ANSI Standard N538

Classification of Industrial Ionizing Radiation Gauging Devices

IMS Test Report 22000154

Procedure and Results

IMS Gauge Model 5321 Series Multi-Channel Radiometric Tube Gauge

Overview

The following pages present a brief description of the test procedure and results used to establish the ANSI classification for the IMS Gauge Model 5321 Series. The tests were performed according to the specifications of ANSI N538 by IMS GmbH in Heiligenhaus, Germany. The testing was performed directly on the IMS Model TIAS 211 Heavy Metal Shielding Unit (source holder and shutter mechanism), which was cycled about 25,000 times during testing. The testing temperature range was 0 C to 85 C. No fire condition test was performed. The reader is referred to ANSI N538 for a detailed presentation of the test specifications.

Device Tested:

Description Heavy Metal Shielding IMS Model Identifier: TIAS 211 IMS Article Nr.: 5321-025 Ident-Nr.: 22000154

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1. Source Shutter Mechanism Long Term Test

1.1 Test Dates & Personnel

Test Engineer: H. Treder Test Start Date: 14.07.1995 Test End Date: 22.07.1995

1.2 Source Shutter Mechanism Test Schematic



1.3 Accessory Devices

Pos.	Device	Device Name	Supplier
1	Compressed Air, 10 bar		IMS
2	Compressed Air Filter / Regulator	Model FRC-1/4-S IMS-Nr.: 0059-121	Kuhnke
3	Constant Voltage Supply	Model GA-NT 40	AEG
4	Solenoid Valve	Model 65.111 IMS-Nr.: 0052-311	Kuhnke
5	Multi-function relay	Model XMW S2 IMS-Nr.: 0226-223-01	EAO LUMITAS
6	Electro-mechanical counter	Model 162E	Sodeca
7	Dose Meter	Babyline 31 System CEA E433 Nr.: 2670 Photon energy range: 5 keV - 3 MeV	Herfurth
8	Lead bricks (shielding)		IMS
9	Sealed Radiation Source Isotope: Cs 137 Radiation Type: Gamma Activity: 370 GBq (10 Ci) Capsule Type: X38/4 Source S/N: 1429 BK		Amersham International

1.4 Test Execution

1.4.1 Preliminary Remarks

The TIAS 211 Heavy Metal shielding is constructed as depicted in IMS drawing 5321-025. It is tested as described in this test report (document Q\QS\AA\5\0911\22000154). In preparation for the test, the TIAS 211 was loaded with 370 Gbq (10 Ci) Cs 137 source (serial number 1429BK). Precautionary radiation flux test measurements were taken with the source installed (ref. IMS drawing 5321-025 I01). The test equipment was prepared as shown under 1.2 above.

1.4.2 Operating/Test Conditions

The compressed air supply pressure was reduced to 5.5 bar (maximum pressure) for the test. The supply voltage was 24 VDC (position 3 under heading 1.3). The multi-function relay (position 5 under 1.3) was used as a timer. The SHUTTER OPEN and SHUTTER CLOSED duration times were set at ten seconds each. The room temperature during the test ranged from 20 - 25 C.

A lead shield was placed in front of the source shutter primary radiation beam outlet to absorb primary radiation emitted when the shutter was open.

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1.4.3 Test Procedure

The source shutter actuator was driven by a solenoid valve (position 4 under heading 1.3). The solenoid valve was controlled by the multi-function relay (position 5 under 1.3). A new timer cycle of ten seconds was triggered whenever the shutter reached the OPEN or CLOSED position. The electro-mechanical counter incremented by one each time the shutter reached the CLOSED position.

At the start of the test the TIAS 211 was operated in three different positions (horizontal, vertical, and side). The initial compressed air operating pressure was set at 4.0 bar. The shutter mechanism was actuated 20 times to demonstrate that it was operating normally. The operating pressure was then increased to 5.5 bars and the device was operated in the horizontal position for the duration of the test. The shutter mechanism was inspected for mechanical wear at 5000 open/close cycle intervals.

The shutter mechanism was opened 25,000 times during testing. After testing the TIAS 211 was again operated for 20 cycles in the horizontal, vertical, and side position at an operating pressure of 4 bars. It was verified that the TIAS 211 operated normally in all three positions.

Inspection at the conclusion of testing revealed no changes in the function or significant mechanical wear in the TIAS 211. The radiation survey conducted after the test matched the survey conducted before the test. The testing caused no change in the open or closed shutter isodose curve.

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2. Temperature Test, Range +20°C to 0°C

2.1 Test Dates & Personnel

Test Engineer: H. Elsner Test Start Date: 24.07.1995 Test End Date: 26.07.1995

2.2 Test Set-up Schematic



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2.3 Accessory Devices

Pos.	Device	Device Name	Supplier
1	Compressed Air, 10 bar		IMS
2	Compressed Air Filter / Regulator	Model FRC-1/4-S IMS-Nr.: 0059-121	Kuhnke
3	Constant Voltage Supply	Model GA-NT 40	AEG
4	Solenoid Valve	Model 65.111 IMS-Nr.: 0052-311	Kuhnke
5	ON / OFF Switch		
6	Electro-mechanical counter	Model 162E	Sodeca
7	Temperature Sensor	Type 5005-01	IMS
8	Meas. Value Acquisition System		IMS-PC
9	Cooling Cabinet (freezer)	Type GSD 2114	Boost
10	Thermostat		
11	Dose Meter	Babyline 31 System CEA E433 Nr.: 2670 Photon energy range: 5 keV - 3 MeV	Herfurth
12	Lead bricks (shielding)		IMS
13	Sealed Radiation Source Isotope: Cs 137 Radiation Type: Gamma Activity: 370 GBq (10 Ci) Capsule Type: X38/4 Source S/N: 1429 BK		Amersham International

2.4 Test Execution

2.4.1 Preliminary Remarks

The TIAS 211 Heavy Metal shielding is constructed as depicted in IMS drawing 5321-025. It is tested as described in this test report (document Q\QS\AA\5\0911\22000154). In preparation for the test, the TIAS 211 was loaded with at 370 Gbq (10 Ci) Cs 137 source (serial number 1429 BK). Precautionary radiation flux test measurements were taken with the source installed (ref. IMS drawing 5321-025 I01). The test equipment was prepared as shown under 2.2 above.

2.4.2 Operating/Test Conditions

The compressed air supply pressure was reduced to 5.5 bar (maximum pressure) for the test. The supply voltage was 24 VDC (position 3 under heading 2.3). The multi-function relay (position 5 under 2.3 above) was used as a timer. The SHUTTER OPEN and SHUTTER CLOSED duration times were set at ten seconds each. The room temperature during the test ranged from 20 - 25 C.

A lead shield was placed in front of the source shutter primary radiation beam outlet to absorb primary radiation emitted when the shutter was open.

2.4.3 Test Procedure

The source shutter actuator was driven by a solenoid valve (position 4 under heading 2.3). The solenoid valve was controlled by the ON / OFF switch (position 5 under 2.3). The electromechanical counter incremented by one each time the shutter reached the OPEN position. The measurement value acquisition cycle was triggered each time the shutter reached the OPEN position. The temperature of the TIAS 211 and the measured values were recorded for each cycle.

At the start of the test (at room temperature) the TIAS 211 was operated in three different positions (horizontal, vertical, and side). The initial compressed air operating pressure was set at 4.0 bar. The shutter was actuated 20 times and it was verified that the shutter operated normally. The operating pressure was then increased to 5.5 bars and the device was placed in the horizontal position. The cooling cabinet (position 9 under point 2.3) was turned on.

At temperatures of 10 C and 0 C the TIAS 211 shutter mechanism was actuated 20 times. The shutter mechanism was then operated for 2 hours at a temperature of 0 C. 30 minutes after the TIAS 211 reached a temperature of 0 C the operating pressure was increased to 6.0 bars and the shutter was actuated 20 times. After two hours at a temperature of 0 C and 6.0 bars operating pressure, the shutter was actuated another 20 times.

The operating pressure was then reduced to 4.0 bars and the cooling cabinet was turned off. The shutter mechanism was actuated 20 times when it reached 10 C. The shutter mechanism was actuated 20 times when it reached 20 C. The TIAS 211 was then operated at 20 C.

After testing the TIAS 211 was again operated for 20 cycles in the horizontal, vertical, and side position at an operating pressure of 4 bars. It was verified that the TIAS 211 operated normally in all three positions.

Inspection at the conclusion of testing revealed no changes in the function or significant mechanical wear in the TIAS 211. The radiation survey conducted after the test matched the survey conducted before the test. The testing caused no change in the open or closed shutter isodose curve.

