclosures, listed below. The U.S. Nuclear Regulatory Commission's regulations shall govern unless the statements, representations, and procedures in the licensee's application and correspondence are more restrictive than the regulations.

    A. Application dated November 25, 2014 (ML14339A262);
    B. Letter dated November 20, 2014 (ML15034A321).

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Date: February 5, 2015

By: _____

Shirley S. Xu
Materials Safety License Branch
Division of Material Safety, State, Tribal and Rulemaking Programs
Office of Nuclear Material Safety and Safeguards
Washington, DC 20555

Exciter (Ignitor)				Gap #1	Gap #2	Gap #3
Unison Part Number	OEM Customer Part Number	OEMCustomer	Number of Spark Gaps in the Exciter	Kr-85 Radioactivity (kBq)	Kr-85 Radioactivity (kBq)	Kr-85 Radioactivity (kBq)
10-106700-3	811127	P&W	1	3.7		
10-111160-6	6895689	Rolls-Allison	2	3.7	3.7	
10-111160-7	23056222	Rolls-Allison	2	3.7	3.7	
10-187950-1	47505-12	Teledyne Ryan	1	8.3		
10-187950-1	577899	Teledyne Ryan	1	8.3		
10-324330-3	37D401588P103	GEAE	2	8.3	8.3	
10-324910-1	4000T23P02	GEAE	1	12.1		
10-348450-1	37D400347P101	GEAE	2	3.2	3.2	
10-348850-4	106C5281P6	GEAE	2	3.6	3.6	
10-353875-4	571219	P&W	2	3.7	3.1	
10-358265-5	P737762	Volvo	1	4.5		
10-358860-1	694012	Honeywell	1	8.3		
10-369510-2	585781	P&W	1	3.1		
10-374190-2	6897970	Rolls-Allison	2	3.7	3.7	
10-377700-6	5020T06P01	GEAE	2	3.2	3.2	
10-377700-7	5020T06P02	GEAE	2	3.2	3.2	
10-378160-3	369963-3	Honeywell	1	8.3		
10-378160-4	369963-4	Honeywell	1	8.3		
10-378160-5	369963-5	Honeywell	1	8.3		
10-378175-4	6892939	Rolls-Allison	1	12.1		
10-378175-4	868961-2	Honeywell	1	12.1		
10-378175-5		Honeywell	1	3.7		
10-378175-6		Honeywell	1	3.7		
10-378175-7		Honeywell	1	3.7		
10-378335-1	362799-2	Honeywell	1	8.3		
10-378340-1	100624-1	Hamilton-Sundstrand	1	7.3		
10-378345-1	102744-1	Hamilton-Sundstrand	1	7.3		
10-378400-3	868962-2	Honeywell	1	11.7		
10-378400-5	868962-3	Honeywell	1	107.7		
10-378575-1	698090-1	Honeywell	1	8.3		
10-378600-6	9654M49P06	GEAE	3	3.7	3.7	3.7
10-378825-1	362799-3	Honeywell	1	3.2		
10-381160-2	968034-1	Honeywell	1	8.3		
10-381175-1	899580-2	Honeywell	1	12.1		
10-381175-2	378640	Honeywell	1	12.1		
10-381175-10	3603281-8	Honeywell	1	3.7		
10-381175-3	3603281-3	Honeywell	1	12.1		
10-381175-4	3603281-4	Honeywell	1	12.1		
10-381175-7	3603281-4	Honeywell	1	3.7		
10-381175-8	899580-5	Honeywell	1	3.7		
10-381175-9	3603281-7	Honeywell	1	3.7		
10-381200-10	969373-2	Honeywell	1	3.7		
10-381200-11	3603281-5	Honeywell	1	3.7		
10-381200-3	377869	Honeywell	1	12.1		
10-381550-2	3035546	PWC	1	3.7		
10-381550-21	3117870-01	PWC	1	3.7		
10-381550-22	3119450-01	PWC	1	3.7		
10-381550-4	3035889	PWC	1	3.7		
10-381550-5	3900106	PWC	1	3.7		
10-381750-1		Honeywell	1	12.1		
10-381750-10	3603281-2	Honeywell	1	3.7		
10-381750-14	3603281-6	Honeywell	1	3.7		
10-381750-15	00-84E-560-03	Kawasaki	1	3.7		

