



March 11, 1997

U.S. Nuclear Regulatory Commission
Division of Industrial and Medical Nuclear Safety
Medical, Academic, and Commercial Use Safety Branch
Washington DC 20555

Dear Sir,

Enclosed is an amendment application for NRC registry # NR 522-D-892-B. Our intention is to consolidate the models SHLG-1, SHLG-2, SHLG-3, and the SHN under the NRC registry # NR 522-D-892-B. These source holders are currently manufactured and are presently registered under the recently reactivated NRC registries #NR-522-D-892-S and NR-522-D-867-S. The source holders are similar in that the source is contained in a source tube assembly and operation of the source shutter is the same (reference drawings D-50663, D-51993, D-52030 and D-32801). The models SHLG-1, SHLG-2, and SHLG-3 source holders are used in density, level, and interface applications. The SHN source holder is used in bulk moisture applications.

We are seeking approval for General License Distribution when used in some limited density, level, and interface applications. It is our intention to supply only Cs-137 to General Licensees. The SHLG-1, SHLG-2, SHLG-3 and the SHN source holders are capable of maintaining a radiation field intensity of less than 5 mR/hr at a distance of 12 inches (except in the radiation beam). The maximum activity limits for the model A-2102, A-2104, A-22593, A-25159 and A57878 Cs-137 source capsules and the model A-2100 Co-60 source capsule used in the SHLG series source holders are as follows.

ISOTOPE:

MAXIMUM ACTIVITY:

Cesium-137	Model A-2102	2.4 Curies for the SHLG-1 9.0 Curies for the SHLG-2 10.0 Curies for the SHLG-3
Cesium-137	Model A-2104	2.4 Curies for the SHLG-1 9.0 Curies for the SHLG-2 10.0 Curies for the SHLG-3
Cesium-137	Model A-22593	10.0 Curies for the SHLG-3
Cesium-137	Model A-25159	2.4 Curies for the SHLG-1 9.0 Curies for the SHLG-2 10.0 Curies for the SHLG-3
Cesium-137	Model A-57878	2.4 Curies for the SHLG-1 5.0 Curies for the SHLG-2 5.0 Curies for the SHLG-3

Cobalt-60	Model A-2100	25.0 millicuries for the SHLG-1 (Specific License)
		75.0 millicuries for the SHLG-2 (Specific License)
		500.0 millicuries for the SHLG-3 (Specific License)

The maximum activity limits for the model A-33131 and the A-56740 Cf-252 source capsule used in the SHN source holder are as follows.

ISOTOPE:

MAXIMUM ACTIVITY:

Californium-252	Model A-33131	1.5 millicuries for the SHN (Specific License)
	Model A-56740	1.5 millicuries for the SHN (Specific License)

SEALED SOURCE MODEL DESIGNATION:

Minnesota Mining and Manufacturing Co. (4F6S)	A-2102
Minnesota Mining and Manufacturing Co. (4D6L)	A-2104
Minnesota Mining and Manufacturing Co. (4D6P)	A-25159
Minnesota Mining and Manufacturing Co. (4P6T)	A-22593
Monsanto Research Company (24148)	A-2102
Amersham Corp. (CDC.700/CDC.711m/ CDC.800)	A-2102
Amersham Corp. (CDC PE2)	A-2104
U.S. Nuclear Co. (TYPE 2102)	A-2102
U.S. Nuclear Co. (TYPE 3280)	A-2104
U.S. Radium Corp. (Model 713-W-C)	A-2102
U.S. Radium Corp. (Model Lab # 713 (S)-W-E)	A-2104
Gamma Industries (S-10-1A)	A-2100
Amersham Corp.(CKC.P1/ CKC.P4)	A-2100
U.S. Nuclear (3280)	A-2100
Monsanto Research Corporation (24148)	A-2100
Minnesota Mining and Manufacturing Co. (4F3D)	A-2100
Amersham Corporation (CVN.CY6)	A-33131
Amersham Corporation (CVN.CY2)	A-56740
Amersham Corporation (CDC.93)	A-57878
BEBIG Trade Inc. (Cs7.PO4)	A-57878

DESCRIPTION:

The SHLG Series

The SHLG Series include models SHLG-1, SHLG-2 and SHLG-3 source holders. The design for the SHLG-1, SHLG-2 and SHLG-3 is basically the same. The source holder bodies are lead-filled welded steel shells fitted with an internal stainless steel tube assembly and collimating structure. The physical size differs between models. The physical size determines the amount of lead each model contains for shielding (ref. dwgs D-50663, D-51993, and D-52030).

The source capsule is held in place in the source holder in the following manner (ref. dwgs C-50655, C-50653, and B-36215). The source capsule is placed in a stainless steel source tube assembly. The source tube assembly is held in place by a steel détente/bearing block bolted to the source holder body (ref. dwgs D-50663, D-51993, and D-52030). Unauthorized removal of the source tube assembly is prevented by covering the counter-bored bolt holes of the détente/bearing block with a neoprene gasket attached with weather-strip compound. The source and source tube assembly are protected from the exterior environment by means of close dimensional tolerance between the shaft of the source tube assembly, the bronze bushing in the retaining block and the neoprene gasket.

Source location in the **OFF** position is fixed in assembly by a ball détente and secured by a padlock through the source tube assembly shaft. The source **ON** position is controlled by pushing the operating knob on the end of the source tube assembly against the gasket stop. The source is **OFF** (shielded condition) when the source tube assembly is in the extended position.

The radiation beam port is covered for additional protection with a thin steel or aluminum plate (0.030") which is attached to the source holder body with weather-strip compound.

The SHLG series source holders are used as components of Densart and Levelart gauge systems for measuring density, level and/or interface positions of substances in vessels. The source holders are fitted with fan shaped collimators which allow for a predetermined beam angle between 0 and 45 degrees.

The approved models are the SHLG-1, SHLG-2 and SHLG-3 source holders.

A typical SHLG series source holder in a density gauge configuration that is used by general licensees is shown in dwg. C-57129.

A typical SHLG series source holder in a level or interface gauge configuration that is used by general licensees is shown in dwg. C-57114.

The SHN Source Holder

The SHN source holder body is constructed of a high density polyethylene block and cadmium sheet encased in steel and aluminum (ref. dwg D-32801). The cadmium sheet is used to reduce thermal neutron radiation levels. The polyethylene block is fitted with an internal tube assembly and collimating structure.

