GENERAL LICENSE

As a recipient of a Metorex instrument containing radioactive source(s), the recipient is granted a GENERAL LICENSE by the NRC or the State (if you reside in an Agreement State). The GENERAL LICENSE is issued in the name of the company to which the instrument is shipped. The GENERAL LICENSE requires that the licensee carry out specific actions.

The GENERAL LICENSEE is required to:

1. Assure that all labels affixed to the instrument are maintained in good condition and the instructions thereon are followed.

2. Assure that leak tests and shutter operation tests are performed at an interval of not greater than six (6) months.

3. Assure that all leak tests, shutter operation tests and servicing are done in accordance with the instructions provided or by a person holding a specific license to do so.

4. Maintain records of the leak tests, shutter operation tests and service for at least three (3) years after the next scheduled test or until the instrument is disposed of.

5. Upon the occurrence of a failure of or damage to the shutter mechanism or other shielding of the radioactive material or the indication of 0.005 microcurie or more of removable activity, immediately suspend operation of the device until repairs have been effected by Metorex. In addition, within 30 days of the occurrence of such an event, notify the appropriate regional office of the NRC.

6. Not abandon the device containing radioactive sources.

7. Not transfer or dispose of the unit except by return to Metorex or as provided in 10 CFR 31.5, (a copy of which is found on page 8).

8. Comply with the reporting provisions of 10 CFR 20.2201 and 20.2202 (found on page 11).

9. Respond to written request from the NRC or Agreement State to provide information relating to the general license within 30 days.

IN CASE OF ANY QUESTIONS OR PROBLEMS
CONTACT METOREX INC. AT
(609) 406-9000

NOTE: This page should be printed on red stock!

SECTION ON RADIATION SAFETY

AND

REGULATIONS (GENERAL LICENSE)

XMET 800 and Courier Series Probes

NOTE: THIS MANUAL MUST ACCOMPANY THE INSTRUMENT AT ALL TIMES

METOREX INC

1 - 609 - 406 - 9000

Revised: May 15, 2000

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8. Comply with the reporting provisions of 10 CFR 20.2201 and 20.2202

9. Respond to written request from the NRC or Agreement State to provide information relating to the general license within 30 days.

1.1. General Discussion

The instrument you have received contains sealed radioisotope sources and is subject to licensing and regulation by the U.S. Nuclear Regulatory Commission (NRC). Many states have an agreement with the NRC to control radioisotopes within their state, these states are known as Agreement States. In most cases, the state and the NRC regulations are similar and allow the receipt of the instrument under a General License. In those states, it is normally required that the recipient of the device notify the state within 30 days of receipt of the unit. The best way to determine if your state is an agreement state is via the Internet at:

http://www.hsrd.ornl.gov/nrc/asframe.htm

If Internet access is not available, contact Metorex. Once you have determined the proper contact person, you should call and inform the state that you have taken possession of a device which is Generally Licensed by the NRC under 10 CFR 31.5 and ask what steps must be taken to comply with state regulations.

Instead of the general license, it is possible to possess these units under a specific license issued by the NRC or your state. At this time, a few states require a specific license to possess this device. The need for a specific license can be determined by contacting the appropriate individual for your state. If you prefer to maintain the instrument under a specific license please contact Metorex to arrange for redistribution of your instrument under your specific license.

VERY IMPORTANT:

Please note that **it is the probe** of the X-MET analyzer rather than the X-MET itself **which is to be reported as the device containing radioactive source.** The probe type and serial number, and source type and serial number(s) to be reported are on the radioactive device label(s) placed on the probe. These must be reported.

1.2. DISCUSSION OF REQUIREMENTS

All the requirements summarized above stem from the language of the regulations,

ad 1) All instructions provided with the device, both in manuals and on labels attached to the device have to be observed, and labels must be maintained in good condition. This requirement also means that all instruction manuals, copy of this General License, and all test records have to accompany the device at all times and be always available for reference or inspection. This refers also to any records of receipt, installation, servicing, assignment, transfer and disposal.

ad 2, 3 & 4). The user of the device containing radioactive material (source) has to have the device tested for leakage every six months. The results and records of the tests have to be maintained for at least three years or until the device has been transferred to the specifically licensed recipient (usually the manufacturer). There are a number of facilities that specialize in performing the wipe test for a nominal fee. The detailed instructions on how to perform the wipe test for each probe (device) type are described in sub-section 3.1 of manual along with few addresses of services as an example.

Only the original manufacturer of the device or its legally appointed representative are allowed to perform the servicing and disassembly of the device. Whenever it is necessary to ship the device for service to Metorex service facility the user should contact Metorex which will advise on proper shipping procedures. These procedures are outlined in sub-section 3.4. Metorex uses only trackable methods of shipment such as provided by the second day Fedex Service.

Anytime a wipe test is performed on the device its ON/OFF or trigger mechanism - whichever applicable - should also be tested for operation and test results recorded.

ad 5). If the leak test shows a removable activity of greater than 0.005 microcuries or the shutter mechanism test fails, or any other indication exist that the shielding has failed, it is essential that the unit be removed from operation immediately. The you should contact Metorex immediately and arrange for the unit to be returned to Metorex. It is also required that the event be reported to the NRC. Please contact the Radiation Safety Officer at Metorex for assistance in completing this report.

ad 6, 7). The recipient of the device under provisions of general license is not allowed to dispose of or transfer the device to a third party. The only transfer allowed is either to Metorex Inc for the purpose of service or disposal or the party specifically licensed to receive the device. ***In particular, it is illegal for the recipient of the device to sell it to a third party***.

ad 8). Any loss of the device, for whatever the reason, has to be reported immediately to appropriate agency (NRC Regional Office or to an Agreement State) and Metorex. Similarly, in the remote case of leakage from radioactive source or damage to the radiation shielding report the event to Metorex and appropriate agency. Metorex will advise on proper safety procedures and repair the device.

ad 9). The NRC and Agreement states may contact you for additional information regarding the unit you possess under a general license. It is required that you provide the requested information within 30 days of receiving the request. If you are not certain of the correct response to the request please contact Metorex for assistance.

1.3 MAINTANENCE AND REPAIR

Under a General License, the user is prohibited from opening or dismantling the probe in any way. Thus, in order to maintain or repair the probe it is necessary to return the probe to Metorex or another company that is specifically licensed by either the NRC or an Agreement State to perform the repairs to the probe. The wipe tests and shutter tests outlined in Section 3 of this manual can and should be performed by the user.

2. GENERAL LICENSE.

2.1. INFORMATION ABOUT METOREX MATERIALS LICENSE.

Metorex Inc possesses materials license and distribution license, both issued by the USNRC. The license numbers are:

Materials possession 29-30342-01
Distribution 29-30342-02G

These licenses authorize Metorex Inc to manufacture and distribute its devices under General License as set out in the federal regulations. As a manufacturer and distributor, Metorex Inc is required to furnish to the recipient of the device(s) parts of the regulations pertaining to General Licensees.

The excerpts from the NRC regulations (10 CFR 35.1, 20.2201 and 20.2202) attached outline the recipient's responsibilities as a licensee and the conditions under which he must possess, use and transfer these devices.

2.2 Excerpts from the Title 10 CFR, Energy, related to general license.

§31.5 Certain measuring, gauging or controlling devices.[2]

(a) A general license is hereby issued to commercial and industrial firms and research, educational and medical institutions, individuals in the conduct of their business, and Federal, State or local government agencies to acquire, receive, possess, use or transfer, in accordance with the provisions of paragraphs (b), (c) and (d) of this section, byproduct material contained in devices designed and manufactured for the purpose of detecting, measuring, gauging or controlling thickness, density, level, interface location, radiation, leakage, or qualitative or quantitative chemical composition, or for producing light or an ionized atmosphere.

(b) The general license in paragraph (a) of this section applies only to byproduct material contained in devices which have been manufactured or initially transferred and labeled in accordance with the specifications contained in a specific license issued pursuant to §32.51 of this chapter or in accordance with the specifications contained in a specific license issued by an Agreement State which authorizes distribution of the devices to persons generally licensed by

the Agreement State.

(c) Any person who acquires, receives, possesses, uses or transfers byproduct material in a device pursuant to the general license in paragraph (a) of this section:

(1) Shall assure that all labels affixed to the device at the time of receipt and bearing a statement that removal of the label is prohibited are maintained thereon and shall comply with all instructions and precautions provided by such labels;

(2) Shall assure that the device is tested for leakage of radioactive material and proper operation of the on-off mechanism and indicator, if any, at no longer than six-month intervals or at such other intervals as are specified in the label; however:

(i) Devices containing only krypton need not be tested for leakage of radioactive material, and
(ii) Devices containing only tritium or not more than 100 microcuries of other beta and/or gamma emitting material or 10 microcuries of alpha emitting material and devices held in storage in the original shipping container prior to initial installation need not be tested for any purpose;

(3) Shall assure that the tests required by paragraph (c)(2) of this section and other testing, installation, servicing, and removal from installation involving the radioactive materials, its shielding or containment, are performed:

(i) In accordance with the instructions provided by the labels; or
(ii) By a person holding a specific license pursuant to parts 30 and 32 of this chapter or from an Agreement State to perform such activities;

(4) Shall maintain records showing compliance with the requirements of paragraphs (c)(2) and (c)(3) of this section. The records must show the results of tests. The records also must show the dates of performance of, and the names of persons performing, testing, installing, servicing, and removing from the installation radioactive material and its shielding or containment. The licensee shall retain these records as follows:

(i) Each record of a test for leakage or radioactive material required by paragraph (c)(2) of this section must be retained for three years after the next required leak test is performed or until the sealed source is transferred or disposed of.
(ii) Each record of a test of the on-off mechanism and indicator required by paragraph (c)(2) of this section must be retained for three years after the next required test of the on-off mechanism and indicator is performed or until the sealed source is transferred or disposed of.
(iii) Each record that is required by paragraph (c)(3) of this section must be retained for three years from the date of the recorded event or until the device is transferred or disposed of.

(5) Upon the occurrence of a failure of or damage to, or any indication of a possible failure of or

damage to, the shielding of the radioactive material or the on-off mechanism or indicator, or upon the detection of 0.005 microcurie or more removable radioactive material, shall immediately suspend operation of the device until it has been repaired by the manufacturer or other person holding a specific license pursuant to parts 30 and 32 of this chapter or from an Agreement State to repair such devices, or disposed of by transfer to a person authorized by a specific license to receive the byproduct material contained in the device and, within 30 days, furnish to the Administrator of the appropriate Nuclear Regulatory Commission, Regional Office listed in appendix D of part 20 of this chapter, a report containing a brief description of the event and the remedial action taken;

(6) Shall not abandon the device containing byproduct material;

(7) Shall not export the device containing byproduct material except in accordance with part 110 of this chapter;

(8) Except as provided in paragraph (c)(9) of this section, shall transfer or dispose of the device containing byproduct material only by transfer to persons holding a specific license pursuant to parts 30 and 32 of this chapter or from an Agreement State to receive the device and within 30 days after transfer of a device to a specific licensee shall furnish to the Director of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555 a report containing identification of the device by manufacturer's name and model number and the name and address of the person receiving the device. No report is required if the device is transferred to the specific licensee in order to obtain a replacement device;

(9) Shall transfer the device to another general licensee only:

(i) Where the device remains in use at a particular location. In such case the transferor shall give the transferee a copy of this section and any safety documents identified in the label of the device and within 30 days of the transfer, report to the Director of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555, the manufacturer's name and model number of device transferred, the name and address of the transferee, and the name and/or position of an individual who may constitute a point of contact between the Commission and the transferee; or
(ii) Where the device is held in storage in the original shipping container at its intended location of use prior to initial use by a general licensee.

(10) Shall comply with the provisions of §§20.2201, and 20.2202 of this chapter for reporting radiation incidents, theft or loss of licensed material, but shall be exempt from the other requirements of parts 19, 20, and 21, of this chapter.

(11) Shall respond to written requests from the Nuclear Regulatory Commission to provide information relating to the general license within 30 calendar days of the date of the request, or other time specified in the request. If the general licensee cannot provide the requested

information within the allotted time, it shall, within that same time period, request a longer period to supply the information by submitting a letter to the Director, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001 and provide written justification as to why it cannot comply.

(d) The general license in paragraph (a) of this section does not authorize the manufacture or import of devices containing byproduct material.

[39 FR 43532, Dec. 16, 1974, as amended at 40 FR 8785, Mar. 3, 1975; 40 FR 14085, Mar. 28, 1975; 42 FR 25721, May 19, 1977; 42 FR 28896, June 6, 1977; 43 FR 6922, Feb. 17, 1978; 53 FR 19246, May 27, 1988; 56 FR 23471, May 21, 1991; 56 FR 61352, Dec. 3, 1991; 58 FR 67659, Dec. 22, 1993]

20.2201 Reports of theft or loss of licensed material.

(a) Telephone reports. (1) Each licensee shall report by telephone as follows:

(i) Immediately after its occurrence becomes known to the licensee, any lost, stolen, or missing licensed material in an aggregate quantity equal to or greater than 1,000 times the quantity specified in appendix C to part 20 under such circumstances that it appears to the licensee that an exposure could result to persons in unrestricted areas; or

(ii) Within 30 days after the occurrence of any lost, stolen, or missing licensed material becomes known to the licensee, all licensed material in a quantity greater than 10 times the quantity specified in appendix C to part 20 that is still missing at this time.

(2) Reports must be made as follows:

(i) Licensees having an installed Emergency Notification System shall make the reports to the NRC Operations Center in accordance with §50.72 of this chapter, and

(ii) All other licensees shall make reports by telephone to the NRC Operations Center (301 - 951 - 0550).

(b) *Written reports.* (1) Each licensee required to make a report under paragraph (a) of this section shall, within 30 days after making the telephone report, make a written report setting forth the following information:

(i) A description of the licensed material involved, including kind, quantity, and chemical and physical form; and

(ii) A description of the circumstances under which the loss or theft occurred; and

(iii) A statement of disposition, or probable disposition, of the licensed material involved; and

(iv) Exposures of individuals to radiation, circumstances under which the exposures occurred, and the possible total effective dose equivalent to persons in unrestricted areas; and

(v) Actions that have been taken, or will be taken, to recover the material; and

(vi) Procedures or measures that have been, or will be, adopted to ensure against a recurrence of the loss or theft of licensed material.

(2) Reports must be made as follows:

(i) For holders of an operating license for a nuclear power plant, the events included in paragraph (b) of this section must be reported in accordance with the procedures described in §50.73(b), (c), (d), (e), and (g) of this chapter and must include the information required in paragraph (b)(1) of this section, and

(ii) All other licensees shall make reports to the Administrator of the appropriate NRC Regional Office listed in appendix D to part 20.

(c) A duplicate report is not required under paragraph (b) of this section if the licensee is also required to submit a report pursuant to §§30.55(c), 40.64(c), 50.72, 50.73, 70.52, 73.27(b), 73.67(e)(3)(vi), 73.67(g)(3)(iii), 73.71, or §150.19(c) of this chapter.

(d) Subsequent to filing the written report, the licensee shall also report any additional substantive information on the loss or theft within 30 days after the licensee learns of such information.

(e) The licensee shall prepare any report filed with the Commission pursuant to this section so that names of individuals who may have received exposure to radiation are stated in a separate and detachable part of the report.

[56 FR 23406, May 21, 1991, as amended at 58 FR 69220, Dec. 30, 1993; 60 FR 20186, Apr. 25, 1995]

§20.2202 Notification of incidents.

(a) Immediate notification. Notwithstanding any other requirements for notification, each licensee shall immediately report any event involving byproduct, source, or special nuclear material possessed by the licensee that may have caused or threatens to cause any of the following conditions --

(1) An individual to receive --

(i) A total effective dose equivalent of 25 rems (0.25 Sv) or more; or

(ii) A lens dose equivalent of 75 rems (0.75 Sv) or more; or

(iii) A shallow-dose equivalent to the skin or extremities of 250 rads (2.5 Gy) or more; or

(2) The release of radioactive material, inside or outside of a restricted area, so that, had an individual been present for 24 hours, the individual could have received an intake five times the annual limit on intake (the provisions of this paragraph do not apply to locations where personnel are not normally stationed during routine operations, such as hot-cells or process enclosures).

(b) Twenty-four hour notification. Each licensee shall, within 24 hours of discovery of the event, report any event involving loss of control of licensed material possessed by the licensee that may have caused, or threatens to cause, any of the following conditions:

(1) An individual to receive, in a period of 24 hours --

(i) A total effective dose equivalent exceeding 5 rems (0.05 Sv); or

(ii) A lens dose equivalent exceeding 15 rems (0.15 Sv); or

(iii) A shallow-dose equivalent to the skin or extremities exceeding 50 rems (0.5 Sv); or

(2) The release of radioactive material, inside or outside of a restricted area, so that, had an individual been present for 24 hours, the individual could have received an intake in excess of one occupational annual limit on intake (the provisions of this paragraph do not apply to locations where personnel are not normally stationed during routine operations, such as hot-cells or process enclosures).

(c) The licensee shall prepare any report filed with the Commission pursuant to this section so that names of individuals who have received exposure to radiation or radioactive material are stated in a separate and detachable part of the report.

(d) Reports made by licensees in response to the requirements of this section must be made as follows:

(1) Licensees having an installed Emergency Notification System shall make the reports required by paragraphs (a) and (b) of this section to the NRC Operations Center in accordance with 10 CFR 50.72; and

(2) All other licensees shall make the reports required by paragraphs (a) and (b) of this section by telephone to the NRC Operations Center (301) 816-5100.

(e) The provisions of this section do not include doses that result from planned special exposures, that are within the limits for planned special exposures, and that are reported under §20.2204.

[56 FR 23406, May 21, 1991, as amended at 56 FR 40766, Aug. 16, 1991; 57 FR 57879, Dec. 8, 1992; 59 FR 14086, Mar. 25, 1994]

Appendix D to Part 20 -- United States Nuclear Regulatory Commission Regional Offices

		Telephone (24 hour)
Region I: Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.	USNRC, Region I 475 Allendale Road King of Prussia, PA 19406.	(610) 337-5000
Region II: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, Puerto Rico, South Carolina, Tennessee, Virginia, Virgin Islands, and West Virginia.	USNRC, Region II Atlanta Federal Center 61 Forsyth Street,SW., Suite 23T85 Atlanta, GA 30303.	(404) 562-4400
Region III: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin.	USNRC, Region III 801 Warrenville Road Lisle, IL 60532-4351.	(708) 829-9500
Region IV: Alaska, Arizona, Arkansas, California, Colorado, Hawaii, Idaho, Kansas, Louisiana, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, Wyoming, and the U.S. territories and possessions in the Pacific.	USNRC, Region IV 611 Ryan Plaza Drive Suite 400 Arlington, TX 76011.	(817) 860-8100
Region IV: Field Office	USNRC, Region IV Walnut Creek Field Office, 1450 Maria Lane, Suite 300, Walnut Creek, CA 94596.	(510) 975-0200.

[56 FR 23468, May 21, 1991, as amended at 56 FR 41449, Aug. 21, 1991; 58 FR 64111, Dec. 6, 1993; 59 FR 17465, Apr. 13, 1994; 60 FR 24551, May 9, 1995; 62 FR 22880, Apr. 28, 1997]

3. APPENDICES

3.1. WIPE TEST PROCEDURES.

3.1.1. Wipe test kits.

There are many companies which provide the wipe test kits along with subsequent analysis of the wipe. The addresses of few are listed in Section 3.1.3. The cost of the kit and service runs about 30 to 60 US$. The company providing this type of service has to be certified either by the State Department of Radiation Safety (if in Agreement State) or by Nuclear Regulatory Commission (if in Non-agreement State). Therefore, prior to the intended use of the services of a particular company you should ask for the copy of the license authorizing them to perform the service. Most of these companies will put a new customer on their list and will send wipe tests automatically every six months. This way the user of the equipment is assured of timely wipe tests as required by regulations.

The wipe test kit usually consists of wipe solution, the wipe, and a plastic container to store the used wipe in it for transport to the laboratory. Typically the wipe solution may be a mild detergent or an alcohol solution in water. The alcohol-based solution is recommended over the detergent one because it does not leave any residue on the probe window. A detergent based solution may leave some phosphorus salt residue, which can interfere with analysis. A wipe is usually a piece of a soft paper tissue or a cotton swab on a wooden stick (a "Q-tip"). A plastic container may be in the form of plastic bag or a small, 25 ml capacity polyethylene bottle with a tight stopper. Each manufacturer of the kit provides instructions on how to prepare and use the kit.

3.1.2. Performing the wipe test.

IF ANY ASSISTANCE IS NEEDED PLEASE CONTACT THE X-MET SERVICE DEPARTMENT AT: 609-406-9000

3.1.2.1. HEPS and LEPS Probes.

- Obtain the wipe test kit.
- Prepare the kit for use according to the manufacturer's instructions.
- Wet the wipe tissue or cotton swab with the wipe solution so that it is moist but not dripping.
- Move the probe measuring head in forward position so that the probe measuring head cover can be opened by tilting to the back. Lift the sample chamber from the probe head. Wipe the plastic film on the bottom of sample chamber with moist wipe tissue paper or cotton swab. Perform the wipe on this side of the film which faces the source.

NOTE: *Under the provisions of general license, the user of the device containing radioisotope is restricted from dismantling the device (probe) to expose the source. Therefore, it is not the source which is to be wipe tested, but that part of the probe which comes in closest proximity to the source and which is accessible to the user without taking the probe apart. For the probes mentioned above this is the surface of the plastic film on the bottom of sample chamber.*

- Place the wipe in a plastic bag provided, or brake off the tip of the Q-tip and drop it into the bottle with wipe solution. However, the exact handling of the wipe should follow the instructions provided with the kit by its supplier.
- Seal the plastic bag or a bottle.
- Mark the bag or a bottle with a type and serial number of the source just wiped. Record the date of wipe, source serial number, and type of the isotope on the form provided by kit manufacturer.
- Make copy of that record for your own files, and send the original along with the wipe to the lab for analysis.
- After you receive the results of the wipe test place them in a safe place. By law you are obliged to maintain these record for at least three consecutive years or until you transfer the radioisotope containing device permanently back to manufacturer.

3.1.2.2. DOPS, SAPS, SLPS, SUPS and SSPS Probes.

- Obtain the wipe test kit.
- Prepare the kit for use according to the manufacturer's instructions.
- Wet the wipe tissue or cotton swab with the wipe solution so that it is moist but not dripping.
- Wipe the plastic window of the probe with a moist wipe.

NOTE: *Under the provisions of general license, the user of the device containing radioisotope is restricted from dismantling the device (probe) to expose the source. Therefore, it is not the source which is to be wipe tested, but that part of the probe which comes in closest proximity to the source and which is accessible to the user without taking the probe apart. For the probes mentioned above this is the surface of the mylar film covering probe measurement window. It is not required to open the probe shutter in order to perform the wipe test!!*

- Place the wipe in a plastic bag provided, or brake off the tip of the Q-tip and drop it into the bottle with wipe solution. However, the exact handling of the wipe should follow the instructions provided with the kit by its supplier.
- Seal the plastic bag or a bottle.
- Mark the bag or a bottle with a type and serial number of the source(s) just wiped. Record the date of wipe, source(s) serial number(s), and type of the isotope on the form provided by kit manufacturer.
- Make copy of that record for your own files, and send the original along with the wipe to the lab for analysis.
- After you receive the results of the wipe test place them in a safe place. By law you are obliged to maintain these record for at least three consecutive years or until you transfer the radioisotope containing device permanently back to manufacturer.

NOTE: *If the probe contains two sources, it is not necessary to perform two wipes. You need only to mark on the bottle or plastic bag both isotopes and their serial numbers, as well as to include that information on the form.*

3.1.2.3. Courier 10 and 20.

- Obtain the wipe test kit.
- Prepare the kit for use according to the manufacturer's instructions.
- Wet the wipe tissue or cotton swab with the wipe solution so that it is moist but not dripping.
- Set the MAINTENANCE switch to "ON".
- In Courier 10S detach the sample cell by unscrewing it, in Courier 20 and in Courier 10 with the slurry type sample cell swing the cell on its hinge bracket away from the measuring window.
- Wipe the plastic window separating detector compartment from the sample cell with a moist wipe.
- If Courier 20 is fitted with two sample cells repeat the whole procedure for the second cell.

NOTE: *Under the provisions of general license, the user of the device containing radioisotope is restricted from dismantling the device (probe) to expose the source. Therefore, it is not the source which is to be wipe tested, but that part of the sample cell assembly which comes in closest proximity to the source and which is accessible to the user without taking the assembly apart. For the Courier heads this is the surface of the mylar film separating detector/source compartment from sample cell. One must not expose the source in order to perform the wipe test!!*

- Place the wipe in a plastic bag provided, or brake off the tip of the Q-tip and drop it into the bottle with wipe solution. However, the exact handling of the wipe should follow the instructions provided with the kit by its supplier.
- Seal the plastic bag or a bottle.
- Mark the bag or a bottle with a type and serial number of the source(s) just wiped. Record the date of wipe, source(s) serial number(s), and type of the isotope on the form provided by kit manufacturer.
- Make copy of that record for your own files, and send the original along with the wipe to the lab for analysis.
- After you receive the results of the wipe test place them in a safe place. By law you are obliged to maintain these record for at least three consecutive years or until you transfer the radioisotope containing device permanently back to manufacturer.

NOTE: *If the probe contains two sources, it is not necessary to perform two wipes. You need only to mark on the bottle or plastic bag both isotopes and their serial numbers, as well as to include that information on the form.*

3.1.3. Partial list of suppliers of wipe test services.

ATOMIC ENERGY INDUSTRIAL LAB.
9261 Kirby Drive
Houston, TX 77054-2514

MONITORING SERVICES
P.O.Box 266677
Houston, TX 77207-6677

Tel.: 713-790-9719 Tel.: 713-242-9038

NOTE: *This list does not constitute the endorsement of those companies by Metorex Inc.*

3.2. Instructions for testing the shutter mechanisms of METOREX probes.

3.2.1. General.

Under the provisions of the general license, the user or recipient of the device containing radioisotope source is obliged to test the so called "on-off mechanism and indicator, if any" (see 10 CFR 31.5, paragraph c), and maintain the log of those tests. The phrase "on-off mechanism" relates also to the shutter mechanism, which prevents the source exposure when not in measurement state.

3.2.2. HEPS and LEPS Probes.

These probes do not have an "on-off" mechanism as such. Instead the sources are contained within the probe body which effectively blocks the source radiation from emerging outside. The only moving part of the probe is the probe cover which slides back and forth. When in the front (safe) position this cover blocks radiation from the source. When in the rear (measurement) position, this probe cover brings the sample over the source for measurement. Testing of this mechanism involves nothing more than just the routine, operational check of the probe, inadvertently performed as a part of each measurement. Therefore, if the instrument is being used frequently, the test described below is an integral part of the daily routine work.

Performing the test

- Visually inspect the probe for any visible defects such as cracks, dents, etc.
- Move the sliding cover of the probe back and forth several times. It should slide in both directions without any resistance, squeak or mechanical jamming.
- Connect the probe to analyzer and turn the analyzer on. Select any calibrated model.
- Select relatively short measurement time, say 5 sec. Place the sample in the probe and start measurement.
- Repeat this sequence several times.
- Make a signed entry in a test log book stating name of the tester, date, time, and the result of the test (such as "passed" or "satisfactory"). This log book should accompany the probe at all times. It is also recommended that the dates and results of the mandatory six months wipe tests be recorded in that book.

NOTE: *Should any part of the probe fail to work as indicated in this test stop using the probe. In the event of malfunctioning, place a piece of at least 3 mm thick (1/8 of an inch) steel plate flush*

with the probe window completely covering it. Place the probe in a secure location with controlled access. Notify the supervisor and immediately contact Metorex Service Department at 609-406-9000.

3.2.3. DOPS Probe.

The DOPS probe does not have an "on-off" mechanism as such, but has a mechanical shutter which blocks the radiation from the source when probe is not used. Testing of this mechanism involves nothing more than just the routine, operational checks of the probe, ordinarily performed before each measurement session. Therefore, if the instrument is being used frequently, the test described below is an integral part of the daily routine work.

Performing the test

- Visually inspect the probe for any visible defects such as cracks, dents, etc.
- Inspect the probe measuring window. You should see the shutter in the window. In the small, round window on the side of the probe you should see a green indicator. Unlock the probe trigger.
- Place the probe against the sample. Pull the trigger several times. It should operate smoothly, without resistance, friction and jamming. Each time the trigger is being pulled all the way, a red indicator with a white digit 1 (one) should be clearly visible in the window on the side of the probe. A green indicator should be visible when the trigger is completely released.
- Connect the probe to analyzer and turn the analyzer on. Select the calibration model which uses both sources.
- Select relatively short measurement time, say 5 sec. Place the probe against the sample. Pull the trigger. A white "1" on a red background should be visible in the indicator window on the side of the probe. At the same time a red LED on the probe handle should light and stay on for the duration of the measurement.
- Hold the trigger until the first source measurement is completed. You should then hear the click caused by a second source going into measurement position, followed by a white "2" on red background visible in the indicator window. The red LED in the probe handle should stay lit.
- Wait until the measurement with the second source is over and release the trigger. The shutter should return to closed position, signaled by a green color in the indicator window. The red LED should be off.
- Visually inspect the shutter position. It should be closed.
- Repeat this sequence several times.
- Make an signed entry in a test log book stating name of the tester, date, time, and the result of the test (such as "passed" or "satisfactory"). This log book should accompany the probe at all times. It is also recommended that the dates and results of the mandatory six months wipe tests be recorded in that book.