Exciter				Gap #1	Gap #2	Gap #3
Unison Part Number	OEM Customer Part Number	OEMCustomer	Number of Spark Gaps in the Exciter	Kr-85 Radioactivity (kBq)	Kr-85 Radioactivity (kBq)	Kr-85 Radioactivity (kBq)
10-381750-5	899580-3	Honeywell	1	12.1		
10-381750-6	3603281-2	Honeywell	1	12.1		
10-383160-2	L903908	Rolls-Royce	1	3.7		
10-383160-3	L903917	Rolls-Royce	1	3.7		
10-383225-1	1-300-363-03	Honeywell	1	8.3		
10-383900-16	9101M52P17	GEAE	2	106.2	149.1	
10-387125-2	969690-2	Honeywell	1	3.7		
10-387320-1	976099-1	Honeywell	1	12.1		
10-387650-1	105782-1	Hamilton-Sundstrand	1	107.7		
10-387990-3	6896130	Rolls-Allison	2	3.7	3.7	
10-392000-2	21T2444	Westinghouse	1	3.7		
10-392000-2	3070378-2	Honeywell	1	3.7		
10-392630-4	367051-2	Honeywell	1	8.3		
10-392775-4	L21454P04	GEAE	2	149.1	106.2	
10-392775-4	315A4204P001	GEPS	2	149.1	106.2	
10-392775-4	4195C30001	Westinghouse	2	149.1	106.2	
10-392775-5	L21454P05	GEAE	2	3.7	1.4	
10-397050-1	110418-1	Hamilton-Sundstrand	1	107.7		
10-397050-2	110418-2	Hamilton-Sundstrand	1	107.7		
10-397050-4	5910121	Hamilton-Sundstrand	1	107.7		
10-397050-5	5901038-1	Hamilton-Sundstrand	1	107.7		
10-397450-2	0-300-163-01	Honeywell	1	8.3		
10-397550-1	5027T49P02	GEAE	2	3.7	3.7	
10-397625-1	106C5281P5	GEAE	2	3.7	3.7	
10-397630-2	517D994P02	GEAE	2	3.7	3.7	
10-397650-1	2-303-026-01	Capstone	1	107.7		
10-397650-1	2-303-026-01	Honeywell	1	107.7		
10-516000-1	3888000-2	Honeywell	1	107.7		
10-516000-2	3888000-4	Honeywell	1	107.7		
10-516000-3	3888000-3	Honeywell	1	107.7		
10-516000-5	3888000-5	Honeywell	1	107.7		
10-516300-2	5039T90P04	GEAE	1	3.7		
10-516451-1	23321	Williams	1	3.2		
10-516675-2	3001433-3	Honeywell	1	3.7		
10-614325-2	23000500	Rolls-Allison	1	12.1		
10-614495-4	3888042-3	Honeywell	1	107.7		
10-614500-1	780524	P&W	2	107.7	3.7	
10-614575-1	305639-3	Honeywell	1	107.7		
10-614675-1	DL20078	Rolls-Royce	1	3.7		
10-614910-1	L25806P02	GEAE	2	3.7	3.7	
10-614910-3	L25806P04	GEAE	2	3.7	3.7	
10-614950-1	6899093	Rolls-Royce	1	107.7		
10-617050-1	3073914-1	Honeywell	2	107.7	107.7	
10-617050-2	3073914-2	Honeywell	2	107.7	107.7	
10-617050-4	3073914-4	Honeywell	2	107.7	107.7	
10-617075-6	3888058-5	Honeywell	1	107.7		
10-617075-6	WE3888439-1	Honeywell	1	107.7		
10-617700-2	5045T94P02	GEAE	1	3.7		
10-617775-1	162308-1	Hamilton-Sundstrand	1	107.7		
10-617860-2	811128	P&W	2	3.7	3.6	
10-617865-4	813084	P&W	1	3.7		
10-617980-1	9238M66P05	CFM	1	3.7		
10-617980-1	9238M66P05	GEAE	1	3.7		