The neutron source capsule is placed in a stainless steel source tube assembly (ref. dwg B-33132). The source tube assembly is secured in the SHN source holder body by means of the détente/bearing block bolted to the source holder body (ref. dwg D-32801). Unauthorized removal of the source tube assembly is prevented by covering the counter-bored bolt holes of the détente/bearing block with a neoprene gasket attached with weather-strip compound. The source and source tube assembly are protected from the exterior environment by means of close dimensional tolerance between the shaft of the source tube assembly, the bronze bushing in the retaining block and the neoprene gasket.

Source location in the **OFF** position is fixed in assembly by a ball indent and secured by a padlock through the source tube assembly shaft. The source **ON** position is controlled by pushing the operating knob, on the end of the source tube assembly, against the gasket stop. The source is **OFF** (shielded condition) when the source tube assembly is in the extended position.

The SHN source holder is used as a component of the Moistart M-5010 moisture gauge. The Moistart M-5010 gauge is used to measure the moisture content of bulk materials on a conveyor belt.

A typical SHN source holder in a Moistart M-5000 gauge configuration is shown in drawing A-57926

DESCRIPTION OF DENSITY, LEVEL OR INTERFACE APPLICATIONS:

A typical SHLG series source holder in a density level or interface application is shown in drawing C-57114. The process material measured is inside a totally enclosed vessel. Typical process vessels vary from 4 inches to 30 feet. Access to the primary radiation beam is prevented because of the mounting of the source holder against the pipe or vessel, the detector housing, and the non-accessible pipe or vessel. We are seeking approval for General License Distribution for devices used in non-accessible vessel applications.

In other applications, access to the primary radiation beam is limited by the mounting of the source holder against the vessel, the detector housing, and by restricted access to the inside of the vessel. Some enclosed vessels have access to the inside of the vessel through a man-way. User controlled lockout procedures (an example of an Ohmart customer-used procedure is included) prevent access through the man-way until various other safety procedures are in place. One of these safety procedures is the closing of the source holder shutter and locking the shutter in the **OFF** position. We are seeking approval for distribution to persons Specifically Licensed by the U.S. NRC or an Agreement State for these applications.

DESCRIPTION OF MOISTURE GAUGE APPLICATIONS:

A typical SHN source holder in a moisture gauge application is shown in dwg D-56951. The process material measured passes through the moisture gauge opening (throat opening) on an open conveyor belt. Typical process belts widths vary from 24 to 48 inches. The one-size moisture gauge will accommodate belts from 24 to 48 inches.

The moisture gauge has two channels of operation: gamma and neutron. The SH-FX/SH-X series source holder is used in the gamma channel. The SHN source holder is used for the neutron channel.

Access to the primary radiation beam is limited by the physical construction of the gauge and the conveyor belt. User controlled lockout procedures prevent access until various other safety procedures are in place. One of the safety procedures is the closing of the source holder shutter and locking it in the **OFF** position. We are seeking approval for distribution to persons Specifically Licensed by the U.S. NRC or an Agreement State for these applications.

SAFETY FEATURES OF DENSITY, LEVEL, INTERFACE GAUGES:

The safety features of the density, level and interface gauges using the Model SHLG series source holders that could prevent workers, who may encounter this device, from receiving an occupational dose in excess of that specified in 10 CFR Part 20 Section 20.1201(a) include:

1) Labels:

- * Radiation Caution Label per A-33739
- * General License Label per B-33568
- * Air Gap Warning Label per A-53678
- * On-Condition Warning Label per A-53677

2) Manuals:

- * Sections from the Instruction Manual for the density, level or interface gauge measuring assembly
- * RS-305 "Radiation Safety for Ohmart Density, Level and Weigh Scale Gauges. Distributed to Specific Licensees"
- * RS-322 "Radiation Safety for Ohmart Density, Level, and Weigh Scale for Gauges Distributed to General Licensees."

3) Physical Barriers:

- * The vessel is enclosed and man-way access is controlled by safety procedures (known as "lockout procedures") A sign, as shown on drawing C-53676, can also be posted.

4) Lock-Out Procedures

- * The vessel must be safe before personnel may enter. All OSHA-type regulations must be observed, such as the inside of the vessel must be at an acceptable temperature and pressure and the air quality must be suitable for safe breathing. Another of these safety considerations is the radiation field level, which must not exceed regulation limits.
- * A suggested lock-out procedure for radiation safety is included at the end of this letter. Also included is an example of a Radiation Lockout Permit as used by an Ohmart customer in the past.

RADIATION SURVEYS:

B-57086 (2 pages-- source **ON** and source **OFF**) Strayfield Isodistance Data for 2.4 Ci Cs-137 in an SHLG-1 source holder used in Density, Level and/or Interface position applications.

B-57087 (2 pages-- source **ON** and source **OFF**) Strayfield Isodistance Data for 9.0 Ci Cs-137 in an SHLG-2 source holder used in Density, Level and/or Interface position applications.

B-57088 (2 pages source **ON** and source **OFF**) Strayfield Isodistance Data for 10.0 Ci Cs-137 in an SHLG-3 source holder used in Density, Level, and/or Interface position applications.

B-57089 (2 pages--source **ON** and source **OFF**) Strayfield Isodistance Data for 25.0 millicuries Co-60 in an SHLG-1 source holder used in Density, Level, and/or Interface position applications.

B-57090 (2 pages--source **ON** and source **OFF**) Strayfield Isodistance Data for 85.0 millicuries Co-60 in an SHLG-2 source holder used in Density, Level, and/or Interface position applications.

B-57091 (2 pages--source **ON** and source **OFF**) Strayfield Isodistance Data for 500.0 millicuries Co-60 in an SHLG-3 source holder used in Density, Level, and/or Interface position applications.

SAFETY FEATURES OF AN MOISTART M-5010 MOISTURE GAUGE:

The safety features of the Moistart M-5010 moisture gauge using the Model SH-FX/ SH-X series source holder for the Gamma channel and the Model SHN for the Neutron channel that could prevent workers who may encounter this device from receiving an occupational dose in excess of that specified in 10 CFR Part 20 Section 20.1201(a) include:

1) Labels:

- * Radiation Caution Label per A-33739
- * On Condition Warning Label per A-53677
- * Air Gap Warning Label per A-53678

2) Manuals:

- * Sections from the Instruction Manual for the Moistart M-5010 Moisture Gauge measuring assembly.
- * RS-306 "Radiation Safety For Ohmart Model Moistart M-5010 Bulk Moisture Gauge Distributed To Specific Licensees".