NOTE: *Should any part of the probe fail to work as indicated in this test stop using the probe. Block the trigger with the lock provided. In the unlikely event of the shutter malfunction, place*

a piece of at least 3 mm thick (1/8 of an inch) steel plate flush with the probe window completely covering it. Place the probe in a secure location with controlled access. Notify the supervisor and immediately contact Metorex Service Department at 1-609-406-9000.

3.2.4. SAPS Probe.

The SAPS probe does not have an "on-off" mechanism as such, but has a mechanical shutter which blocks the radiation from the source when probe is not used. Testing of this mechanism involves nothing more than just the routine, operational checks of the probe, ordinarily performed before each measurement session. Therefore, if the instrument is being used frequently, the test described below is an integral part of the daily routine work.

Performing the test

- Visually inspect the probe for any visible defects such as cracks, dents, etc.
- Inspect the probe measuring window. You should see the shutter in the window. In the small, round window on the side of the probe you should see a green indicator. Unlock the probe trigger.
- Place the probe against the sample. Pull the trigger several times. It should operate smoothly, without resistance, friction and jamming. Each time the trigger is being pulled all the way, a red indicator should be clearly visible in the window on the side of the probe. A green indicator should be visible when the trigger is completely released.
- Connect the probe to analyzer and turn the analyzer on. Select any calibrated model.
- Select relatively short measurement time, say 5 sec. Place the probe against the sample. Pull the trigger. A red indicator should be visible in the indicator window on the side of the probe. At the same time a red LED on the probe handle should light and stay on for the duration of the measurement.
- Hold the trigger until the measurement is completed and then only release the trigger. The shutter should return to closed position, signaled by a green color in the indicator window. The red LED on the probe handle should be off.
- Visually inspect the shutter position. It should be closed.
- Repeat this sequence several times.
- Make an signed entry in a test log book stating name of the tester, date, time, and the result of the test (such as "passed" or "satisfactory"). This log book should accompany the probe at all times. It is also recommended that the dates and results of the mandatory six months wipe tests be recorded in that book.

NOTE: *Should any part of the probe fail to work as indicated in this test stop using the probe. Block the trigger with the lock provided. In the unlikely event of the shutter malfunction, place a piece of at least 3 mm thick (1/8 of an inch) steel plate flush with the probe window completely covering it. Place the probe in a secure location with controlled access. Notify the supervisor and immediately contact Metorex Service Department at 1-609-406-9000.*

3.2.5. SLPS Probe.

The SLPS probe does not have an "on-off" mechanism as such, but has a mechanical shutter which blocks the radiation from the source when probe is not used. Testing of this mechanism involves nothing more than just the routine, operational checks of the probe, ordinarily performed before each measurement session. Therefore, if the instrument is being used frequently, the test described below is an integral part of the daily routine work.

Performing the test

- Visually inspect the probe for any visible defects such as cracks, dents, etc.
- Inspect the probe measuring window. You should see the shutter in the window. By the window you should see the push-in pin, which actuates the shutter when probe is pressed flush against the measured surface.
- Place the probe against the sample and push until flush with the sampled surface. Do this several times. The push-in pin should operate smoothly, without any other resistance but that of the returning spring, without friction or jamming.
- Connect the probe to analyzer and turn the analyzer on. The LED in the probe handle should be green. Select any calibrated model.
- Select relatively short measurement time, say 5 sec. Place the probe against the sample and push it flush with the sampled surface. The LED on the probe handle should change from green to red and stay red for the duration of the measurement.
- Hold the probe against sample until the measurement is completed and then only release it. The shutter should return to closed position and the red LED on the probe handle should change to green.
- Visually inspect the shutter position. It should be closed.
- Repeat this sequence several times.
- Make a signed entry in a test log book stating name of the tester, date, time, and the result of the test (such as "passed" or "satisfactory"). This log book should accompany the probe at all times. It is also recommended that the dates and results of the mandatory six months wipe tests be recorded in that book.

NOTE: *Should any part of the probe fail to work as indicated in this test stop using the probe. In the unlikely event of the shutter malfunction, place a piece of at least 3 mm thick (1/8 of an inch) steel plate flush with the probe window completely covering it. Place the probe in a secure location with controlled access. Notify the supervisor and immediately contact Metorex Service Department at 1-609-406-9000.*

3.2.6. Mechanical SUPS 484 Probe.

Two SUPS probes exist, one has a mechanical shutter activation the other has an electrical shutter activation. If there is no button on the handle of your SUPS probe, you have a SUPS 484 probe and

this section applies. The SUPS probe does not have an "on-off" mechanism as such, but has a mechanical shutter which blocks the radiation from the source when probe is not used. Testing of this mechanism involves nothing more than just the routine, operational checks of the probe, ordinarily performed before each measurement session. Therefore, if the instrument is being used frequently, the test described below is an integral part of the daily routine work.

Performing the test

- Visually inspect the probe for any visible defects such as cracks, dents, etc.
- Inspect the probe measuring window. You should see the shutter in the window. By the window you should see the push-in pin, which actuates the shutter when probe is pressed flush against the measured surface.
- Place the probe against the sample and push until flush with the sampled surface. Do this several times. The push-in pin should operate smoothly, without any other resistance but that of the returning spring, without friction or jamming.
- Connect the probe to analyzer and turn the analyzer on. Select any calibrated model.
- Select relatively short measurement time, say 5 sec. Place the probe against the sample and push it flush with the sampled surface. A red LED on the probe handle should light and stay on for the duration of the measurement.
- Hold the probe against sample until the measurement is completed and then only release it. The shutter should return to closed position and the red LED on the probe handle should go off
- Visually inspect the shutter position. It should be closed.
- Repeat this sequence several times.
- Make a signed entry in a test log book stating name of the tester, date, time, and the result of the test (such as "passed" or "satisfactory"). This log book should accompany the probe at all times. It is also recommended that the dates and results of the mandatory six months wipe tests be recorded in that book.

NOTE: *Should any part of the probe fail to work as indicated in this test stop using the probe. In the unlikely event of the shutter malfunction, place a piece of at least 3 mm thick (1/8 of an inch) steel plate flush with the probe window completely covering it. Place the probe in a secure location with controlled access. Notify the supervisor and immediately contact Metorex Service Department at 1-609-406-9000.*

3.2.7. Electro-mechanical SUPS 2476 Probe.

Two SUPS probes exist, one has a mechanical shutter activation the other has an electronic shutter activation. If there is a button on the handle of your SUPS probe, you have a SUPS 2476 probe and this section applies. The SUPS probe does not have an "on-off" mechanism as such, but has a electro-mechanical shutter which blocks the radiation from the source when probe is not used. Testing of this mechanism involves nothing more than the routine, operational checks of the probe, ordinarily performed before each measurement session. Therefore, if the instrument is being used frequently, the test described below is an integral part of the daily routine work.

Performing the test

- Visually inspect the probe for any visible defects such as cracks, dents, etc.
- Inspect the probe measuring window. You should see the shutter in the window. By the window you should see the push-in pin, which enables the shutter when probe is pressed flush against the measured surface.
- Place the probe against the sample and push until flush with the sampled. Do this several times. The push-in pin should operate smoothly, without any other resistance but that of the returning spring, without friction or jamming.
- Connect the probe to analyzer and turn the analyzer on. The LED on the handle of the probe should be green. Select any calibrated model.
- Select relatively short measurement time, say 5 sec. Place the probe against the sample and push it flush with the sampled surface then momentarily press the button on the handle. The LED on the probe handle should change to red and stay red for the duration of the measurement.
- Hold the probe against sample until the measurement is completed. The shutter should return to closed position and the red LED on the probe handle should change back to green.
- Visually inspect the shutter position. It should be closed.
- Repeat this sequence several times.
- Make a signed entry in a test log book stating name of the tester, date, time, and the result of the test (such as "passed" or "satisfactory"). This log book should accompany the probe at all times. It is also recommended that the dates and results of the mandatory six months wipe tests be recorded in that book.

NOTE: *Should any part of the probe fail to work as indicated in this test stop using the probe. In the unlikely event of the shutter malfunction, place a piece of at least 3 mm thick (1/8 of an inch) steel plate flush with the probe window completely covering it. Place the probe in a secure location with controlled access. Notify the supervisor and immediately contact Metorex Service Department at 1-609-406-9000.*

3.2.8. SSPS Probe.

The SSPS probe does not have an "on-off" mechanism as such. Instead its sources are contained in tungsten alloy tubes which effectively block the radiation from sources when probe is not used. Testing of this mechanism involves nothing more than just the routine, operational checks of the probe, ordinarily performed as a part of each measurement. Therefore, if the instrument is being used frequently, the test described below is an integral part of the daily routine work.

Performing the test

- Visually inspect the probe for any visible defects such as cracks, dents, etc.
- Inspect the probe measuring window. You should not see any of the two sources in openings in tungsten tubes. A green indicator should be visible in each window on the probe cover.
- Connect the probe to analyzer and turn the analyzer on. Select any model calibrated for two sources.
- Select relatively short measurement time, say 5 sec. Place the probe against the sample and push the START button on the probe handle. A red LED on the probe handle should light and stay on for the duration of the measurement cycle. Also, a red indicator should appear in the side window in the probe cover on that side of the probe on which the source being used for measurement is located. Wait until the measurement with the first source is completed and second source is placed in measurement position. This time the red indicator should appear on the other side, while a green indicator on the side of the first source should replace the red one.
- Hold the probe against sample until the measurement is completed. Both sources should return to secured position and the red LED on the probe handle should go off. The indicators in both windows should be green.
- Repeat this sequence several times.
- Make a signed entry in a test log book stating name of the tester, date, time, and the result of the test (such as "passed" or "satisfactory"). This log book should accompany the probe at all times. It is also recommended that the dates and results of the mandatory six months wipe tests be recorded in that book.

NOTE: *Should any part of the probe fail to work as indicated in this test stop using the probe. In the event of malfunctioning, place a piece of at least 3 mm thick (1/8 of an inch) steel plate flush with the probe window completely covering it. Place the probe in a secure location with controlled access. Notify the supervisor and immediately contact Metorex Service Department at 609-406-9000.*

3.2.9. Courier 10 and 20.

The measuring heads of these analyzers do not have an "on-off" mechanism as such. Instead the source(s) mounted on the detector are moved to the measuring position and to the safe, reference position. There are four situations in which the source/detector assembly should move into reference position:

- when MAINTENANCE switch is set in "ON" position;
- when there is sample cell window rupture;
- when operator inadvertently opens the sample cell;
- when there is a power failure.

These conditions are easily tested by deliberate creation of the conditions as described above.

3.3. INSTRUCTIONS FOR SAFE OPERATION OF METOREX PROBES

3.3.1. HEPS and LEPS Probes.

CAUTION: *The HEPS and LEPS probes are designed to measure bulk samples presented for analysis in plastic cups of at least 30 mm in diameter and 10 mm high. The probe should be handled and operated according to the instructions provided in the X-MET Operating Manual. The probe should be operated by a person trained on the use of the probe, or under the supervision of a trained person.*

Operation

- Connect the probe to the X-MET analyzer (Note: If the probe is built into the analyzer, such as X-MET 820, it is already connected to the analyzer!).
- Turn on the analyzer and let it warm up for about 20 to 30 minutes.
- To perform the measurement place sample cup filled with the substance to be analyzed in the probe measuring tray and push the probe measuring tray to the back. Press the START button on the analyzer keyboard to initiate measurement. At the end of the measurement the analyzer will beep at which time this sequence should be repeated.
- Do not leave the probe unattended. Whenever not in use, the probe should be placed in secure location.

Storage

- Whenever not in use, the probe should be disconnected from the X-MET unit (with the exception of the X-MET 820 analyzer).
- Probe (or instrument) should be stored in a cool, dry place. The access to the storage area should be controlled at all times.

3.3.2. DOPS and SAPS Probes.

CAUTION: *The DOPS or SAPS probe is designed to measure extended surfaces such as the surface of a soil or metal plate, or metal samples which are at least 30 mm in diameter and 1 mm thick. The probe should be handled and operated according to the instructions provided in the X-MET Operating Manual. The probe should be operated by a person trained on the use of the probe, or under the supervision of a trained person.*

Operation

- Connect the probe to the X-MET analyzer.
- Turn on the analyzer and let it warm up for about 20 to 30 minutes.
- To perform the measurement, remove the lock from the probe trigger.
- Place the probe measuring window against the sample and only then pull the trigger to initiate the measurement. Hold the probe steady for the measurement time. At the end of the measurement the analyzer will beep at which time the trigger should be released. To measure another sample, place the probe on the new sample and repeat this sequence.
- Do not leave the probe unattended. Whenever not in use, the probe trigger should be secured with the lock provided.

- DURING OPERATION, NEVER POINT THE PROBE IN THE DIRECTION OF ANOTHER PERSON OR AT YOURSELF. PULL THE TRIGGER ONLY AFTER THE PROBE IS POSITIONED AGAINST THE MEASURED SAMPLE.

Storage

- Whenever not in use, the probe trigger must be blocked with the lock provided with the probe.
- Probe should be stored in a cool, dry place. The access to the storage area should be controlled at all times.

3.3.3. SLPS Probe.

CAUTION: *The SLPS probe is designed to measure extended surfaces such as the surface of a paper or metal plate, or metal samples which are at least 30 mm in diameter and 1 mm thick. The probe should be handled and operated according to the instructions provided in the X-MET Operating Manual. The probe should be operated by a person trained on the use of the probe, or under the supervision of a trained person.*

Operation

- Connect the probe to the X-MET analyzer.
- Turn on the analyzer and let it warm up for about 20 to 30 minutes.
- To perform the measurement place the probe measuring window against the sample and push

the probe flush with the measured surface. Press the START button on the analyzer keyboard to initiate measurement. Hold the probe steady for the measurement time. At the end of the measurement the analyzer will beep at which time the probe can be removed. To measure another sample, place the probe on the new sample and repeat this sequence.

- Do not leave the probe unattended. Whenever not in use, the probe should be placed in secure location.

Storage

- Whenever not in use, the probe should be disconnected from the X-MET unit.
- Probe should be stored in a cool, dry place. The access to the storage area should be controlled at all times.

3.3.4. SUPS Probe.

CAUTION: *The SUPS probe is designed to measure extended surfaces such as the surface of a paper or metal plate, or metal samples which are at least 30 mm in diameter and 1 mm thick. The probe should be handled and operated according to the instructions provided in the X-MET Operating Manual. The probe should be operated by a person trained on the use of the probe, or under the supervision of a trained person.*

Operation

- Connect the probe to the X-MET analyzer.
- Turn on the analyzer and let it warm up for about 20 to 30 minutes.
- To perform the measurement place the probe measuring window against the sample and push the probe flush with the measured surface. Press the START button on the analyzer keyboard (or on the probe handle for the electro-mechanical SUPS) to initiate measurement. Hold the probe steady for the measurement time. At the end of the measurement the analyzer will beep at which time the probe can be removed. To measure another sample, place the probe on the new sample and repeat this sequence.
- Do not leave the probe unattended. Whenever not in use, the probe should be placed in secure location.

Storage

- Whenever not in use, the probe should be disconnected from the X-MET unit.
- Probe should be stored in a cool, dry place. The access to the storage area should be controlled at all times.

3.3.5. SSPS Probe

CAUTION: *The SSPS probe is designed to measure extended surfaces such as the surface of a soil or metal plate, or metal samples which are at least 30 mm in diameter and 1 mm thick. Alternatively, the probe can be used for measurement of bulk samples in cups, but only after a special probe shield is mounted over the probe measuring window. The probe should be handled and operated according to the instructions provided in the X-MET Operating Manual. The probe should be operated by a person trained on the use of the probe, or under the supervision of a trained person*

Operation

- Fill the probe dewar with nitrogen. Close the filling port with the plug provided.
- Connect the probe to the X-MET analyzer.
- Turn on the analyzer and let it warm up for about 20 to 30 minutes.

Measurement of Extended Surfaces:

- To perform the measurement, place the probe on the surface to be analyzed with the probe measuring window in direct contact with the measured surface, and push the red START button on the probe handle. Do not lift the probe or shift it during the measurement. Only after the measurement is completed may the probe be moved to another site for the next measurement. If there is a need to abort the measurement, press the green STOP button on the probe handle.

Measurement of Bulk Samples:

- Set the probe on a flat, level surface, with the measuring window facing up.
- Install the special, hinged shield over the probe measuring window.
- Place the sample cup (containing sampled material such as powder, liquid) on the probe measuring window and close the shield's hinged cover. Press the START button on the probe handle to initiate the measurement. Only after the measurement is finished, open the shield cover and remove the sample cup. To continue measurements place another sample cup on the probe, close the shield cover, and press the START button again. If there is a need to abort the measurement, press the green STOP button on the probe handle.
- Do not leave the probe unattended. Whenever not in use, the probe should be disconnected from the X-MET analyzer, and the plug in its filling port loosened.

- DURING OPERATION, NEVER POINT THE PROBE IN THE DIRECTION OF ANOTHER PERSON OR AT YOURSELF. INITIATE THE MEASUREMENT ONLY AFTER THE PROBE IS POSITIONED AGAINST THE MEASURED SAMPLE OR THE PROBE SHIELD COVER IS CLOSED.

Storage

- Whenever not in use, the probe should be disconnected from the X-MET unit, and the plug in its filling port loosened.
- Probe should be stored in a cool, dry place. The access to the storage area should be controlled at all times.

3.4. INSTRUCTIONS IN CASE OF DAMAGE TO THE PROBE

3.4.1. Test Shutter Mechanism

If the probe is potentially damaged (for example, dropped or involved in a transportation accident), the user must – at the first available opportunity – assess the proper functioning of the shutter mechanism.

CAUTION: If the probe is dropped during a measurement, it is possible that the shutter will not close properly. Never point a potentially damaged probe in the direction of another person or at yourself (e.g., body, hands, and face).

Perform the shutter test procedure outlined in Section 3.2 of this manual.

WARNING: Do not attempt to service the probe. Only Metorex Inc. is authorized by the USNRC to disassemble and service the probe.

3.4.2 Secure the damaged/failed probe.

If the probe fails to work as indicated in the shutter test procedure, do the following:

- Place the end cap cover or a piece of lead or steel over the probe window;
- Secure the cover mechanically or with tape;
- Place the probe in a secure location with controlled access; and
- Make the appropriate notifications.

3.4.3 Notifications in case of a damaged/failed probe

The failure of the shutter mechanism(s) to operate properly reduces the radiation shielding properties of the probe. Therefore, the following entities must be notified:

- Metorex Inc.'s Service Department (1-609-406-9000).
- US Nuclear Regulatory Commission Regional Office (or state radiation control office for Agreement States).

3.5. INSTRUCTIONS FOR SHIPPING OF DEVICES CONTAINING RADIOACTIVE MATERIAL.

Due to the fact that the sources being shipped are in Special Form (49 CFR 173.401), the devices containing the sources can be classified with the proper shipping name "Radioactive Material, Excepted Package – Instruments." This classification allows the shipper to be exempted from most of the packaging, labeling, marking and placarding requirements that would normally apply to a fully regulated radioactive material shipment. Although the material is excepted, in some cases, the devices may be considered a Hazardous Substance due to the presence of a Reportable Quantity of Americium-241 (49 CFR 171.8). Hazardous substance that are in exempt quantities as subject to a slightly higher degree of regulation than non-hazardous substances in exempt quantities. Below are guidelines for the proper shipment of radioactive materials in excepted packages, however, all applicable requirements of 49 CFR must still be met, including 49 CFR 173.424.

Guidelines for a Non-hazardous Substance, Radioactive Material, Excepted Packages (containing ^{55}Fe and/or ^{109}Cd only):

Proper Shipping Name:	Radioactive Material, Excepted Package - Instruments
Class:	7
UN #:	UN2910
Packaging:	Non-specification packaging that complies with 49 CFR 410 (i.e., a "strong-tight" container).
Marking/Labeling:	None required.
Mode:	Any
Paperwork:	No Shippers Declaration is required. However, at a minimum, there must be a paper in the box with the name of either the consignor or the consignee and the following statement: "This package conforms to the conditions and limitations specified in 49 CFR 173.424 for radioactive material, excepted package – instruments or articles, UN2910".
Additional Information:	A copy of the special form certificate for each source and a copy of the leak test results should also be included.

Guidelines for a Hazardous Substance, Radioactive Material, Excepted Packages (containing ^{241}Am or ^{244}Cm):

Proper Shipping Name:	**RQ, Radioactive Material, Excepted Package - Instruments**
Class:	7
UN #:	UN2910
Packaging:	Non-specification packaging that complies with 49 CFR 410 (i.e., a "strong-tight" container).
Marking/Labeling:	None required.
Mode:	If shipping by air, then it must go by cargo aircraft only.
Paperwork:	A fully completed Shippers Declaration is required. It must include the following statement: "This package conforms to the conditions and limitations specified in 49 CFR 173.424 for radioactive material, excepted package – instruments or articles, UN2910". It also must include a 24-hour emergency telephone number.
Additional Information:	♦ Must include emergency response information (e.g., a copy of an ERG) ♦ Should include a copy of the special form certificate for each source ♦ Should include a copy of the leak test results (no older than 6 months)

3.6. TABLES OF TYPICAL DOSE RATES AROUND PROBES.

TABLE 1: TYPICAL DOSE RATES IN [mR/hr] MEASURED FOR SURFACE PROBE, SAPS

LOCATION	SOURCE			
	Fe-55 40 mCi	Cm-244 100 mCi	Cd-109 20 mCi	Am-241 30 mCi
A	<0.05	0.4	<0.05	<0.05
B	<0.05	<0.05	<0.05	<0.05
C	<0.05	0.4	<0.05	<0.05
D	<0.05	<0.05	<0.05	<0.05
E	<0.05	1.4	<0.05	0.15
F	<0.05	<0.05	<0.05	<0.05
A'	<0.05	0.4	<0.05	<0.05
B'	<0.05	<0.05	<0.05	<0.05
C'	<0.05	0.4	<0.05	<0.05
D'	<0.05	<0.05	<0.05	<0.05
E'	<0.05	0.6	<0.05	0.1
F'	<0.05	<0.05	<0.05	<0.05

NOTE: 1. Source activities are the maximum that would ever be used in the probe.

2. Refer to Figure 1 for details.

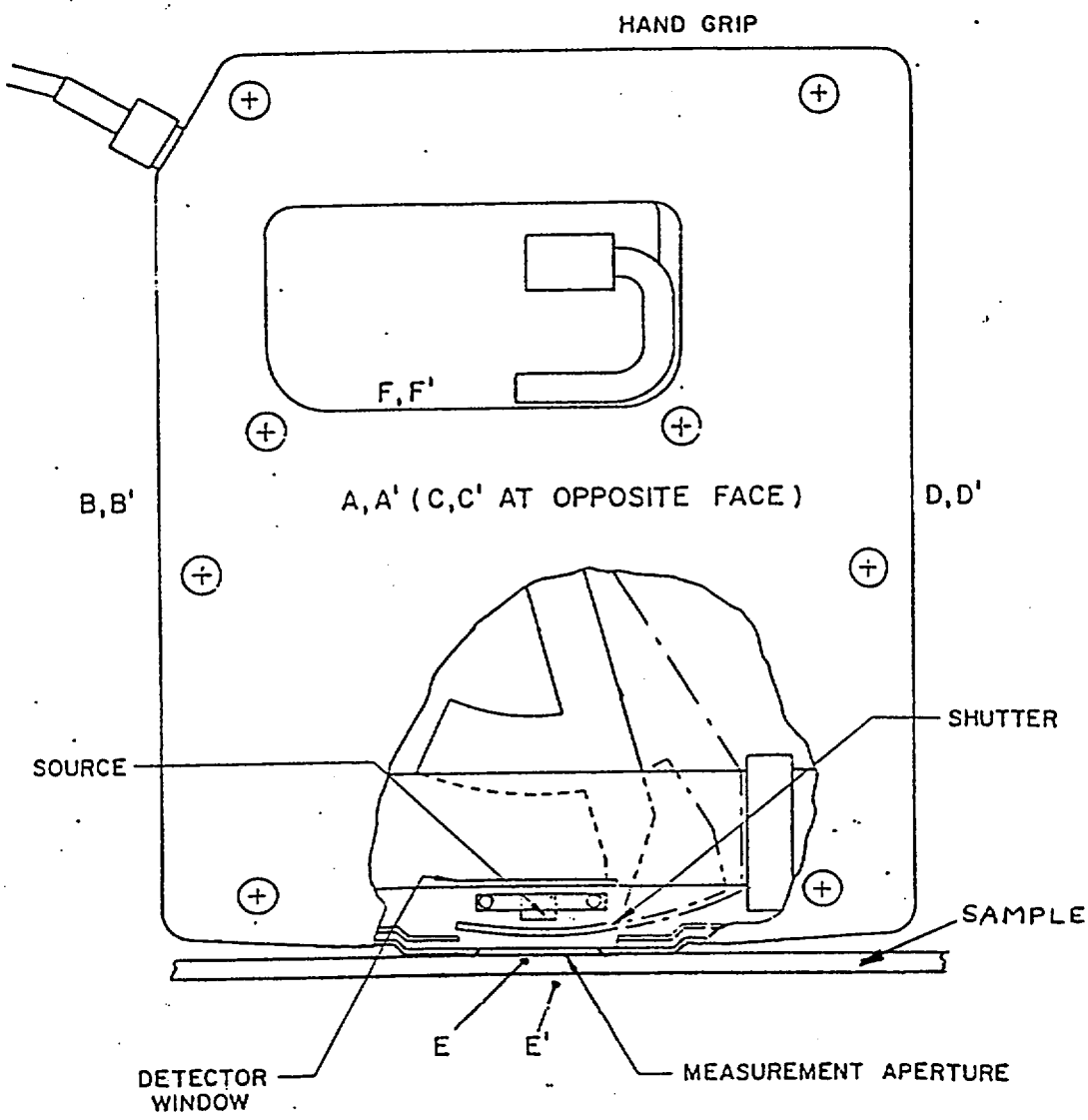


Figure 1. Single Source Surface Probe, SAPS, showing the relative positions of the source, shutter, aperture, detector and sample. The six probe faces are labelled A - F for shutter closed and A' - F' for shutter open.

TABLE 2: TYPICAL DOSE RATES IN [mR/hr] MEASURED FOR SURFACE PROBE, DOPS

LOCATION	SOURCE			
	Fe-55 40 mCi	Cm-244 100 mCi	Cd-109 20 mCi	Am-241 30 mCi
A	<0.05	0.45	<0.05	<0.05
B	<0.05	<0.05	<0.05	<0.05
C	<0.05	0.45	<0.05	<0.05
D	<0.05	<0.05	<0.05	<0.05
E	<0.05	1.4	<0.05	0.15
F	<0.05	<0.05	<0.05	<0.05
A'	<0.05	0.4	<0.05	<0.05
B'	<0.05	<0.05	<0.05	<0.05
C'	<0.05	0.5	<0.05	<0.05
D'	<0.05	<0.05	<0.05	<0.05
E'	<0.05	0.75	<0.05	0.3
F'	<0.05	<0.05	<0.05	<0.05

NOTE: 1. Source activities are the maximum that would ever be used in the probe.