Exciter				Gap #1	Gap #2	Gap #3
Unison Part Number	OEM Customer Part Number	OEMCustomer	Number of Spark Gaps in the Exciter	Kr-85 Radioactivity (kBq)	Kr-85 Radioactivity (kBq)	Kr-85 Radioactivity (kBq)
10-621020-2	305639-4	Honeywell	1	107.7		
10-621630-1	50T241	P&W	1	3.7		
10-621630-2	50U984	P&W	1	3.7		
10-621630-3	52U567	P&W	1	3.7		
10-631045-1	9238M66P07	CFM	1	3.7		
10-631045-1	9238M66P07	GEAE	1	3.7		
10-631045-2	9238M66P08	CFM	1	3.7		
10-631045-2	9238M66P08	GEAE	1	3.7		
10-631045-3	9238M66P11	CFM	1	3.7		
10-631045-3	9238M66P11	GEAE	1	3.7		
41540		P&W	2	159.8	59.2	
42721		P&W	2	159.8	59.2	
430015	4068T45G01	GEAE	1	1.4		
430020-2	1797M97P03	GEAE	2	1.4	1.4	
430021-2	3105886-5	Honeywell	1	107.7		
430028	1025T04P01	GEAE	1	3.7		
430035	23057324	Rolls-Allison	1	107.7		
430107	L963046	Rolls-Royce	1	3.7		
430120	4042T42G04	GEAE	1	1.4		
430138	23065922	Rolls-Allison	1	107.7		
430141	23065924	Rolls-Allison	1	107.7		
430142	23065923	Rolls-Allison	1	107.7		
430143	83311-430143	Rolls GmbH	1	96.2		
430152	L963047	Rolls-Royce	1	3.7		
430154	L963045	Rolls-Royce	1	3.7		
43326	1-300-363-04	Honeywell	1	59.2		
43379	653555	P&W	1	107.7		
43467	4026T03P01	GEAE	1	1.4		
43661	4022T65P01	GEAE	2	1.4	1.4	
43789	4024T03P01	GEAE	1	1.4		
44302	922403	Rolls-Royce	1	159.8		
44303	963026	Rolls-Royce	1	159.8		
44387	780438	P&W	1	3.7		
44525	4068T11P02	GEAE	1	1.4		
44878	4000T23P04	GEAE	1	59.2		
44 997	5052T41P01	GEAE	1	1.4		
45566	3876154-2	Honeywell	1	107.7		
45570		GEAE	1	59.2		
45570-1	1538M69P01	GEAE	1	59.2		
46011	3-300-717-03	Honeywell	1	107.7		
46470	4080687	P&W	2	118.4	118.4	
46470-1	4080687	P&W	2	161.6	161.6	
47418	4060998	P&W	2	118.4	118.4	
47418-3		P&W	2	161.6	161.6	
47523	9339M27P01	GEAE	3	107.7	3.7	3.7
47582-1	1265M17P02	GEAE	2	59.2	59.2	
47649-3	1B7880	P&W	1	3.7		
48404-7	4020244	P&W	1	118.4		
48404-8	508968	Hamilton-Sundstrand	1	161.6		
48946	5027T49P01	GEAE	1	59.2		
48950	6887768	Rolls-Allison	1	59.2		
48987	4040T18P02	GEAE	1	1.4		
49520	287-4098	Rolls GmbH	1	107.7		