3) Lock-Out Procedures:

- * Service on the Moistart M-5010 gauge is prohibited until the source holders are padlocked in the **OFF** position. Supervisory sign-off may be required before a work permit is issued. Radiation safety is a safety consideration just as other power source and mechanical hazards are a safety consideration.

RADIATION SURVEYS:

B-57109 (2 pages--source **ON** and source **OFF**) Strayfield Isodistance Data for 1.5 millicuries Cf-252 in an SHN source holder used in bulk moisture applications.

MAXIMUM DISTANCE FROM DENSITY LEVEL OR INTERFACE GAUGE MODEL SHLG SERIES SOURCE HOLDER TO RADIATION DETECTOR:

The maximum distance, for a density, level or interface gauge, from the source holder to the radiation detector depends upon the size of the vessel on which the gauge is mounted. Typical process vessels vary from 4 inches to 30 feet. With the source holder mounted against the vessel wall, the only access to the primary radiation beam is inside the vessel or on the opposite side of the vessel at the detector. If the vessel is open, other access control procedures must be determined and implemented at the time of gauge startup.

Various user-maintained lockout procedures prevent access to the inside of the vessel until all safety conditions are in place. The radiation field at the detector side of the vessel is typically limited to 5 mR/hr under normal operating conditions. This is determined by the source activity used to make the measurement.

In a typical density or level application the source activity is calculated before the gauge is assembled. The source activity is selected to provide a typical radiation field at the detector of 2 mR/hr or less when the vessel is empty. All vessel parameters (wall thickness, insulation, diameter, operating pressure, mounting, etc.) are used to determine the optimum source activity to make the process measurement. Because of the low radiation field at the detector, only the inside of the vessel presents a potential hazard.

Some applications are for density or level interface measurements, i.e., the measurement of the density or level in a tank containing two liquids of different densities. In these applications an empty vessel (not a normal operating condition) usually results in a radiation field that is higher than 5 mR/hr at the detector. Special provisions must be implemented by the user as a result of the Installation Radiation Survey and Occupancy Evaluation at the time of gauge startup.

Many vessels are pressurized and the access man-way is sealed with many door-bolts. These pressurized vessels prevent accidental entry because of the vessel design.

MAXIMUM DISTANCE FROM THE MOISTART M-5010 MOISTURE GAUGE MODEL SHN SOURCE HOLDERS TO THE RADIATION DETECTORS:

The maximum distance from the source holders to the radiation detectors (also called the throat opening) for a MOISTART M-5010 moisture gauge depends upon the width of the process-delivering conveyor. The typical process belt width for the MOISTART M-5010 moisture gauge is 24 through 48 inches with a throat opening of 14 through 26 inches.

In every case, a conveyor is in the throat opening. The available opening, for the MOISTART M-5010 moisture gauge on a belt, depends upon the amount of material loaded on the belt. On wide belt applications the available opening may exceed 18 inches. If a person ignores the hazard of the moving conveyor belt, or if the conveyor is stopped and empty, a person could get their body or parts of their body into the radiation beam. To prevent such exposure a protective barrier is to be installed. The need for such a protective barrier is determined at the installation of the moisture gauge.

At the gauge startup, it is the responsibility of the Specifically Licensed service person to conduct a detailed Radiation Survey around the MOISTART M-5010 frame to verify that the applicable regulations for posting are in compliance. The service person also conducts an Occupancy Evaluation that determines the typical exposures to any personnel working or passing in the vicinity of the MOISTART M-5010 frame to ensure that applicable regulations are not violated. Service personnel are instructed to direct the user to install protective barriers when certain conditions exist. If the available throat opening (the distance from the conveyor belt surface to the underside of the top arm source holder) does not exceed 18 inches, no barriers are required. If the MOISTART M-5010 frame is located where access is achieved only with special equipment such as ladders or a key to unlock an access door, no barrier is required. If the available throat opening does exceed 18 inches and if the MOISTART M-5010 frame is located where access is achieved without special equipment, then barriers are required. The MOISTART M-5010 frame is considered accessible where personnel can ride the conveyor belt and doing so does not constitute a safety violation.

The typical Model MOISTART M-5010 moisture gauge has one 50 mCi Cs-137 source in a Model SH-F1 source holder for the gamma channel and one 1.5mCi Cf-252 source in a Model SHN source holder for the neutron channel.

POTENTIAL HAZARDS:

1) The device can be operated safely by persons not having training in radiological protection. At startup the device source shutter is turned **ON** by a Specifically Licensed person. Thereafter, the source shutter is usually only turned **OFF** for shutter operation checks or for maintenance of the process or measurement electronics. Work involving the source holder is done by a Specifically Licensed person.

Operating the Model SHLG series and the Model SHN source shutter involves pushing or pulling the **ON/OFF** handle its total amount of travel. Pushing the handle towards the source holder body against the gasket stop to a clearly-marked **ON** position or pulling the handle away from the source holder body to a clearly-marked **OFF** position. (ref. dwgs A-22264, A-29256, C-49792, C-49796, C-49800 and C-57115. The source holder can be locked in the **OFF** position by means of a padlock which passes through a hole in the operating shaft. On the Model SHN only, the source shutter is secured in the **ON** position by means of a finger tightened screw. Optional equipment may be added to the source shutter handle to permit remote **ON/OFF** operation of the source shutter. Labels or signs clearly indicate when the device should be turned **OFF**.

2) Under ordinary conditions of handling, storage, and use of the device, the by-product material contained in the device will not inadvertently be removed from the device, nor is it likely that any person will receive an occupational dose in excess of 10 percent of that specified in 10 CFR Part 20 Section 20.1201(a), for the following reasons:

- A) Under normal conditions of handling, storage, and use the by-product material cannot be removed accidentally because the source capsule is secured inside the holder in the source tube assembly. Unauthorized removal of the source tube assembly from the body of the source holder is prevented by covering the counter-bored bolt holes of the détente/bearing block with a gasket attached with weather-strip compound.
- B) The General License label (ref. dwg B-33568) prohibits removal of the source holder from its mounting except by a Specifically Licensed person.
- C) The Installation Radiation Survey (ref. dwgs B-43217 and B-48744) and Occupancy Evaluation (by Specifically Licensed person) determines normal exposure levels and the requirement for protective barriers to insure that dose limits are not exceeded.