2.4.4 Test Data





Plot: Shutter OPEN Signal Output Voltage vs. Time for the 20 to 0 C Temp. Test



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3. Temperature Test, Range +20°C to 85°C

3.1 Test Dates & Personnel

Test Engineer: H. Elsner Test Start Date: 24.07.1995 Test End Date: 26.07.1995

3.2 Test Set-up Schematic



Abt./Name: TF/EI

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3.3 Accessory Devices

Pos.	Device	Device Name	Supplier
1	Compressed Air, 10 bar		IMS
2	Compressed Air Filter / Regulator	Model FRC-1/4-S IMS-Nr.: 0059-121	Kuhnke
3	Constant Voltage Supply	Model GA-NT 40	AEG
4	Solenoid Valve	Model 65.111 IMS-Nr.: 0052-311	Kuhnke
5	ON / OFF Switch		(and the second of). As we have a second of the second of the
6	Electro-mechanical counter	Model 162E	Sodeca
7	Temperature Sensor	Type 5005-01	IMS
8	Meas. Value Acquisition System		IMS-PC
9	Warming Oven	Type 8 A# F-Nr. 00204	Heraeus
10	Thermostat		
11	Dose Meter	Babyline 31 System CEA E433 Nr.: 2670 Photon energy range: 5 keV - 3 MeV	Herfurth
12	Lead bricks (shielding)		IMS
13	Sealed Radiation Source Isotope: Cs 137 Radiation Type: Gamma Activity: 370 GBq (10 Ci) Capsule Type: X38/4 Source S/N: 1429 BK		Amersham International

3.4 Test Execution

3.4.1 Preliminary Remarks

The TIAS 211 Heavy Metal shielding is constructed as depicted in IMS drawing 5321-025. It is tested as described in this test report (document Q\QS\AA\5\0911\22000154). In preparation for the test, the TIAS 211 was loaded with 370 Gbq (10 Ci) Cs 137 source (serial number 1429 BK). Precautionary radiation flux test measurements were taken with the source installed (ref. IMS drawing 5321-025 I01). The test equipment was prepared as shown under heading 3.2.

3.4.2 Operating/Test Conditions

The compressed air supply pressure was reduced to 4.0 bar (maximum pressure) for the test. This represents the minimum pressure required to open the shutter. The supply voltage was 24 VDC (position 3 under heading 3.3). A lead shield was placed in front of the source shutter primary radiation beam outlet to absorb primary radiation emitted when the shutter was open.

3.4.3 Test Procedure

The source shutter actuator was driven by a solenoid valve (position 4 under heading 3.3). The solenoid valve was manually controlled by the ON / OFF switch (position 5 under heading 3.3). The electro-mechanical counter incremented by one each time the shutter reached the OPEN position. The measurement value acquisition cycle was triggered each time the shutter reached the OPEN position. The temperature of the TIAS 211 and the measured values were recorded for each cycle.

At the start of the test (at room temperature) the TIAS 211 was operated in three different positions (horizontal, vertical, and side). The initial compressed air operating pressure was set at 4.0 bar. The shutter was actuated 20 times and it was verified that the shutter operated normally. The operating pressure was then increased to 5.5 bar and the device was placed in the horizontal position. The warming (position 9 under heading 3.3) was turned on.

At temperatures of 50 C and 85 C the TIAS 211 shutter mechanism was actuated 20 times. The shutter mechanism was then operated for the next 2 hours at a temperature of 85 C. 30 minutes after the TIAS 211 reached a temperature of 0 C the operating pressure was increased to 6.0 bars and the shutter was actuated 20 times. After two hours at a temperature of 85 C and 6.0 bars operating pressure, the shutter was actuated another 20 times.

The operating pressure was then reduced to 4.0 bars and the warming oven was turned off. The shutter mechanism was actuated 20 times when it reached 50 C. The shutter mechanism was actuated 20 times when it reached 20 C. The TIAS 211 was then operated at 20 C for the next hour.

After testing the TIAS 211 was again operated for 20 cycles in the horizontal, vertical, and side position at an operating pressure of 4 bars. It was verified that the TIAS 211 operated normally in all three positions.

Inspection at the conclusion of testing revealed no changes in the function or significant mechanical wear in the TIAS 211. The radiation survey conducted after the test matched the survey conducted before the test. The testing caused no change in the open or closed shutter isodose curve.

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3.5 Test Data



Plot: Temperature vs. Time for the 20 to 85 C Temperature Test

Plot: Shutter OPEN Signal Output Voltage vs. Time for the 20 to 85 C Temp. Test



4. ANSI Classification

The IMS Device TIAS 211 Heavy Metal Shielding (with integral shutter mechanism) is used in the IMS Model 5321 series of multi-channel tube gauges. Based on the test procedure and results presented above, the IMS TIAS 211 and the IMS Gauge Model 5321 series have the ANSI N538 classification described below.

4.1 ANSI Standard N538

The American National Standard N538 was issued in October 1979 and is entitled **Classification of Industrial Ionizing Radiation Gauging Devices** This standard applies to the radiation safety aspects of gauging devices.

4.1.1 For the TIAS 211 (Free Standing)

The ANSI classification for the free-standing Heavy Metal Shielding Device TIAS 211 is

ANSI - S3 - 538 - 565 - R1

where the "S" refers to a high temperature test condition of 85 C.

4.1.2 For the IMS Model 5321 Gauge Series

The ANSI classification for the IMS Model 5321 multi-channel tube gauge with the TIAS 211 installed is

ANSI - S3 - 543 - 885 - R1

where "S" refers to a high temperature test condition of 85 C.

Note Regarding OFF position measurements for the Model 5321:

The 5 cm measurement position is in the measuring gap. The 30 cm and the 100 cm positions are outside the gap as required to achieve the proper measurement standoff distances. The measurement gap is this case is a circle with an inside diameter of about 300 mm. All measurements were taken from the nearest accessible surface.

THE FOLLOWING RADIOACTIVE SOURCES ARE CONTAINED WITHIN THIS PROFILE THICKNESS GAUGE:

1 X Cs 137, ID ACTIVITY: 10 CURIE (370 GBq) ACTIVITY: 10 CURIE (370 GBq)

EACH SOURCE MUST BE LEAK TESTED ONCE PER SIX (6) MONTHS. THE SOURCE SHUTTER OPERATION (OPEN/CLOSED) MUST BE CHECKED EVERY SIX (6) MONTHS.

REMOVAL OF THIS LABEL IS PROHIBITED

PLEASE REFER TO THE PROFILE THICKNESS GAUGE OPERATING / MAINTENANCE MANUAL FOR INSTALLATION, OPERATING AND SERVICE INSTRUCTIONS.

SERVICE AGENT

ISOTOPE MEASURING SYSTEMS 108 BLUE RIDGE DRIVE CRANBERRY TWP, PA 16066

ANSI CLASSIFICATION:

REMOVAL OF THIS LABEL IS PROHIBITED

THE RECEIPT, POSSESSION, USE AND TRANSFER OF THIS DEVICE MODEL PROFILE THICKNESS GAUGE, SERIAL NUMBER 5321 ARE SUBJECT TO A SPECIFIC LICENSE OR THE EQUIVALENT AND THE REGULATIONS OF THE U.S. N.R.C. OR OF A STATE WITH WHICH THE N.R.C. HAS ENTERED INTO AN AGREEMENT FOR THE EXERCISE OF REGULATORY AUTHORITY. THIS LABEL SHALL BE MAINTAINED ON THE DEVICE IN A LEGIBLE CONDITION.

REMOVAL OF THIS LABEL IS PROHIBITED

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DEVICE TYPE: Tube Wall Thickness Gauge

MODEL: 5321

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DISTRIBUTOR: Isotope Measuring System, Inc. (IMS) 108 Blue Ridge Drive Cranberry Twp., PA 16066

MANUFACTURER: Isotopen Measuring Systems Dieselstrasse 55 Heiligenhaus D-42579 Germany

SEALED SOURCE MODEL DESIGNATION: Amersham Model: CDC.711M

ISOTOPE:

MAXIMUM ACTIVITY:

Cesium-137

90 curies (3.33 TBq) [10 Curies (370 GBq) per source housing]

LEAK TEST FREQUENCY: 6 months

PRINCIPAL USE: (D) Gamma Gauge

CUSTOM DEVICE: YES X NO



S#1 BPP.

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DEVICE TYPE: Tube Wall Thickness Gauge

DESCRIPTION:

The gauge is an O-frame structure intended to measure the tube wall thickness and eccentricity of hot, rigid tubes passing through the center of the O-frame. Overall gauge dimensions (including a rail transport mechanism) are approximately 87" (2.21 m) in height, 103.5" (2.63 m) in length, 49.2" (1.25 m) in width, and a 13.8" (35 cm) air gap. The measurement O-frame is constructed primarily of 0.394" (10 mm) thick stainless steel and is transported to and from the measurement and storage locations via a rail system. The O-frame is placed in the park position when not in use, for maintenance, or in the case of an emergency.