Exciter				Gap #1	Gap #2	Gap #3
Unison Part Number	OEM Customer Part Number	OEMCustomer	Number of Spark Gaps in the Exciter	Kr-85 Radioactivity (kBq)	Kr-85 Radioactivity (kBq)	Kr-85 Radioactivity (kBq)
49543-8	4049295	Hamilton-Sundstrand	2	161.6	161.6	
49609-1	5030T49P02	GEAE	1	3.7		
49810-2	9939M67P05	GEAE	1	107.7		
49930	3032167	PWC	1	59.2		
500005-1	2780688-1	Honeywell	1	107.7		
500210-1	500210-1	GEAE	None			
500335-1	31J2807-07	PWC	None			
500380-2	2042M15P02	GEAE	3	107.7	3.7	3.7
500955-1	4155T11P01	GEAE	1	3.7		
501240-1	23077617	Rolls-Allison	1	107.7		
502510-2	73489	Williams International	1	107.7		
503109-1	508956-1	Capstone	None			
503306-2	9238M66P10	GEAE	1	3.7		
503453-4	7000273H04	Hamilton-Sundstrand	None			
503791-1	365-602-202-0	Snecma	1	3.7		
504210-4	2121M94P04	GEAE	1	3.7		
504210-5	2121M94P05	GEAE	1	3.7		
506010-1	4155T06P01	GEAE	2	3.2	3.2	
508688-1	2139M52P01	GEAE	1	3.7		
509950-1	5147T36P01	GEAE	2	107.7	107.7	
513610-1	2489M04P01	CFM	1	3.7		
513610-1	2489M04P01	GEAE	1	3.7		
9040875-1	9101M52P20	GEAE	2	106.2	149.1	
9040960-1	3876129-1	Honeywell	1	107.7		
9045000-1	804765	P&W	2	107.7	3.7	
9045200-1	806375	P&W	2	107.7	3.7	
9045220-2	3888289-2	Honeywell	2	107.7	107.7	
9045220-3	3888289-3	Honeywell	2	107.7	107.7	
9045330-2	5U0012	IAE	1	3.7		
9045515-1	179068-1	Hamilton-Sundstrand	1	107.7		
9045600-1	806312	P&W	2	107.7	3.7	
9045950-1	304271-1	Honeywell	1	3.7		
9047575-3	9550171820	Turbomeca	None			
9047650-3	3094741-3	Honeywell	1	3.7		
9047770-2	3051402-2	CFE	2	107.7	107.7	
9047810-4	LH70001-04	LHTEC	1	3.7		
9047810-6	LH30149-01	LHTEC	1	3.7		
9047840-2	3040032	PWC	None			
9047845-1	TRN 11721	Rolls-GTE	None			
9047880-1	L972304	Rolls-Royce	1	3.7		
9047900-2	5073T36P02	GEAE	1	3.7		
9047900-2	5073T36P02	Volvo	1	3.7		
9047950-1	463850000	MAK	1	107.7		
9047975-3	304543-4	Honeywell	1	3.7		
9047980-21	31B4636-02	PWC	None			
9048700-8	3876195-8	Honeywell	None			
9048700-9	3876195-9	Honeywell	None			
9048800-3	LH50454-03	LHTEC	1	107.7		
9048800-5	LH11157-01	LHTEC	1	107.7		
9048900-2	179420-2	Hamilton-Sundstrand	1	107.7		
9049000-1	4950000	Hamilton-Sundstrand	1	1.4		
9049075-1	350E2055-1	Teledyne Ryan	1	107.7		
9049150-3	3039488	PWC	None			