3) Under accident conditions (such as fire or explosion) associated with handling, storage and use of the device, it is unlikely that any person would receive an external radiation dose in excess of the dose as specified in Column IV of the table in 32.24 of 10 CFR Part 32.

In the event of a fire, for gauges using the SHLG series source holder, the source capsule will remain in the original position. The lead shielding for the SHLG series, however, could melt

and leak out of the source holder thus reducing the shielding of the source holder causing the radiation field intensity on the surface of the source holder to increase.

In the event of a fire, for gauges using the SHN source holder, the source capsule will remain in the original position. The polyethylene shielding for the SHN, however, could melt and leak out of the source holder thus reducing the shielding of the source holder causing the radiation field intensity on the surface of the source holder to increase.

In the event of an explosion, the explosion would be external to the source holder. The risk to the source holder would result from the force of the explosion moving the device from its mounting and hitting something else. The SHLG series and the SHN source holders meet DOT-7A transport regulations and therefore withstand a drop of 4 feet onto an unyielding surface.

In the event of accident conditions, such as stated above, it is wise to proceed with caution. Assume a bare source condition, cordon off the area to a level of 2 mrem/hr and seek qualified help from a Specifically-Licensed person to assess the situation.

Under ordinary conditions of handling, storage and use, the most likely condition of hazard is a source shutter stuck in the open position. A "stuck shutter" can be prevented by regular shutter checks, protection from process material and operation at temperature limits specified in the instruction manual. In the event of a stuck shutter the conditions are exactly the same as in the normal operating condition. There is no more risk than that of the normal operating condition. Thus, there is time for remedial action without emergency procedures or training.

QUALITY ASSURANCE AND CONTROL:

The Ohmart Corporation received its ISO-9001 Certification #107563 on January 14, 1997. The Ohmart Corporation maintains a quality assurance and control program. This program includes the following inspections:

Sealed source:

- Examination of vendor source certificate for proper activity and leak test results.
- Incoming wipe test before placing source in inventory.
- Wipe test of complete device prior to shipment.
- Wipe test counting equipment can detect less than 0.005 μCi of activity on the wipe.

Radiation Field intensity:

- Measure radiation field intensity of completed device prior to shipment to assure that values do not exceed 5 mR/hr at 30 cm from the surface of the device nor 100 mR/hr at 5 cm from the surface as defined by ANSI standard N-43.8 1979.
- Look for defects in the source holder body and streaming from all mating surfaces adjacent to the source.

Mechanical parts and construction:

- Visual inspection of all parts before and after assembly.
- Visual inspection of all welds.
- Operations check of source **OFF** and **ON** mechanism.
- Visual check for proper location and attachment of all labels.

DOT 7A TESTING:

Ohmart has records on file for testing of the Model SHLG series and the Model SHN source holder design for compliance with DOT 7A. Ohmart has produced the Model SHLG series for more than twenty years and the Model SHN for more than fifteen years. Test reports are enclosed at the end of this letter.

ADDITIONAL DOCUMENTATION:

Servicing personnel other than Ohmart servicing personnel have available the instruction manual that contains the radiation safety details. A Specifically-Licensed service person should make use of all available instructions and contact the Ohmart Field Service Department for any necessary clarifications. A qualified service person would also know applicable regulations regarding posting.

Please proceed with device review and contact me if additional information is required.



Paul L. Houillion
Nuclear Service Group

enclosures:

Instruction Manual extracts, RS-305, RS-306, RS-322, Suggested Radiation Lockout Procedures, Radiation Lockout Permit, DOT-7A test reports

Source Capsule Dwgs: A-2100, A-2102, A-2104, A-22593, A25159, A-33131, A-56740, A-57878

Label Dwgs: A-22264, A-29256, A-33739, A-53677, A-53678, B-33568, C-53676,

Typical Installation Dwgs: C-57114, C-57129, C-57926

SHLG-1 Associated Dwgs: B-57086, B-57089, B-57141, B-57142, C-49792, C-50655, D-50663

SHLG-2 Associated Dwgs: B-57087, B-57090, B-57143, B-57144, C-49796, C-50653, D-51993

SHLG-3 Associated Dwgs: B-36215, B-57088, B-57091, B-57145, B-57146, C-49800, D-52030

SHN Associated Dwgs: B33132, B-57109, B-57147, D-32801, D-56951, D-57115

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE
(Amended In Its Entirety)

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MODEL: SHLG Series (see description for approved models)
SHN source holder

MANUFACTURER / DISTRIBUTOR:

Ohmart Corporation
4241 Allendorf Dr.
Cincinnati, Ohio 45209

SEALED SOURCE MODEL DESIGNATION:

Minnesota Mining and Manufacturing Co. (4F6S)	A-2102
Minnesota Mining and Manufacturing Co. (4D6L)	A-2104
Minnesota Mining and Manufacturing Co. (4D6P)	A-25159
Minnesota Mining and Manufacturing Co. (4P6T)	A-22593
Monsanto Research Company (24148)	A-2102
Amersham Corp. (CDC.700/CDC.711m/ CDC.800)	A-2102
Amersham Corp. (CDC PE2)	A-2104
U.S. Nuclear Co. (TYPE 2102)	A-2102
U.S. Nuclear Co. (TYPE 3280)	A-2104
U.S. Radium Corp. (Model 713-W-C)	A-2102
U.S. Radium Corp. (Model Lab # 713 (S)-W-E)	A-2104
Gamma Industries (S-10-1A)	A-2100
Amersham Corp.(CKC.P1/ CKC.P4)	A-2100
U.S. Nuclear (3280)	A-2100
Monsanto Research Corporation (24148)	A-2100
Minnesota Mining and Manufacturing Co. (4F3D)	A-2100
Amersham Corporation (CVN.CY6)	A-33131
Amersham Corporation (CVN.CY2)	A-56740
Amersham Corporation (CDC.93)	A-57878
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REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF DEVICE
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ISOTOPE:

MAXIMUM ACTIVITY:

Cesium-137	Model A-2102	2.4 Curies for the SHLG-1 9.0 Curies for the SHLG-2 10.0 Curies for the SHLG-3
Cesium-137	Model A-2104	2.4 Curies for the SHLG-1 9.0 Curies for the SHLG-2 10.0 Curies for the SHLG-3
Cesium-137	Model A-22593	10.0 Curies for the SHLG-3
Cesium-137	Model A-25159	2.4 Curies for the SHLG-1 9.0 Curies for the SHLG-2 10.0 Curies for the SHLG-3
Cesium-137	Model A-57878	2.4 Curies for the SHLG-1 5.0 Curies for the SHLG-2 5.0 Curies for the SHLG-3
Cobalt-60	Model A-2100	25.0 millicuries for the SHLG-1 (Specific License) 75.0 millicuries for the SHLG-2 (Specific License) 500.0 millicuries for the SHLG-3 (Specific License)
Californium-252	Model A-33131	1.5 millicuries for the SHN) (Specific License)
	Model A-56740	1.5 millicuries for the SHN (Specific License)

LEAK TEST FREQUENCY: 36 months

PRINCIPAL USE: (D) Gamma Gauge

CUSTOM DEVICE: ☐ Yes ☒ No

DESCRIPTION:

The SHLG Series

The SHLG Series include models SHLG-1, SHLG-2 and SHLG-3 source holders. The design for the SHLG-1, SHLG-2 and SHLG-3 is basically the same. The source holder bodies are lead filled welded steel shells fitted with an internal tube assembly and collimating structure. The physical size differs between models. The physical size determines the amount of lead each model contains for shielding.

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The source capsule is held in place in the source holder in the following manner. The source capsule is placed in a stainless steel source tube assembly. The source tube assembly is held in place by a steel détente/bearing block bolted to the source holder body. Unauthorized removal of the source tube assembly is prevented by covering the counter-bored bolt holes of the détente/bearing block with a neoprene gasket attached with weather-strip compound. The source and source tube assembly are protected from the exterior environment by means of close dimensional tolerance between the shaft of the source tube assembly, the bronze bushing in the détente/bearing block and the neoprene gasket. Source location in the **OFF** position is fixed in assembly by a ball détente and secured by a padlock through the source tube assembly shaft. The source **ON** position is when the operating knob, on the end of the source tube assembly, is pushed against the gasket stop. The source is in the **OFF** position (shielded condition) when the source tube assembly is in the extended position.

The radiation beam port is covered for additional protection with a thin steel or aluminum plate (0.030") which is attached to the source holder body with weather-strip compound

The SHLG series are used as components of gauge systems for measuring density, level or interface positions of substances in vessels. The source holders are used with fan shaped collimators which allow an adjustable beam angle from 0 to 45 degrees

The approved models are the SHLG-1, SHLG-2 and SHLG-3 source holders.

A typical SHLG series source holder in a density gauge configuration that is used by general licensees is shown in **Attachment 1**.

A typical SHLG series source holder in a level or interface gauge configuration that is used by general licensees is shown in **Attachment 2**.

The SHN Source Holder

The SHN source holder body is constructed of a high density polyethylene block and cadmium sheet encased in steel and aluminum. The cadmium sheet is use to reduce thermal neutron radiation levels. The polyethylene block is fitted with an internal tube assembly and collimating structure.

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The neutron source capsule is placed in a stainless steel source tube assembly. The source tube assembly is secured in the SHN source holder body by means of the détente/bearing block bolted to the source holder body. Unauthorized removal of the source tube assembly is prevented by covering the counter-bored bolt holes of the détente/bearing block with a neoprene gasket attached with weather-strip compound. The source and source tube assembly are protected from the exterior environment by means of close dimensional tolerance between the shaft of the source tube assembly, the bronze bushing in the retaining block and the neoprene gasket. Source location in the **OFF** position is fixed in assembly by a ball détente and secured by a padlock through the source tube assembly shaft. The source **ON** position is when the operating knob, on the end of the source tube assembly, is pushed against the gasket stop. The source is **OFF** (shielded condition) when the source tube assembly is in the extended position.

The SHN source holder is used as a component of the Moistart M-5010 moisture gauge. The Moistart M-5010 gauge is used to measure the moisture content of bulk materials on a conveyor belt.

A typical SHN source holder in a Moistart M-5000 gauge configuration is shown in **Attachment 3**.

LABELING:

The source holder is labeled in accordance with 10 CFR 20.1904. The label contains the radiation symbol, isotope, activity, model number, serial number, name of the manufacturer, and the words "CAUTION-RADIOACTIVE MATERIAL" (ref. dwg. A-33739).

In addition, source holders intended for distribution to persons generally licensed will be labeled in accordance with 10 CFR 32.51. When the density, level, or interface gauge is distributed to general licensees, a general license label which explains regulatory responsibilities is also attached (ref. dwg B-33568).

The Radiation Caution and the General License labels are made of 28 gauge, type 304 stainless steel etched 0.003 inch deep and filled enamel paint. The Radiation Caution and the General License labels are both attached with stainless steel drive screws.

There are two positions of the source holder shutter on the SHLG Series and the SHN source holders. **OFF and ON**. The positions are clearly indicated by a label attached to the source holder (ref. dwgs A-22264 and A-29256). The position label is made of 28 gauge, type 304 stainless steel etched 0.003 inch deep and filled with enamel paint. The position label is attached with stainless steel drive screws or pop-rivets.

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The **ON** condition warning label cautions the user not to place the device in the **ON** position unless properly mounted (ref. dwg A-53677). The **ON** condition warning label is made of four mil yellow vinyl and attached with pressure adhesive.

DIAGRAM:

See attachments 1, 2 and 3

CONDITIONS OF NORMAL USE:

The SHLG Series source holder is used as a component of The Ohmart Corporations Model Densart and Levelart gauges. The Densart and Levelart gauges are used in industrial and process control environments for the measurements of density, level and/or the interface position of materials in vessels.

Typical environmental conditions are as follows:

Temperature	-40°C to 60°C (-40°F to 140°F)
Pressure	Atmospheric
Vibration	Ranges from zero to mild
Corrosion	Ranges from zero to highly corrosive vapor
Impact	Accident Conditions only
Fire	Unlikely
Explosion	Unlikely

The SHN source holder is used as a component of the Ohmart Corporations Model Moistart 5010 moisture gauge. The Moistart 5010 moisture gauge is used in industrial and process control environments to measure the moisture content of bulk materials on a conveyor belt.