The gauge contains 9 independent source housing/detector assemblies, each containing a maximum 10 curie (370 GBg), Cs-137 source. Each assembly is constructed primarily of sintered tungsten alloy and stainless steel components. The source housing consists of tungsten alloy shielding, a cylindrical shutter, a pneumatic actuator and shutter return springs for shutter positioning, a CDC.711M source capsule, and a stainless steel enclosure. The radiation beam exits the housing through a collimated opening, passes through -- and is attenuated by -- the tube material to be measured, and strikes an ion chamber detector directly opposite the source housing on the O-frame. The detector is mounted to the source housing in a line coincident with the collimated beam opening and is used to detect the attenuated radiation from the source housing on the opposite side of the O-frame. Each housing/detector assembly is bolted to the O-frame in a concentric circular pattern around the measuring gap. Overall dimensions of the source housing/detector assembly are approximately 15.2" (386 mm) in length, 12.0" (305 mm) in height, and 5.9" (150 mm) in width.

Each CDC.711M source capsule is held in place in the shutter by a tungsten alloy locking bolt, pressure spring, and locking screw. A cylindrical shaft is cut out of the housing shielding to allow for transmission of the radiation beam when the shutter is rotated to the "OPEN" position. A flange is bolted and pinned to the shutter and is used for positioning the shutter. A shaft extends out from the flange along the centerline of the shutter. The end of the shaft, opposite the shutter, is attached to a lever aim that is attached to a pneumatic actuator. The pneumatic actuator/lever arm is used to rotate the shutter to the

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DEVICE TYPE: Tube Wall Thickness Gauge

DESCRIPTION: (Cont'd)

open position. Return springs are attached to the flange shaft and are used to return the shutter to the closed position whenever air pressure is removed from the pneumatic actuator (e.g., shutter "CLOSE" command issued or loss of air supply due to an accident). The flange shaft rides on two sets of ball bearings attached near to either end of the shaft.

Operation of the shutter may be automatic or by several manual methods. Automatic operation of the shutter is accomplished by a sensor up line that detects approaching material. In automatic mode, the shutter will remain open whenever process material is present. The shutter remains open after process material is absent from the measurement gap to perform a "standardization" process, and will automatically close when the process is complete (within five minutes). Manual operation of the shutter may be performed at the gauger's station, if installed, or the gauge control station using the "OPEN" and "CLOSE" controls. In addition, a lock-out valve on the O-frame may be used by maintenance personnel to vent the pneumatic air supply prior to performing maintenance in and around the gauge. This action closes the shutter and prevents further operation until the valve is closed.

According to the manufacturer, the device would be taken off line only during maintenance, leak testing, or in an emergency. Calibration is automatic and need not be performed by the user.

The arrangement of the process equipment and high temperature of the tubes make it unlikely that personnel would be in close proximity to the gauge when in the use/measure position on the process line. In addition, a 0.25 mR/hr (2.5 μ Sv/hr) controlled access area will be erected by the end user, in conjunction with IMS, around the gauge.

A shutter position indicator light box is installed near the gauge so as to provide maximum visibility to approaching persons. The box contains three illuminated fields, visible "all-around". The fields are as follows: yellow and the words "SHUTTER OPEN" for source shutter open; green and the words "SHUTTER CLOSED" for source shutter closed; and white and the trefoil symbol for electrical power on.

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DEVICE TYPE: Tube Wall Thickness Gauge

DESCRIPTION: (Cont'd)

The process tube to be measured may reach temperatures up to 2000°F (1093°C). In order to keep the inner frame temperature below the 212°F (100°C) maximum operating temperature, the O-frame contains a water cooling system.

The system electronics contain a number of sensors to alert the user to possible problems such as a failure of the cooling system, high temperature in the frame or cooling water, or failure of hardware components. Whenever a fault is detected, the user is notified via the control console. The manufacturer instructs the user to cease operation of the device whenever a high temperature fault is detected and to perform any needed maintenance.

LABELING:

Several labels are affixed to the external surface of the O-frame. Label location is selected by IMS so as to provide maximum visibility to persons approaching the gauge from both sides. The labels will be constructed of an appropriate (20 gauge minimum thickness) metal, selected for its ability to withstand the environmental conditions (temperature, corrosive atmospheres, etc.) at the installation location. At a minimum, the metal labels will have a melting point greater than 500°F (260°C) and a yield strength greater than 5000 psi (34.5 MPa). Typical label metals include stainless steel, aluminum alloy, brass, and bronze. The labels contain the information required by 10 CFR 20.1901 and 20.1904, the manufacturer's identification information, and the source identification information.

In addition, a metal indicator flag is attached to the end of the each shutter flange shaft and contains OPEN and CLOSED position indicators. This indicator provides a mechanical display of source position to persons working near the source housings.

Labeling information is formed into the metal label material by engraving, etching, stamping, or other equivalent permanent process. The labels are attached to the device with metal fasteners (screws, bolted, etc.).

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DEVICE TYPE: Tube Wall Thickness Gauge

DIAGRAMS:

See attachments 1-3.

CONDITIONS OF NORMAL USE:

The device is intended for installation at steel mills on rigid tube production lines. Typical use condition extremes vary from freezing (32°F [0°C]) to hot (up to 150°F [65.5°C]) temperatures, high humidity, and dirty environments. In addition, the process material may reach 2000°F (1093°C). The design of the shutter mechanisms and detectors is such that the operating temperature of the inner frame must be between 32°F and 212°F (0°C and 100°C). In order to maintain the inner frame temperature below this, the gauge is water cooled. During operation, the area near the gauge would not be suitable for extended human occupancy.

PROTOTYPE TESTING:

IMS reported that a prototype unit has been in operation since 1988 with no reported incidents of failure or loss of source integrity. The operating conditions for this prototype include up to 100% humidity, greater than 150°F (65.5°C) ambient air temperature, and 2000°F (1093.3°C) process material for extended periods. IMS indicates that the shutters of this unit have been operated in excess of 500,000 cycles without failure.

In addition, the manufacturer performed a controlled long term shutter operation test. The shutter was operated for 25,000 cycles at ambient temperature. Following this, the shutter was operated 20 times in three different orientations to verify proper operation. IMS reported that the shutter operated normally during, and following, the test and that no change to the radiation profiles were detected.

IMS claims the gauge and source housing have been tested to ANSI N538 and have achieved classifications of:

Component Classified Entire O-frame Source housing alone ANSI-43-565-565-R1

ANSI N538 Classification ANSI-43-543-885-R1

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DEVICE TYPE: Tube Wall Thickness Gauge

PROTOTYPE TESTING: (Cont'd)

Amersham Corporation manufactures the model CDC.711M sealed source. This source has been tested to ANSI N542-1977 requirements and achieved a rating of 77C64444.

EXTERNAL RADIATION LEVELS:

The manufacturer supplied isodose curves for the device, when loaded with maximum activity, showing the 0.25 mR/hr (2.5 μ Sv/hr) and 0.75 mR/hr (7.5 μ Sv/hr) levels at approximately 118" (3 m) and 59" (1.5 m) respectively. According to the ANSI N538 classification, the typical radiation dose rates from the nearest accessible surface of the O-frame (not in-beam) with the shutter open are:

Distance from Surface	kadiation Level
2.0" (5 cm)	20 mR/hr (200 µSv/hr)
11.8" (30 cm)	20 mR/hr (200 µSv/hr)
39.4" (100 cm)	2 mR/hr (20 μ Sv/hr)

In addition, the typical dose rates for the O-frame (not in-beam) with the shutter in the closed position are:

Distance from Surface	Radiation Level	
2.0" (5 cm)	0.75 mR/hr (7.5	$\mu Sv/hr)$
11.8" (30 cm)	0.25 mR/hr (2.5	$\mu Sv/hr)$
39.4" (100 cm)	0.25 mR/hr (2.5	$\mu Sv/hr)$

The manufacturer did not supply typical radiation dose rates "in-beam" as the central circular area of the O-frame measures only 13.5" (35 cm) in diameter and would, in general, be inaccessible to persons around the device.

According to the ANSI N538 classification, typical dose rates from the nearest accessible surface of the source housing with the shutter in the closed position are:

Distance from Surface	Radiation Level
2.0" (5 cm)	20.0 mR/hr (200 µSv/hr)
11.8" (30 cm)	2.0 mR/hr (20 µSv/hr)
39.4" (100 cm)	0.25 mR/hr (2.5 μ Sv/hr)

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DEVICE TYPE: Tube Wall Thickness Gauge

QUALITY ASSURANCE AND CONTROL:

The manufacturer and Isotope Measuring Systems have supplied quality assurance and control programs adequate for licensing purposes. Copies of the programs are on file with the Medical, Academic, and Commercial Use Safety Branch.