Exciter				Gap #1	Gap #2	Gap #3
Unison Part Number	OEM Customer Part Number	OEMCustomer	Number of Spark Gaps in the Exciter	Kr-85 Radioactivity (kBq)	Kr-85 Radioactivity (kBq)	Kr-85 Radioactivity (kBq)
9049300-2	3888000-7	Honeywell	1	107.7		
9049300-3	AP100193	Rolls-Allison	1	107.7		
9049310-1	9550171720	Turbomeca	None			
9049400-1	3039609	PWC	None			
9049720-2	4951070	Hamilton-Sundstrand	None			
9049770-3	3041641-01	PWC	None			
9049770-3	4951302	PATS	None			
9049800-4	3041640-01	PWC	None			
9049820-3	WE 3876295-3	Honeywell	None			
9049820-5	WE3876295-5	Honeywell	None			
9049820-6	WE3876295-6	Honeywell	None			
9049835-3	31J2807-03	PWC	None			
9049860-1	3876280-1	Honeywell	None			
9049860-10	3876280-4	Honeywell	None			
9049900-4	5405230	P&W	2	3.7	3.7	
9049910-1	354A1709P001	GEPS	2	3.7	3.7	
9049910-2	354A1709P002	GEPS	2	3.7	3.7	
9049910-4	354A1709P102	GEPS	2	3.7	3.7	
9049910-5	354A1709P103	GEPS	2	3.7	3.7	
9049915-1	4950745	Hamilton-Sundstrand	None			
9049950-1	3060T07P01	GEAE	1	107.7		
9060000-1	LW17921	Rolls-Royce	None			
9060030-86	64/07001494/1	Alstom	None			
9060030-88	64/07001494/4	Alstom	None			
9060040-1	64/07001493/1	Alstom	None			
9060040-2	64/07001493/2	Alstom	None			
9060095-1	3094834-1	Honeywell	1	3.7		
9060095-2	3094972-1	Honeywell	1	3.7		
9060145-1	TRN 13842	Rolls-GTE	None			
9060260-1	3073776-1	Honeywell	2	107.7	107.7	
9060280-1	3061186-1	Honeywell	2	107.7	107.7	
9060315-1	4321570	P&W	1	161.6		
9060340-1	0-300-261-02	Honeywell	1	107.7		
9060370-1	0-300-261-01	Honeywell	1	107.7		
9060380-1	0-300-297-01	Honeywell	1	107.7		
9060420-2	31J2807-05	PWC	None			
9060420-3	3052328-03	PWC	None			
9060420-4	31J2807-06	PWC	None			
9060420-5	30B5592-01	PWC	None			
9060430-1	AG59572	Rolls-Royce	None			
9060430-2	AG59437-2	Rolls-Royce	None			
9060440-1	9060440-1	Rolls GmbH	1	3.7		
9060440-2	9060440-2	Rolls GmbH	1	3.7		
9060660-1	3054825-01	PWC	None			
9060660-2	3054825-02	PWC	None			
9060665-1	1025T04P02	GEAE	1	3.7		
9400160-2		Honeywell	1	107.7		

Ignition Exciter (Ignitor) Subassemblies and Spare Part Kits Unison Part Number	Application	Number of Spark Gaps Contained	Gap #1 Kr-85 Radioactivity (kBq)	Gap #2 Kr-85 Radioactivity (kBq)
501234	Subassembly for 47649-3	1	3.7	
502144	Subassembly for 46470-1, 49543-8	2	161.6	161.6
502419	Subassembly for 48404-8	1	161.6	
510526	Subassembly for 43467, 43661	2	1.4	1.4
84356	Kit for 47418	2	161.6	161.6
84371	Kit for 46470	2	161.6	161.6
K509516	Kit for 10-631045-1/2/3	1	3.7	
K509517	Kit for 10-381550-2/4/5/21/22	1	3.7	
K509518	Kit for 10-621630-1	1	3.7	
K509519	Kit for 10-621630-2/3	1	3.7	
K509520	Kit for 10-617075-6	1	107.7	
K509521	Kit for 9040960-1	1	107.7	
K509522	Kit for 9045330-2	1	3.7	
K509523	Kit for 47649-3	1	3.7	
K509524	Kit for 9045000-1	1	107.7	
K509526	Kit for 10-381750-14; 10-381200-1; 10-111160-7	1	3.7	
K509527	Kit for 10-111160-6/7	2	3.7	3.7
K509528	Kit for 10-614500-1	2	107.7	3.7
K509529	Kit for 9048900-2	1	107.7	
K509530	Kit for 10-387125-2	1	3.7	
K509531	Kit for 503791-1	1	3.7	
K509533	Kit for 504210-4	1	3.7	
K511716	Kit for 508688-1	1	3.7	
K511717	Kit for 10-397550-1	2	3.7	3.7