2. Dose rates for any two sources installed in the probe are the sums of the above values for each source.

3. Refer to Figure 2 for details.

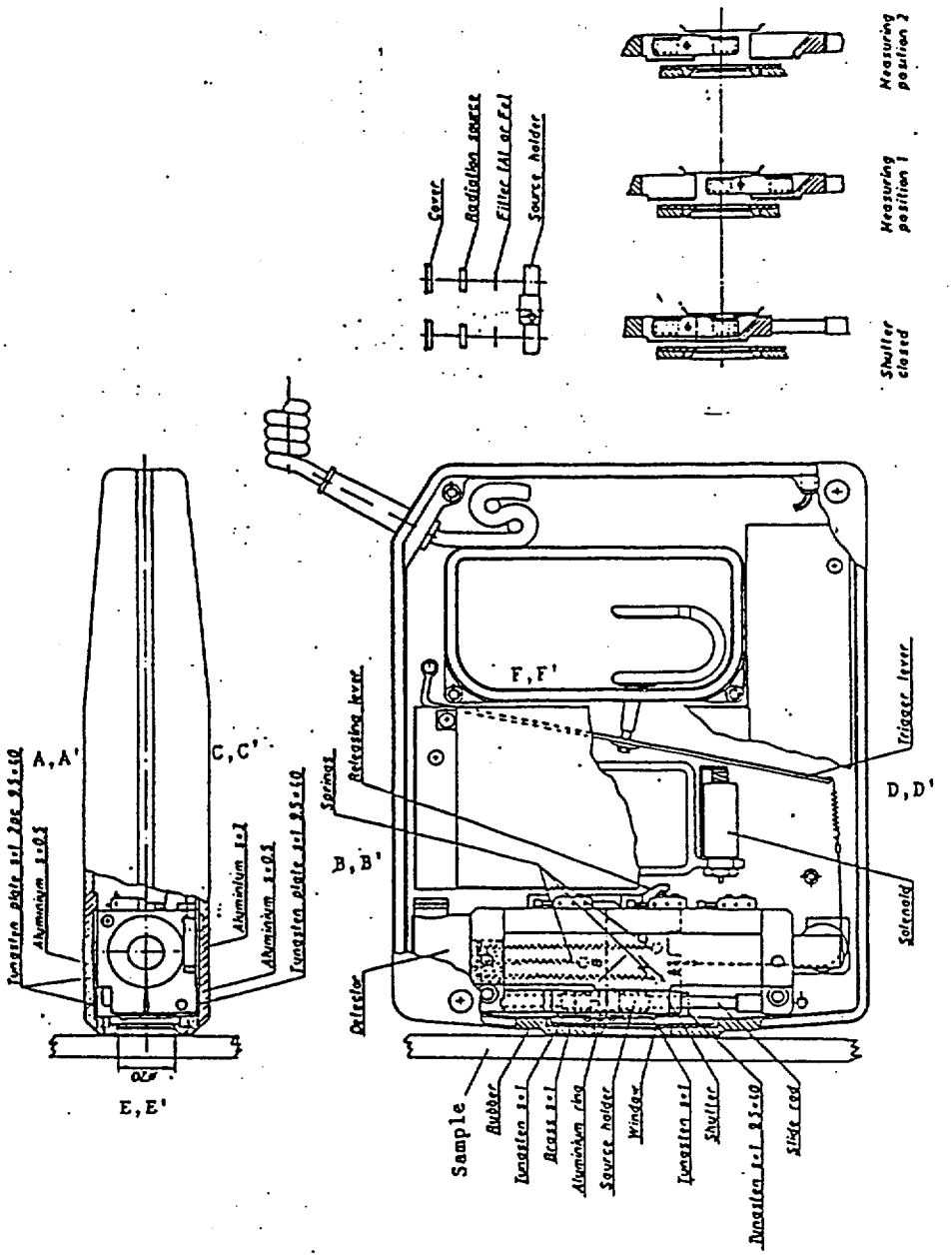


Figure 2. Dual Source Surface Probe, DOPS, showing the relative positions of sources, shutter, shielding, window, detector and sample. The six probe faces are labelled A - F for shutter closed and A' - F' for shutter open.

TABLE 3: TYPICAL DOSE RATES IN [mR/hr] MEASURED FOR LABORATORY SAMPLE PROBE, HEPS

LOCATION	SOURCE			
	Fe-55 40 mCi	Cm-244 100 mCi	Cd-109 20 mCi	Am-241 30 mCi
A	<0.05	0.2	<0.05	<0.05
B	<0.05	<0.05	<0.05	<0.05
C	<0.05	0.2	<0.05	<0.05
D	<0.05	<0.05	<0.05	<0.05
E	<0.05	0.6	<0.05	0.2
F	<0.05	0.2	<0.05	<0.05
A'	<0.05	0.2	<0.05	0.1
B'	<0.05	<0.05	<0.05	<0.05
C'	<0.05	0.2	<0.05	0.1
D'	<0.05	<0.05	<0.05	<0.05
E'	<0.05	0.4	0.1	0.2
F'	<0.05	0.2	<0.05	<0.05

NOTE: Refer to Figure 3 for details.

TABLE 4: TYPICAL DOSE RATES IN [mR/hr] MEASURED FOR LABORATORY SAMPLE PROBE LEPS, AND SURFACE PROBE SLPS

LOCATION	SOURCE
	Fe-55 40 mCi
A	<0.05
B	<0.05
C	<0.05
D	<0.05
E	<0.05
F	<0.05
A'	<0.05
B'	<0.05
C'	<0.05
D'	<0.05
E'	<0.05
F'	<0.05

NOTE: Refer to Figures: 3 (LEPS)

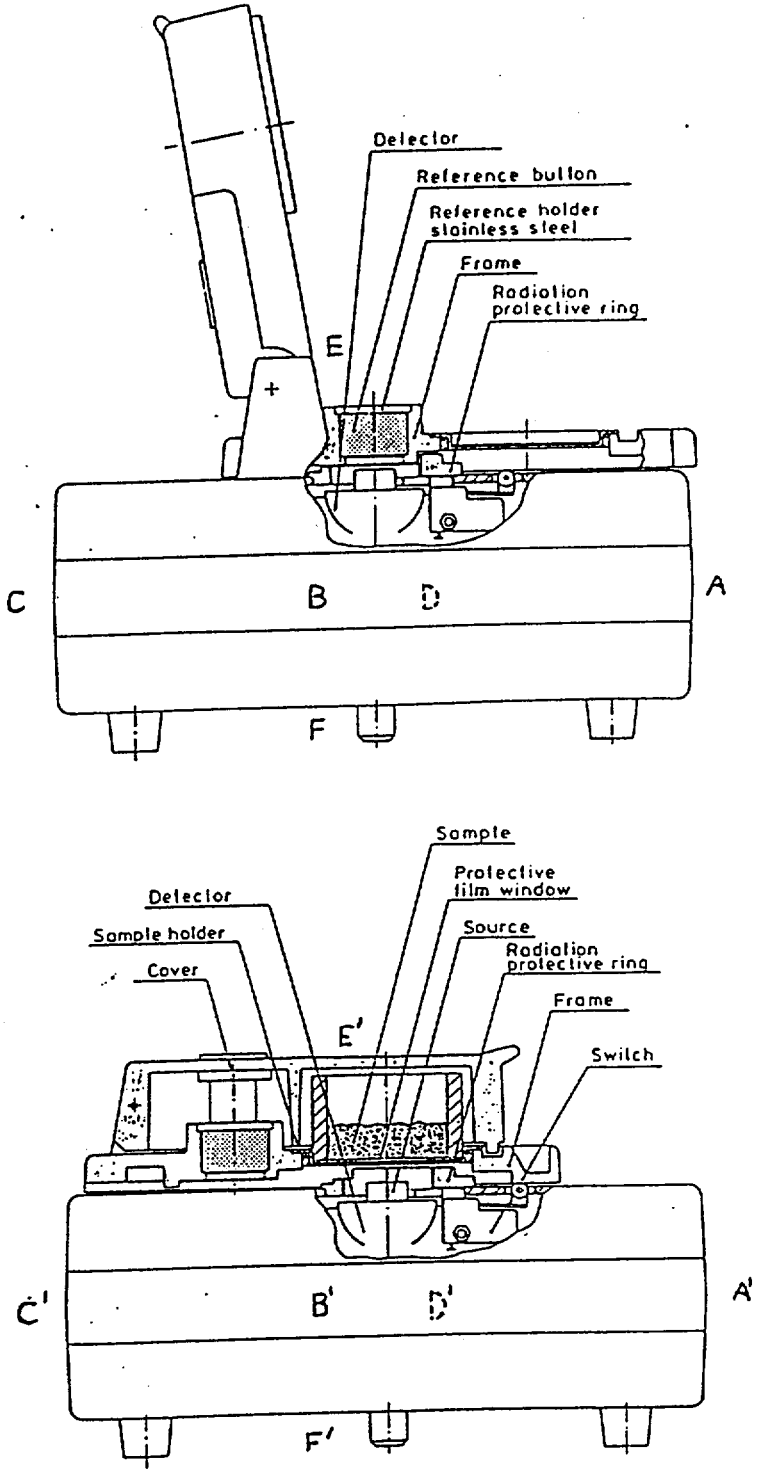


Figure 3. Laboratory Sample Probe, HEPS or LEPS models, showing the relative positions of source, radiation shielding, detector and sample in the **Reference/Sample Change** position (top figure) and in the **Measurement** position (bottom figure). The six probe faces are labelled A - F for Reference position and A' - F' for the Measurement position.

Table 5

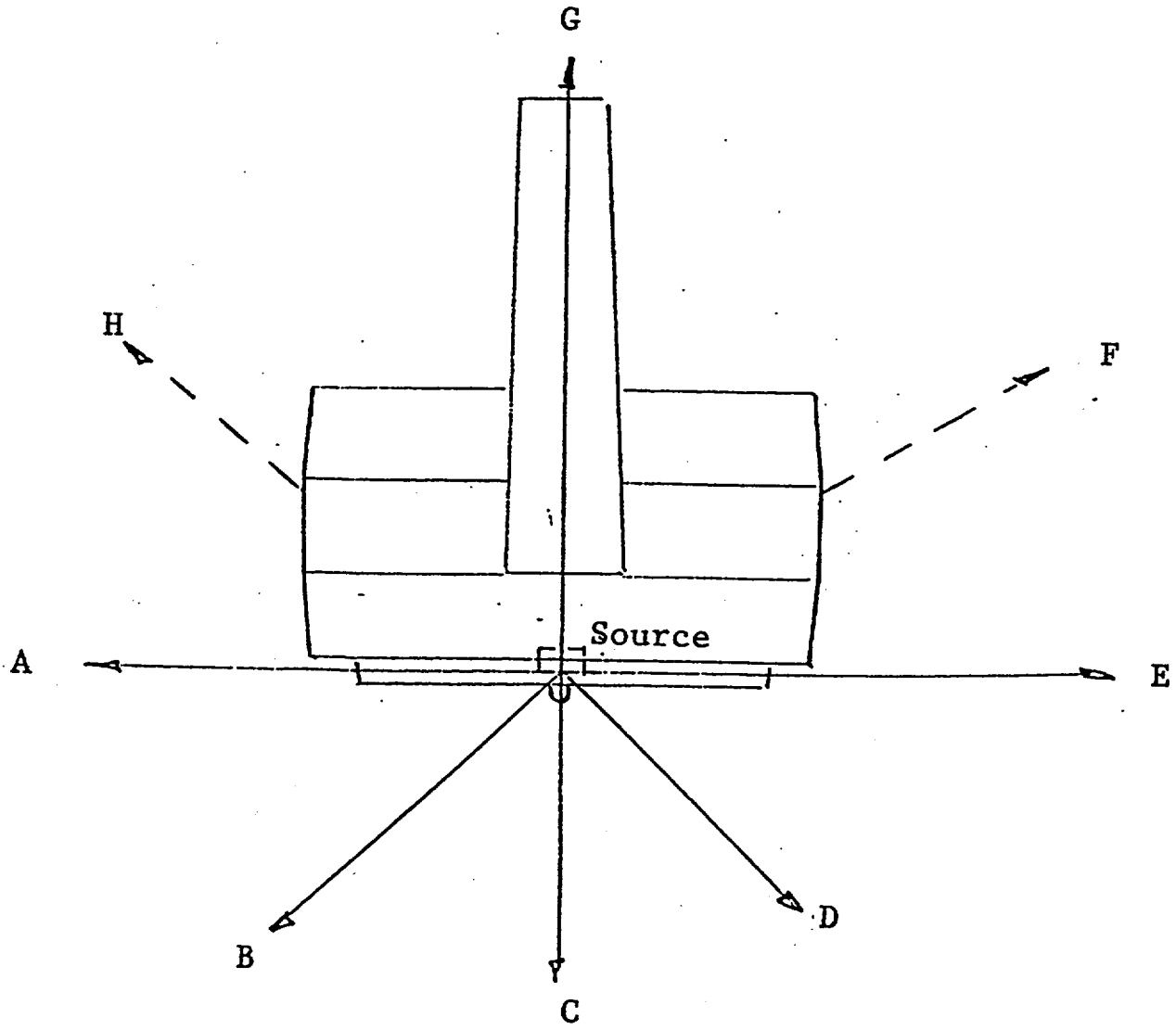
Typical Dose Rate in [mR/hr] for SUPS 0484 & SUPS 2476 Probes

Probe	0484	0484	2476	2476
Source	30 mCi Am	60 mCi Cm	30 mCi Am	60 mCi Cm
Location				
A	<0.05	<0.05	<0.05	<0.05
B	<0.05	0.05	0.08	0.06
C	0.45	0.08	0.28	0.08
D	<0.05	0.05	0.08	0.06
E	<0.05	0.15	0.06	0.06
F	0.16	0.08	0.11	0.06
G	<0.05	0.05	<0.05	0.06
H	0.11	0.08	0.07	0.09

NOTE: 1) Refer to Figure 4 for locations.
2) All activities are at 5 cm from probe with shutter closed.

Figure 4

SUPS Probe Measurement Locations



Procedure for Return and Inspection of Damaged Probe

1. When a user calls regarding a stuck shutter or damaged probe:
    a. Determine if the user has performed the test outlined in Section 3.4 of the General License Manual (if so much of the following is repetitive).
    b. If the shutter is stuck or the probe damaged, tell the user to isolate the probe in a secured area and minimize the time anyone is in the room with the probe.
    c. If the probe has a cover, have the user secure the cover over the probe (either by mechanical means or with appropriate tape. If no cover exist, have the customer cover the window with a piece of lead or steel and fasten it to the probe with appropriate tape.
    d. Inform the RSO and assist in a determination if the incident should be reported to the NRC and/or the State and to determine the proper next steps.
    e. Inform the user that a wipe test should be performed.
    f. With the concurrence of the RSO, ship a lead sheet to the customer and instruct the customer to incase the probe in the lead sheet and pack and ship the unit in accordance with the shipping instructions in the General License manual.

2. When the probe arrives at Metorex:
    a. Open the container only in the source room.
    b. Using a hand held survey meter, determine if the radiation profile has any unexpected high readings. If any unexpected readings are obtained, notify the RSO.
    c. If no wipe test has been run on the probe since the incident perform a wipe test and wait for the results before proceeding.
    d. If the wipe test is positive, notify the RSO.
    e. If the wipe test is negative, repair the unit if possible.
    f. If repair is impossible, the source should be processed for disposal and the probe should be thoroughly wiped to insure there is no internal contamination and disposed of.

Flat Head and Button Head Pin-in-Head Torx

18-8 STAINLESS STEEL. Length is measured from the top of the head. **Package quantity is 25.**

Length	No.	NET/100
Flat Head		
	Coarse Thread	
6-32	T10 Torx Drive	
½"	91870A148	$27.00
¾"	91870A151	27.00
1"	91870A153	27.00
	Coarse Thread	
8-32	T15 Torx Drive	
⅜"	91870A192	$29.50
½"	91870A194	29.50
¾"	91870A197	32.00
1"	91870A199	32.00
	Coarse Thread	
10-24	T20 Torx Drive	
½"	91870A242	$47.00
¾"	91870A245	47.00
1"	91870A247	47.00
1¼"	91870A259 ♦	62.00
	Fine Thread	
10-32	T20 Torx Drive	
½"	91870A829	$47.00
¾"	91870A831	47.00
1"	91870A833	47.00
1¼"	91870A835 ♦	62.00
Button Head		
	Coarse Thread	
4-40	T8 Torx Drive	
¼"	91900A106	$34.50
½"	91900A110	34.50
	Coarse Thread	
6-32	T10 Torx Drive	
¼"	91900A144	$27.00
⅜"	91900A146	27.00
½"	91900A148	27.00
¾"	91900A151	27.00
1"	91900A153	27.00
	Coarse Thread	
8-32	T15 Torx Drive	
⅜"	91900A192	$29.50
½"	91900A194	29.50
¾"	91900A197	32.00
1"	91900A199	32.00
	Coarse Thread	
10-24	T25 Torx Drive	
½"	91900A242	$47.00
¾"	91900A245	47.00
1"	91900A247 ♦	62.00
1¼"	91900A249 ♦	62.00
	Fine Thread	
10-32	T25 Torx Drive	
½"	91900A829	$47.00
¾"	91900A831	47.00
1"	91900A833 ♦	62.00
	Coarse Thread	
¼"-20	T27 Torx Drive	
½"	91900A537 ♦	$64.50
¾"	91900A540 ♦	64.50
1"	91900A542 ♦	64.50
1¼"	91900A544 ♦	89.50
1½"	91900A546 ♦	89.50

For pan-head, flat-head, and fillister-head torq-set screws, please see page 2255.

For tools to install and remove tamper-

Attachment D

General License Manual

SUMMARY DATA

Name and Complete Mailing Address of the Applicant:

Metorex Inc.
Princeton Crossraods Corporate Center
250 Phillips Blvd.
Ewing, nJ 08618

Name, Title, and Telephone Number of the Individual to Be Contacted If Additional Information or Clarification Is Needed by the NRC:

John I.H. Patterson, R.S.O./President
(609) 406-9000, ext. 122

The Applicant is (check one):

	Custom User
	Manufacturer
XX	Distributor
	Manufacturer and Distributor

If the Applicant Is Not the Manufacturer, Provide the Name and Complete Mailing Address of the Manufacturer:

Metorex International OY
Nihtisillankuja 5
P.O. Box 85
FIN-02631 ESPOO
Finland

If the Applicant Is a Custom User, Provide the Name and Complete Mailing Address of the Distributor:

N/A

Provide the Name, Complete Mailing Address, and Function of Other Companies Involved:

N/A

Model Number: SUPS 0484 & SUPS 2476

Principal Use Code (see Appendix F): U

Name Used by the Industry to Identify the Product (e.g., Radiography Exposure Device, Teletherapy Source, Calibration Source, etc.):

XRF Probe

For Use by:

	Specific Licensees Only
	General Licensees Only
X	Both Specific and General Licensees
	Persons Exempt from Licensing

Leak-Test Frequency:

	Periodic Leak-Testing is Not Required
X	6 Months
	Attached is justification for a leak test frequency of greater than 6 months

Principal Section of the 10 CFR that Applies to the User (e.g., General Licensees under 10 CFR 31.5): 10CFR31.5

Radionuclides and Maximum Activities (including loading tolerance):

Am-241 30mCi; Cm-244 60mCi

CERTIFICATION:

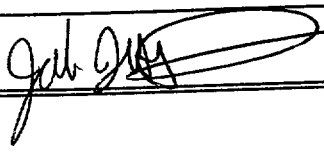
THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT.

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30 AND 32 AND THAT ALL INFORMATION CONTAINED HEREIN IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.

WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948 62 STAT. 749 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

Certifying Officer — Typed Name and Title

John I.H. Patterson, Ph.D., R.S.O./President

Signature: 

Date: 6/8/00

CHECKLIST

Registration Certificate Holder: Metorex Inc.

Model: SUPS 0484 & SUPS 2476

DESCRIPTION	OK/DEF	COMMENTS
DESCRIPTION/CONSTRUCTION		
If registration certificate holder is requesting to register more than one source/device on a certificate, are designs similar enough to do so?	OK	Only different shutter activation.
Device/source design with complete engineering drawings (dimensions, tolerances, list of materials)	OK	
Assembly methods (screw, welds, etc.); verify integrity		
Source mounting (size and integrity) and security	OK	
Is source ANSI classification sufficient (from ANSI N542-1977): Radiography - Unprotected ..... 43515 Radiography - In Device ..... 43313 Medical - Radiography ..... 32312 Medical - γ Teletherapy ..... 53524 γ Gauges - Unprotected ..... 43333 γ Gauges - In Device ..... 43232 β Gauges, Low Energy γ Gauges, or X-ray fluorescence ..... 33222 Oil Well Logging ..... 56522 Portable Moist/Density ..... 43333 Neutron Applications ..... 43323 γ Irradiators (II, III, IV) ..... 43424 γ Irradiators (I) ..... 43323 Static Eliminators ..... 22222 Smoke Detectors 32222	OK	
Definition of shutter operation (locked in Off position, not locked in On position), Fail safe, spacing and tolerances	OK	
On-Off indicators (description, qty., location)	OK	
Safety interlocks, guards, etc. to prevent access to beam or high radiation levels	OK	
Corrosion between unlike materials (e.g., aluminum & steel, depleted uranium & steel, etc.)		
Shielding efficiency and integrity		
For medical devices: Was a 510(k) provided? (provide written notification to FDA)		
Well logging sources must be nondispersible and nonsoluble. (see Appendix B for a list of approved well logging sources as of November 1991)		
See "ANSI and Other Standards" list for references for particular source/device designs (e.g. radiography, Brachytherapy, etc.)		

CHECKLIST

Registration Certificate Holder: Metorex Inc.

Model: SUPS 0484 & 2476

DESCRIPTION	OK/DEF	COMMENTS
LABELING		
Copy of label	OK	
Materials, dimensions, colors (note on registration certificate if labeling is exempt from the color requirements of 10 CFR Part 20)	OK	
Permanent attachment and location(s) - visible to users?	OK	
Contents: Model#, Serial#, Isotope, Activity, Manufacturer, Date of Assay, Trefoil, "CAUTION - RADIOACTIVE MATERIAL" (Depleted Uranium information must be included)	OK	
CONDITIONS OF USE		
Expected working life of the source/device (years, operations)	10-15	
Actions to be taken when product reaches end of its working life.	OK	Return to manufacturer.
Maximum allowable temperature, vibration, shock, corrosion, etc. (during use, handling, storage, and transport)	OK	
How the device will be used	OK	
Meets dose limits of Part 32 for distribution general licensees or persons exempt from licensing	OK	
PROTOTYPE TESTING/HISTORICAL USE	OK	
Tests methods and conditions (for source and device)	OK	
Tests results	OK	
Years of use (incidents, failures, etc.)	OK	
Similarities to other sources/devices if they are used as basis.	OK	
RADIATION PROFILES		
Survey instrument used (type, window thickness, sensitivity, etc.)	OK	
Conditions: including environments, scatter (product in beam), and use of guards and shields	OK	
Distance from source/surface (per ANSI 538-1979)	OK	
Shutter Open and Closed/Source Shielded	OK	
Verify radiation surveys for γ radiation meet inv^2 law.	OK	
Verify radiation surveys for non-γ radiation have not been calculated using inv^2 law.	OK	

CHECKLIST

Registration Certificate Holder: Metorex Inc.

Model: SUPS 0484 & SUPS 2476

DESCRIPTION	OK/DEF	COMMENTS
QUALITY ASSURANCE		
Materials, subassemblies, services		
Assembly methods (screws, welding, etc.)	OK	
Dimensions and tolerances		
Activity, radiation levels, leak tests		
QA Manual and comparison of manual to Regulatory Guide 6.9		
INSTALLATION		
Fixed, portable, movable, fixed installation but portable source housing	OK	
Inherent shielding, inaccessibility		
Beam access: size of air gap/opening to beam and use of interlocks, locks, additional shielding or barriers		
Mounting integrity		
SAFETY INSTRUCTIONS		
Operation, maintenance, calibration, damage/failure, specific warnings, leak test, and radiation surveys	OK	
ACCOMPANYING DOCUMENTATION		
Leak tests results and radiation surveys	OK	
Transportation documents	OK	
Operation, maintenance, calibration, damage/failure, specific warnings, leak test, and radiation survey instructions if applicable	OK	
For Distribution to General Licensees: Verify NRC Regions and Agreement State listing is up-to-date and copies of all pertinent regulations	OK	

May 15, 2000

X-MET PROBE SUPS 0484 & SUPS 2476

1. PRACTICAL SAFETY ASPECTS IN THE USE OF THE SUPS PROBE

See GENERAL LICENSE Manual.

2. GENERAL DESCRIPTION OF THE SUPS PROBE

X-Met is an X-ray fluorescence analyser where the excitation source is either a radionuclide or an X-ray tube. SUPS (Surface Probe Set) is one of the radionuclide excited probes. Photographs 1 and 2 (on pages10, 11) and Figure 1 (p13) show the probe the SUPS 0484 probe. The SUPS 2476 probe is similar in appearance and operation except that the shutter is electro-mechanically operated and a button exist on the handle to operate the shutter. The SUPS 2476 is shown in figure 42 (page 57). These probes are meant for surface measurements. The probe has one radioactive source that is located in the middle of the bottom part of the probe.

In the SUPS 0484 probe, pushing the probe against the sample opens the shutter. This causes the button on the bottom of the to move the shutter and expose the source. The measurement can not start unless the shutter is fully open. This action engages a microswitch, which starts the measurement. In the SUPS 2476 probe, pressing the probe against the sample releases the shutter interlock. Pressing the button on the handle opens the shutter electronically and starts the measurement. The measurement is stopped by the clock after either the pre-set time has elapsed or when the probe is lifted from the sample enough that the shutter starts to close. Lifting the probe from the sample makes the retracting spring turn the shutter to the closed position. With either probe, the measurement result is shown in the display of the main unit.

To keep the spectral stability good a reference sample that is glued to the shutter is measured when the shutter is closed. The position of the shutter/reference is sensed by microswitches and indicated by an LED on the handle. The LED in the handle indicates by green color that the shutter is closed and the probe is not ready for the measurement and by red color that the shutter is open and the measurement is in progress. If this light turns green during the measurement due to lifting of the probe, the measurement is interrupted and must be started anew after adjusting the position of the probe properly. If the light remains red when the probe is lifted, the shutter is not completely closed and corrective action is required.

When not in use the probe is stored on a calibration base having a properly positioned hole for the push button of the probe to prevent accidental opening of the shutter.

3. RADIATION SOURCES

The sources for these probes are manufactured by Amersham International plc (UK). The Am-241 source used is a 30 mCi Type AMC.D2 capsule type X.10/2 which achieved a classification of C44344 based on the ANSI guide N542-1977. The Cm-244 source used is a 60 mCi Type CLCL capsule X.130/7 which achieved a classification of C64545. Attached are the registrations for the AMC.D2 Americium source starting on page 82 and the CLCL Curium Source starting on page 86. The minimum requirement set for the radiation source of an XRF analyzer is C33222 and thus all the above sources fulfill this requirement.

The radiation profiles of the SUPS probe are enclosed beginning on page 72.

4. WARNING LABELS

The probe is equipped with warning label(s) bearing the radiation symbol and giving the name of the nuclide of the source, its activity and the date of the measurement of the activity (see Label 2, p12) which is placed on the right side of the probe (shown in photograph 1 without the labels). In addition the label has the text required for a Generally Licensed device (see Label 1, p12) which is placed on the top of the probe (directly below the handle). The probe is also marked with the type of the equipment and the name of the manufacturer.

5. CONSTRUCTION OF THE PROBE

5.1 General construction

Figure 1 (p13) shows in 3 projections of the SUPS 0484 probe. It is a simple box having a handle and on the bottom a round plate protruding from the box. In this round part there is a window covered with a Mylar film and somewhat off center, a push button that operates the shutter located behind the window. Behind the shutter, there is the radiation source just in front of the detector window. The detector is a cylindrical proportional counter. Above these parts, in a separate compartment, are the electronic circuits necessary for the probe. The main analyzer (not shown here) contains most electronics such as the power supplies and data handling electronics. Figure 1A (p14) shows the Calibration Base for the unit. This base is machined so that the probe easily fits into the base and aligns with the center hole. For calibration, a standard is placed in the center well and the probe is places so that the shutter opens. For storage, the probe should be placed the opposite direction on the plate where the shutter button will fit into the hole to prevent the shutter from opening. Figure 42 (p57) shows the three projections of the SUPS 2476 probe. The general construction is similar to the SUPS 0484 with the mounting base and shutter assembly modified to achieve electro-mechanical activation of the shutter.

5.2 Constructional details

Figures 3-5 (p 16-18) present the two (2) covers and the frame between them. Almost all the components are fixed to this frame. The electronic circuits attach to one side of the frame and the detector and the other components directly related to radiation to the other side. The detector is fixed with part 16 (figure 13, p26) in Figure 1 (p13). The radiation source (part 20) is fixed first to the source holder with a seger ring (part 18) and the source holder (figure 2, p 15) is attached with two (2) screws (part 27) to the same part that holds the detector (part 16). The measurement base to which the shutter mechanism is attached is shown in Figure 14 (p27). When Cover 1 is fixed with four (4) screws (part 24 in figure 1) to the frame, the radiation is limited to the compartment between these two parts.

The measurement base for the SUPS 0484 probe and its components are shown in Figures 14-41 (on p 27-56). The aluminium mounting base (figure 16, p31) is lined on the inside with lead (figure 19, 20, p31, 35) for radiation shielding and those parts of lead that could give disturbing fluorescence radiation to the detector are covered with thin iron (figure 22, p37) and aluminium plates (figure 21, p36). The shutter comes as close to the bottom cover and correspondingly the source as close to the shutter as possible. Microswitches S1 and S2 sense the position of the shutter. The window of the probe (figure 17, p32) is covered with a mylar foil to prevent dust and humidity from getting into the probe.