LIMITATIONS AND/OR OTHER CONSIDERATIONS OF USE:

- The device may be distributed only to persons specifically licensed by the NRC of an Agreement State.
- REVIEWER NOTE: The manufacturer reports that the shutter will not automatically close if a "fault" is detected by one of the electronic sensors. The user must have procedures in place to identify these faults in a timely manner and take appropriate action. In particular, OPERATION OF THE DEVICE IN CONDITIONS THAT WOULD EXCEED AN INNER FRAME TEMPERATURE OF 21237 (100°C) MUST BE PROHIBITED.
- REVIEWER NOTE: The user is responsible for ensuring a controlled area is maintained around the device, both "on-line" and in the "park" position, such that persons will not inadvertently enter areas exceeding a dose rate of 0.25 mR/hr (2.5 μ Sv/hr). IMS will only assist the user with a determination of this radiation level and requirements for the construction of any needed barriers.
- REVIEWER NOTE: The design of the model 5321 device includes the option of a gauger's office located in close proximity to the gauge. The user is responsible for determining an appropriate location such that persons working in this office will not receive doses in excess of regulatory limits. IMS will only provide assistance to the user with the determination of the gauger's office location.
- REVIEWER NOTE: The model 5321 device includes a cooling system that is necessary to maintain the temperature of the inner frame components below 212°F (100°C). The user must have in place an appropriate maintenance/inspection schedule for essential cooling system components (valves, filters, regulators, sensors, etc.) to ensure proper operation. Proper operation must also be verified prior to initial use.

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DEVICE TYPE: Tube Wall Thickness Gauge

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

- REVIEWER NOTE: The model 5321 device includes an air lockout valve for venting air supply to the pneumatic system (closing the shutter and preventing its opening) during periods of maintenance and service. The user must have in place appropriate procedures for the use of this lockout valve.
- REVIEWER NOTE: The on/off light box and identification labels must be located in such a way as to be easily visible to persons approaching the device, and from either side.
- REVIEWER NOTE: Operation of the on/off light box, shutter controls (automatic and manual) and sensors, lockout valve, and fault detection system must be verified prior to initial use and at intervals not to exceed 6 months.
- The device may only be operated in temperatures greater than 32°F (0°C). In addition, inner frame and source housing operating temperature must be no greater than 212°F (100°C).
- These devices shall be leak tested at intervals not to exceed 6 months using techniques capable of detecting 0.005 microcurie (185 Bq) of removable contamination.
- Handling, storage, use, transfer, and disposal to be determined by the licensing authority. In view that the model CDC.711M sources exhibit high dose rates, the sources should be handled only by experienced licensed personnel using adequate remote handling equipment and procedures.
- This registration sheet and the information contained with the references shall not be changed without the written consent of the NRC.

SAFETY ANALYSIS SUMMARY:

Based on a review of the information and test data cited below we conclude that the Model 5321 device containing 9 source housings, each containing a maximum of 10 curies (370 GBq) Cs-137, are acceptable for specific licensing for the purpose of controlling tube wall thickness and eccentricity.

NO.: NR-375-D-104-S DATE: May 14, 1996

PAGE 9 OF 9

DEVICE TYPE: Tube Wall Thickness Gauge

SAFETY ANALYSIS SUMMARY: (Cont'd)

Furthermore, given the stainless steel and tungsten construction of the source housings and O-frame, the ANSI N538 classifications of the source housing and O-frame and additional shutter prototype testing provided, the source manufacturer's claimed ANSI N542 classification, and the historical use a similar device in Europe without reported incidents of failure, we conclude that the Model 5321 device would be expected to maintain source containment integrity for normal conditions of use and accident conditions which might occur during uses specified in this certificate.

REFERENCES:

The following supporting documents for the Model 5321 tube wall thickness gauge device are hereby incorporated by reference and are made a part of this registry document.

- Isotope Measuring Systems' application dated March 1, 1995, with enclosures thereto.
- Isotope Measuring Systems' letters dated April 15, 1996, March 13, 1996, February 21, 1996, December 4, 1995, and
 (2) November 20, 1995, with enclosures thereto.
- Isotope Measuring Systems' facsimiles received May 7, 1996, and May 6, 1996, with enclosures thereto.

Concurrence:

ISSUING AGENCY:

U.S. Nuclear Regulatory Commission

ous op A. Sigo Reviewer: Douglas A. Broaddus

no

Date: May 14, 1996

Date: May 14, 1996

Steven L. Baggett

<u>NO.:</u> NR-375-D-104-S <u>DATE:</u> May 14, 1996 <u>ATTACHMENT 1</u>

Measuring position

Service position

TTELEVISION STATES

Supply line

Rail transport System

Typical Installation w/Rail Transport System



NO.: NR-375-D-104-S DATE: May 14, 1996

ATTACHMENT 2

Source Housing/Detector Assembly

NO.: NR-375-D-104-S DATE: May 14, 1996 ATTACHMENT 3



Light Box Status Indicator

12/4/95

Drawing Number	Proprietary (Yes / No)			
5321-01 1	Isodose Curve	N		
94-02-006-91	Typical General Arrangement / IMS Gauge	N		
5321 - 025 A1	Heavy Metal Shielding Type TIAS 211 / 00 (textual naming of individual components)	N		
5321 - 025 M1	Heavy Metal Shielding Type TIAS 211 / 00 (with dimensions)	Y		
5321 - 025	Heavy Metal Shielding Type TIAS 211 / 00 (accompanies Bill of Materials)	Y		
n/a	Bill of Materials	Y		
5321 - 02 M1	Tube Wall Thickness Gauge (cameras and laser are optional)	Y		
5321 - 025 - 01	Abschirmung (Shielding)	Y		
5321 - 025 - 02	Scheiber (Source Shutter Barrel)	Y		
5321 - 025 - 03	Verschlußbolzen (Source Capsule Locking Bolt)	Y		
5321 - 025 - 04	Flansch (Flange)	N		
5321 - 025 - 05	Welle (Shaft)	N		
5321 - 025 - 06	Welle (Shaft)	N		
5321 - 025 - 11	Lagergehäuse (Bearing Housing)	N		
5321 - 025 - 12	Federgehäuse (Torsional Spring Housing)	N		
5321 - 025 - 13	Schalterplatte (Prox. Switch Mounting Plate)	N		
5321 - 025 - 14	Welle (Shutter Barrel Drive Shaft)	N		
5321 - 025 - 15	Platte (Shutter Drive Cyl Mounting Plate)	N		
5321 - 025 - 16	Gabel (Fork, used to connect cyl. drive shaft to shutter drive shaft)	N		
5321 - 025 - 17	Bolzen (Pin, used to attach cvl, drive shaft to fork)	N		
5321 - 025 - 18	Bolzen (Bolt, used to attach drive cyl. to mounting plate)	N		
5321 - 025 - 20	Schraube (Screw, used for fine adjustment of shutter barrel OPEN / CLOSED end positions)	N		
5321 - 025 - 21	1 Verschlußschraube (Locking Screw, used to lock the source capsule in place. This screw and the source (apsule are also constrained in place by the prox.			
5321 - 025 - 22	Abdeckung (Cover Plate)	N		
5321 - 025 - 23	21 - 025 - 23 Winkel (Mechanical Indication, used as a shutter position indication flag. This flag has the OPEN and CLOSED labels attached to it. The OPEN label is attached to an orange surface. The CLOSED label is attached to a green surface.)			
5321 - 025 - 30	Ionisationskammer (Ion Chamber Detector)	N		
5321 - 025 - 40	Schild (Label: CLOSED for mechanical shutter position indicator)	N		
5321 - 025 - 41	Schild (Label: OPEN for mechanical shutter position indicator)	N		
5321 - 025 - 42	Plombierschraube (Leading Screw, used to fasten prox. switch plate)	N		
5951-03 M(3)	Signal Lamp	N		

Isotope Measuring Systems, Inc. 108 Blue Ridge Drive Cranberry Twp. PA 16066 USA tel. 412 776 9586 fax: 412 776 2700

Enclosure 2

March 1, 1995



Isotope Measuring Systems Inc. 108 Blue Ridge Drive Mars, PA 16046 USA Telephone: (412) 776-9586 Fax: (412) 776-2700

Mr. John Lubinsky US Nuclear Regulatory Commission Commercial Section Washington, D.C. 20555 USA

(301) 415-7868 (301) 415-7000 -main

Dear Mr. Lubinsky:

Enclosed please find three applications. The first application is a new device registration for a tube wall thickness gauge model 5321. The second and third applications are amendments to the Cesium 137 model 5245 and Americium 241 model 5221 profile thickness gauges.

As discussed with Sue Engelhardt, we would appreciate your contacting us as soon as your review is complete at which time we would like to remedy any deficiencies in person.