Individual Spark Gaps Unison Part Number	Application	Kr-85 Radioactivity (kBq)
10-187895-14	Various	3.2
10-348779-1	Various	12.1
10-348780-3	Various	8.3
10-374121-22	Various	107.7
10-621055-21	Various	3.7
502000-1	For 10-381160-2	8.3
502000-2	YDK Industrial	3.2
502000-3	For 10-381175-9, 10-381200-11, 10-381750-14	3.7
502000-4	For 10-111150-2	3.7
502000-5	For 10-111160-6/7	3.7
502000-6	For 10-374190-2	3.7
502000-7	For 9045330-2	3.7
502000-8	For 10-621630-1	3.7
502000-9	For 10-397625-1	3.7
502000-10	For 10-617860-2	3.7
502000-11	For 10-383870-1	3.7
502000-12	YDK Industrial	3.7
502000-13	For 10-392000-2	3.7
502000-14	For 10-387125-2	3.7
502000-15	For 516300-2	3.7
502000-16	KEME Industrial	3.7
502000-17	KEME Industrial	3.7

Individual Spark Gaps Unison Part Number	Application	Kr-85 Radioactivity (kBq)
502000-18	KEME Industrial	3.7
502000-19	YDK Industrial	3.7
502000-20	For 10-383160-3/4/5	3.7
502000-21	For 10-378400-5	107.7
502000-22	For 10-614950-1	107.7
502000-23	For 9045000-1	107.7
502000-24	For 10-614500-1	107.7
502000-25	For 9045200-1, 9045600-1/20	107.7
502000-26	For 9048900-2	107.7
502000-27	For 10-397650-1	107.7
502000-28	For 10-614575-1	107.7
502000-29	For 10-621020-2	107.7
502000-30	For 9040960-1	107.7
502000-31	For 10-614495-4	107.7
502000-32	For 10-617075-6	107.7
502000-33	For 10-617050-4	107.7
502000-34	KEME Industrial	107.7
502000-35	YDK Industrial	107.7
502000-36	KEME Industrial	107.7
502000-37	For 10-614500-1	3.7
502000-38	For 904500-1	3.7
502000-39	For 9045200-1, 9045600-1/20	3.7
502000-40	For 430107, 430152	3.7
502000-41	For 10-621630-2/3	3.7
502000-42	For 9048550-2	3.7
502000-43	For 10-631045-1/2/3	3.7
502000-44	For 10-381550-5, 10-614675-1	3.7
502000-45	For 10-381550-1/2/4/22	3.7
502000-46	For 9049900-4	3.7
502000-47	For 503306-2	3.7
502000-48	For 430021-1	107.7

UNISON Industries
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CERTIFICATE FOR SEALED RADIOACTIVE SOURCE

Model number:	10-392775-4 Revision H (GE Aviation P/N L21454P04)
Serial number:	All serial numbers, based on type testing and conformance to ISO 9001 and AS9100 certified quality systems.
Radionuclide:	^{85}Kr
Description:	Beta radiation source - Gas mixture containing ^{85}Kr in sealed glass/metal envelope within the ignition exciter.
ISO Classification:	ISO/99/C11111
Estimated content activity:	255.3 kBq (two spark gaps of 149.1 and 106.2 kBq)
Radiation output:	
Quantity measured:	Air kerma rate at 0.1 m from the source
Results:	< 0.002 µGy/hr
Test for freedom from surface contamination:	N/A (inert gas)
Test for freedom from leakage:	
Method:	Hot-liquid bubble test per ISO 9978, Section 6.2.2
Results:	Passed
Date:	On file at Unison for each serial number
Attestation:	Sealed radioactive source (spark gap) from all ignition exciters returned to Unison Industries will be recycled in accordance with applicable regulations.