Figure 15 (p28) shows the shutter mechanism for the SUPS 0484 probe. Figures 15A and 15B (p 29,30) are photographs of a shutter assembly to illustrate the motion. When the probe is pushed against the sample part 15 in the upper drawing of Figure 15 moves upwards and the top of the long rod (part 14) moves to the left, this causes the shutter to open. The top end of the rod pushes the oblique (see the lower drawing) edge belonging to plate two making the plate turn to the left. Both the lever and the plate are spring-loaded and they will close the shutter when the push button is released. When the shutter is closed, the radiation is stopped by the shutter which is composed of a layered structure made up of the shutter (fig 15, p28), a lead plate (fig24, p39), a copper plate used for gain control (fig. 18, p33) and the aluminium limiter (fig. 23, p38). These parts are glued on top of each other to the area 12 in Figure 15 (p28).

Figure 42 (p 57) illustrates the construction of the SUPS 2476 probe. The main assembly, the detector and source are identical to the SUPS 0484 probe. The composition of the shutter is also the same as in the SUPS 0484 probe. That is, the absorber base (fig. 48, p63), a lead shield (fig. 49, p64), a copper gain reference (fig. 50, p 656) and the limiter ring (fig 51, p66). Also, the mounting base is lined with lead (fig. 52 and 55, p 67,70) and which is covered around the aperture with iron (fig. 53, p68) and aluminium (fig 54, p69). The shutter activation mechanism is different from the SUPS 0484 probe. In the SUPS 2476 probe, the shutter interlock pin releases the safety interlock switch. This allows the rotary solenoid to rotate the shutter assembly when the button on the handle is pressed. The solenoid is spring loaded so that in a power failure

the solenoid will immediately close the shutter. If the probe is lifted during operation, the safety interlock interrupts the power to the shutter, thus closing the shutter. In this probe, the LED will show green only when the shutter is closed completely.

6. CONDITIONS OF USE

The SUPS probe is normally used in indoor settings; however, occasionally it is used as a portable field device. It is operated in conjunction with an electronic analyser such as the Metorex 880 or the earlier 840. Thus, the environment will in general be quite mild. The unit may be operated between 0^0C and $+60^0$C. It may be stored at temperatures from -40^0C and $+85^0$C. The major mechanical stress will be vibration during shipment and possible transport by the user prior to use.

7. PROTOTYPE TESTING

A total of approximately 11 SUPS (mostly of the 0484 probe) were sold in Europe in the early 1980's and 17 SUPS probes (mostly of the 2476 probes) were sold in the United States in the 1980's and 1990's. If we assume that the average useful life was 5 years (a very conservative estimate), this represents a total operational history of 140 years. There are no known cases in which the probe failed in such a way to generate radiation in excess of the values shown in the attached radiation profiles. The shutter failures that have occurred have been with the shutter jammed in the closed position.

During the development of the SUPS 0484, at the Institute of Physics of Outokumpu, some testing was done on the shutter mechanism. This involved the repeated operation of the shutter mechanism on the order of 10,000 times (however, no formal record of those test exist today). The main failure mode was the shutter sticking or becoming jammed. By increasing the clearances, this problem was reduced. The other failure mode that has been experienced is the failure of the spring to return the shutter to the closed position.

During the development of the SUPS 2476, the shutter solenoid (which includes the spring to return the shutter in the case of power failure) was tested with the shutter mechanism attached. In this case, 1,000,000 cycles were performed without a failure of this portion of the mechanism.

8. QUALITY ASSURANCE

The SUPS probes are manufactured by Metorex in compliance with the ISO 9001 certification (a copy of which is attached on p79&80). When they are received at Metorex Inc. the unit is tested for operation, integrity of construction and assembly, accuracy of the paper documentation and analytical performance. The record (Technical Passport) of the instrument is maintained by Metorex Inc. A copy of the QC procedure for outbound shipment is attached on pages 81. Any deficiencies in the probe

construction or operational performance are corrected if feasible, or the probe is returned to the manufacturer for repair.

OUTOKUMPU OY
ENGINEERING DIVISION

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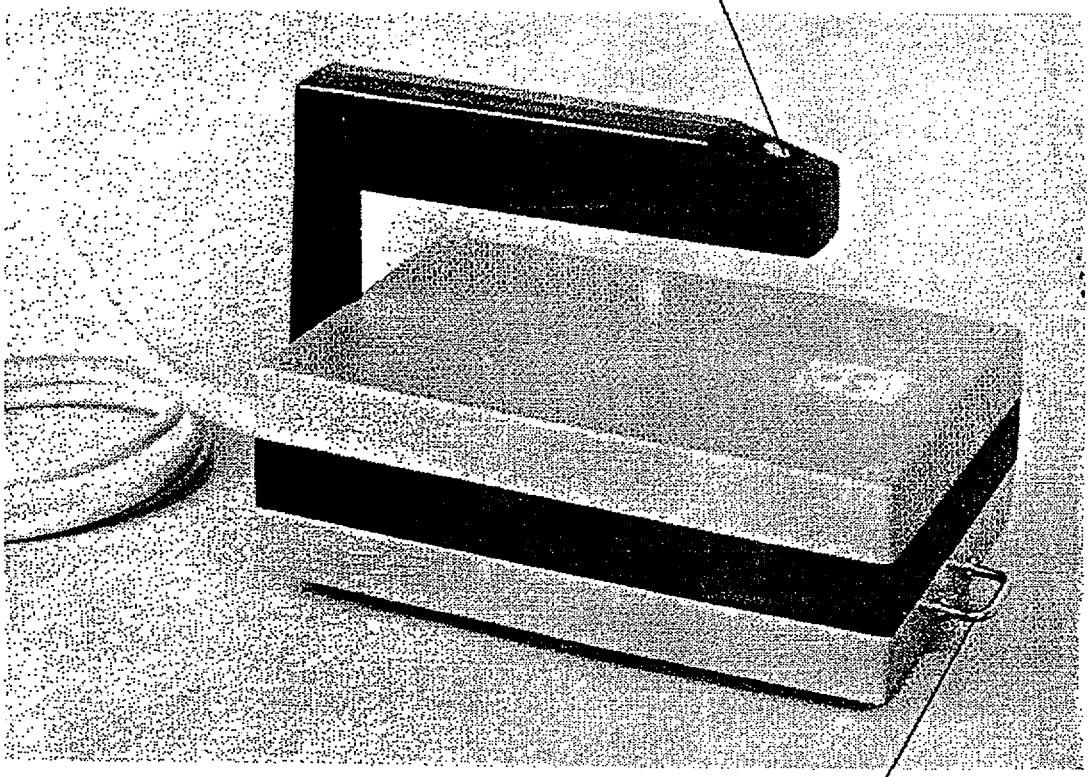
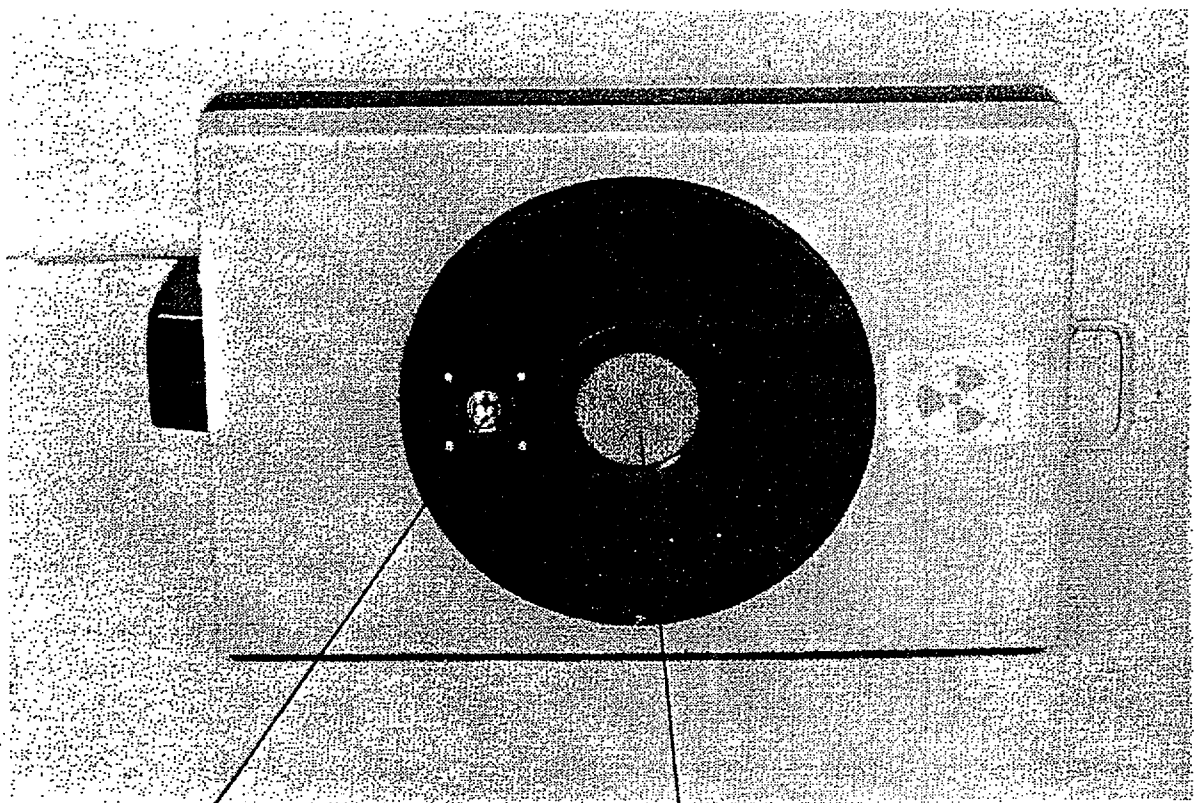
17



Photograph 1 Surface probe.



Photograph 2 Bottom of surface probe.

REMOVAL OF THIS LABEL IS PROHIBITED

The receipt, possession, use and transfer of this device, Model _____, Serial No. _____, are subject to a general license or the equivalent and the regulations of the U.S. Nuclear Regulatory Commission or of a State with which the NRC has entered into an agreement for the exercise of regulatory authority. This label shall be maintained on the device in a legible condition.

Abandonment or disposal of this device is prohibited unless transferred to persons specifically licensed by the NRC or an Agreement State.

Operation of this device is prohibited if there is indication of failure of or damage to shielding, source containment or on-off mechanism.

For service, maintenance, repair or testing refer to the General License Manual provided with this instrument.

Device shall be tested for radioactive leakage and proper functioning of on-off mechanism and indicator, at source installation and thereafter at no longer than 6 month intervals.

Loss, theft or transfer of this device and failure of or damage to the shielding, the source containment or the on-off mechanism must be reported to the NRC or Agreement State.

CAUTION – RADIOACTIVE MATERIAL

Label 1

CAUTION

RADIOACTIVE MATERIAL

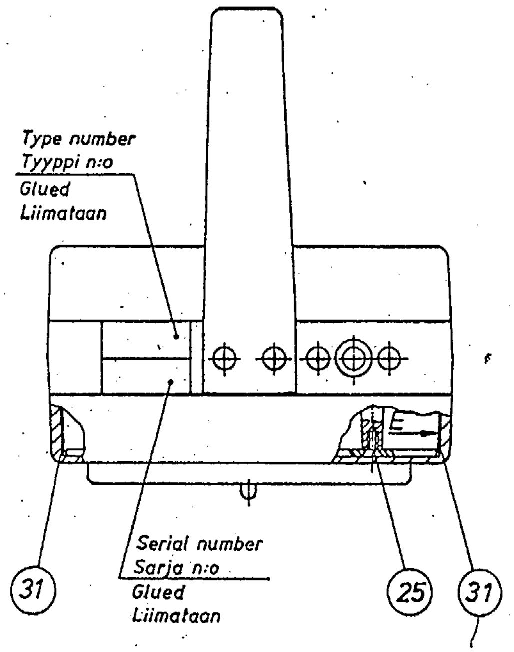
Device Model _____
Device S/N _____
Isotope _____
Isotope S/N _____
Millicuries _____
Date _____

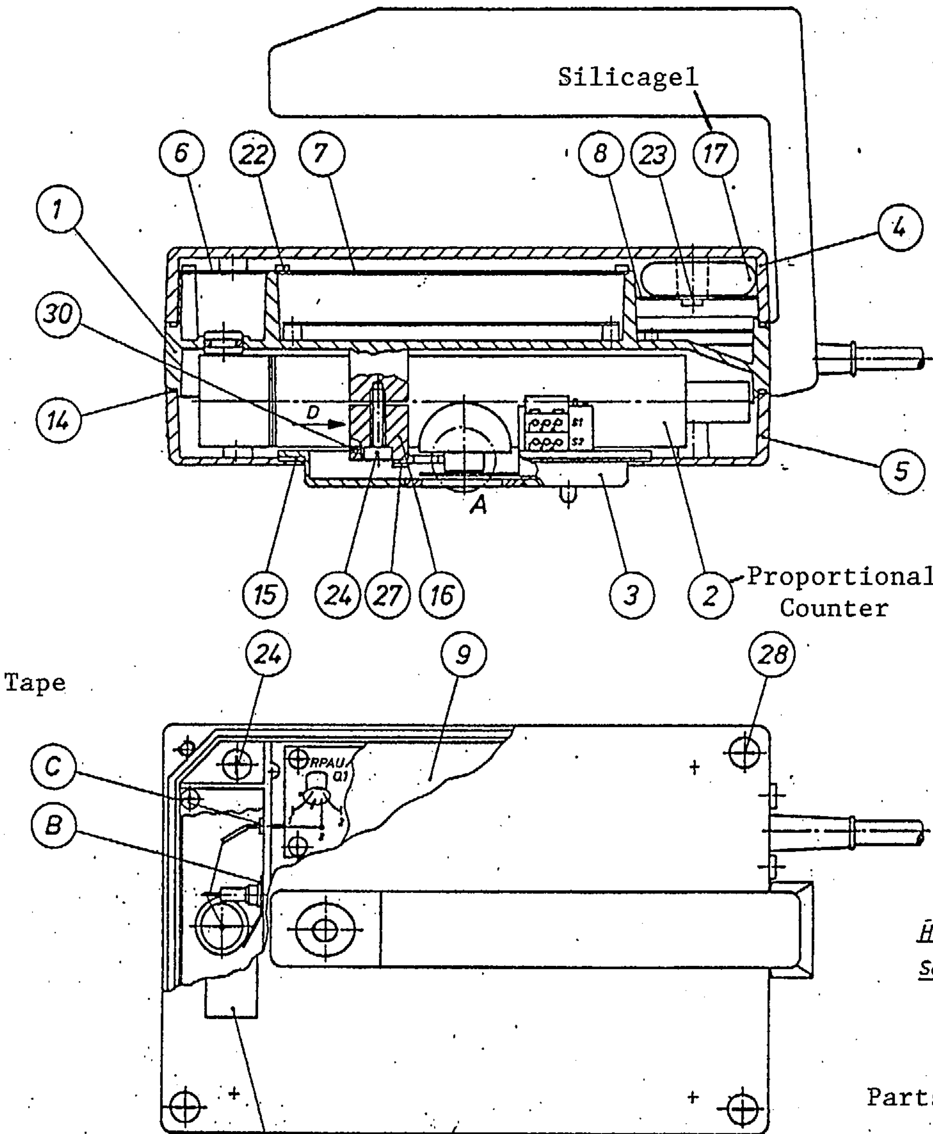
REMOVAL OF THIS LABEL IS PROHIBITED

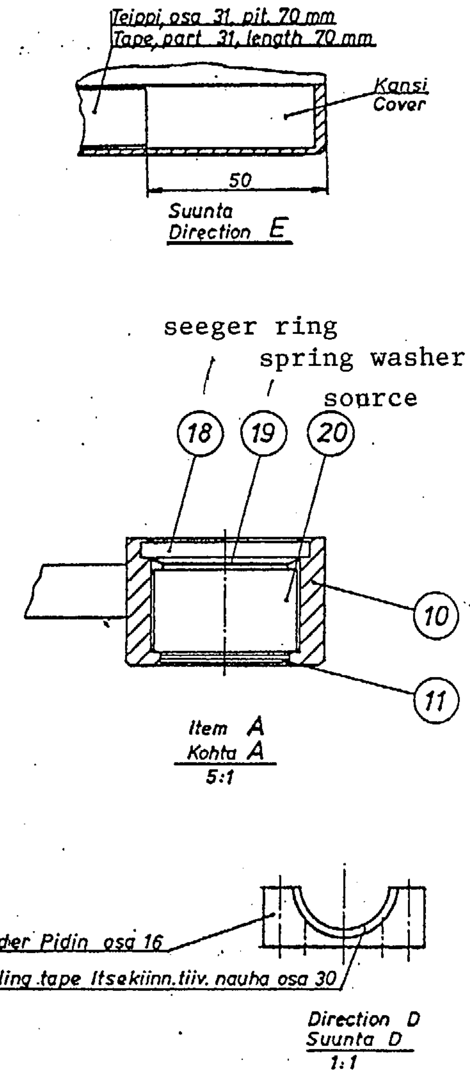
METOREX INC.

Label 2

p13







Parts 21 ... 28: Screws

Warning:
When changing the field effect transistor RPAU/Q1 soldering the detector or touching the high voltage components you have to ground the gate of the field effect transistor RPAU/Q1 by connecting the short circuit jumber first to the ground pin B and then to the pin C.
Varoitus:
FET transistoria RPAU/Q1 vaihdettaessa, detektoria juotettaessa tai suurjännitekomponentteja kosketettaessa on FET transistorin RPAU/Q1 hilalle menevä johto maadoitettava kytkemällä oikosulkulanka ensin maapisteeseen B ja sitten läpivientiin C.

Säteilyvaarakilpi liimataan keskelle 40 mm reunasta.
The label of Radioactive Caution is glued in the middle 40 mm from the edge.

Figure 1

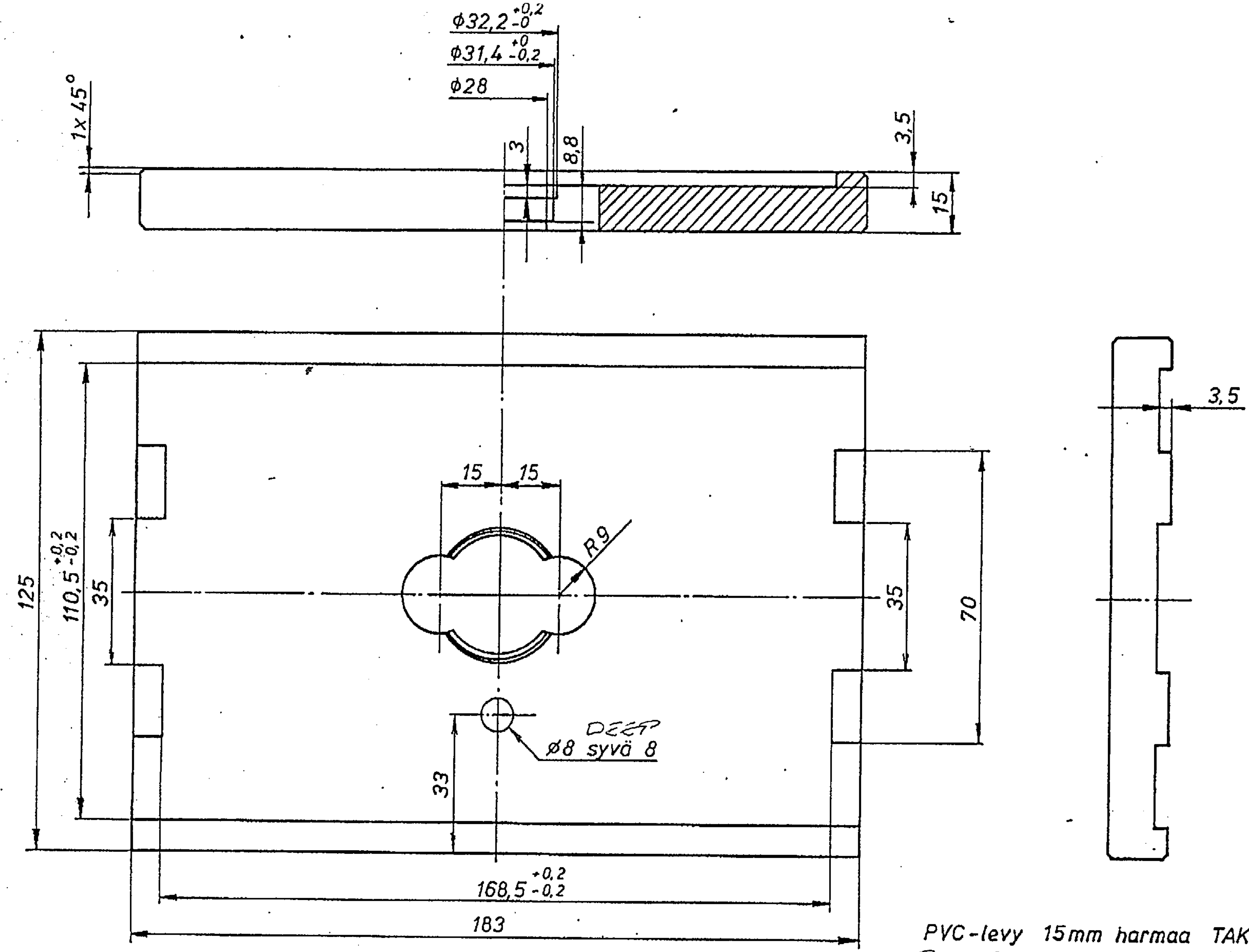
05 -1- 2000

REMOVED PARTS ...

9003	RM	[signature]	Poistettu osat 12,13,21		c
8306	LV	[signature]	Lisätty osa 31		b
8201	LV	[signature]	Lisätty osa 30		a
Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki

ADDED PART ...

Aine Material	Yleistol. Toleranssi	Suunn. Design. 8003JQH	Piirt. Drawn. 8003SLM
Pinta Surface	Pinnat.- Finish	Tark. Check. [signature]	Hyv. App. [signature]
[projection symbol] Mittak. Scale 1:1(5:1)	Liittyy Next Assy X-Met	Osaluku Part No. 3811 841-40	
OUTOKUMPU OY ESPOO FINLAND	SUPS 0484	88-11-24 [signature]	
	Surface Probe Set	3811 858 - 2KE	



PVC-levy 15mm harmaa TAKO 3531 811
PVC-PLATE 15mm GRAY

Aine Material: PVC plate	Yleistol. Tolerances: SFS 4011 keski	Suunn. Design: 8310 KR	Piirt. Draftsm.: 8310 LV		
Pinta Surface	Pintak. Finish	Tark. Check: 8310 ale	Hyv. App.: E.M.		
Suhde Scale: 1:1	Liittyy Next Assy: SLPS, SUPS	Osaluet. Part list			
OUTOKUMPU OY ESPOO FINLAND	Calibration base / Kalibrointilevy	8609 RK / ale	3866 555-3M		

ADDED Φ8 DEEPS

8911	IJ	[signature]	Lisätty Ø8 syvä 8			b
8804	RM	lau	Lisätty kolo mitta 35			a
Päiväys	Muuttaja	Tarkastaja	Muutos		Lukumäärä	Merkki

ADDED GAP DIMENSION 35

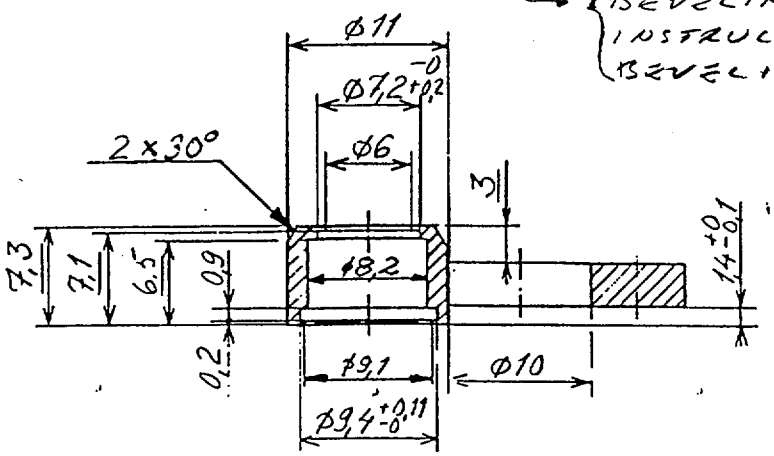
p14

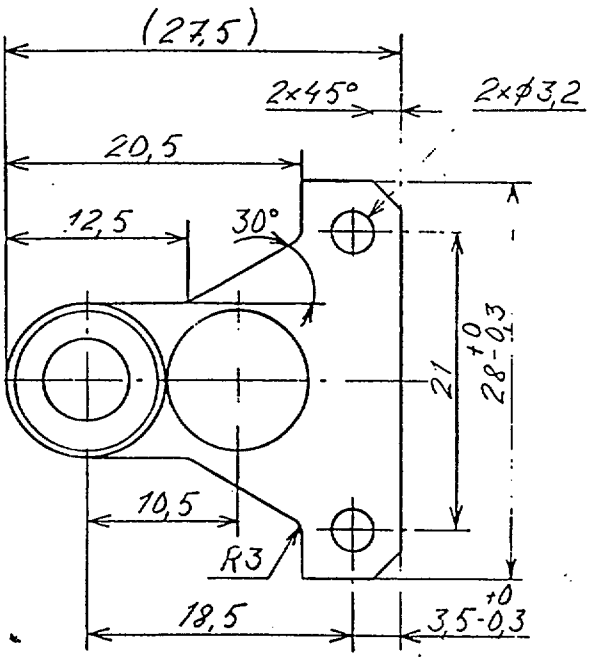
Figure 1A

4	3	2	1

Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki
810804	I.L		Mitta ⌀8,2 → ⌀9,1. Lis. ⌀8,2		
830318	ikl	ala	Viistettä lisätty		
8808	IJ		Työstöohje lisätty	Jan	
9003	IJ		Viiste 1×30° → 2×30°		a

DIMENSION ...
BEVELING INCREASED
INSTRUCTIONS ADDED
BEVELING ...