Enclosed are the checks to cover the fees as follows:

Check 0980 New Device Registration \$3200 Tube Wall Thickness Gauge Model 5321 Check 0981 Device Registration Amendment \$1200 Cs 137 Profile Thickness Gauge Model 5221 NR-375-D-101-B Check 0982 Device Registration Amendment \$1200 Am 241 Profile Thickness Gauge Model 5245 NR-385-D-102-S

We thank you in advance for your review. If there are any questions, please telephone Susan K. Burnet or George Burnet at (412) 776 - 9586 or Sue Engelhardt at (800) 525-3078.

Sincerely.

haven't Know I

Susan K. Burnet President, IMS Inc.

Enclosures:

102150260 3pp.

Device Application Model 5321 Tube Wall Thickness Gauge Device Registration Amendment Model 5221 Am 241 Profile Thickness Gauge Device Registration Amendment Model 5245 Cs 137 Profile Thickness Gauge

ISOTOPE MEASURING SYSTEMS, INC. FED. E.I.N. 25-1674528 108 BLUE RIDGE DRIVE CRANBERRY TWP., PA 15066 TEL: (412) 776-9586

0980

8-26/430

PAY TO THE ORDER OF Mullar Regulatory Commission _1 5 3. 200.00 Thirty Two Hundred Lollars DOLLARS

MELLON BANK NA. MELLON BANK NA. THORN MILL OFFICE 98 PITTSBURGH, PA

Ruth & Hughis

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FOR

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ISOTOPE MEASURING SYSTEMS, INC. FED. E.I.N. 25-1674528 108 BLUE RIDGE DRIVE CRANBERRY TWP., PA 16066 TEL: (412) 776-9586 PAY

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ORDER OF Muchae Regulatory Commission _ \$ 1,200.00 Tucker Hundred Dollars and 100 DOLLARS MELLON BANK THORN HILL OFFICE 98

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Ruth & Hughes 133. 3000. 0982

ISOTOPE MEASURING SYSTEMS, INC. FED. E.I.N. 25-1674528 108 BLUE RIDGE DRIVE CRANBERRY TWP. PA 16086 TEL: (412) 776-9586

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8-26/430

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PAY TO THE ORDER OF Tuchal Regulatory Commission _1 \$ 1,200.00 Twelve Hundred Sollars and OD DOLLARS

MELLON BANK MELLON BANK NA THORN HILL OFFICE 98 PITTSBURGH PA

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UNITED STATES NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

May 28, 1996

Susan K. Burnet President Isotope Measuring Systems, Inc. 108 Blue Ridge Drive Cranberry Twp., PA 16606

Dear Ms. Burnet:

SUBJECT: REQUEST FOR WITHHOLDING INFORMATION FROM PUBLIC DISCLOSURE -ISOTOPE MEASURING SYSTEMS DESIGN DRAWINGS FOR MODEL 5321 MEASURING GAUGE.

ISSUANCE OF REGISTRATION CERTIFICATE NR-0375-D-104-S.

Based on the information and test data submitted in your application dated March 1, 1995 and subsequent letters, with enclosures thereto, we conclude the Model 5321 is acceptable for licensing purposes in accordance with the conditions of registration certificate NR-0375-D-104-S provided as enclosure 1. A number of drawings and a bill of materials were submitted with your application which were requested to be withheld from public disclosure pursuant to 10 CFR 2.790. You also submitted Non-Proprietary versions of some of the drawings to be placed in the NRC Public Document Room for public inspection. Enclosure 2 is a listing of the proprietary and non-proprietary versions.

Please be advised that you must manufacture and distribute the product in accordance with the statements and representations contained in your application, with enclosures thereto, and the information set out in your registration certificate. As a general rule, you must request and obtain an amendment to the certificate before you make changes or modifications to the information submitted to obtain the certificate. You are obligated to notify us promptly in writing should you decide to no longer manufacture or offer service support for the product.

Please read over the registration certificate in its entirety and notify us immediately of any errors or omissions.

Please be aware that, as a holder of an NRC registration, you may be subject to the NRC's licensing and inspection fees in accordance with 10 CFR Part 170, and annual fees in accordance with 10 CFR Part 171. If you have any questions concerning the fee requirements, please contact the License Fee and Debt Collection Branch at (301) 415-7554.

In reference to your letters and affidavits dated March 1, 1995, and December 4, 1995, in which you requested that drawings contained in your application for the Model 5321 gauge be withheld from public disclosure pursuant to 10 CFR 2.790, we have reviewed your application and the material in accordance with the requirements of 10 CFR 2.790. S. Burnet

Your affidavit stated that the submitted information should be considered exempt from mandatory public disclosure for the following reason:

The information is not available to public sources. Due to the tolerances described, the measurement geometry shown, and the collimation depicted in the drawings, disclosure of the drawings to the public would cause irreparable harm to your competitive position.

On the basis of this statement and you claim that you are the only company supplying devices of this type to the metal industry, we have determined that the information sought to be withheld contains trade secrets or proprietary commercial information.

Therefore, we have determined that the proprietary drawings listed in your affidavit dated December 4, 1995, will be withheld from public disclosure pursuant to 10 CFR 2.790(b)(5) and Section 103(b) of the Atomic Energy Act of 1954, as amended.

Withholding from public inspection shall not affect the right, if any, of persons properly and directly concerned to inspect the documents. If the need arises, we may send copies of this information to our consultants working in this area. We will, of course, ensure that the consultants have signed the appropriate agreements for handling proprietary information.

If the basis for withholding this information from public inspection should change in the future, such that the information could then be made available for public inspection, you should promptly notify the NRC. You also should understand that the NRC may have cause to review this determination in the future, for example, if the scope of a Freedom of Information Act request includes your information. In all review situations, if the NRC needs additional information from you or makes a determination adverse to the above, you will be notified in advance of any public disclosure.

If you have any questions, please contact me at (301) 415-5847.

Sincerely,

Douglas A. Broaddus, Mechanical Engineer Sealed Source Safety Section Medical, Academic, and Commercial Use Safety Branch Division of Industrial and Medical Nuclear Safety, NMSS

Enclosures: 1. Registration certificate NR-0375-D-104-S

2. List of proprietary and non-proprietary drawings cc w/encl: SKimberley, LFDCB

Distribution:

SSSS r/f NE01

SSD File # NR-0375-D-104-S

LHeuter, RIII DOCUMENT NAME: C:\WPDOCS\SSDS\NR375104.CMP * See previous concurrence

To mealve a copy of this document, indicate in the box: "C" = Copy without attachment/enclosure "E" = Copy with attachment/enclosure "N" = No copy

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ENCLOSURE 1

PAGE 1 OF 9 NO.: NR-375-D-104-S DATE: May 14, 1996

DEVICE TYPE: Tube Wall Thickness Gauge

MODEL: 5321

Isotope Measuring System, Inc. (IMS) DISTRIBUTOR: 108 Blue Ridge Drive Cranberry Twp., PA 16066

Isotopen Measuring Systems MANUFACTURER: Dieselstrasse 55 Heiligenhaus D-42579 Germany

SEALED SOURCE MODEL DESIGNATION: Amersham Model: CDC.711M

ISOTOPE:

MAXIMUM ACTIVITY:

90 curies (3.33 TBq) [10 Curies (370 GBq) Cesium-137

per source housing]

LEAK TEST FREQUENCY: 6 months

PRINCIPAL USE: (D) Gamma Gauge

CUSTOM DEVICE:

50 1609290208 13pp

YES X NO

NO.: NR-375-D-104-S DATE: May 14, 1996 PAGE 2 OF 9

DEVICE TYPE: Tube Wall Thickness Gauge

DESCRIPTION:

The gauge is an O-frame structure intended to measure the tube wall thickness and eccentricity of hot, rigid tubes passing through the center of the O-frame. Overall gauge dimensions (including a rail transport mechanism) are approximately 87" (2.21 m) in height, 103.5" (2.63 m) in length, 49.2" (1.25 m) in width, and a 13.8" (35 cm) air gap. The measurement O-frame is constructed primarily of 0.394" (10 mm) thick stainless steel and is transported to and from the measurement and storage locations via a rail system. The O-frame is placed in the park position when not in use, for maintenance, or in the case of an emergency.

The gauge contains 9 independent source housing/detector assemblies, each containing a maximum 10 curie (370 GBq), Cs-137 source. Each assembly is constructed primarily of sintered tungsten alloy and stainless steel components. The source housing consists of tungsten alloy shielding, a cylindrical shutter, a pneumatic actuator and shutter return springs for shutter positioning, a CDC.711M source capsule, and a stainless steel enclosure. The radiation beam exits the housing through a collimated opening, passes through -- and is attenuated by -- the tube material to be measured, and strikes an ion chamber detector directly opposite the source housing on the O-frame. The detector is mounted to the source housing in a line coincident with the collimated beam opening and is used to detect the attenuated radiation from the source housing on the opposite side of the O-frame. Each housing/detector assembly is bolted to the O-frame in a concentric circular pattern around the measuring gap. Overall dimensions of the source housing/detector assembly are approximately 15.2" (386 mm) in length, 12.0" (305 mm) in height, and 5.9" (150 mm) in width.