Bruce D. Markert
Consulting Engineer and Radiation Safety Officer

This certificate complies with the requirements of ISO 2919

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CERTIFICATE FOR SEALED RADIOACTIVE SOURCE

Model number: 10-392775-5 Revision A
(GE Aviation P/N L21454P05)

Serial number: All serial numbers, based on type testing and conformance to ISO 9001 and AS9100 certified quality systems.

Radionuclide: ^{85}Kr

Description: Beta radiation source - Gas mixture containing ^{85}Kr in sealed glass/metal envelope within the ignition exciter.

ISO Classification: ISO/99/C11111

Estimated content activity: 5.1 kBq (two spark gaps of 3.7 and 1.4 kBq)

Radiation output:
- **Quantity measured:** Air kerma rate at 0.1 m from the source
- **Results:** < 0.002 µGy/hr

Test for freedom from surface contamination: N/A (inert gas)

Test for freedom from leakage:
- **Method:** Hot-liquid bubble test per ISO 9978, Section 6.2.2
- **Results:** Passed
- **Date:** On file at Unison for each serial number

Attestation: Sealed radioactive source (spark gap) from all ignition exciters returned to Unison Industries will be recycled in accordance with applicable regulations.

Bruce D. Markert
Consulting Engineer and Radiation Safety Officer

This certificate complies with the requirements of ISO 2919

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CERTIFICATE FOR SEALED RADIOACTIVE SOURCE

Model number: 9049910-4 Revision C
(GEPS P/N 354A1709P102)

Serial number: All serial numbers, based on type testing and conformance to ISO 9001 and AS9100 certified quality systems.

Radionuclide: ^{85}Kr

Description: Gas mixture containing ^{85}Kr in sealed glass/metal envelope within the ignition exciter.

ISO Classification: ISO/99/C11111

Estimated content activity: 7.4 kBq (two spark gaps of 3.7 kBq each)

Radiation output:
- **Quantity measured:** Air kerma rate at 0.1 m from the source
- **Results:** < 0.002 µGy/hr

Test for freedom from surface contamination: N/A (inert gas)

Test for freedom from leakage:
- **Method:** Gaseous Emanation Test per ISO 9978, Section 5.2.4
- **Results:** Passed
- **Date:** On file at Unison for each serial number

Attestation: Sealed radioactive source (spark gap) from all ignition exciters returned to Unison Industries will be recycled in accordance with applicable regulations.

Bruce D. Markert
Consulting Engineer and Radiation Safety Officer

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CERTIFICATE FOR SEALED RADIOACTIVE SOURCE

Model number:	9049910-5 Revision A (GEPS P/N 354A1709P103)
Serial number:	All serial numbers, based on type testing and conformance to ISO 9001 and AS9100 certified quality systems.
Radionuclide:	^{85}Kr
Description:	Gas mixture containing ^{85}Kr in sealed glass/metal envelope within the ignition exciter.
ISO Classification:	ISO/99/C11111
Estimated content activity:	7.4 kBq (two spark gaps of 3.7 kBq each)
Radiation output:	
Quantity measured:	Air kerma rate at 0.1 m from the source
Results:	< 0.002 µGy/hr
Test for freedom from surface contamination:	N/A (inert gas)
Test for freedom from leakage:	
Method:	Gaseous Emanation Test per ISO 9978, Section 5.2.4
Results:	Passed
Date:	On file at Unison for each serial number
Attestation:	Sealed radioactive source (spark gap) from all ignition exciters returned to Unison Industries will be recycled in accordance with applicable regulations.

Bruce D. Markert
Consulting Engineer and Radiation Safety Officer

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