The typical environment conditions are as follows:

Temperature	-40°C to 60°C (-40°F to 140°F)
Pressure	Atmospheric
Vibration	Ranges from zero to mild
Corrosion	Ranges from zero to highly corrosive vapors
Impact	Accident Conditions only
Fire	Unlikely
Explosion	Unlikely

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PROTOTYPE TESTING:

A single prototype of the Models SHLG-3 and SHN were subjected to and passed tests for vibration, impact, temperature, and operation of the **ON-OFF** mechanism. The tests were developed and conducted by the Ohmart Corporation.

The classification designation for the SHLG series source holder per ANSI N-43.8 1979 is ANSI 54-353-353-R2

The classification designation for the SHN source holder per ANSI N-43.8 1979 is ANSI 44-353-353-R1.

- a) vibration - 0 through 600 cpm at 0 through 1/16 inch displacement for 16 hours
- b) impact - several hundred blows with 1/2 pound hammer
- c) **OFF** and **ON** control - operated several hundred times.

In addition, the SHLG series and the SHN source holders successfully passed all tests for compliance with DOT spec. 7A Type A packaging which included water spray, 4 ft. free drop, compression and penetration tests.

A wipe test is required every 36 months for the SHLG series and the SHN source holders. This interval is based on the previous performance of Ohmart source holders with similar design features which are already approved for 36 month wipe test intervals and previous performance of the Ohmart A-2100, A-2102, A-2104, A-22593, A-25159, A-33131 and A56740 sealed sources.

EXTERNAL RADIATION LEVELS:

The manufacturer reports the following dose rates for source activity as indicated:

Model SHLG-1

Source: Cs-137 (2.4 Ci)

	<u>*Shutter ON</u>	<u>*Shutter OFF</u>
5 cm =	10.2	11.9
30 cm =	2.4	1.7
100 cm =	0.3	0.2

dose rates are given in mR/hr.

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Source: Co-60 (25.0 mCi)

	<u>*Shutter "ON"</u>	<u>*Shutter "OFF"</u>
5 cm =	30.9	31.8
30 cm =	4.5	3.6
100 cm =	0.6	0.5

Model SHLG-2

Source: Cs-137 (9.0 Ci)

	<u>*Shutter ON</u>	<u>*Shutter OFF</u>
5 cm =	9.0	5.5
30 cm =	3.5	1.0
100 cm =	0.5	0.1

Source: Co-60 (85.0 mCi)

	<u>*Shutter "ON"</u>	<u>*Shutter "OFF"</u>
5 cm =	26.2	26.2
30 cm =	4.4	4.0
100 cm =	0.6	0.5

Model SHLG-3

Source: Cs-137 (10.0 Ci)

	<u>*Shutter ON</u>	<u>*Shutter OFF</u>
5 cm =	2.2	0.6
30 cm =	0.6	0.1
100 cm =	0.1	---

dose rates are given in mR/hr.

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Source: Co-60 (500.0 mCi)

	<u>*Shutter "ON"</u>	<u>*Shutter "OFF"</u>
5 cm =	29.8	27.7
30 cm =	4.5	4.1
100 cm =	0.6	0.6

Model SHN

Source: Cf-252 (1.5 mCi)

	<u>*Shutter ON</u>	<u>*Shutter OFF</u>
5 cm =	3.7	11.8
30 cm =	3.7	5.8
100 cm =	0.2	0.2

dose rates are given in mR/hr.

QUALITY ASSURANCE AND CONTROL:

The Ohmart Corporation received its ISO-9001 Certification #107563 on January 14, 1997. The Ohmart Corporation maintains a quality assurance and control program. This program includes the following inspections:

Sealed source:

- Examination of vendor source certificate for proper activity and leak test results.
- Incoming wipe test before placing source in inventory.
- Wipe test of complete device prior to shipment.
- Wipe test counting equipment can detect less than 0.005 μ Ci of activity on the wipe.

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Radiation Field intensity:

- Measure radiation field intensity of completed device prior to shipment to assure that values do not exceed 5 mR/hr at 30 cm from the surface of the device nor 100 mR/hr at 5 cm from the surface as defined by ANSI standard N-43.8 1979.
- Look for defects in the source holder body and streaming from all mating surfaces adjacent to the source.

Mechanical parts and construction:

- Visual inspection of all parts before and after assembly.
- Visual inspection of all welds.
- Operations check of source **OFF** and **ON** mechanism.
- Visual check for proper location and attachment of all labels.

LIMITATIONS AND / OR CONSIDERATION OF USE:

- When the SHLG Series and SHN models are used as density, level, or interface gauges and labeled in accordance with 10 CFR 32.51, the device shall be distributed only to persons generally licensed by the U.S. NRC or an Agreement State.

When the SHLG Series and SHN models are used as density, level or interface gauges and labeled in accordance with 10 CFR 20.1904, the device may also be distributed to persons specifically licensed by the U.S. NRC or an Agreement State.

- The device shall be leak tested at 36 months intervals using techniques capable of detecting 0.005 μ Ci of removable contamination.
- Handling, storage, use, transfer, and disposal: To be determined by the licensing authority.
- **Review Note:** The device may be installed by the user only when the shutter is locked in the closed position.
- This registration sheet and the information contained within the references shall not be changed without the written consent of the U.S. NRC.

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SAFETY ANALYSIS SUMMARY:

Based on our review of the information and test data cited below, we conclude that the SHLG Series and the SHN model designs are acceptable for licensing purposes. Furthermore, we conclude that the SHLG Series and SHN models would be expected to maintain their integrity for normal conditions of use and accidental conditions which might occur during uses specified in this certificate.