Each CDC.711M source capsule is held in place in the shutter by a tungsten alloy locking bolt, pressure spring, and locking screw. A cylindrical shaft is cut out of the housing shielding to allow for transmission of the radiation beam when the shutter is rotated to the "OPEN" position. A flange is bolted and pinned to the shutter and is used for positioning the shutter. A shaft extends out from the flange along the centerline of the shutter. The end of the shaft, opposite the shutter, is attached to a lever arm that is attached to a pneumatic actuator. The pneumatic actuator/lever arm is used to rotate the shutter to the

<u>NO.:</u> NR-375-D-104-S <u>DATE:</u> May 14, 1996 <u>PAGE 3 OF 9</u>

DEVICE TYPE: Tube Wall Thickness Gauge

DESCRIPTION: (Cont'd)

open position. Return springs are attached to the flange shaft and are used to return the shutter to the closed position whenever air pressure is removed from the pneumatic actuator (e.g., shutter "CLOSE" command issued or loss of air supply due to an accident). The flange shaft rides on two sets of ball bearings attached near to either end of the shaft.

Operation of the shutter may be automatic or by several manual methods. Automatic operation of the shutter is accomplished by a sensor up line that detects approaching material. In automatic mode, the shutter will remain open whenever process material is present. The shutter remains open after process material is absent from the measurement gap to perform a "standardization" process, and will automatically close when the process is complete (within five minutes). Manual operation of the shutter may be performed at the gauger's station, if installed, or the gauge control station using the "OPEN" and "CLOSE" controls. In addition, a lock-out valve on the O-frame may be used by maintenance personnel to vent the pneumatic air supply prior to performing maintenance in and around the gauge. This action closes the shutter and prevents further operation until the valve is closed.

According to the manufacturer, the device would be taken off line only during maintenance, leak testing, or in an emergency. Calibration is automatic and need not be performed by the user.

The arrangement of the process equipment and high temperature of the tubes make it unlikely that personnel would be in close proximity to the gauge when in the use/measure position on the process line. In addition, a 0.25 mR/hr (2.5 μ Sv/hr) controlled access area will be erected by the end user, in conjunction with IMS, around the gauge.

A shutter position indicator light box is installed near the gauge so as to provide maximum visibility to approaching persons. The box contains three illuminated fields, visible "all-around". The fields are as follows: yellow and the words "SHUTTER OPEN" for source shutter open; green and the words "SHUTTER CLOSED" for source shutter closed; and white and the trefoil symbol for electrical power on.

NO.: NR-375-D-104-S DATE: May 14, 1996 PAGE 4 OF 9

DEVICE TYPE: Tube Wall Thickness Gauge

DESCRIPTION: (Cont'd)

The process tube to be measured may reach temperatures u. to 2000°F (1093°C). In order to keep the inner frame temperature below the 212°F (100°C) maximum operating temperature, the O-frame contains a water cooling system.

The system electronics contain a number of sensors to alert the user to possible problems such as a failure of the cooling system, high temperature in the frame or cooling water, or failure of hardware components. Whenever a fault is detected, the user is notified via the control console. The manufacturer instructs the user to cease operation of the device whenever a high temperature fault is detected and to perform any needed maintenance.

LABELING:

Several labels are affixed to the external surface of the O-frame. Label location is selected by IMS so as to provide maximum visibility to persons approaching the gauge from both sides. The labels will be constructed of an appropriate (20 gauge minimum thickness) metal, selected for its ability to withstand the environmental conditions (temperature, corrosive atmospheres, etc.) at the installation location. At a minimum, the metal labels will have a melting point greater than 500°F (260°C) and a yield strength greater than 5000 psi (34.5 MPa). Typical label metals include stainless steel, aluminum alloy, brass, and bronze. The labels contain the information required by 10 CFR 20.1901 and 20.1904, the manufacturer's identification information, and the source identification information.

In addition, a metal indicator flag is attached to the end of the each shutter flange shaft and contains OPEN and CLOSED position indicators. This indicator provides a mechanical display of source position to persons working near the source housings.

Labeling information is formed into the metal label material by engraving, etching, stamping, or other equivalent permanent process. The labels are attached to the device with metal fasteneis (screws, bolted, etc.).

NO.: NR-375-D-104-S DATE: May 14, 1996 PAGE 5 OF 9

DEVICE TYPE: Tube Wall Thickness Gauge

DIAGRAMS:

See attachments 1-3.

CONDITIONS OF NORMAL USE:

The device is intended for installation at steel mills on rigid tube production lines. Typical use condition extremes vary from freezing (32°F [0°C]) to hot (up to 150°F [65.5°C]) temperatures, high humidity, and dirty environments. In addition, the process material may reach 2000°F (1093°C). The design of the shutter mechanisms and detectors is such that the operating temperature of the inner frame must be between 32°F and 212°F (0°C and 100°C). In order to maintain the inner frame temperature below this, the gauge is water cooled. During operation, the area near the gauge would not be suitable for extended human occupancy.

PROTOTYPE TESTING:

IMS reported that a prototype unit has been in operation since 1988 with no reported incidents of failure or loss of source integrity. The operating conditions for this prototype include up to 100% humidity, greater than 150°F (65.5°C) ambient air temperature, and 2000°F (1093.3°C) process material for extended periods. IMS indicates that the shutters of this unit have been operated in excess of 500,000 cycles without failure.

In addition, the manufacturer performed a controlled long term shutter operation test. The shutter was operated for 25,000 cycles at ambient temperature. Following this, the shutter was operated 20 times in three different orientations to verify proper operation. IMS reported that the shutter operated normally during, and following, the test and that no change to the radiation profiles were detected.

IMS claims the gauge and source housing have been tested to ANSI N538 and have achieved classifications of:

<u>Component Classified</u> Entire O-frame Source housing alone

ANSI N538 Classification ANSI-43-543-885-R1 ANSI-43-565-565-R1

NO.: NR-375-D-104-S DATE: May 14, 1996 PAGE 6 OF 9

DEVICE TYPE: Tube Wall Thickness Gauge

PROTOTYPE TESTING: (Cont'd)

Amersham Corporation manufactures the model CDC.711M sealed source. This source has been tested to ANSI N542-1977 requirements and achieved a rating of 77C64444.

EXTERNAL RADIATION LEVELS:

The manufacturer supplied isodose curves for the device, when loaded with maximum activity, showing the 0.25 mR/hr (2.5 μ Sv/hr) and 0.75 mR/hr (7.5 μ Sv/hr) levels at approximately 118" (3 m) and 59" (1.5 m) respectively. According to the ANSI N538 classification, the typical radiation dose rates from the nearest accessible surface of the O-frame (not in-beam) with the shutter open are:

Distance from Surface	Radiation Level
2.0" (5 cm)	20 mR/hr (200 µSv/hr)
11.8" (30 cm)	20 mR/hr (200 µSv/hr)
39.4" (100 cm)	2 mR/hr (20 μ Sv/hr)

In addition, the typical dose rates for the O-frame (not in-beam) with the shutter in the closed position are:

Distance from Surface	Radiation Level
2.0" (5 cm)	0.75 mR/hr (7.5 µSv/hr)
11.8" (30 cm)	0.25 mR/hr (2.5 µSv/hr)
39.4" (100 cm)	0.25 mR/hr (2.5 µSv/hr)

The manufacturer did not supply typical radiation dose rates "in-beam" as the central circular area of the O-frame measures only 13.5" (35 cm) in diameter and would, in general, be inaccessible to persons around the device.

According to the ANSI N538 classification, typical dose rates from the nearest accessible surface of the source housing with the shutter in the closed position are:

Distance from Surface		Radiation Level			
2.0"	(5 cm)	20.0	mR/hr	(200	$\mu sv/hr)$
11.8"	(30 cm)	2.0	mR/hr	(20)	uSv/hr)
39.4"	(100 cm)	0.25	mR/hr	(2.5	$\mu Sv/hr)$

NO.: NR-375-D-104-S DATE: May 14, 1996 PAGE 7 OF 9

DEVICE TYPE: Tube Wall Thickness Gauge

QUALITY ASSURANCE AND CONTROL:

The manufacturer and Isotope Measuring Systems have supplied quality assurance and control programs adequate for licensing purposes. Copies of the programs are on file with the Medical, Academic, and Commercial Use Safety Branch.