IN MACHINING USE ALCOHOL BASE LIQUID, E.G. SINOL. FINISHED PART TO BE WASHED WITH ACETON

Figure 2

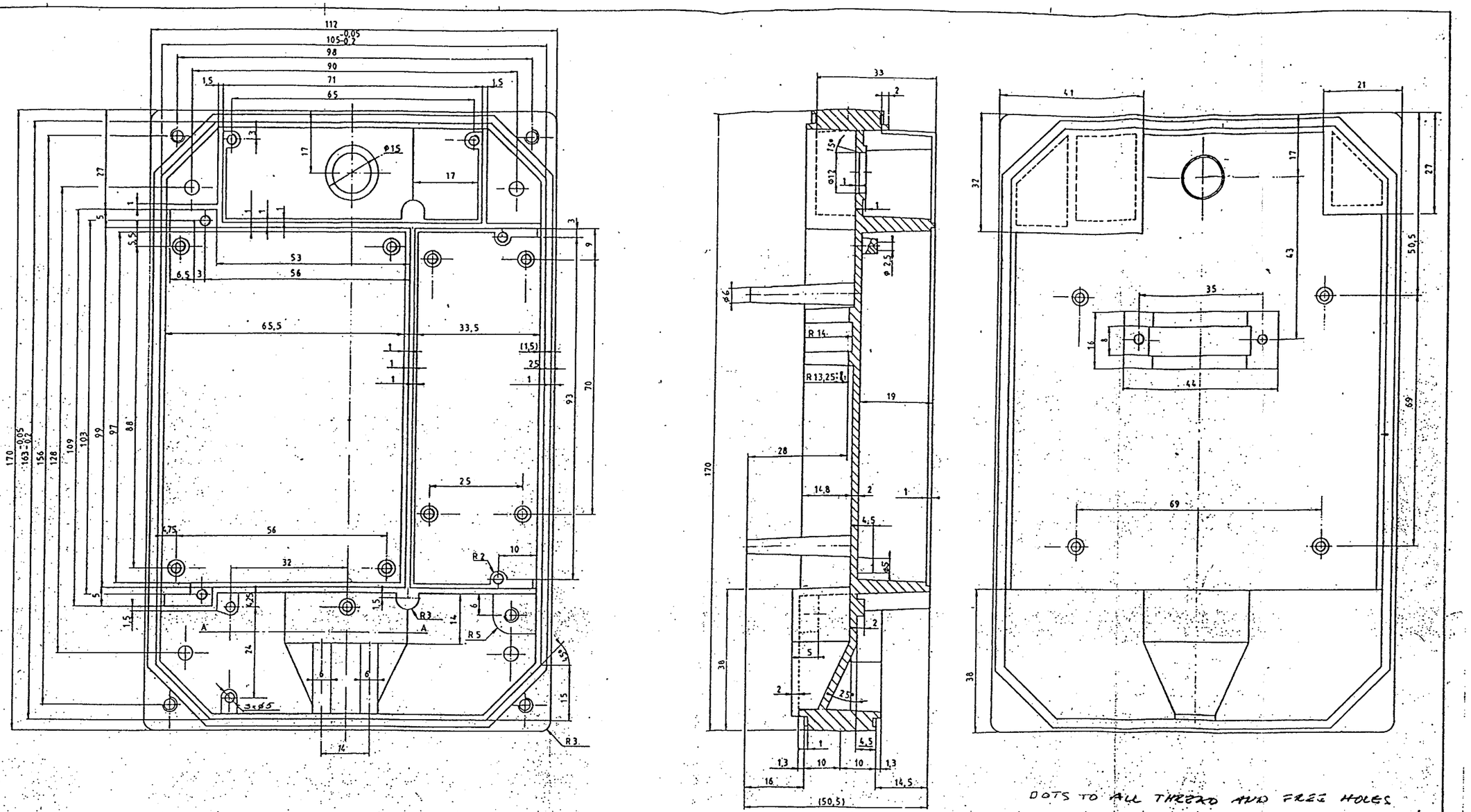
Part 10 (See item A) in figure 1

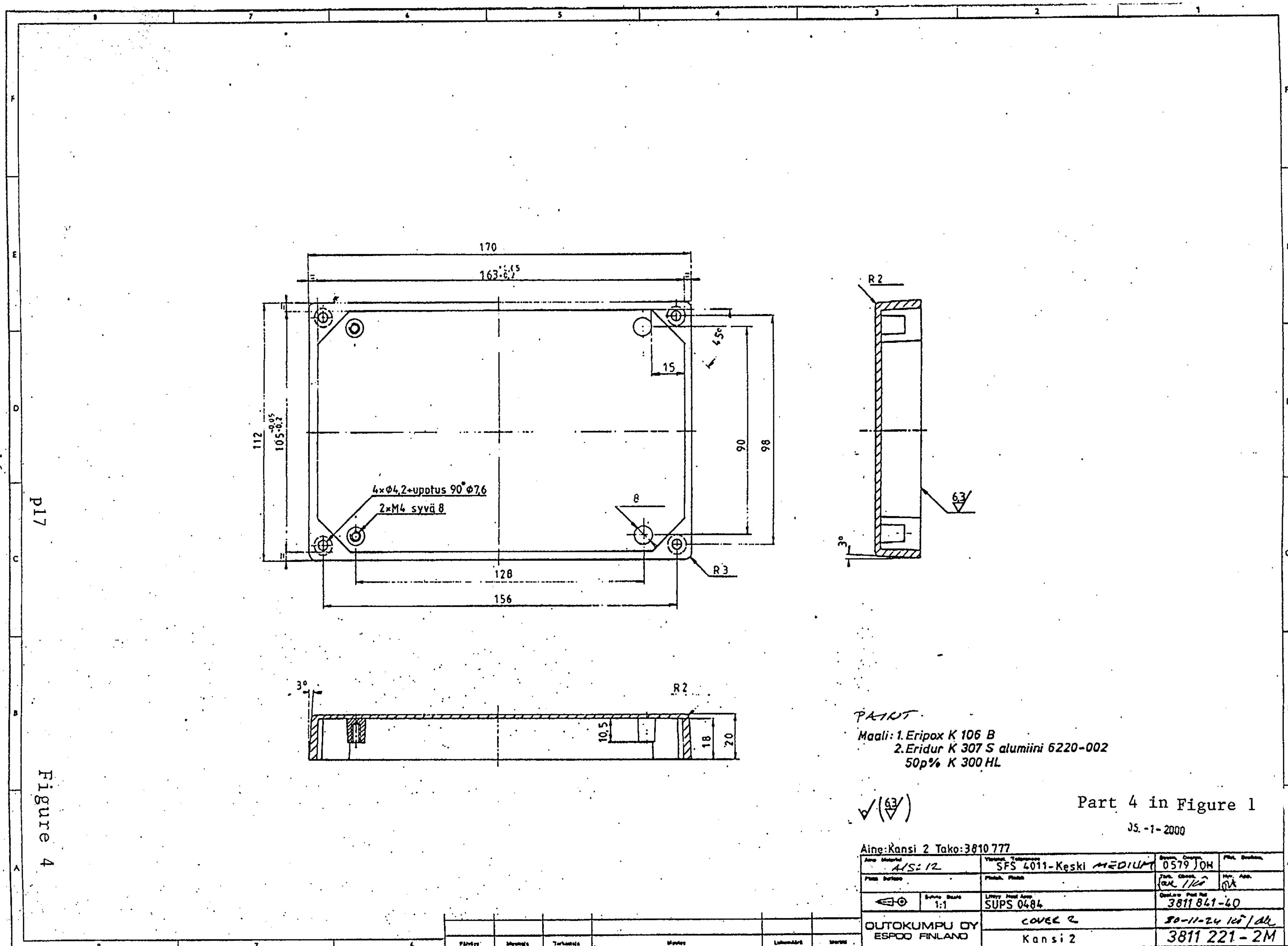
Työstössä käytettävä alkoholipohjaista leikkuunestettä esim. Sinol. Valmis osa pestään asetonilla.

19.-8-1990

MATERIAL:
Aine: Alumiinilevy puhdas 8mm Tako: 3017 373

Aine Material: Pure Al plate 8mm	Yleistol. Tolerances FINE: SFS 4011 - Hieno	Suunn. Design. 8002VI-K	Piirt. Draftsm. 8002SLM
Pinta Surface 3,2	Pintak. Finish	Tark. Check. Jan / KÖ	Hyv. App.
Suhde Scale 2:1	Liittyy Next Assy SUPS 0484, HEPS	Osal.n:o Part list	
OUTOKUMPU OY ESPOO FINLAND	Lähteenpidin	80-11-24 KÖ/Ale	
	Source holder	3811 585 - 4M	


112
105-0,05 -0,2
98
90
71
65
1,5
1,5
ø15
17
27
53
56
6,5
65,5
33,5
(1,5)
25
93
70
170
163-0,05 -0,2
156
128
109
103
99
97
88
25
4,75
56
32
10
R2
R3
R5
14
24
6
15
R3
33
2
15°
ø12
ø2,5
ø6
R 14
R 13,25
19
28
14,8
4,5
38
5
2,5
1,3
10
14,5
(50,5)
41
21
32
17
27
43
50,5
35
16
44
69
38
DOTS TO ALL THREAD AND FREE HOLES
Pisteet kaikkiin kierre- ja vapaareikiin
Valupäästä 2°
SECTION
Leikkaus A - A
R17
R15
0,3
2
p15
p16
Figure 3
Part 1 in Figure 1
AlSi12
SFS 4011-hieno
7905JOH
2:1
X-MET
Runko valu
3807.542-1Y
OUTOKUMPU OY
ELPOO FINLAND
MATERIAL WAS ...
9302 RH. HH Raaka-aine oli ZnAl12
8910 RH. Raaka-aine oli AlSi12

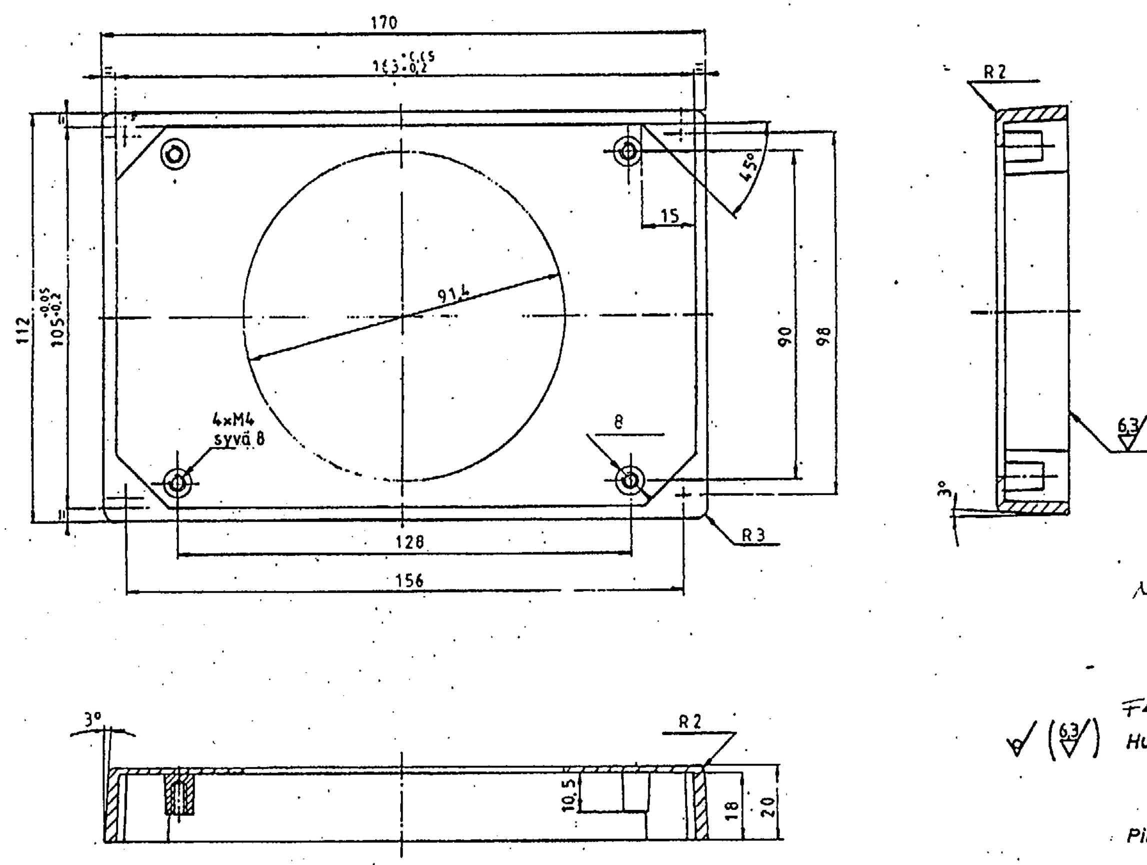

170
163
112
105
90
98
15
45°
8
R 2
R 3
128
156
4×Φ4,2+upotus 90° Φ7,6
2×M4 syvä 8
6,3
3°
10,5
18
20
PAINT
Maali: 1. Eripox K 106 B
2. Eridur K 307 S alumiini 6220-002
50p% K 300 HL
Part 4 in Figure 1
05.-1-2000
Aine: Kansi 2 Tako: 3810 777
A/S: 12
SFS 4011-Keski MEDIUM
0579 JOH
1:1
SUPS 0484
3811 841-40
OUTOKUMPU OY
ESPOO FINLAND
COVER 2
Kansi 2
3811 221 - 2M

p17

Figure 4

p18

Figure 5



NOTE: BEFORE MACHINING CHECK THAT CAST IS STRAIGHT, IF NOT, STRAIGHTEN, REMOVE BURRS

FINISH: SEMIMATTE EFFECT

√ (6.3√)

Huom! Ennen työstöä on tarkistettava että valu on suora, tarvittaessa oikaistava ja häiritsevät purseet poistettava.

Pintakäsittely:
Sadolin Termolux 317/11452
puolimmeä efekti

Part 5 in Figure 1

03.-1-2000

Aine: Kansi 1 Tako: 3807 534

AlSi12	SFS 4011-Keski	0579 JOH	
1:1	SUPS 0484	3811 841-40	
OUTOKUMPU OY ESPOO FINLAND	COVER 1 / Kansi 1	80-11-24 / 3811 205 - 2M	

PAINT WAS ...

Päiväys	Muuttaja	Tarkastaja	Muutos		Merkki
29.3.90	RM		Maali oli Sematex 8793559 UK111 3/4 matta mu		
29.3.90	RM		Polst. reiät 2x⌀3,2		a

REMOVED HOLES 2x⌀3.2

4		3	2	1	
Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki
9003	IJ		DIMENSIONS Mitta 25,2 → 24,5		a
9006	RH	KKO	Muutettu 2×ø 2,8 → 2×ø 3 CHANGED		b

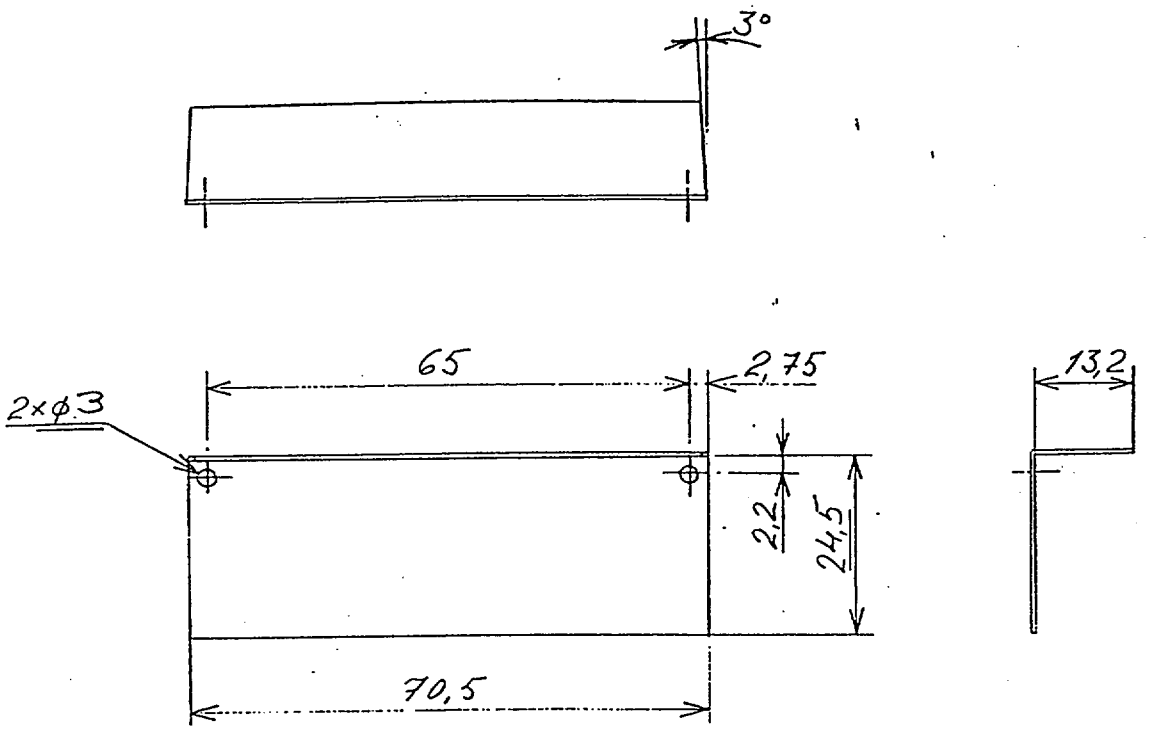


Figure 6

Part 6 in Figure 1

MATERIAL CODE

MATERIAL: STEEL PLATE

Aine: Teräslevy 0,5mm Fe 37 Tako: 1020 304

Aine Material	Yleistol. Tolerances	Suunn. Design.	Piirt. Drafstm.
Steel plate 0.5 mm	SFS 4011-Keski	8002JOH	8002SLM
Pinta Surface	Pintak. Finish	Tark. Check.	Hyv. App.
	SFS 2766 Fe/Zn+pass	[illegible]	
Suhde Scale 1:1	Liittyy Next Assy	Osal.n:o Part list	
OUTOKUMPU OY ESPOO FINLAND	Kansi 1 Steel cover 1	80-11-24 KÖ/Alle 3811 270 - 4M	

4		3	2	1	
Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki
8905	RH		ADDED SLOT. - Lisätty aukko 7×22		a
9006	RH	KKO	CHANGED Muutettu 2×ø2,8 → 2×ø3		b

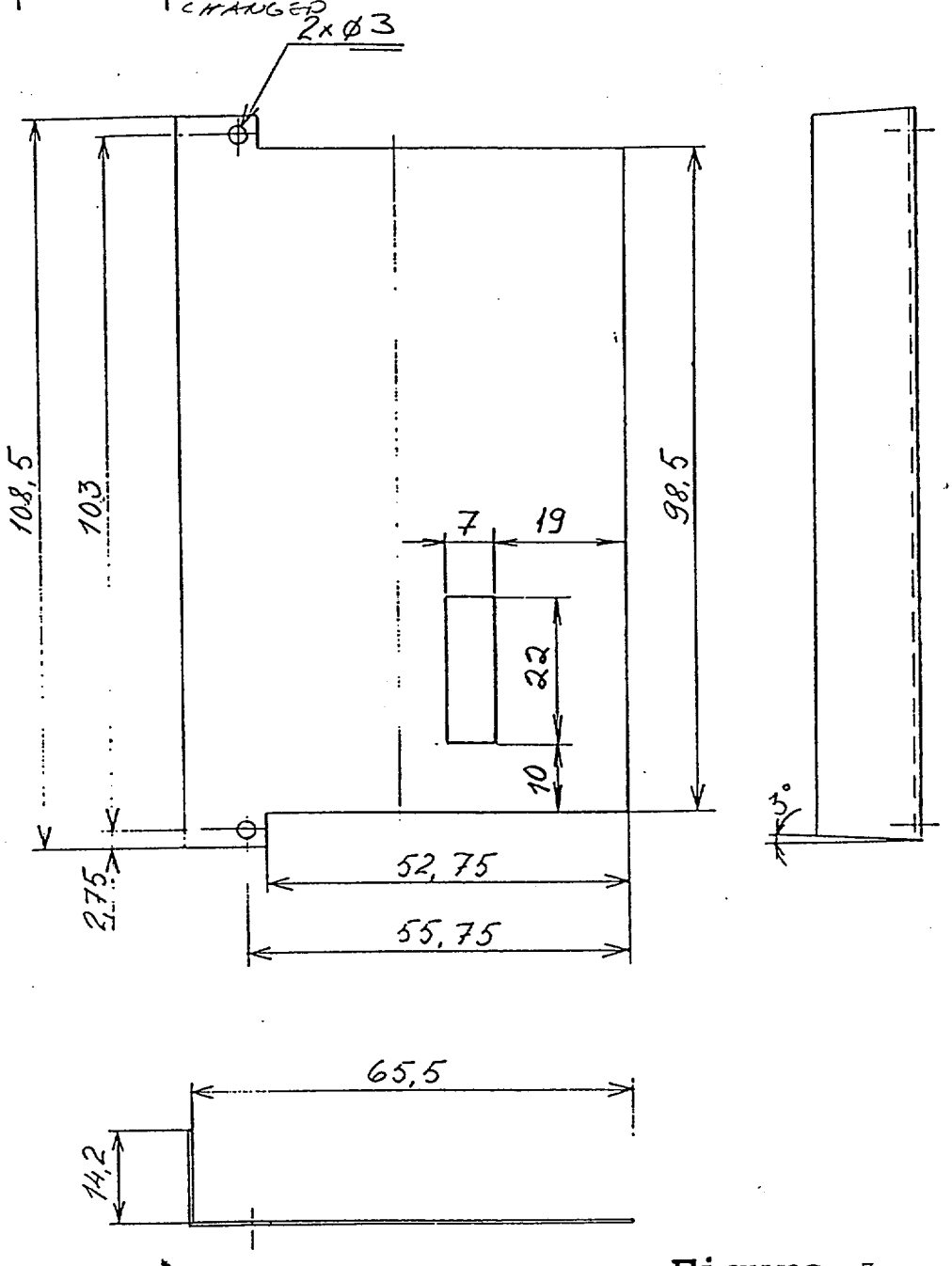


Figure 7

Part 7 in Figure 1

MATERIAL: STEEL PLATE ... CODE
Aine: Teräslevy 0,5mm Fe 37 Tako: 1020 304

Aine Material: Steel plate 0.5 mm	Yleistol. Tolerances MEDIUM: SFS 4011-Keski	Suunn. Design.: 8002JOH	Piirt. Drafstm.: 8002SLM
Pinta Surface	Pintak. Finish: SFS 2766 Fe/Zn+pass	Tark. Check.: Jall	Hyv. App.:
Suhde Scale: 1:1	Liittyy Next Assy	Osal.n:o Part list	
OUTOKUMPU OY ESPOO FINLAND	Kansi 2 / Steel cover 2 p20	80-11-24 KÖ/ale	3811 288 - 4M

4	3	2	1

Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki

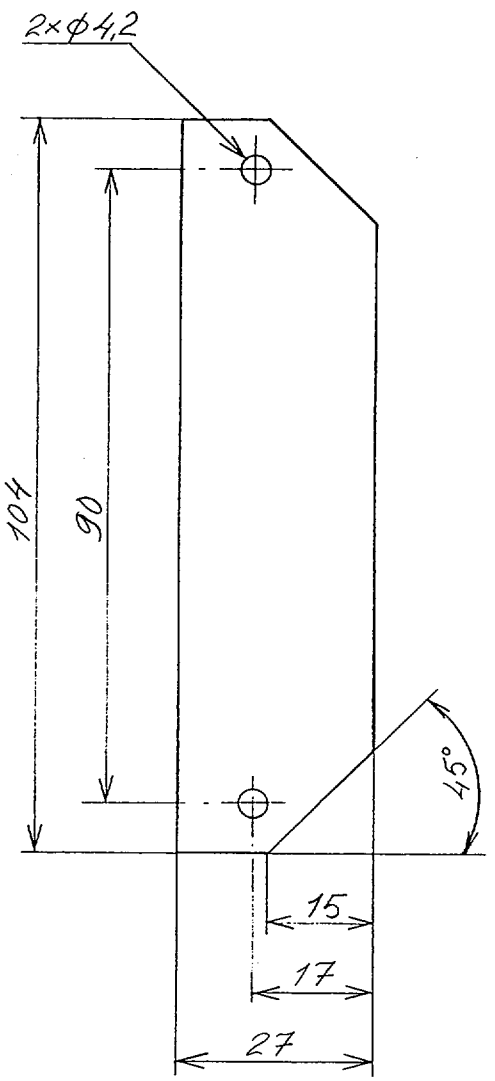


Figure 8

Part 8 in Figure 1

MATERIAL: GLASS FIBER PLATE...

Aine:Lasikuitulevy 1 mm Tako:3145 620

Aine Material	Yleistol. Tolerances	Suunn. Design.	Piirt. Drafstm.
	SFS 4011-Keski	8002JOH	8002SLM
Pinta Surface	Pintak. Finish	Tark. Check.	Hyv. App.
Suhde Scale 1:1	Liittyy Next Assy	Osal.n:o Part list	
OUTOKUMPU OY ESPOO FINLAND	Suoja SHIELD 27. 4-2000	80-11-24 RÖ/ak	3811 262 - 4M

Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki
3006	RM	KKO	Muutettu 2×ø 2,8 → ø3, 33,5 → 33 CHANGED ...		a

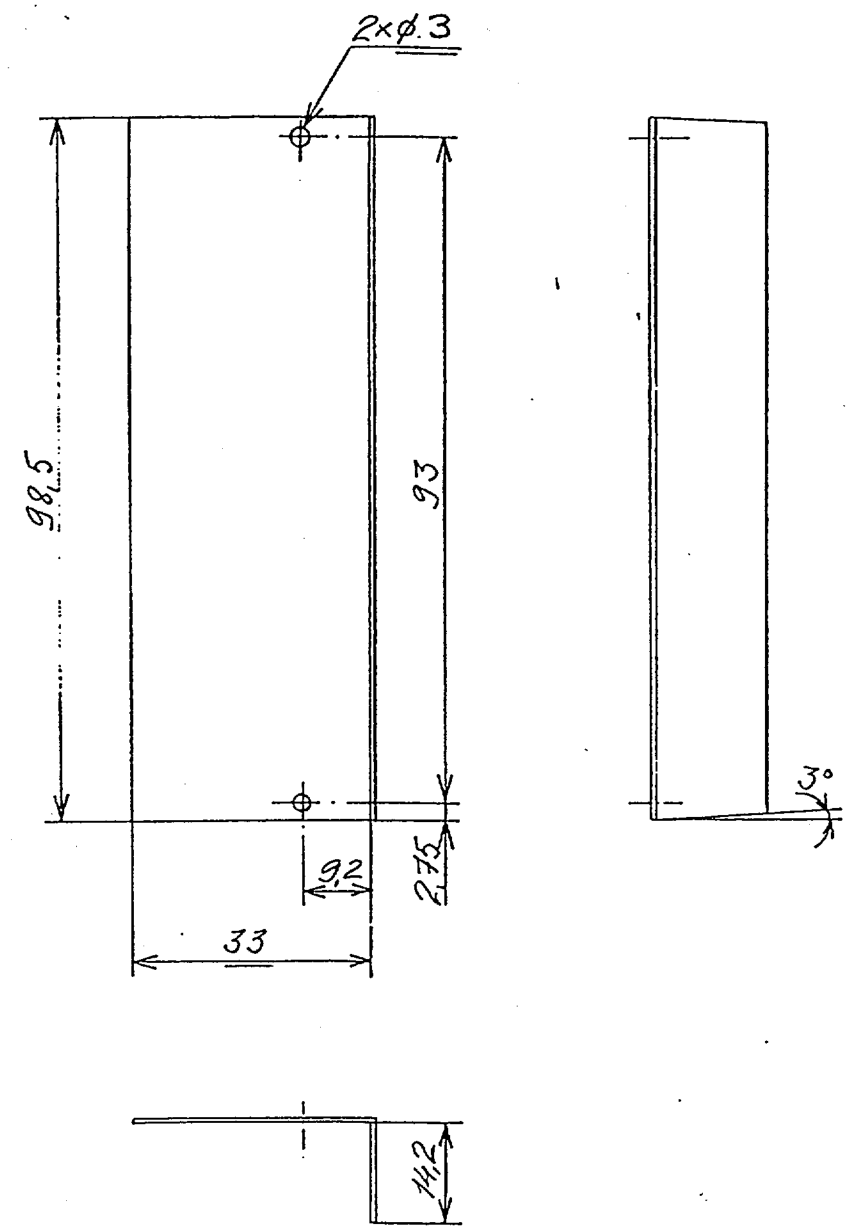


Figure 9

Part 9 in Figure 1

MATERIAL: STEEL PLATE CODE

Aine: Teräslevy 0,5mm Fe 37 Tako: 1020 304

Aine Material: Steel plate 0.5 mm	Yleistol. Tolerances MEDIUM: SFS 4011-Keski	Suunn. Design.: 8002JOH	Piirt. Drafstm.: 8002SLM
Pinta Surface	Pintak. Finish: SFS 2766 Fe/Zn+pass	Tark. Check.: Jal / Kô	Hyv. App.
Suhde Scale: 1:1	Liittyy Next Assy	Osal.n:o Part list	
OUTOKUMPU OY ESPOO FINLAND	Kansi 3 / Steel cover 3	80-11-24 Kô/Ak	3811 296 - 4M

p22

4	3	2	1		
Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki

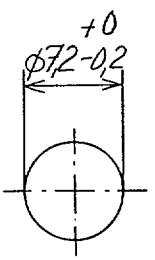


Figure 10

Part 11 in Figure 1

MATERIAL: STEEL PLATE ...