Based on our review of the information and test data submitted and the interpretation of the regulations and the devices intrinsic safety features, we conclude that the SHLG Series and SHN models when used in density, level and interface gauges on non-accessible vessels are acceptable for distribution to persons who are generally licensed. The manufacturer has submitted data to demonstrate that:

- (i) Under ordinary conditions of handling, storage, and use of the device, the by-product material contained in the device will not be released or inadvertently removed from the device, and it is unlikely that any person will receive in any period of one calendar quarter a dose in excess of 10 percent of the limits specified in the table in 10 CFR Part 20 Section 20.1201(a).
- (ii) Under accident conditions (such as fire and explosion) associated with handling, storage, and use of the device, it is unlikely that any person would receive external radiation dose of dose commitment in excess of the dose to the appropriate organ as specified in the following table:

<u>Part of Body</u>	<u>Rem</u>
Whole body, head and trunk, active blood - forming organs; gonads; or lens of eye	15
Hands and forearms; feet and ankles; localized areas of skin average over areas no larger than 1 square centimeter	200
Other organs	50

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REFERENCE:

The following supporting document for the model SHLG Series and SHN is hereby incorporated by reference and is made a part of this registry document:

- Ohmart Corporation's letter dated April 3, 1996.
- Ohmart Corporation's letter dated March, 5 1997.

ISSUING AGENCY:

U.S. Nuclear Regulatory Commission, Division of Industrial and Medical Nuclear Safety,
Medical, Academic, and Commercial Use Safety Branch, Washington DC 20555

DATE: _____

REVIEWER: _____

DATE: _____

CONCURRENCE: _____

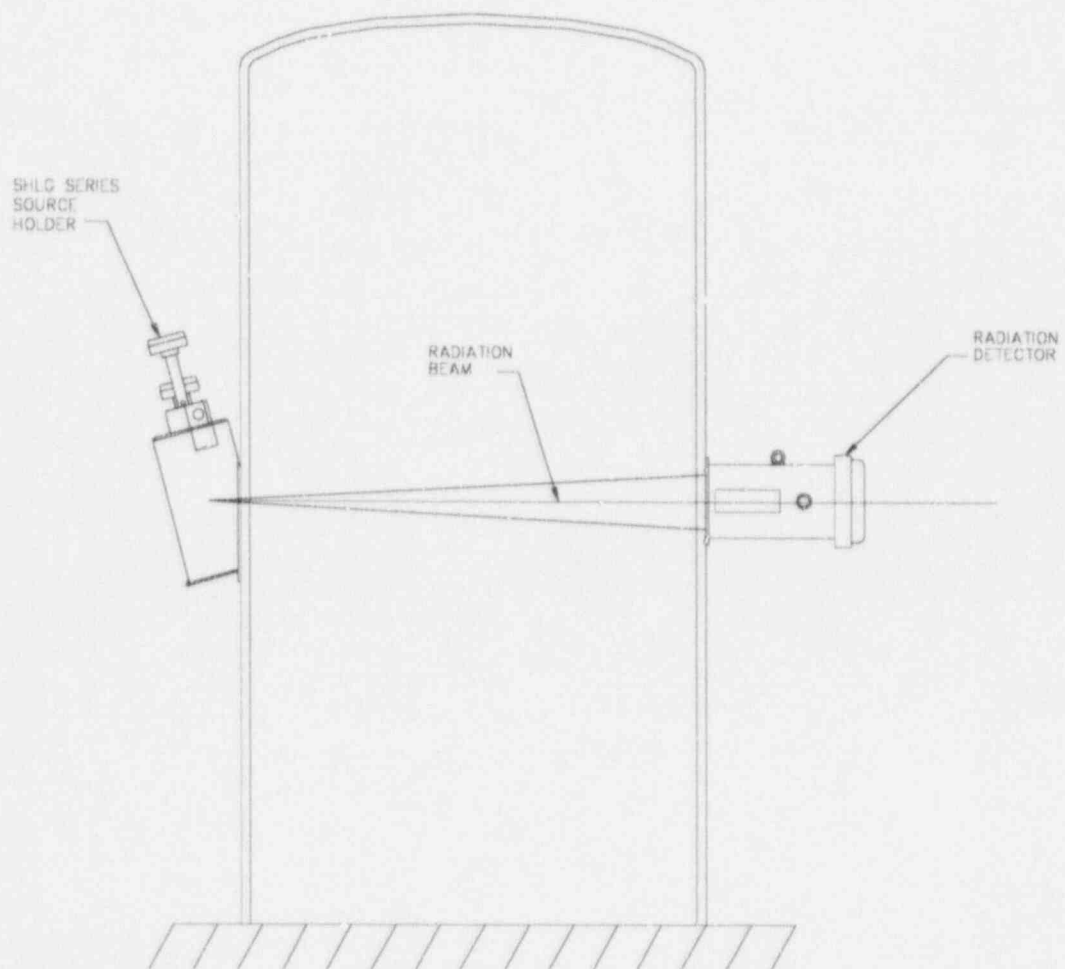
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(Density Gauge)



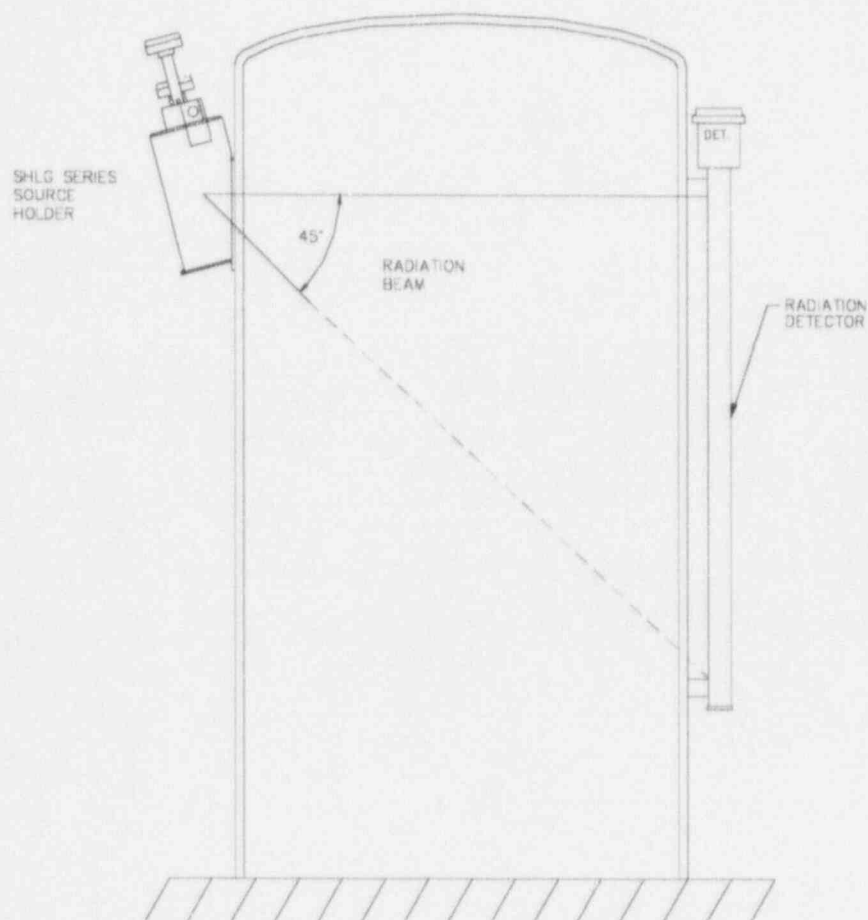
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(Level and/or Interface Gauge)