LIMITATIONS AND/OR OTHER CONSIDERATIONS OF USE:

- The device may be distributed only to persons specifically licensed by the NRC of an Agreement State.
- REVIEWER NOTE: The manufacturer reports that the shutter will not automatically close if a "fault" is detected by one of the electronic sensors. The user must have procedures in place to identify these faults in a timely manner and take appropriate action. In particular, OPERATION OF THE DEVICE IN CONDITIONS THAT WOULD EXCEED AN INNER FRAME TEMPERATURE OF 212°F (100°C) MUST BE PROHIBITED.
- REVIEWER NOTE: The user is responsible for ensuring a controlled area is maintained around the device, both "on-line" and in the "park" position, such that persons will not inadvertently enter areas exceeding a dose rate of 0.25 mR/hr (2.5 μ Sv/hr). IMS will only assist the user with a determination of this radiation level and requirements for the construction of any needed barriers.
- REVIEWER NOT: The design of the model 5321 device includes the option of a gauger's office located in close proximity to the gauge. The user is responsible for determining an appropriate location such that persons working in this office will not receive doses in excess of regulatory limits. IMS will only provide assistance to the user with the determination of the gauger's office location.
- REVIEWER NOTE: The model 5321 device includes a cooling system that is necessary to maintain the temperature of the inner frame components below 212°F (100°C). The user must have in place an appropriate maintenance/inspection schedule for essential cooling system components (valves, filters, regulators, sensors, etc.) to ensure proper operation. Proper operation must also be verified prior to initial use.

NO.: NR-375-D-104-S DATE: May 14, 1996 PAGE 8 OF 9

DEVICE TYPE: Tube Wall Thickness Gauge

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

- REVIEWER NOTE: The model 5321 device includes an ai. lockout valve for venting air supply to the pneumatic system (closing the shutter and preventing its opening) during periods of maintenance and service. The user must have in place appropriate procedures for the use of this lockout valve.
- REVIEWER NOTE: The on/off light box and identification labels must be located in such a way as to be easily visible to persons approaching the device, and from either side.
- REVIEWER NOTE: Operation of the on/off light box, shutter controls (automatic and manual) and sensors, lockout valve, and fault detection system must be verified prior to initial use and at intervals not to exceed 6 months.
- The device may only be operated in temperatures greater than 32°F (0°C). In addition, inner frame and source housing operating temperature must be no greater than 212°F (100°C).
- These devices shall be leak tested at intervals not to exceed 6 months using techniques capable of detecting 0.005 microcurie (185 Bg) of removable contamination.
- Handling, storage, use, transfer, and disposal to be determined by the licensing authority. In view that the model CDC.711M sources exhibit high dose rates, the sources should be handled only by experienced licensed personne' using adequate remote handling equipment and procedures.
- This registration sheet and the information contained with the references shall not be changed without the written consent of the NRC.

SAFETY ANALYSIS SUMMARY:

Based on a review of the information and test data cited below we conclude that the Model 5321 device containing 9 source housings, each containing a maximum of 10 curies (370 GBq) Cs-137, are acceptable for specific licensing for the purpose of controlling tube wall thickness and eccentricity.

<u>NO.:</u> NR-375-D-104-S <u>DATE:</u> May 14, 1996 <u>PAGE 9 OF 9</u>

DEVICE TYPE: Tube Wall Thickness Gauge

SAFETY ANALYSIS SUMMARY: (Cont'd)

Furthermore, given the stainless steel and tungsten construction of the source housings and O-frame, the ANSI N538 classifications of the source housing and O-frame and additional shutter prototype testing provided, the source manufacturer's claimed ANSI N542 classification, and the historical use a similar device in Europe without reported incidents of failure, we conclude that the Model 5321 device would be expected to maintain source containment integrity for normal conditions of use and accident conditions which might occur during uses specified in this certificate.

REFERENCES:

The following supporting documents for the Model 5321 tube wall thickness gauge device are hereby incorporated by reference and are made a part of this registry document.

- Isotope Measuring Systems' application dated March 1, 1995, with enclosures thereto.
- Isotope Measuring Systems' letters dated April 15, 1996, March 13, 1996, February 21, 1996, December 4, 1995, and
 (2) November 20, 1995, with enclosures thereto.
- Isotope Measuring Systems' facsimiles received May 7, 1996, and May 6, 1996, with enclosures thereto.

Concurrence:

ISSUING AGENCY:

Date:

U.S. Nuclear Regulatory Commission

May 14, 1996

Date: May 14, 1996

aug to A. Sugar Reviewer: Douglas A. Broaddus

Steven L. Baggett

<u>NO.:</u> NR-375-D-104-S <u>DATE:</u> May 14, 1996 <u>ATTACHMENT 1</u>

Measuring position

Service position



Supply line

Rail transport System

Typical Installation w/Rail Transport System



NO.: NR-375-D-104-S DATE: May 14, 1996

ATTACHMENT 2

Source Housing/Detector Assembly

Federgehoruse SPRMG HBUXINE

WALP CURFI

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Fineum Zytunder P. M. LBM (171, MOR. R.

SOUND ABSONDAR Scholl duempler

NO.: NR-375-D-104-S DATE: May 14, 1996 ATTACHMENT 3



Light Box Status Indicator

12/4/95

Drawing Number Drawing Title (Remarks)					
5321-01 1	Isodose Curve	N			
94-02-006-91	Typical General Arrangement / IMS Gauge				
5321 - 025 A1	321 - 025 A1 Heavy Metal Shielding Type TIAS 211 / 00 (textual naming of individual components)				
321 - 025 M1 Heavy Metal Shielding Type TIAS 211 / 00 (with dimensions)					
5321 - 025	21 - 025 Heavy Metal Shielding Type TIAS 211 / 00 Y (accumpanies Bill of Materials)				
n/a	Bill of Materials	Y			
5321 - 02 M1 Tube Wall Thickness Gauge (cameras and laser are optional)					
5321 - 025 - 01	Abschirmung (Shielding)	Y			
5321 - 025 - 02	Scheiber (Source Shutter Barrel)	Y			
5321 - 025 - 03	Verschlußbolzen (Source Capsule Locking Bolt)	Y			
5321 - 025 - 04	5 - 04 Flansch (Flange)				
5321 - 025 - 05	Welle (Shaft)	N			
5321 - 025 - 06	Welle (Shaft)	N			
5321 - 025 - 11	Lagergehäuse (Bearing Housing)	N			
5321 - 025 - 12	Federgehäuse (Torsional Spring Housing)	N			
5321 - 025 - 13	Schalterplatte (Prox, Switch Mounting Plate)	N			
5321 - 025 - 14	Welle (Shutter Barrel Drive Shaft)	N			
5321 - 025 - 15	Platte (Shutter Drive Cyl. Mounting Plate)	N			
i321 - 025 - 16 Gabel (Fork, used to connect cyl. drive shaft to shutter 1 drive shaft)					
5321 - 025 - 17	Bolzen (Pin, used to attach cyl, drive shaft to fork)	N			
5321 - 025 - 18 Bolzen (Bolt, used to attach drive cyl. to mounting I plate)					
5321 - 025 - 20 Schraube (Screw, used for fine adjustment of shutter barrel OPEN / CLOSED end positions)					
5321 - 025 - 21 Verschlußschraube (Locking Screw, used to lock the source capsule in place. This screw and the source capsule are also constrained in place by the prox. switch plate)					
5321 - 025 - 22	Abdeckung (Cover Plate)	N			
5321 - 025 - 23 Winkel (Mechanical Indication, used as a shutter position indication flag. This flag has the OPEN and CLOSED labels attached to it. The OPEN label is attached to an orange surface. The CLOSED label is attached to a green surface.)					
5321 - 025 - 30	Ionisationskammer (Ion Chamber Detector)	N			
5321 - 025 - 40	Schild (Label: CLOSED for mechanical shutter position indicator)	N			
5321 - 025 - 41	Schild (Label: OPEN for mechanical shutter position indicator)	N			
5321 - 025 - 42	Plombierschraube (Leading Screw, used to fasten prox, switch plate)	N			
5951-03 M(3)	Signal Lamp	N			
and the second se		and a second sec			

Isotope Measuring Systems, Inc. 108 Blue Ridge Drive Cranberry Twp. PA 16066 USA tel 412 776 9586 fax: 412 776 2700

Enclosure 2

ENCLOSURE 1

Original version



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UNITED STATES NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

Susan K. Burnet President Isotope Measuring Systems, Inc. 108 Blue Ridge Drive Cranberry Twp., PA 16606

Dear Ms. Burnet:

Based on the information and test data submitted in your application dated March 1, 1995 and subsequent letters, with enclosures thereto, we conclude the Model 5321 is acceptable for licensing purposes in accordance with the conditions of the enclosed registration certificate (NR-0375-D-104-S).

Please be advised that you must manufacture and distribute the product in accordance with the statements and representations contained in your application, with enclosures thereto, and the information set out in your registration certificate. As a general rule, you must request and obtain an amendment to the certificate before you make changes or modifications to the information submitted to obtain the certificate. You are obligated to notify us promptly in writing should you decide to no longer manufacture or offer service support for the product.

Please read over the registration certificate in its entirety and notify us immediately of any errors or omissions.