Aine: Teräslevy Fe 37 0,05mm Tako: 2692 564

Aine Material	Yleistol. Tolerances	Suunn. Design. 8002VI-K	Piirt. Draftsm. 8002SLM
Pinta Surface	Pintak. Finish	Tark. Check. Jaa IKö	Hyv. App.
Suhde Scale 2:1	Liittyy Next Assy SUPS 0484, HEPS 0482	Osal.n:o Part list	
OUTOKUMPU OY ESPOO FINLAND	Säteilylähteen rajoitin Fe SOURCE ATTENUATOR	80-11-24 IKö/ak 3811 817 - 4M	

4	3	2	1		
Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki

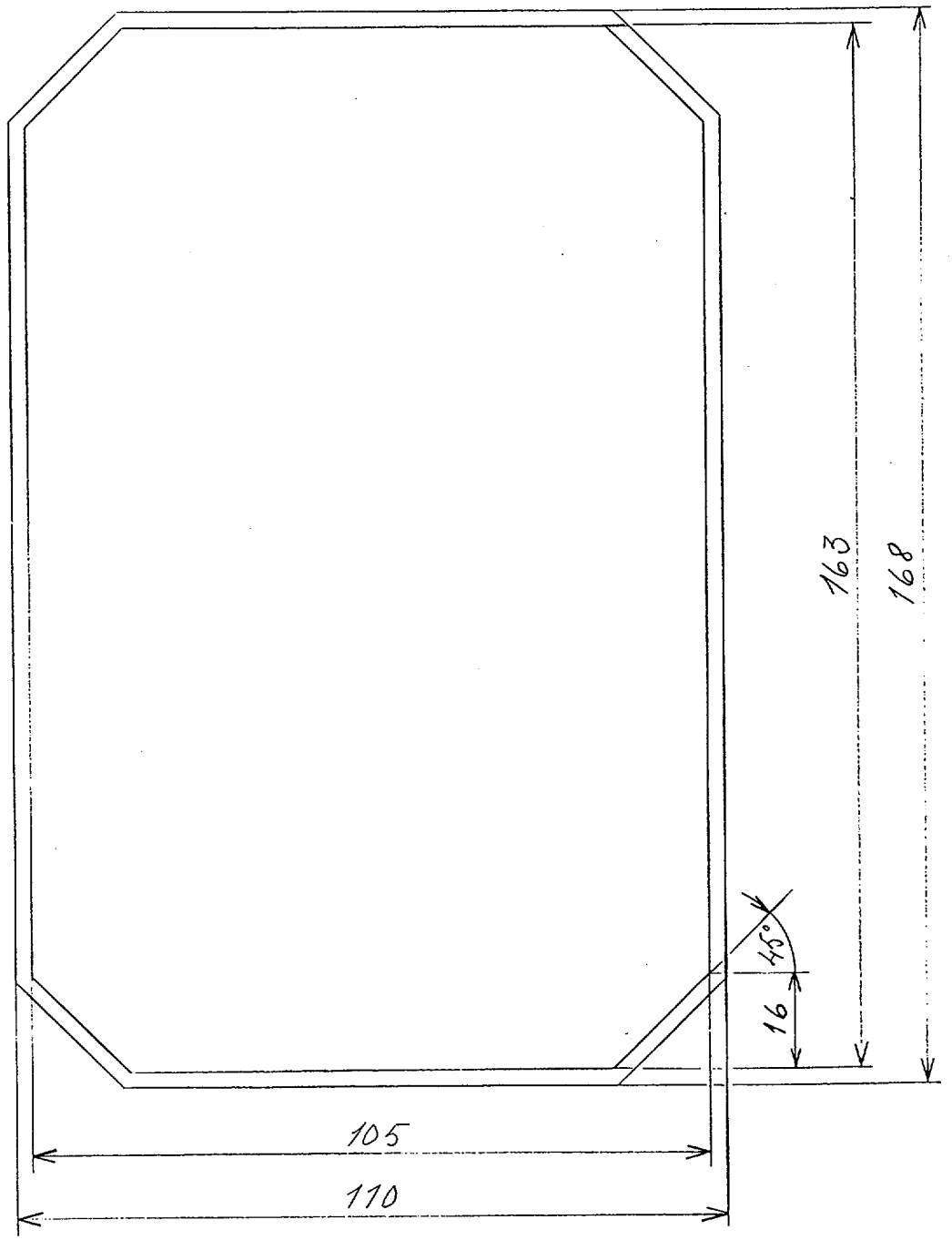


FIGURE 11

Part 14 in Figure 1

ADHESIVE SEALING TAPE ...

Aine: Itsekiin. tiiv. nauha NR 515 2×lev. 2,5mm Tako: 3022 795

Aine Material	Yleistol. Tolerances MEDIUM SFS 4011-Keski	Suunn. Design. 8003VI-K	Piirt. Drafstm. 8003SLM
Pinta Surface	Pintak. Finish	Tark. Check Jaa / Kö	Hyv. App.
	Suhde Scale 1:1	Liittyy Next Assy X-Met	Osal.n:o Part list
OUTOKUMPU OY ESPOO FINLAND	Rungon tiiviste FRAME SEAL	27-4-2000	80-11-24 Kö/ak 3811 833 - 4M

4	3	2	1		
Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki

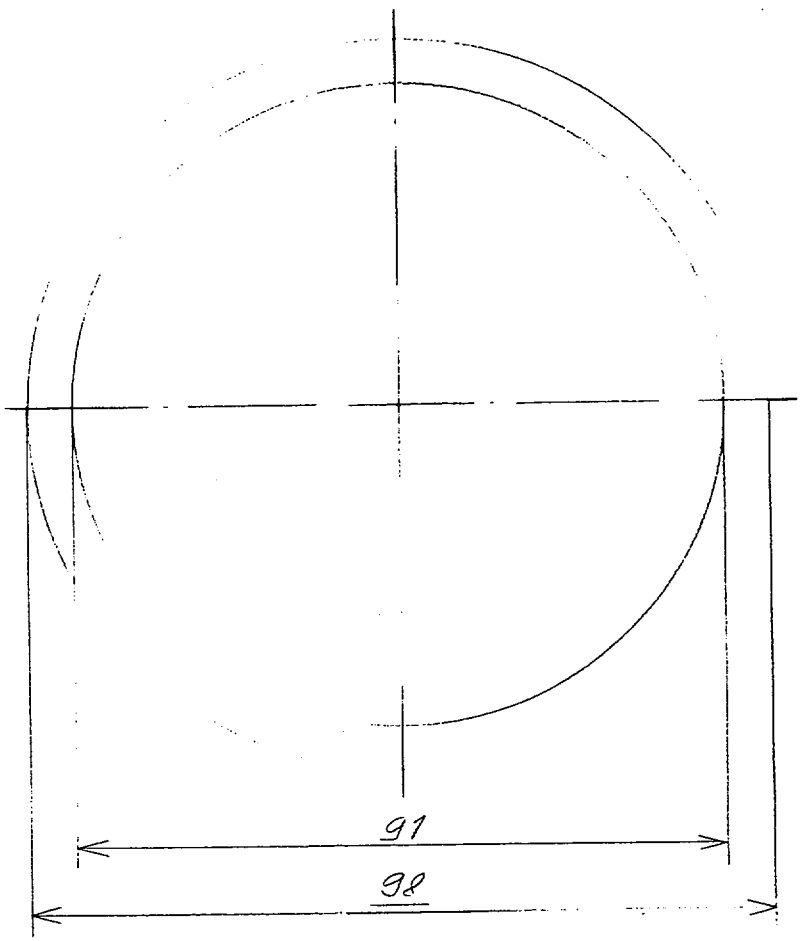


FIGURE 12

Part 15 in Figure 1

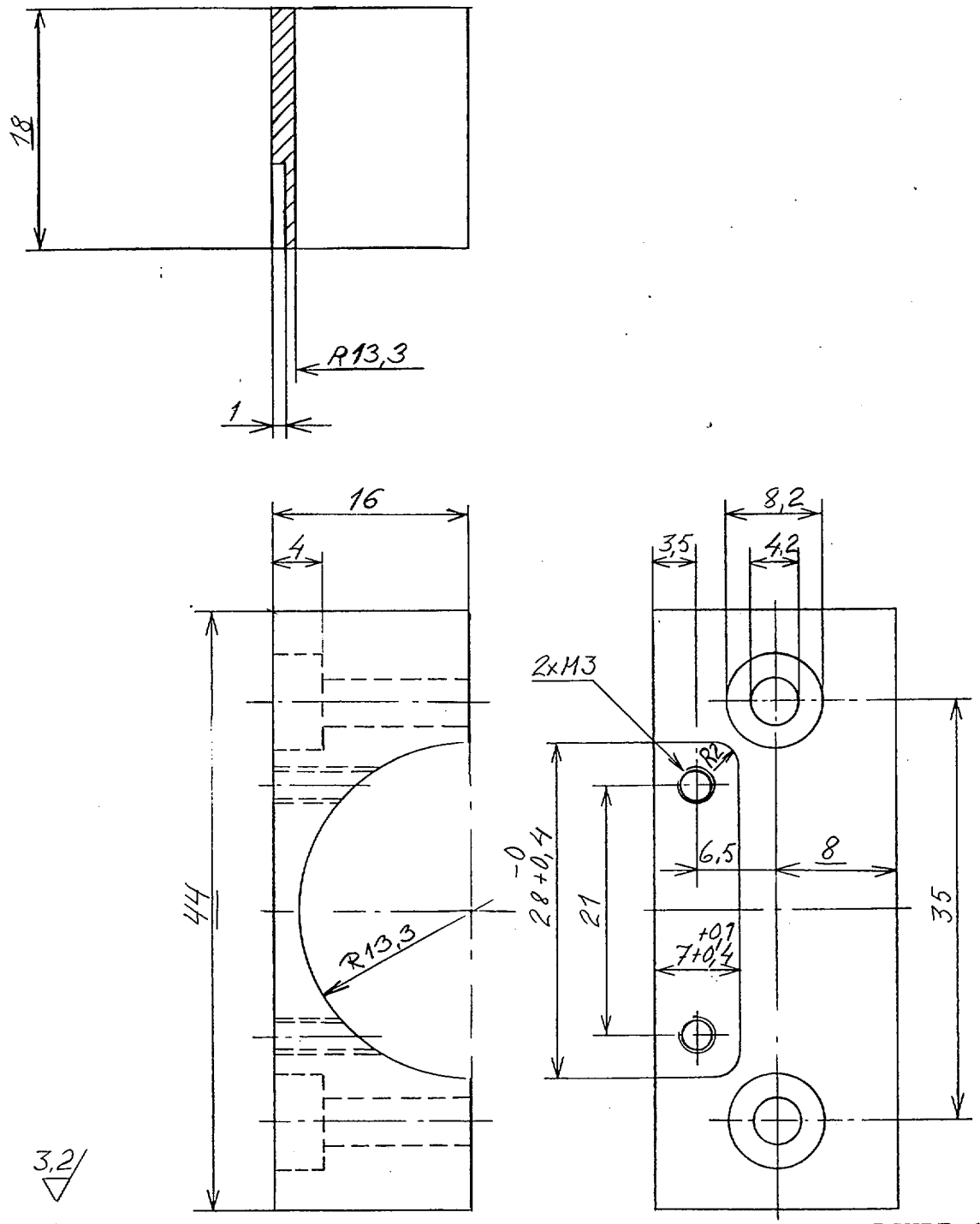
ADHESIVE SEALING TAPE ...

Aine: Itsekiin. tiiv. nauha NR 515 2×111mm Tako: 3022 787

Aine Material	Yleistol. Tolerances SFS 4011-Keski	Suunn. Design. 8003VI-K	Piirt. Drafstm. 8003SLM
Pinta Surface	Pintak. Finish	Tark. Check. Jan / KÖ	Hyv. App.
Suhde Scale 1:1	Liittyy Next Assy X-Met	Osal.n:o Part list	
OUTOKUMPU OY ESPOO FINLAND	Tiiviste SEAL 27.-4-2000	80-11-24 KÖ/Jan 3811 825 - 4M	

4	3	2	1

Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki
			DIMENSION ... WAS ...		
8709	RM		Mitta R13,3 oli: R14,2		
9102	NS	Ale	Turhia mittoja poistettu		
			UNNECESSARY DIMENSIONS REMOVED		



AL FLAT BAR ...

Part 16 in Figure 1

FIGURE 13

Al-litteätanko 20x50mm, eloksoituva Tako:1586 932

Aine Material	Yleistol. Tolerances SFS 4011-Keski	Suunn. Design. 8002VI-K	Piirt. Drafstm. 8002SLM
Pinta Surface	Pintak. Finish	Tark. Check. Jan /KÖ	Hyv. App.
Suhde Scale 2:1	Liittyy Next Assy SUPS 0484, HEPS 0482	Osal.n:o Part list	
OUTOKUMPU OY ESPOO FINLAND	Pidin CLAMP	80-11-24 KÖ/Ale	
	27.-4-2000	3811 320 - 4M	

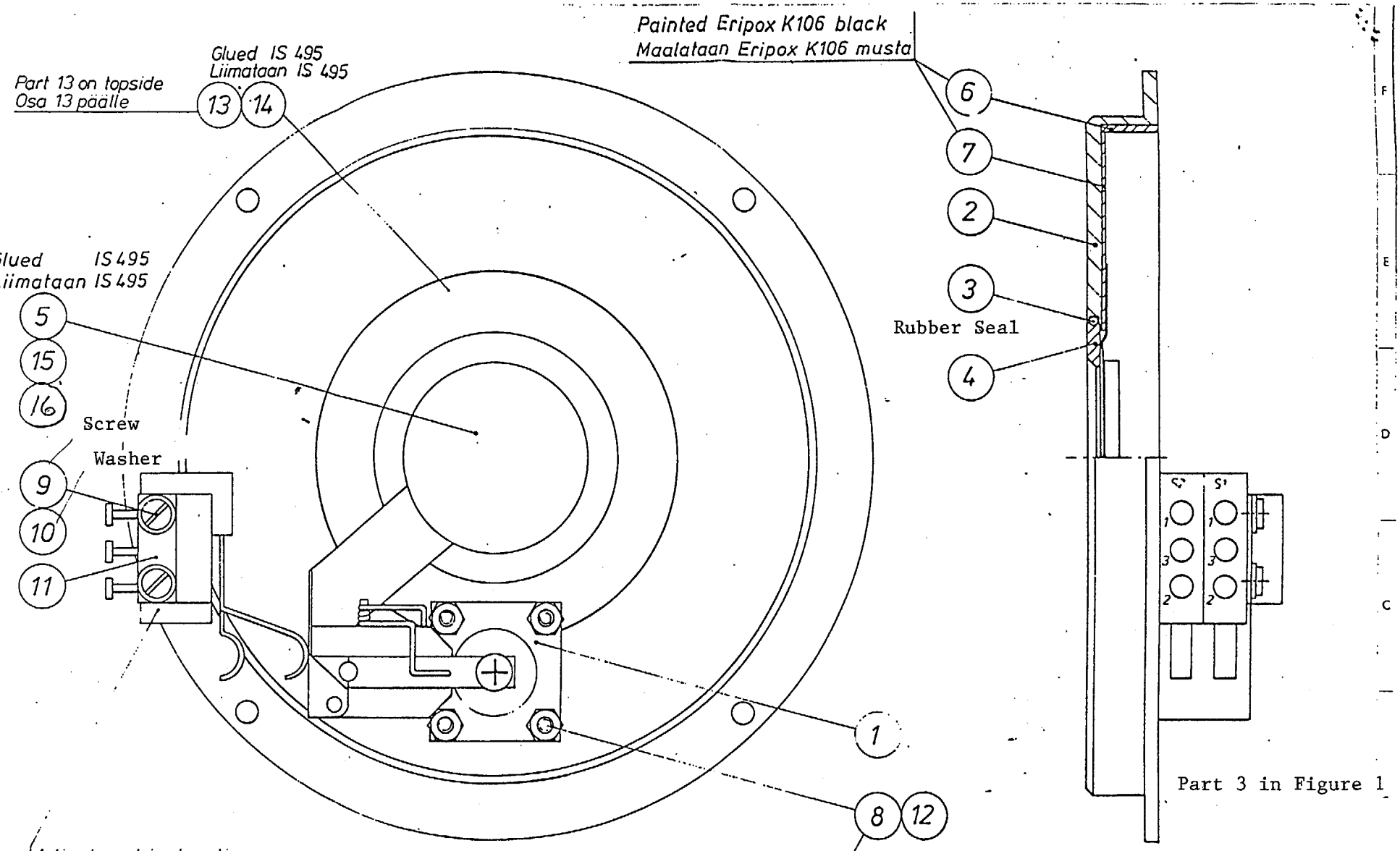


Figure 14

Adjustment instructions:
Viritysohje:
S2 is switched on when the shutter is going away from the front of the window.
S2 kytkee kun suljin poistuu ikkunan edestä.
S1 is switched on when the shutter is in front of the window.
S1 kytkee kun suljin on ikkunan edessä.

Pvm	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki
830322	jkl		Lisätty osat 13, 14 ja 15		
8104		12 8109	Lisätty osat 8 ja 12		a

Aine Material	Yleistol. Tolerances	Suunn. Design. 8004 JOH	Piirt. Drafts. 8004 alm
Pinta Surface	Pintak. Finish	Tark. Check	Hyv. App
Suhde Scale 2:1	Liittyy Next Assy SUPS 0484	Osal no Part list 3812 229 - 40	
OUTOKUMPU OY ESPOO FINLAND	Measurement base		
	13. - 4 - 1983		3812 237 – 3KE

Piirustus	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki
830322	ihl	aa	Säteilysuoja toiselle puolelle		

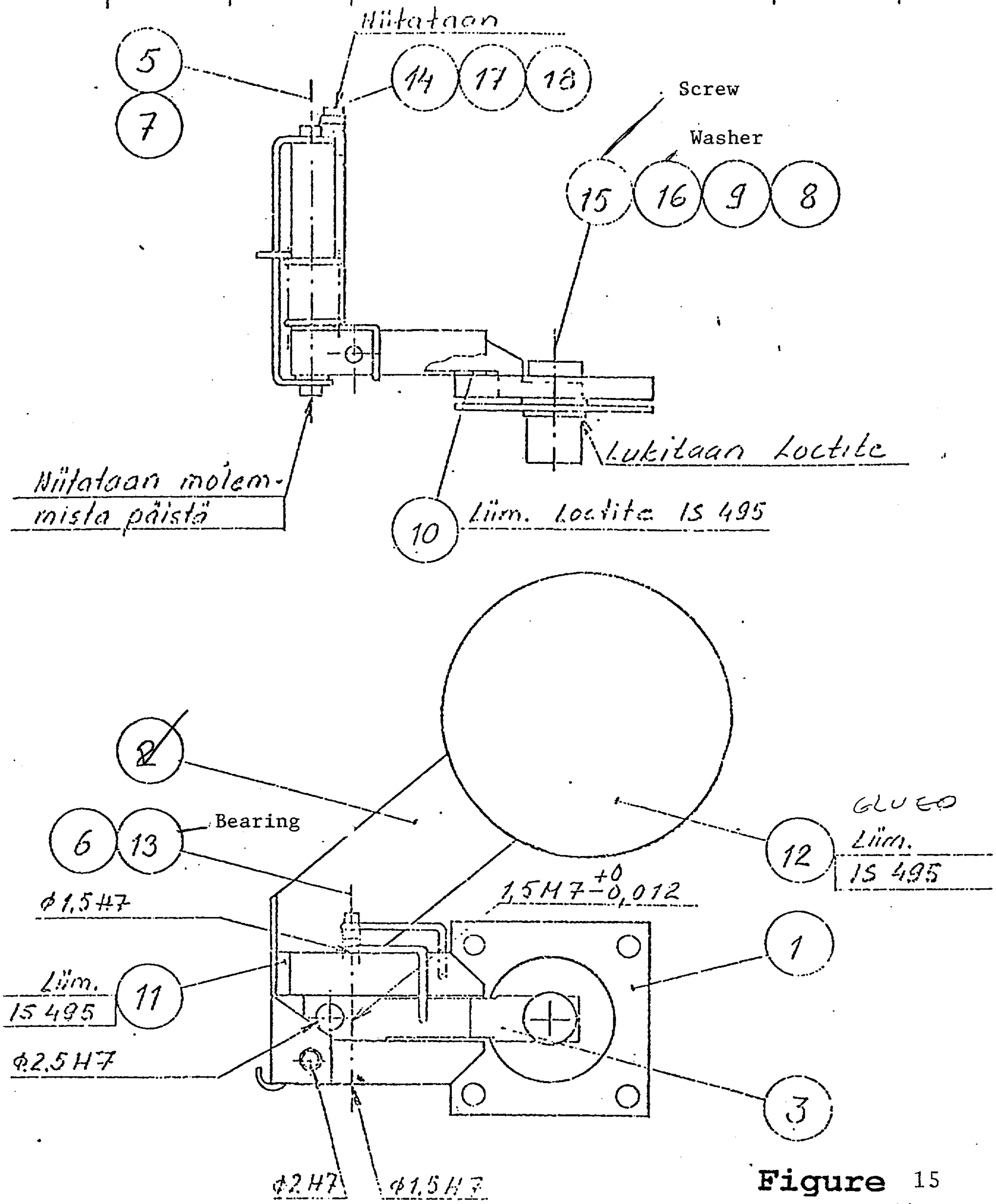


Figure 15

Part 1 in Figure 14

Aine Material	Yleistol. Tolerances	Suunn. Design. 7904 VI-K	Piirt. Drafted 8002 alm
Pinta Surface	Pintak. Finish	Tark. Check.	Hyv. App.
Suhde Scale 2:1	Kuuluu Next Assy HEPS 0482, SUPS 0484	Os. numero Part no. 3812 500-40	
OUTOKUMPU OY TAPIOLA FINLAND	Shutter / reference ~~13-4-1983~~	80-11-24	
	Suljin p28	3813 813 - 4K	