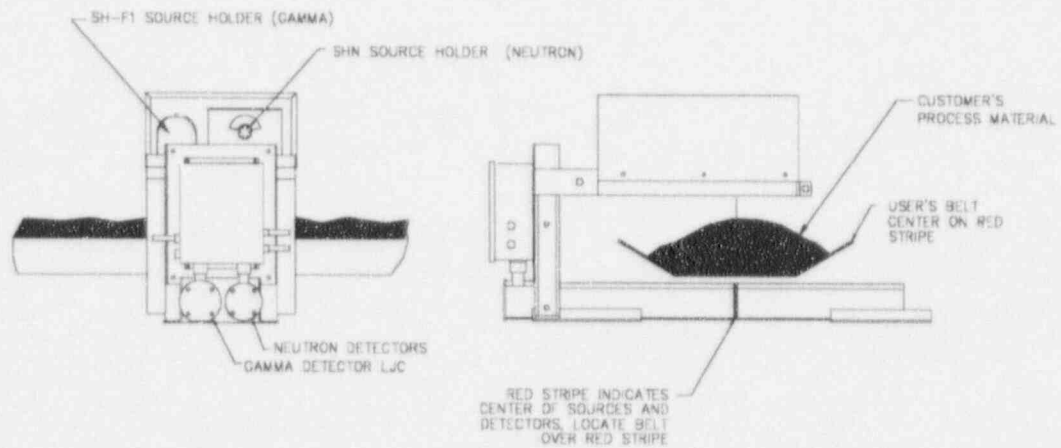
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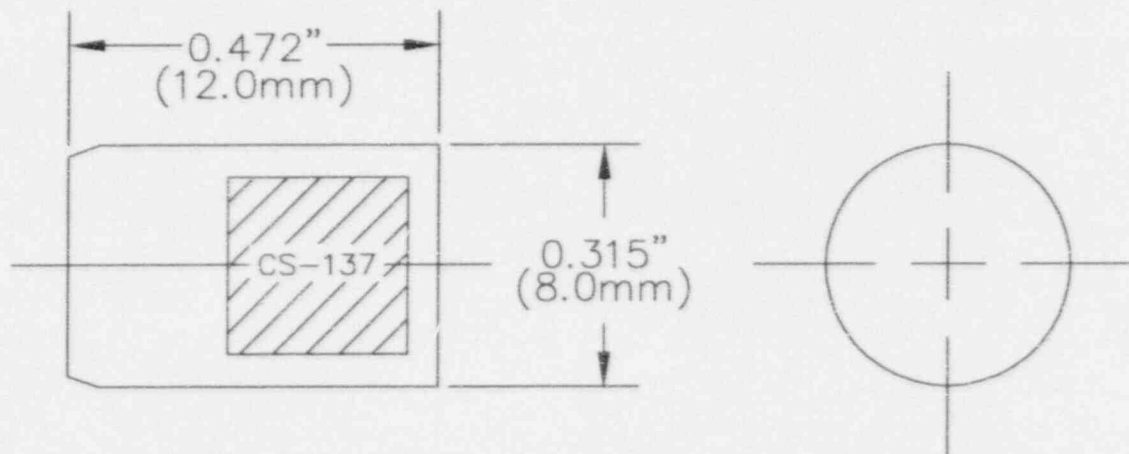
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(MOISTART M-5000 GAUGE)





ECG NUMBER	QTM	REVISION	BY	CHECKED

CURRENT MANUFACTURER MODELS

- AMERSHAM CORPORATION
 CAPSULE X.9 MODEL CDC93
 (ANSI CLASSIFICATION C66646)
 ENGRAVED INFORMATION: AI
 CS-137
 (SERIAL NUMBER)
 TREFOIL (ON END OF CYLINDER)
- BEBIG
 CAPSULE Cs7.P04
 (ANSI CLASSIFICATION 77C66646)
 ENGRAVED INFORMATION: BB
 Cs7.P04
 (SERIAL NUMBER/YEAR OF
 MANUFACTURE)
 TREFOIL

OHMART B/A NUMBER	
OHMART IDENTIFICATION NUMBER 57878	
OHMART THE OHMART CORPORATION <small>4241 ALLENDORF DRIVE, CINCINNATI, OHIO 45209 U.S.A.</small>	
Cs-137 SOURCE CAPSULE 5000 mCi MAX.	
THIS DOCUMENT INCLUDES INFORMATION WHICH IS PROPRIETARY TO THE OHMART CORPORATION. NEITHER THIS DOCUMENT NOR THE INFORMATION DISCLOSED HEREIN SHALL BE USED OR DISCLOSED TO OTHERS FOR MANUFACTURING OR ANY OTHER PURPOSE EXCEPT AS SPECIFICALLY AUTHORIZED IN WRITING BY THE OHMART CORPORATION. THIS DOES NOT APPLY TO INFORMATION FURNISHED BY VENDORS OR OTHERS OUTSIDE THE OHMART CORPORATION.	
MATERIAL TOLERANCES UNLESS OTHERWISE SPECIFIED ANGLES $\pm 1/2^\circ$ CAST OR WELD $\pm 1/8"$ MACHINE DECIMAL $\pm 0.005"$ BREAK ALL SHARP CORNERS DIMENSIONS UNLESS OTHERWISE SPECIFIED ARE IN INCHES	USAGE FINISH MADE FROM A-2102
DRAWN BY/DATE KH 2/20/97	CHECKED BY/DATE RLH 2/20/97 A-57878