Please be aware that, as a holder of an NRC registration, you may be subject to the NRC's licensing and inspection fees in accordance with 10 CFR Part 170, and annual fees in accordance with 10 CFR Part 171. If you have any questions concerning the fee requirements, please contact the License Fee and Debt Collection Branch at (301) 415-7554.

In reference to your letters and affidavits dated March 1, 1995, and December 4, 1995, in which you requested that drawings contained in your application for the Model 5321 gauge be withheld from public disclosure pursuant to 10 CFR 2.790, we have reviewed your application and the material in accordance with the requirements of 10 CFR 2.790. On the basis of your statements that the submitted information should be considered exempt from public disclosure since release of the documents would cause irreparable harm to your competitive position and that the design of the device is essentially unique, we have determined that the information sought to be withheld contains trade secrets or proprietary commercial information.

Therefore, we have determined that the drawings listed in your affidavit dated December 4, 1995, will be withheld from public disclosure pursuant to 10 CFR 2.790(b)(5) and Section 103(b) of the Atomic Energy Act of 1954, as amended.

Withholding from public inspection shall not affect the right, if any, of persons properly and directly concerned to inspect the documents. In

OGC-96- 002161

S. Burnet

addition, the information may be subject to inspection b certain parties in accordance with 10 CFR 2.790(b)(6).

If the basis for withholding this information from public inspection should change in the future, such that the information could then be made available for public inspection, you should promptly notify the NRC. You also should understand that the NRC may have cause to review this determination in the future, for example, if the scope of a Freedom of Information Act request includes your information. In all review situations, if the NRC needs additional information from you or makes a determination adverse to the above, you will be notified in advance of any public disclosure.

If you have any questions, please contact me at (301) 415-5847.

Sincerely,

aufor A Barlo

Douglas A. Broaddus, Mechanical Engineer Sealed Source Safety Section Medical, Academic, and Commercial Use Safety Branch Division of Industrial and Medical Nuclear Safety, NMSS

cc w/encl: SKimberley, LFDCB

S. Burnet

addition, the information may be subject to inspection by certain parties in accordance with 10 CFR 2.790(b)(6).

If the basis for withholding this information from public inspection should change in the future, such that the information could then be made available for public inspection, you should promptly notify the NRC. You also should understand that the NRC may have cause to review this determination in the future, for example, if the scope of a Freedom of Information Act request includes your information. In all review situations, if the NRC needs additional information from you or makes a determination adverse to the above, you will be notified in advance of any public disclosure.

If you have any questions, please contact me at (301) 415-5847.

Sincerely,

Douglas A. Broaddus, Mechanical Engineer Sealed Source Safety Section Medical, Academic, and Commercial Use Safety Branch Division of Industria and Medical Nuclear Safety, NMSS

cc w/encl: SKimberley, LFDCB

Distribution: IMAB r/f

SSD-95-31

NE01

SSD File # NR-0375-D-104-S

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OFFICIAL RECORD COPY

5/23/96 MPS Concurrence basel on incorporating the following comments, EAR REGI NI Request for ing Info, from Susan K. Burnet President pe with the Isotope Measuring Systems 108 Blue Ridge Drive Cranberry Twp., PA 16606 Dear Ms. Burnet: Based on the information and test data submitted in your application dated March 1, 1995 and subsequent letters, with enclosures thereto, we conclude the Model 5321 is acceptable for licensing purposes in accordance with the conditions of the enclosed registration certificate (NR-0375-D-104-S). drawings and a Billof Materials were submitted . appropriate drawings number of Please be advised that you must manufacture and distribute the product in Were accordance with the statements and representations contained in your SUB mi Hed application, with enclosures thereto, and the information set out in your WITH registration certificate. As a general rule, you must request and obtain an hon-plop amendment to the certificate before you make changes or modifications to the information submitted to obtain the certificate. You are obligated to notify versions us promptly in writing should you decide to no longer manufacture or offer service support for the product. be placed n the NRC Please read over the registration certificate in its entirety and notify us immediately of any errors or omissions. DUBLIC acument Please be aware that, as a holder of an NRC registration, you may be subject ROOMS to the NRC's licensing and inspection fees in accordance with 10 CFR Part 170, and annual fees in accordance with 10 CFR Part 171. If you have any questions tou, concerning the fee requirements, please contact the Liconse Fee and Debt DUBLIC Collection Branch at (301) 415-7554. Inspection Enclosed is In reference to your letters and affidavits dated March 1, 1995, and alisting December 4, 1995, in which you requested that drawings contained in your application for the Model 5321 gauge be withheld from public disclosure ofthe pursuant to 10 CFR 2.790, we have reviewed your application and the material proprietory in accordance with the requirements of 10 CFR 2.790, (On the basis of your and non i statements that the submitted information should be considered exempt from Proprietury Versions. public disclosure since release of the documents would cause irreparable harm \pm o your competitive position and that the design of the device is essentially unique, we have determined that the information sought to be withheld contains trade secrets or proprietary commercial information. proprietary Therefore, we have determined that the drawings listed in your affidavit dated December 4, 1995, will be withheld from public disclosure pursuant to 10 CFR 2.790(b)(5) and Section 103(b) of the Atomic Energy Act of 1954, as amended. Withholding from public inspection shall not affect the right, if any, of persons properly and directly concerned to inspect the documents. In 05290205 12 ACC AC AADIET



UNITED STATES NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20666-0001

May 21, 1996

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Mr. N. J. Liparulo, Manager Regulatory & Engineering Networks Westinghouse Electric Corporation Post Office Box 355 Pittsburgh, Pennsylvania 15230-0355

Dear Mr. Liparulo:

SUBJECT: REQUEST FOR WITHHOLDING INFORMATION FROM PUBLIC DISCLOSURE -WESTINGHOUSE REPORT NSD-JLH-6114, REV. 1 - JOSEPH M. FARLEY NUCLEAR PLANT, UNIT 2

By your application and affidavit signed by N. J. Liparulo, dated May 1, 1996, Westinghouse Electric Corporation submitted Report NSD-JLH-6114, Rev. 1 "L" Criterion for Farley Unit 2," and requested that it be withheld from public disclosure pursuant to 10 CFR 2.790. You also submitted a Non-Proprietary version (NSD-JLH-6136) to be placed in the NRC and Public Document Rooms for public inspection.

Your affidavit stated that the submitted information should be considered exempt from mandatory public disclosure for the following reasons:

- The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.
- Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product.
- It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.

We have reviewed your application and the material in accordance with the requirements of 10 CFR 2.790 and, on the basis of Westinghouse Electric Corporation's statements, have determined that part of the submitted information may be withheld, but that certain other material should be released and placed in the Nuclear Regulatory Commission's Public Document Room.

We do not believe that all the designated information includes distinguishing aspects or would improve a competitor's economic advantage and, therefore, is not considered trade secrets or proprietary information. The information that we do not believe is trade secrets or proprietary commercial information is the following:

- The bracketed percentage probabilities in the second from the bottom paragraph on page 9. These tolerance limits are accepted industry practice.
- 2. The L* tubesheet configuration on Figure 1 (page 21).
- The model for plastic collapse Figures 2 and A.4-4 (pages 22 and A-26), except perhaps for some of the symbol definitions.
- Comparison of load-displacement records, Figures 3, 4, A.4-5 and A.4-6 (pages 23, 24, A-27 and A-28), except for the numerical values.
- Test equipment dimensions, Sections A.1.3 and A.3.3, Items 1, 2 and 3 (pages A-2 and A.12).
- Conceptual drawing of geometry of slots in tube specimen, Figures A.3-1, A.3-2 and A.3.3 (pages A-16, A-17 and A-18), except for numerical values.
- Sketch of testing machine, Figure A.3-4 (page A-19).

You are requested to review your claim and provide a detailed justification as to why the above information is considered proprietary. In accordance with 10 CFR 2.790(c), please provide the results of your reevaluation within 30 days of the date of this letter. If a formal response is not received by this date, we intend to place the portions of this report identified above, which the staff believes to be non-proprietary, in the NRC Public Document Room, in accordance with 10 CFR 2.790(c). If you wish to withdraw the document you may do so within the 30-day time period, pursuant to 10 CFR 2.790(c).

Withholding from public inspection shall not affect the right, if any, of persons properly and directly concerned to inspect the documents. If the need arises, we may send copies of this information to our consultants working in this area. We will, of course, ensure that the consultants have signed the appropriate agreements for handling proprietary information.

If the basis for withholding this information from public inspection should change in the future such that the information could then be made available for public inspection, you should promptly notify the NRC. You also should understand that the NRC may have cause to review this determination in the future, for example, if the scope of a Freedom of Information Act request includes your information. In all review situations, if the NRC makes a determination adverse to the above, you will be notified in advance of any public disclosure.

Sincerely,

Bypon L. Siegel, Senior Project Manager Project Directorate II-2 Division of Reactor Projects - I/II Office of Nuclear Reactor Regulation

Docket No. 50-364

cc: See next page