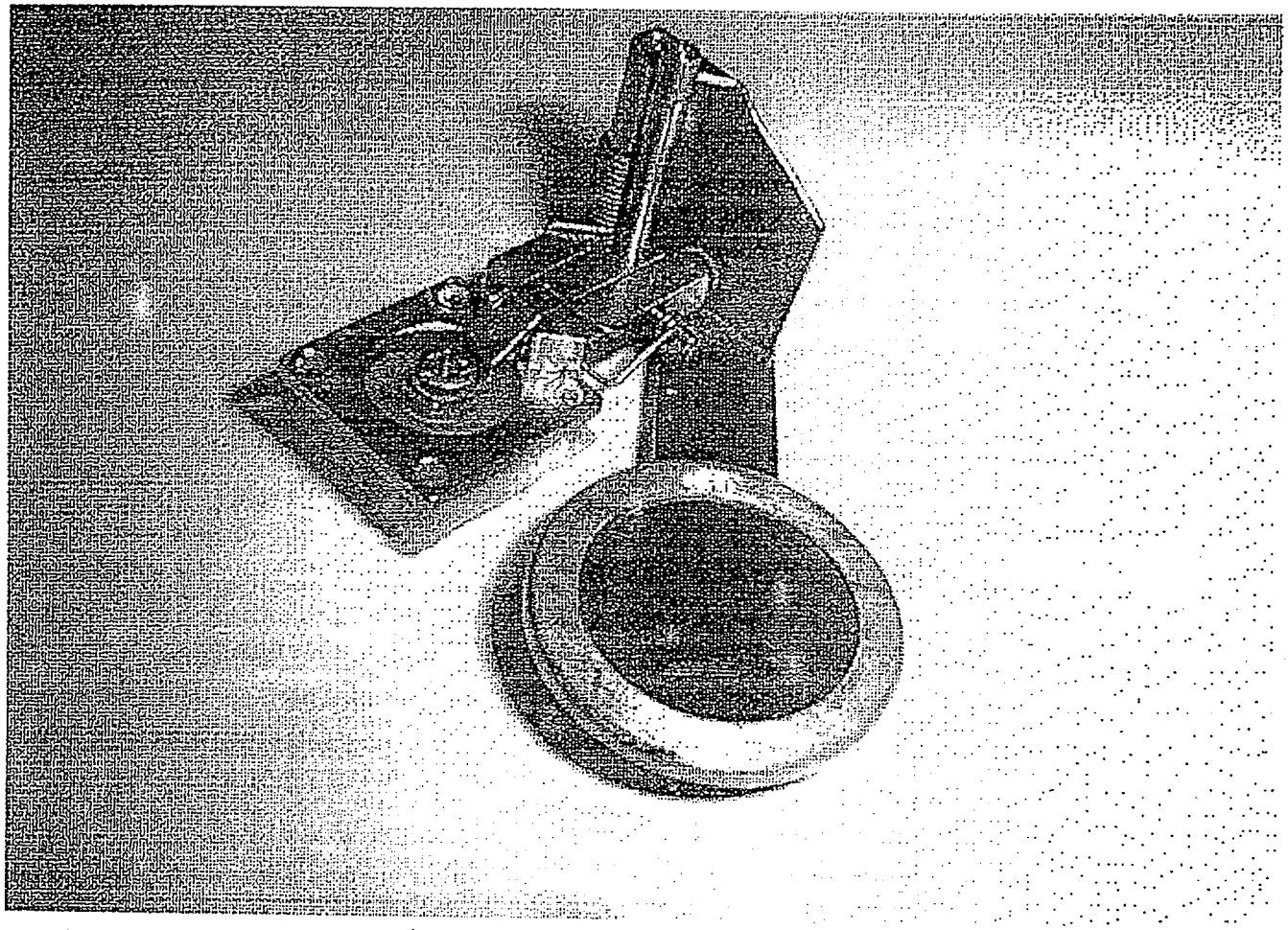


Figure 15A

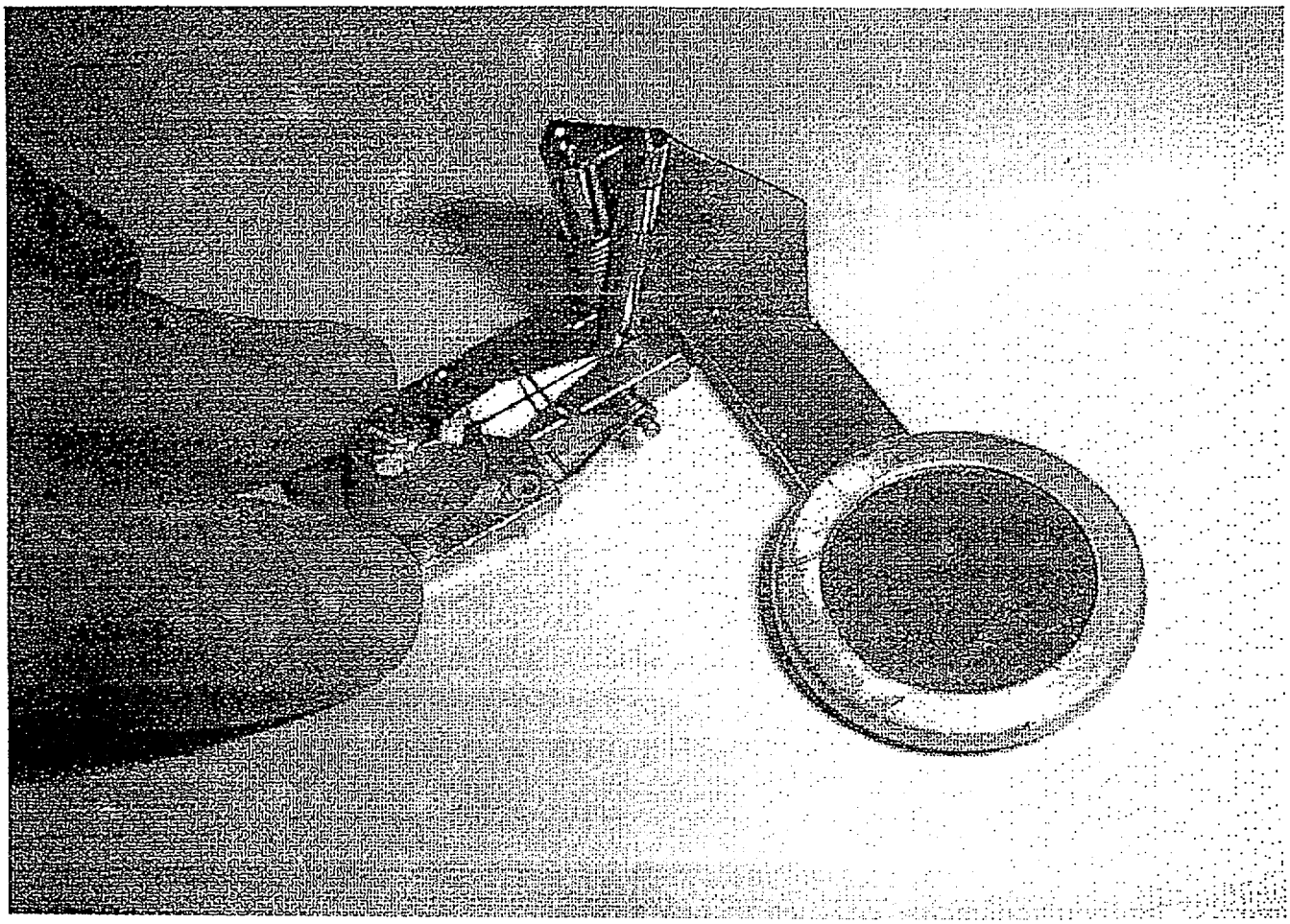


Figure 15B

p31

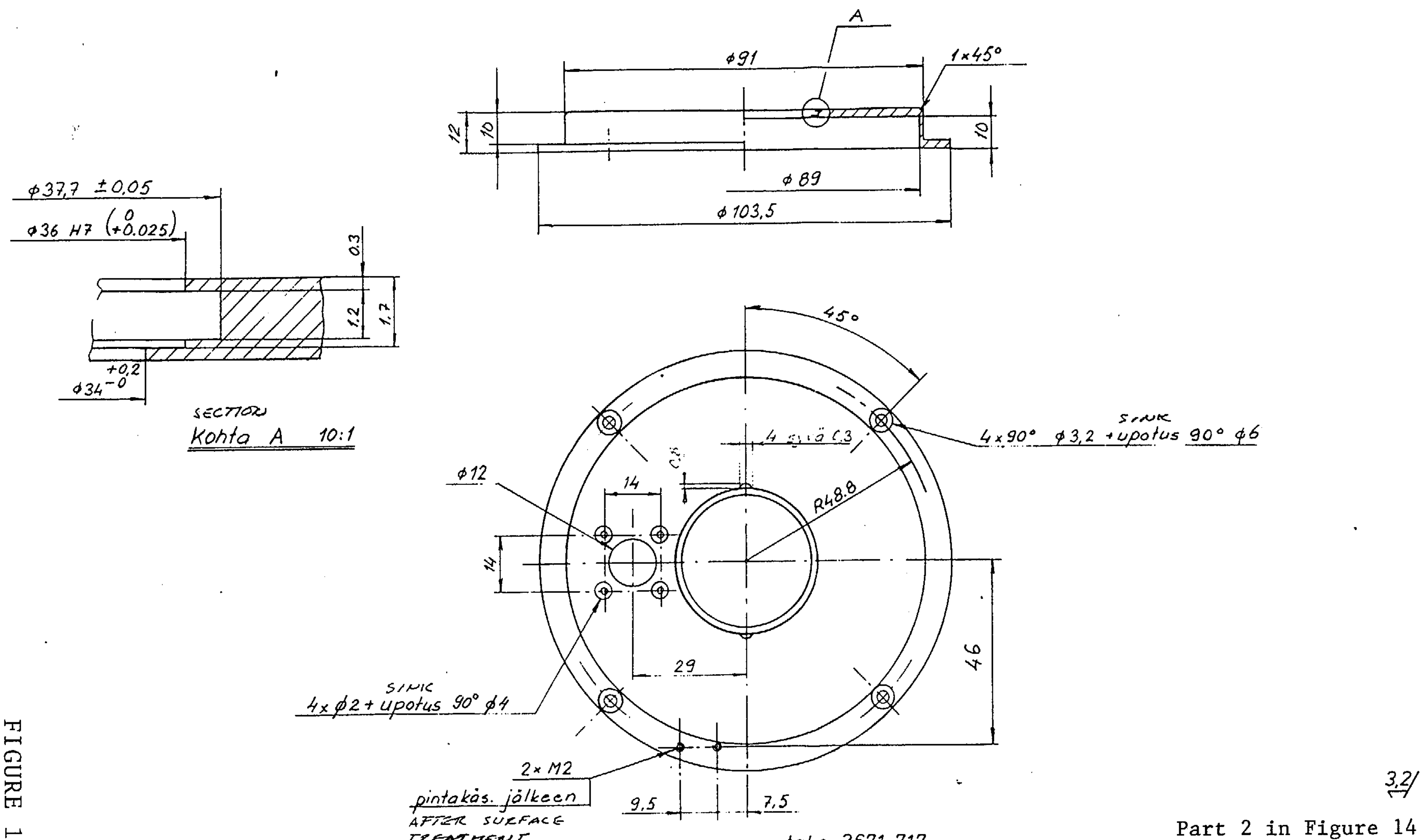


FIGURE 16

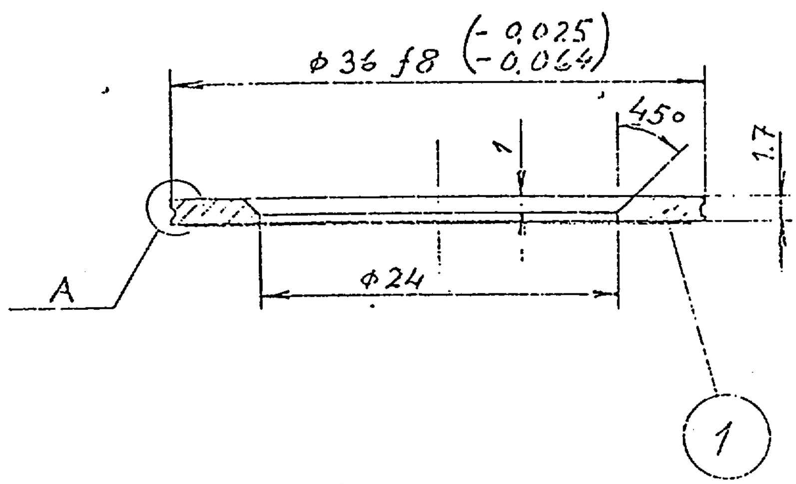
Part 2 in Figure 14

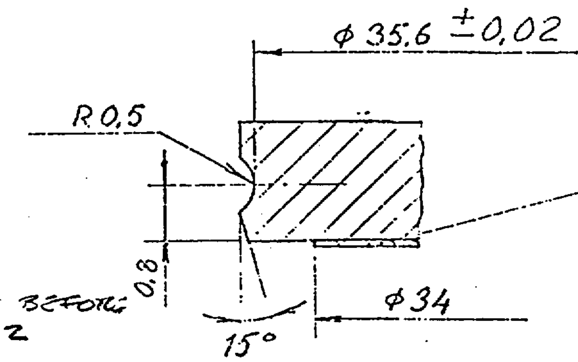
tako: 2671 717

Aine Material AL ROD Al-tanko ϕ110 eloks.	Yleistol. Tolerances FINE SFS 4011 hieno	Suunn. Design. 7904 VI-K	Piirt. Draftsm. 8003 alm
Pinta Surface	Pintak. Finish ANODIZED BLACK Anodisointi mu	Tark. Check. Jou / Kö	Hyv. App. JA
Suhde Scale 1:1 (10:1)	Liittyy Next Assy SUPS 0484	Osal.n:o Part list 3812 229 -40	
OUTOKUMPU OY ESPOO FINLAND	27.-4-2000 MOUNTING BASE Asennuslevy	80-11-24 Kö/ Ale 3812 245 — 3M	

Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki
8104	LV	Ale	CHANGED... SINK... Muutettu → 4×ϕ2+upotus 90° ϕ4		a

4		3	2		1
Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki





SEE GLUEING INSTRUCTION
katso liim.ohje
3812 260-4X

Figure 17

Part 4 in figure 14

SURFACE FINISH: ANODIZED BLACK BEFORE GLUEING PART 2

1. AL ROUND ROD...
2. MYLAR FOIL ...

AREA A
Kohta A 10:1

Pintakäsittely : Anodisointi musta ennen osa 2 liimausta

1. Al-pyörötanko 38mm eloks. tako: 3017 399
2. Mylar-kalvo 0,05mm tako: 2362 093

1981-02-10

Aine Material	Yleistol. Tolerances FINE SFS 4011 hieno	Suunn. Design. 7904 VI-K	Piirt. Drafstm. 8003 alm
Pinta Surface	Pintak. Finish	Tark. Check.	Hyv. App.
Suhde Scale 2:1 (10:1)	Liittyy Next Ass'y SUPS 0484	Osat n:o Part No. 3812 229 - 40	
OUTOKUMPU OY ESPOO FINLAND	Window ring / Ikkunarengas p32	80-11-24	3812 252 - 4MC

4	3	2	1		
Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki

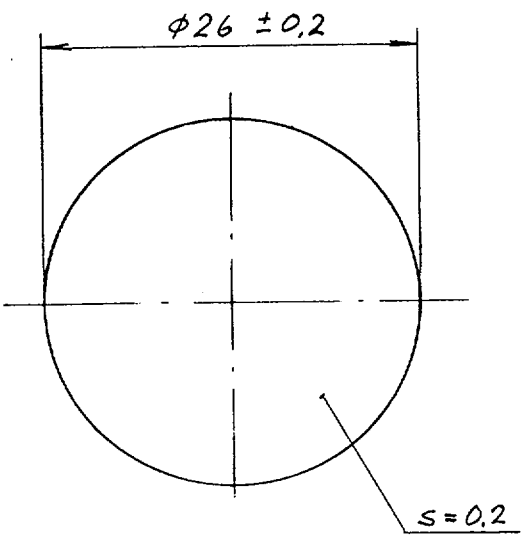


FIGURE 18

Part 5 in Figure 14

MATERIAL: CU PLATE...

Aine: Kuparilevy K1E-04 0,2mm 99,95% Tako: 2692 465

Aine Material: Cu-levy 0,2mm	Yleistol. Tolerances	Suunn. Design. 7904 VI-K	Piirt. Draftsm. 8002 alm
Pinta Surface	Pintak. Finish	Tark. Check. [illegible] /KO	Hyv. App. OK
Suhde Scale 2:1	Liittyy Next Assy HEPS 0482, SUPS 0484	Osal.n:o Part list	
OUTOKUMPU OY TAPIOLA FINLAND	REFERENCE PLATE CU	80-11-24 KÖ/ [illegible]	
	Säätöreferenssi Cu	3811 486 - 4M	

4		3	2	1	
Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki

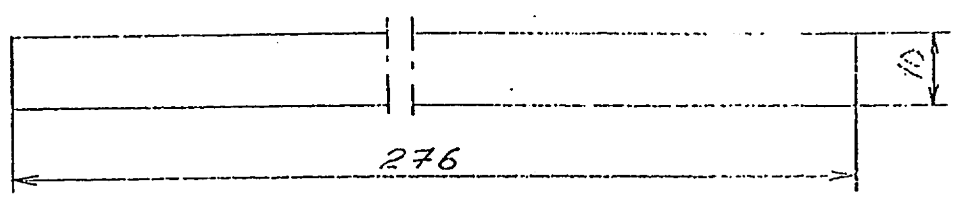


Figure 19

Part 6 in figure 14

1981 -02- 10

MATERIAL: LEAD PLATE...

Aine: Lyijylevy 1mm Tako: 1082 080

Aine Material: Lead plate 1mm	Yleistol. Toleranssi: SFS 4011-Keski	Suunn. Design.: 8006JOH	Piirt. Draftsm.: 8006SLM
Pinta Surface:	Pintak. Finish:	Tark. Check: [signature]	Hyv. App.: [signature]
Suhde Scale: 1:1	Liittyy Next assy: SUPS 0484, HEPS 0482	Osaluettelo Part list:	
OUTOKUMPU OY ESPOO FINLAND	Säteilysuojavaippa Radiation shield strip p34	80-11-24 [signature] 3812 823 - 4M	

4		3	2	1	
Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki

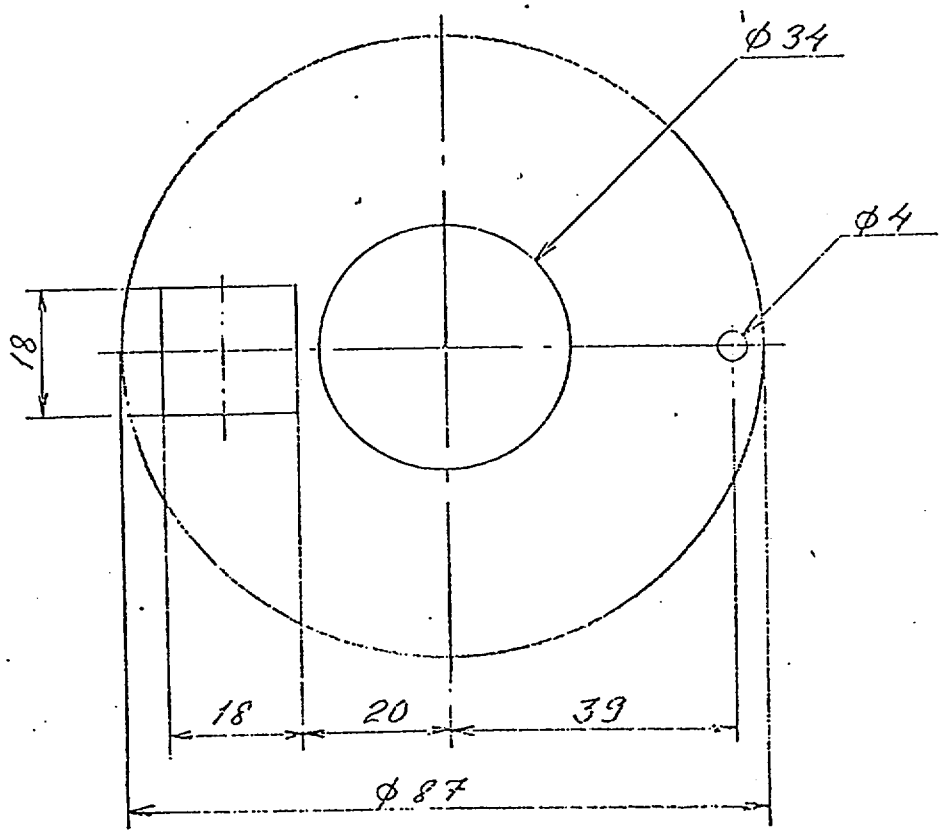


FIGURE 20

Part 7 in Figure 14

1981-02-19

MATERIAL: LEAD PLATE ...

Aine: Lyijylevy 0,5mm Tako: 3017 464

Aine Material	Standard, Tolerances	Suunn. Design.	Piirt. Draftsm.
Lead plate 0.5mm	SFS 4011-Keski	8006JOH	8006SLM
Pinta Surface	Postak. Finish	Tark. Check.	Hyv. Appr.
Suhde Scale 1:1	Liittyy Appl. Assy SUPS 0484, HEPS 0482	Osaluo Part No.	
OUTOKUMPU OY ESPOO FINLAND	Säteilysuojalevy / Radiation shield plate p35	80-11-24 1651/Ou	3812 815 - 4M

4	3	2	1		
Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki

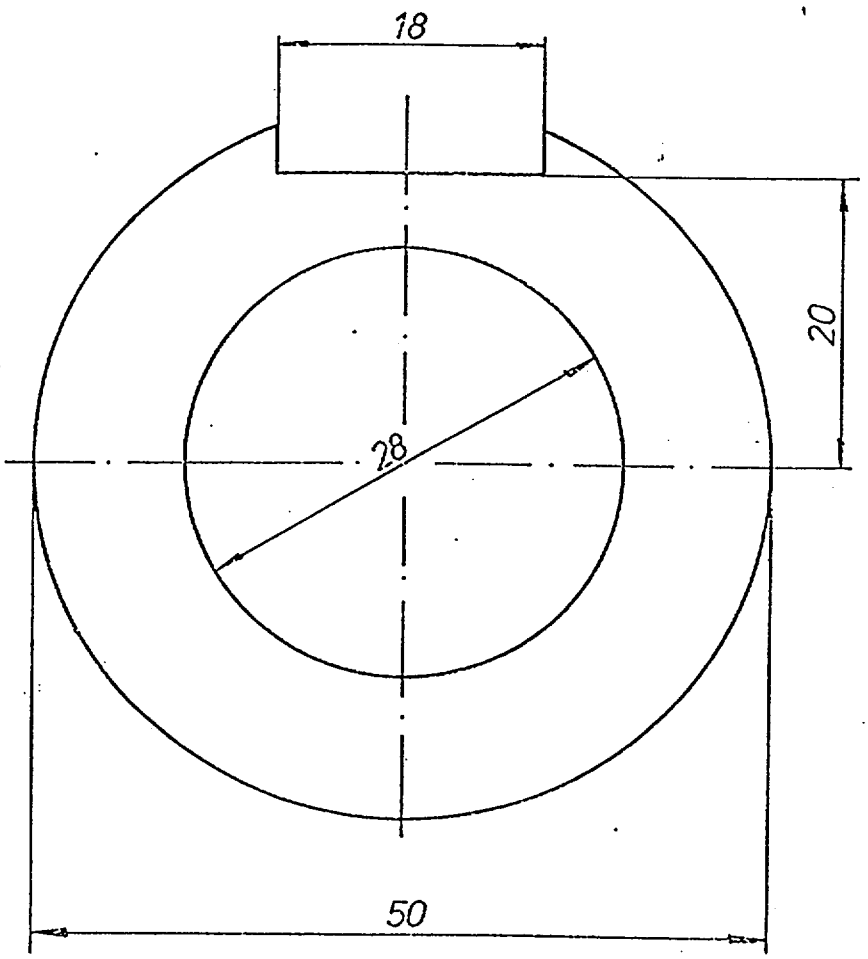


Figure 21

Part 13 in figure 14

Tako 2692 440

Ine Material: Al S=0,2	Yleistol. Tolerances: SFS 4011 Keski (MEDIUM)	Suunn. Design. 8210 JOH	Piirt. Drafsm. 8303 ikl
inta Surface	Pintok. Finish	Tark. Check. [illegible]	Hyv. App.
Suhde Scale 2:1	Liittyy Next Assy SUPS 0484	Osal.nro Part list 3812 229-40	
OUTOKUMPU OY ESPOO FINLAND	Rajoitin 2 Limiter 2		
	pg36 13.-4-1983	3865 052-4M	

4	3	2	1		
Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki

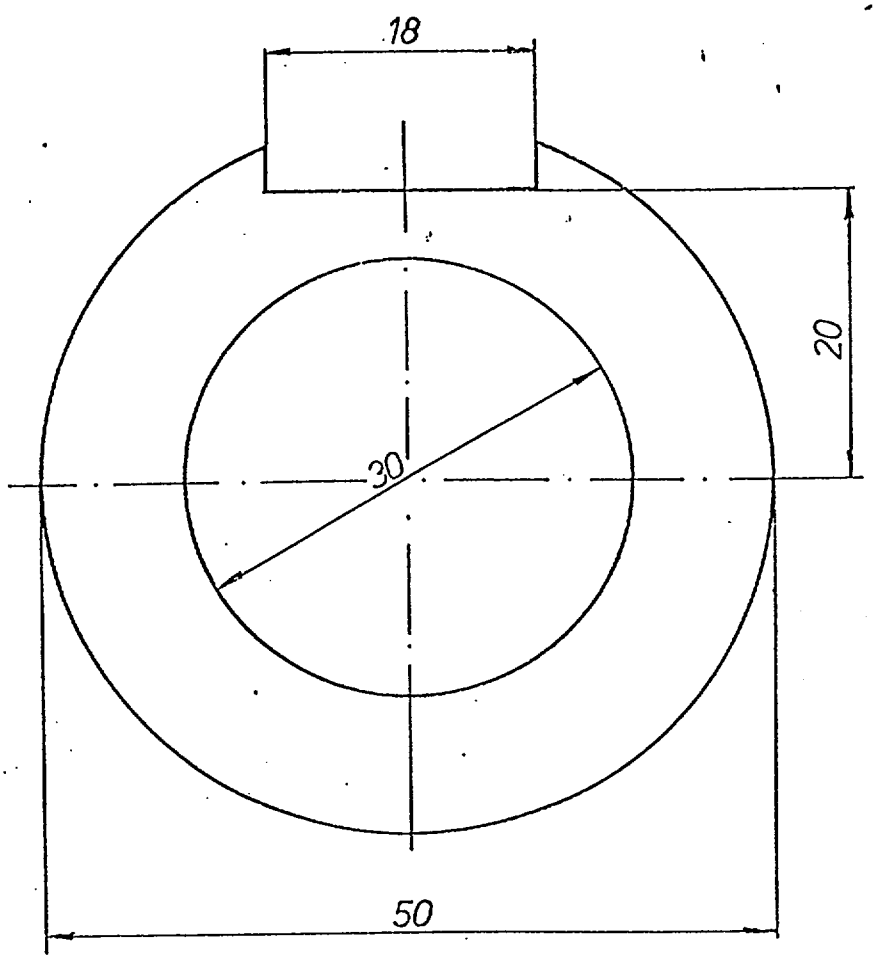


Figure 22

Part 14 in figure 14

Tako 3047 966

Aine Material: Fe S=0,075	Yleistol. Tolerances: MEDIUM SFS 4011 Keski	Suunn. Design.: 8210 JOH	Piirt. Draftsm.: 8303 ikl
Pinta Surface	Pintak. Finish	Tark. Check.: L03 Aa.	Hyv. App.
Suhde Scale: 2:1	Liittyy Next Assy: SUPS 0484	Osal.n:o Part list: 3812 229-40	
OUTOKUMPU OY ESPOO FINLAND	Rajoitin 1 Limiter 1		
	13.-4-1983	3865 045-4M	

4	3	2	1		
Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki
830608	ikl		Φ 26,2 on sisämitta INNER DIAMETER		
851018	alk		uran leveys oli 10 nyt 11		

GROOVE EARLIER 10, NOW 11

Leikkaus A-A

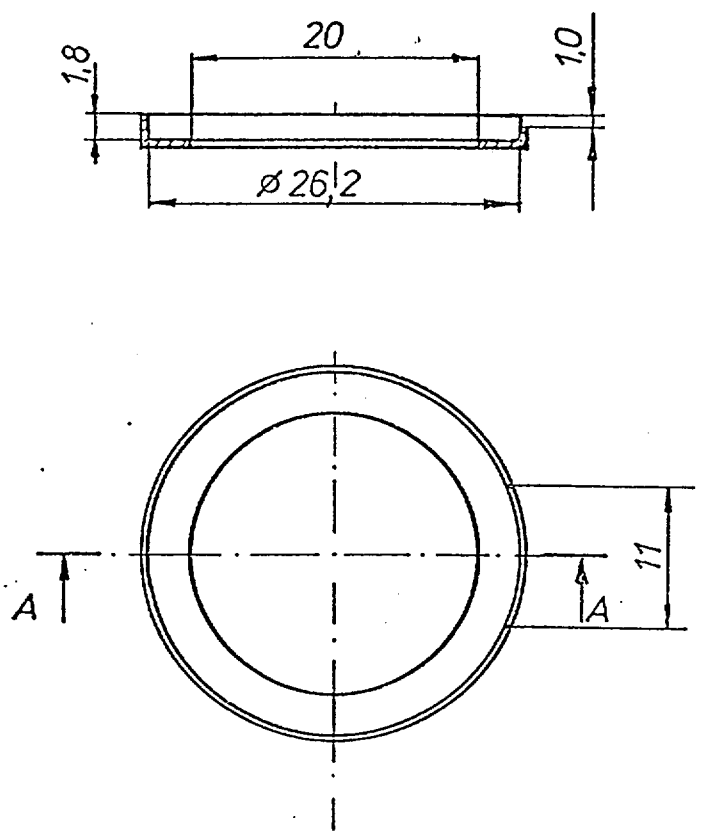


Figure 23

Part 15 in Figure 14

Tako 2683 878

Aine Material: Al 99,99 S=0.5	Yleistol. Tolerances FINE: SFS 4011 Hieno	Suunn. Design. 8212 JOH	Piirt. Draftsm. 8303 ikl
Pinta Surface	Pintak. Finish	Tark. Chock. 8303 alk	Hyv. App.
Suhde Scale 2:1	Liittyy Next Assy: HEPS 0482, SUPS 0484	Osat n:o Part list	
OUTOKUMPU OY ESPOO FINLAND	Rajoitin 3 Limiter 3		
	07.-[illegible]-1985	3865 060-4M	

Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki

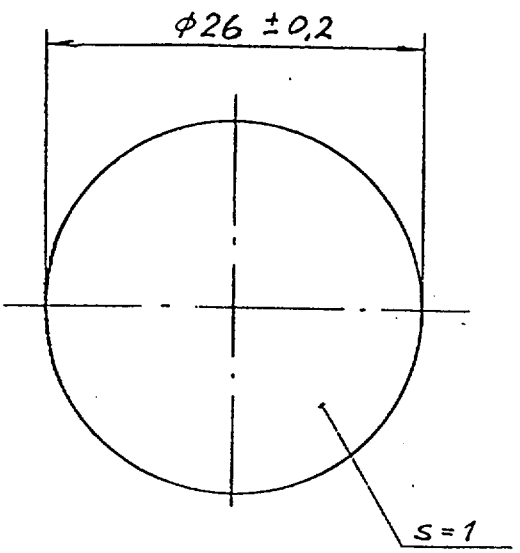


Figure 24

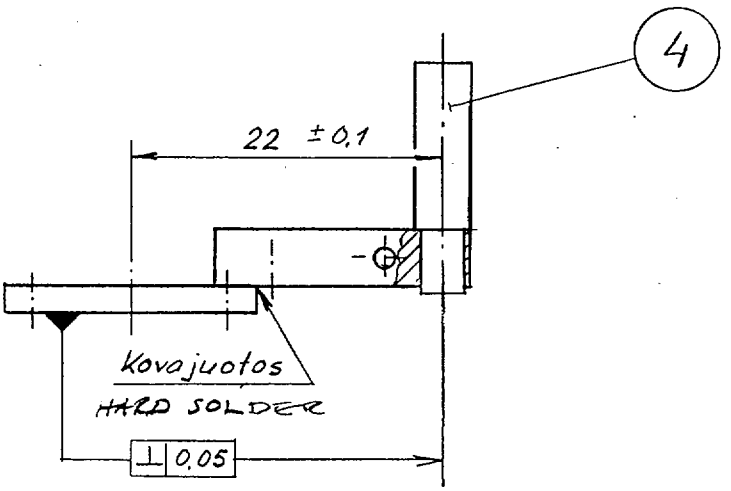
Part 16 in Figure 14

Lead plate 1mm

Aine Material: Lyijylevy 1mm	Yleistol. Tolerances	Suunn. Design. 7904 VI-K	Piirt. Draftsm. 8002 alm
Pinta Surface	Pintak. Finish	Tark. Check. Jaa 11/8	Hyv. App.
Suhde Scale 2:1	Liittyy Next Assy HEPS 0482, SUPS 0484	Osal.n:o Part list	
OUTOKUMPU OY TAPIOLA FINLAND	Radiation shield / Säteilysuoja p39	80-11-24 145/ah	3811 429 – 4M

4	3	2	1

Päivävs	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki



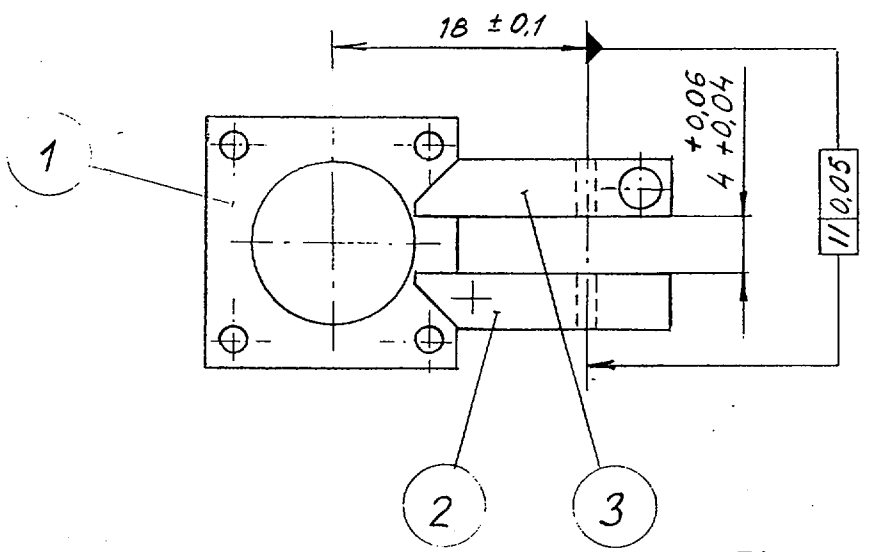


Figure 25

Part 1 in Figure 15

SURFACE : GRANULE BLASTED

Pintak.: Raepuhallus 45-5XLX

Ni 20µm

Aine Material	Yleistol. Tolerances	Suunn. Design. 7905 VI-K	Piirt. Drafstm. 8002 alm
Pinta Surface	Pintak. Finish	Tark. Check. Jan /Ko	Hyv. App.
Suhde Scale 2:1	Liittyy Next Assy X-met	Osal.n:o Part list	
OUTOKUMPU OY TAPIOLA FINLAND	27.-4-2000 SHUTTER FRAME	80-11-24 KÖ/	
	Suljinrunko	3811 122 - 4MO	

4	3	2	1		
Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki

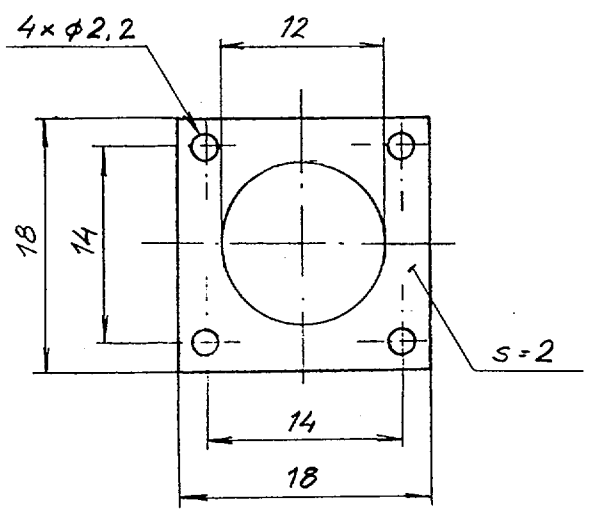


Figure 26

Part 1 in Figure 25

Tako 1243 427

Aine Material BRASS MS-levy 2mm	Yleistol. Tolerances SFS 4011 - MEDIUM keski	Suunn. Design. 7905 VI-k	Piirt. Drafstm. 8002 alm
Pinta Surface 3,2	Pintak. Finish	Tark. Check. Jaa /Kö	Hyv. App.
Suhde Scale 2:1	Liittyy Next Assy X-met	Osal.n:o Part list 3811 122 -4M0	
OUTOKUMPU OY TAPIOLA FINLAND	BASE	80-11-24 Kö/ale	
	Runko	3811 130 - 4M	

Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki

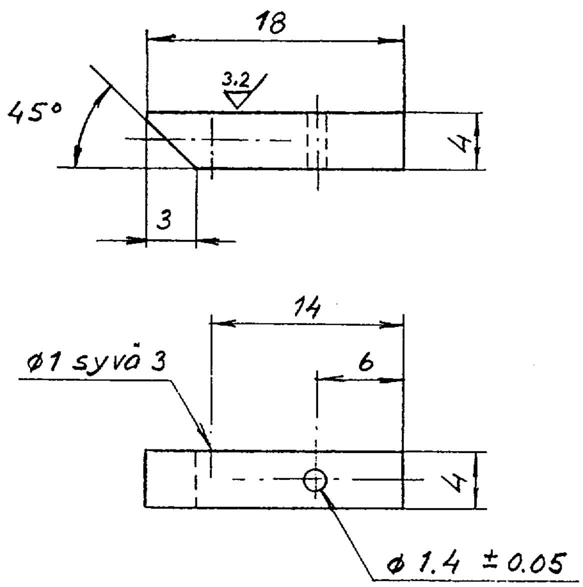


Figure 27

Part 2 in Figure 25

Tako 1329 960

Aine Material BRASS MS □-tanko 4mm	Yleistol. Tolerances MEDIUM SFS 4011 - keski	Suunn. Design. 7905 VI-K	Piirt. Drafstm. 8002 alm
Pinta Surface 3,2 (3,2)	Pintak. Finish	Tark. Check.	Hyv. App.
Suhde Scale 2:1	Liittyy Next Assy X-met	Osal.n:o Part list 3811 122 -4MO	
OUTOKUMPU OY TAPIOLA FINLAND	27 -4- 2000	80-11-24	
	Jalka 1 LEG 1	3811 148 - 4M	

4	3	2	1

Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki

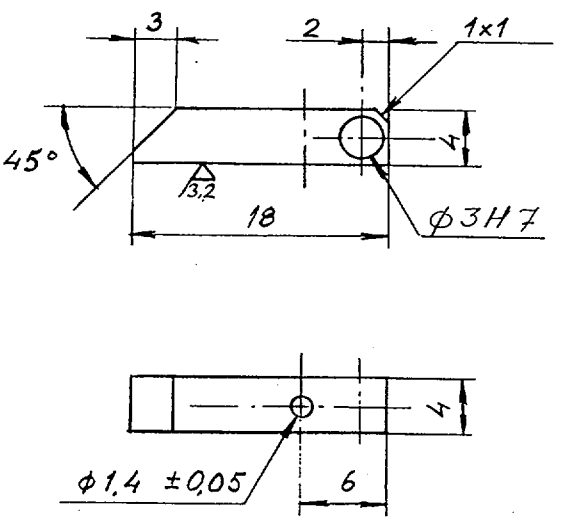
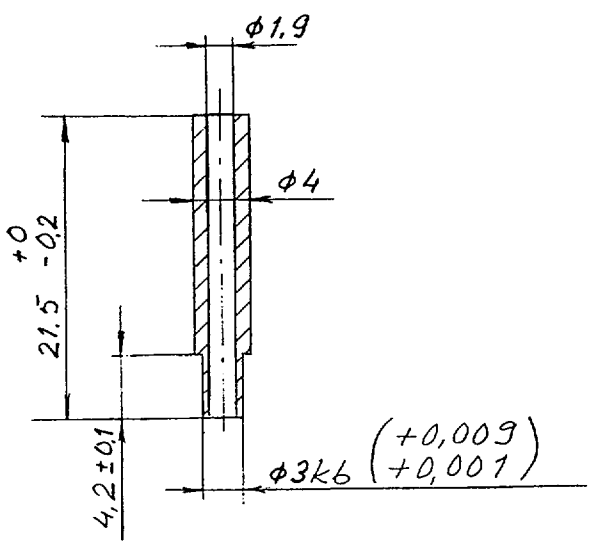


Figure 28
Part 3 in Figure 25

Tako 1329 960

Aine Material BRASS MS ☐-tanko 4mm	Yleistol. Tolerances SFS 4011 - keski	Suunn. Design. 7905 VI-K	Piirt. Drafstm. 8002 alm
Pinta Surface 3,2 (3,2)	Pintak. Finish	Tark. Check. Jan 1/Ko	Hyv. App.
Suhde Scale 2:1	Liittyy Next Assy X-met	Osal.n:o Part list 3811 122 - 4MO	
OUTOKUMPU OY TAPIOLA FINLAND	27.-4-2000	80-11-24 Kô/aa	
	Jalka 2 LEG 2	3811 155 - 4M	

4	3	2	1	
Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki



3,2

Figure 29

Part 4 in Figure 25

tako: 1329 853

Aine Material BRASS ROD Ms-tanko ϕ5	Yleistol. Tolerances MEDIUM SFS 4011 keski	Suunn. Design. 7904 VI-K	Piirt. Draftsm. 8002 alm
Pinta Surface	Pintak. Finish	Tark. Check. Jaa / Kö	Hyv. App.
Suhde Scale 2:1	Liittyy Next Assy X-met	Osal.n:o Part list 3811 122 - 4MO	
OUTOKUMPU OY TAPIOLA FINLAND	27-4-2000	80-11-24 Kö/aa	
	Holkki SLEEVE	3811 379 - 4M	

4	3	2	1

Päivävs	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki

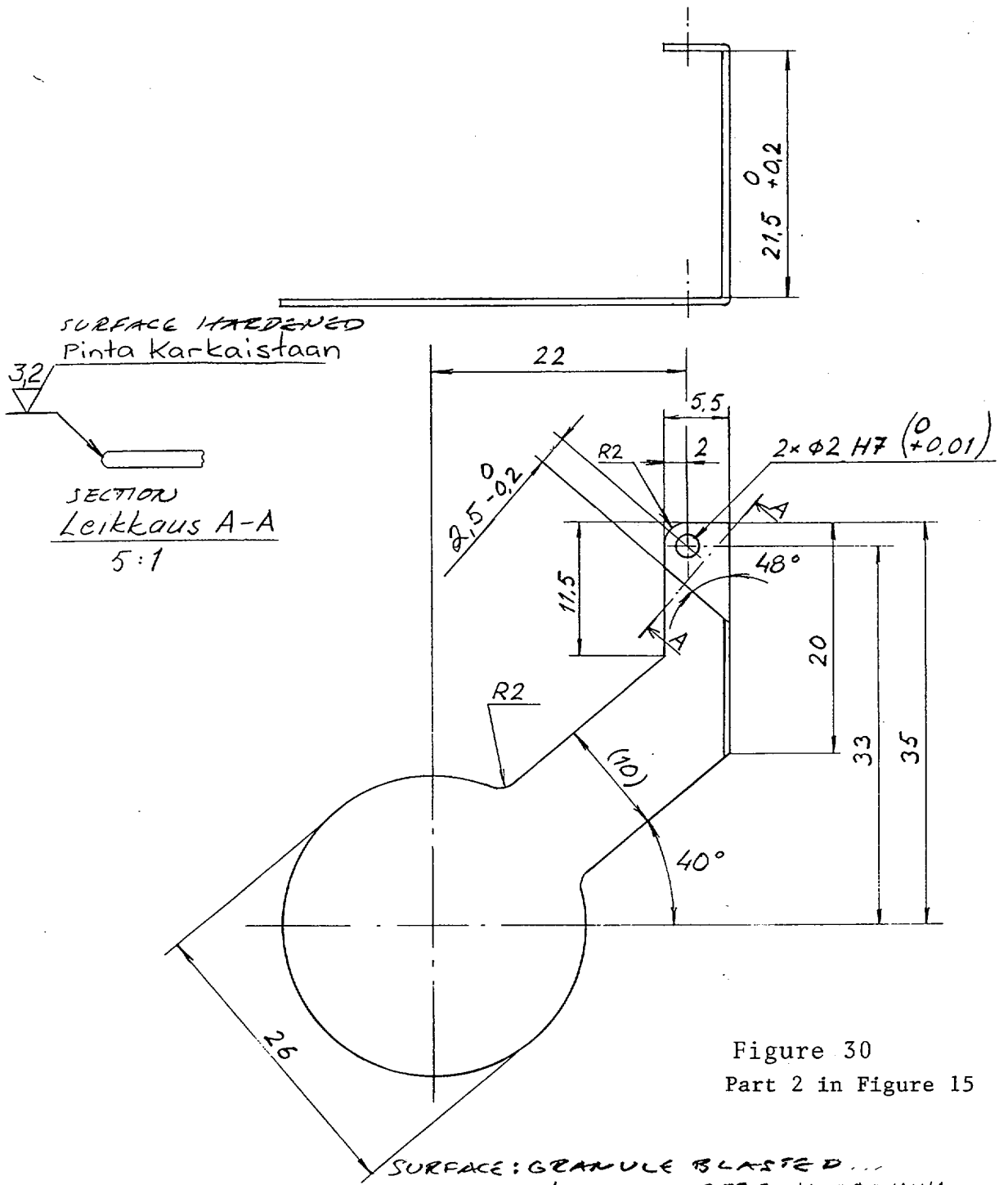


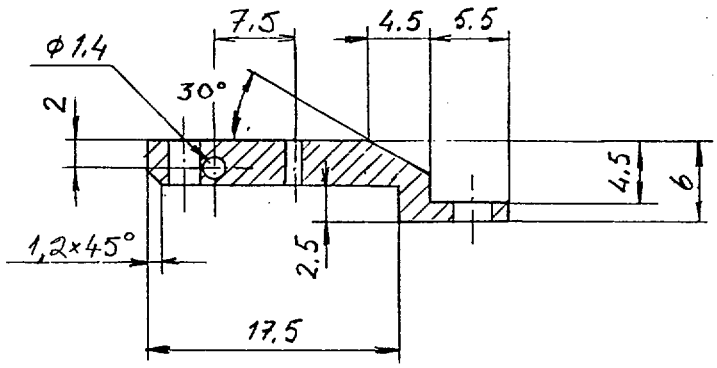
Figure 30
Part 2 in Figure 15

Pintak.: Raepuhallus 45-5XLX
Ni 20µm, karkaisun jälkeen

tako: 1020 304

Aine Material STEEL PLATE Levy 0,5mm Fe37	Yleistol. Tolerances MEDIUM SFS 4011 keski	Suunn. Design.	Piirt. Drafstm. 8003 alm
Pinta Surface	Pintak. Finish	Tark. Check. Jaal / KÖ	Hyv. App.
Suhde Scale 2:1(5:1)	Liittyy Next Assy HEPS 0482, SUPS 0484	Osal.n:o Part list 3811 338-40	
OUTOKUMPU OY TAPIOLA FINLAND	ABSORBER BASE PLATE	80-11-24 KÖ/ale	
	Peitesarana	3811 353 - 4M	

4	3	2	1		
Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki



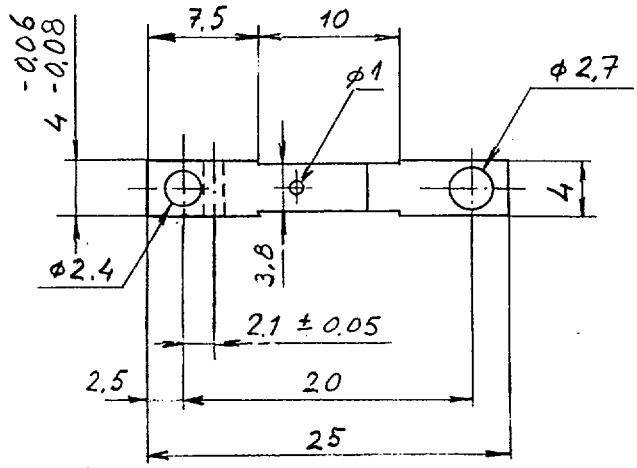


Figure 31

Part 3 in Figure 15

3,2

SURFACE: GRANULE BLASTED

Pintak.: Raepuhallus 45-5XLX

Ni 20µm

tako: 1243 468

Aine Material BRASS MS-levy 6mm	Yleistol. Tolerances SFS 4011 keski	Suunn. Design. 7904 VI-K	Piirt. Drafstm. 8002 alm
Pinta Surface	Pintak. Finish	Tark. Check. Jan Ilkö	Hyv. App.
Suhde Scale 2:1	Liittyy Next Assy X-met	Osal.n:o Part list	
OUTOKUMPU OY TAPIOLA FINLAND	27.-4-2000	80-11-24 Kö/ale	
	Vipuvarsi LEVER	3811 361 - 4M	

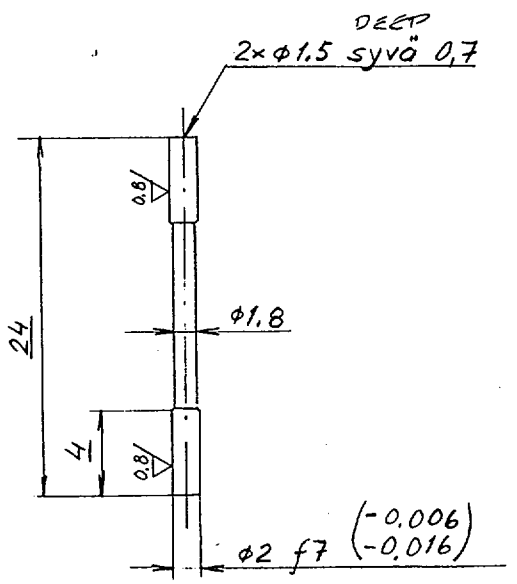
4	3	2	1		
Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki

D

C

B

A



6,3 (0,8)

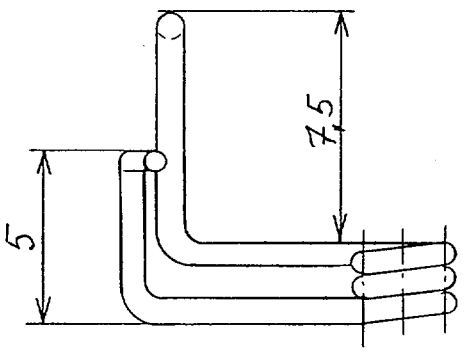
Figure 32
Part 5 in Figure 15

tako: 1530 807

Aine Material ROD... tanko φ2 Aisi 304	Yleistol. Tolerances SFS 4011 MEDIUM keski	Suunn. Design. 7904 VI-K	Piirt. Drafstm. 8002 alm
Pinta Surface	Pintak. Finish	Tark. Check. Jaa /Ko	Hyv. App.
Suhde Scale 2:1	Liittyy Next Assy X-met	Osal.n:o Part list	
OUTOKUMPU OY TAPIOLA FINLAND	27.-4-2000	80-11-24 Kõ/ala	
	Tappi PIN	3811 387 - 4M	

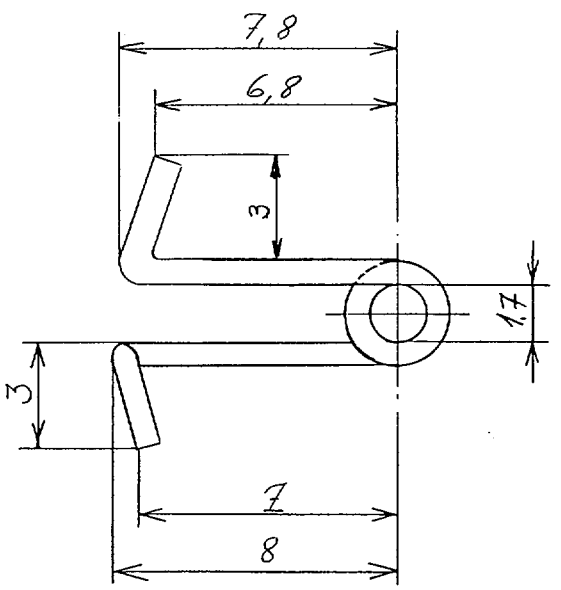
4	3	2	1

Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki



3 TURNS TO RIGHT

3 kierrosta oikealle



ALL RADII R1

kaikki säteet R1

Figure 33
Part 6 in Figure 15

MATERIAL: STAINLESS PIANO WIRE...

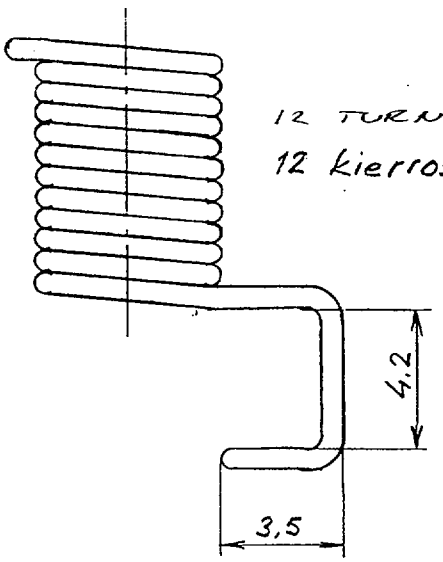
Aine: Ruostumaton pianolanka Φ0,6mm

Aine Material	Yleistol. Tolerances ROUGH SFS 4011-Karkea	Suunn. Design. 8004VI-K	Piirt. Drafstm. 8004SLM
Pinta Surface	Pintak. Finish	Tark. Check. Jan Ilkö	Hyv. App.
Suhde Scale 5:1	Liittyy Next Assy X-Met	Osal.n:o Part list	
OUTOKUMPU OY ESPOO FINLAND	Jousi 1 27.-4-2000 SPRING 1	80-11-24 IKÖ/aa	3811 395 - 4M

0,16

4	3	2	1		
Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki
9.09	RM		Taivutuskulma muutettu 90° -> 45°		a

BENDING ANGLE CHANGED ...



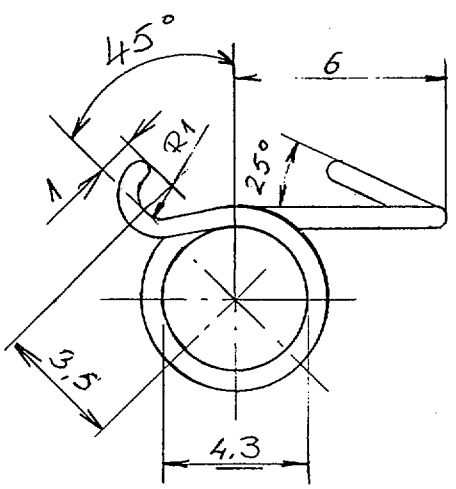


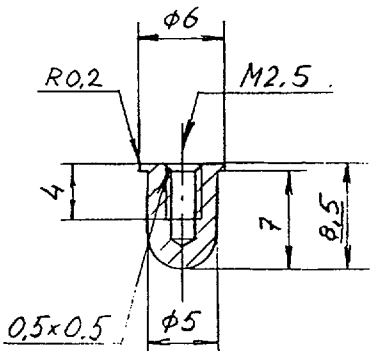
Figure 34
Part 7 in Figure 15

MATERIAL: STAINLESS PIANO WIRE ...
Aine: Ruostumaton pianolanka ϕ 0,6 mm

Aine Material	Yleistol. Tolerances ROUGH SFS 4011 karkea	Suunn. Design. 7904 VI-K	Piirt. Drafstm. 8002 alm
Pinta Surface	Pintak. Finish	Tark. Check. Jan /Ko	Hyv. App.
Suhde Scale 5 : 1	Liittyy Next Assy X-met	Osal.n:o Part list	
OUTOKUMPU OY TAPIOLA FINLAND	27. - 4 - 2000	80-11-24 KÖ/ak	
	Jousi 2 SPRING 2	3811 403 - 4M	

Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki
830322	ikl	olv	Pituusmitta muuttunut 7,5→8,5		
8905	IJ	Jä	M2,6 → M2,5		

LENGTH CHANGED ...



3,2

Figure 35
Part 8 in Figure 15

tako: 2131 464

Aine Material: tanko ϕ6 Aisi 304 (R00)	Yleistol. Tolerances: SFS 4011 - keski (MEDIUM)	Suunn. Design. 7701 JOH	Piirt. Drafstm. 8002 alm
Pinta Surface	Pintak. Finish	Tark. Check. Jaa / Ko	Hyv. App.
Suhde Scale 2:1	Liittyy Next Assy SUPS 0484	Osal.n:o Part list 3811 411 - 40	
OUTOKUMPU OY TAPIOLA FINLAND	27. - 4 - 2000	80-11-24 Kõ/ale	
	Nuppi KNOB	3811 411 - 4M	

4	3	2	1	
Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki

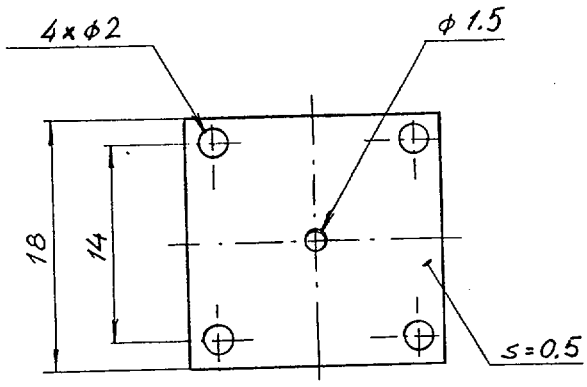


Figure 36
Part 9 in Figure 15

Tako: 2692 481

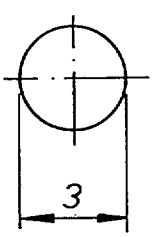
Aine Material SILICON RUBBER Silikonikumi s=0,5	Yleistol. Tolerances SFS 4011 MEDIUM keski	Suunn. Design. 8002 JOH	Piirt. Drafstm. 8002 alm
Pinta Surface	Pintak. Finish	Tark. Check. Jaa IKO	Hyv. App.
Suhde Scale 2:1	Liittyy Next Assy X-met	Osal.n:o Part list	
OUTOKUMPU OY TAPIOLA FINLAND	27.-4-2000 Tiiviste SEAL	80-11-24 IKÖ/Ale 3811 510 - 4M	

4	3	2	1

Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki

D

C



B

Figure 37
Part 10 in Figure 15

A

MATERIAL : SILICON RUBBER PLATE ...

Aine: Silikonikumilevy 0,5mm tako 2692 481

Aine Material	Yleistol. Tolerances SFS 4011 - Karkea ROUGH	Suunn. Design. 8010 JOH	Piirt. Drafstm. 8010 RM
Pinta Surface	Pintak. Finish	Tark. Check. JOH / KS	Hyv. App. PT
Suhde Scale 5:1	Liittyy Next Assy X-MET	Osat.n:o Part list	
OUTOKUMPU OY ESPOO FINLAND	27. - 4 - 2000	80-11-2416 / ak	
	Vaimennin 1 DAMPER 1	3811 528 - 4M	

4	3	2	1		
Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki

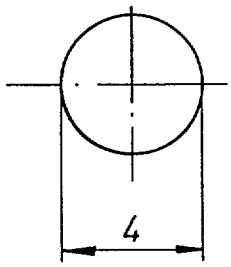


Figure 38

Part 11 in Figure 15

MATERIAL: RUBBER PLATE ...

Aine: Kumilevy BBX 1mm Tako 1999 572

Aine Material	Yleistol. Tolerances ROUGH SFS 4011-Karkea	Suunn. Design. 8010 JOH	Piirt. Drafstm. 8010 RM
Pinta Surface	Pintak. Finish	Tark. Check. Jaa IKö	Hyv. App.
Suhde Scale 5:1	Liittyy Next Assy X-MET	Osal.n:o Part list	
OUTOKUMPU OY ESPOO FINLAND	27.-4-2000	80-11-24 KÖ/aa	
	Vaimennin 2 DAMPER 2	3811 536-4M	

4	3	2	1		
Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki

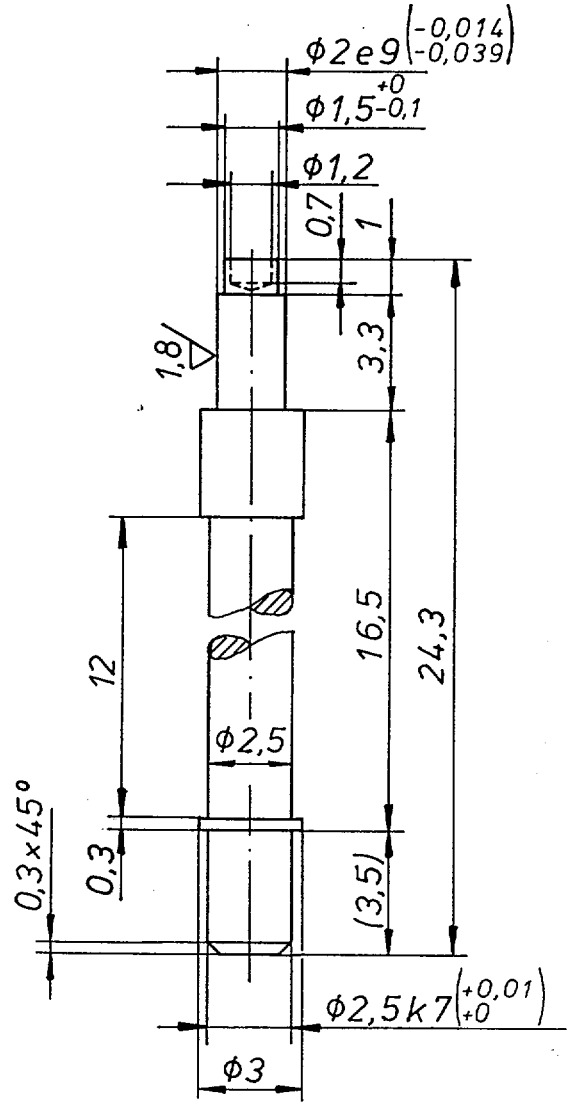


Figure 39
Part 14 in Figure 15

3,2/ (1,8/)

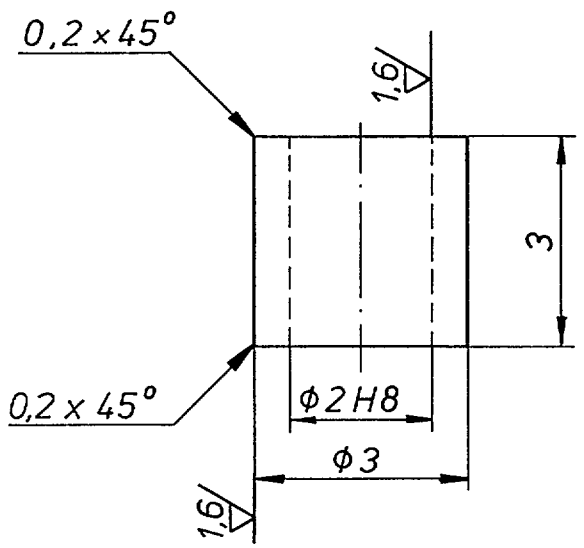
MATERIAL: STEEL ROD...
Aine: Pyöröteräs 1.4301 3mm Tako 2997 492

Aine Material	Yleistol. Tolerances MEDIUM SFS 4011 - Keski	Suunn. Design. 8010 JOH	Piirt. Drafstm. 8010 RM
Pinta Surface	Pintak. Finish	Tark. Check. Jan / KÖ	Hyv. App. JA
Suhde Scale 5:1	Liittyy Next Assy SUPS, HEPS, LEPS	Osal.n:o Part list	
OUTOKUMPU OY ESPOO FINLAND	27-4-200[illegible]	80-11-24 KÖ/ale	
	Varsi AXIS	3813 490 - 4M	

4	3	2	1

Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki
8107	LV	31-07 KR	Raaka-aine muutettu		
9209	RM		Pintamerkit muutettu, oli 1,8		9

MATERIAL CHANGED
SURFACE FINISH CHANGED, WAS 1,8



3,2/ (1,6/)

Figure 40
Part 17 in Figure 15

MATERIAL: STEEL ROD...
Aine: Pyöröteräs 3mm Tako 3039 815

Aine Material	Yleistol. Tolerances SFS 4011 - Keski	Suunn. Design. 8010 JOH	Piirt. Draftm. 8010 RM
Pinta Surface	Pintak. Finish	Tark. Check. Jaa / Kö	Hyv. App. JA
Suhde Scale 10:1	Liittyy Next Assy	Osal.n:o Part list	
OUTOKUMPU OY ESPOO FINLAND	27.-4-2000	80-11-24 Kö/ale	
	Rulla ROLL	3813 508-4M	

4	3	2	1		
Päiväys	Muuttaja	Tarkastaja	Muutos	Lukumäärä	Merkki

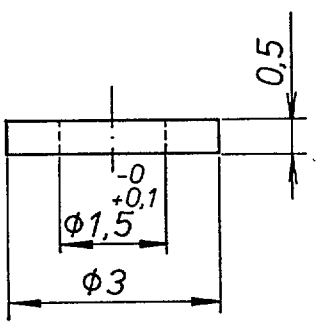


Figure 41
Part 18 in Figure 15

MATERIAL: BRASS SHEET ...

Aine: Levy MS63-04 (10-K) 0,5mm Tako 1243 377

Aine Material	Yleistol. Tolerances SFS 4011-Keski	Suunn. Design. 8010 JOH	Piirt. Drafstm. 8010 RM
Pinta Surface	Pintak. Finish	Tark. Check. Jaa /Kö	Hyv. App.
Suhde Scale 10:1	Liittyy Next Assy SUPS, HEPS, LEPS	Osal.n:o Part list	
OUTOKUMPU OY ESPOO FINLAND	27-4-2000 LOCK RING	80-11-24 Kö/ak	
	Pidätin rengas	3813 482 - 4M	

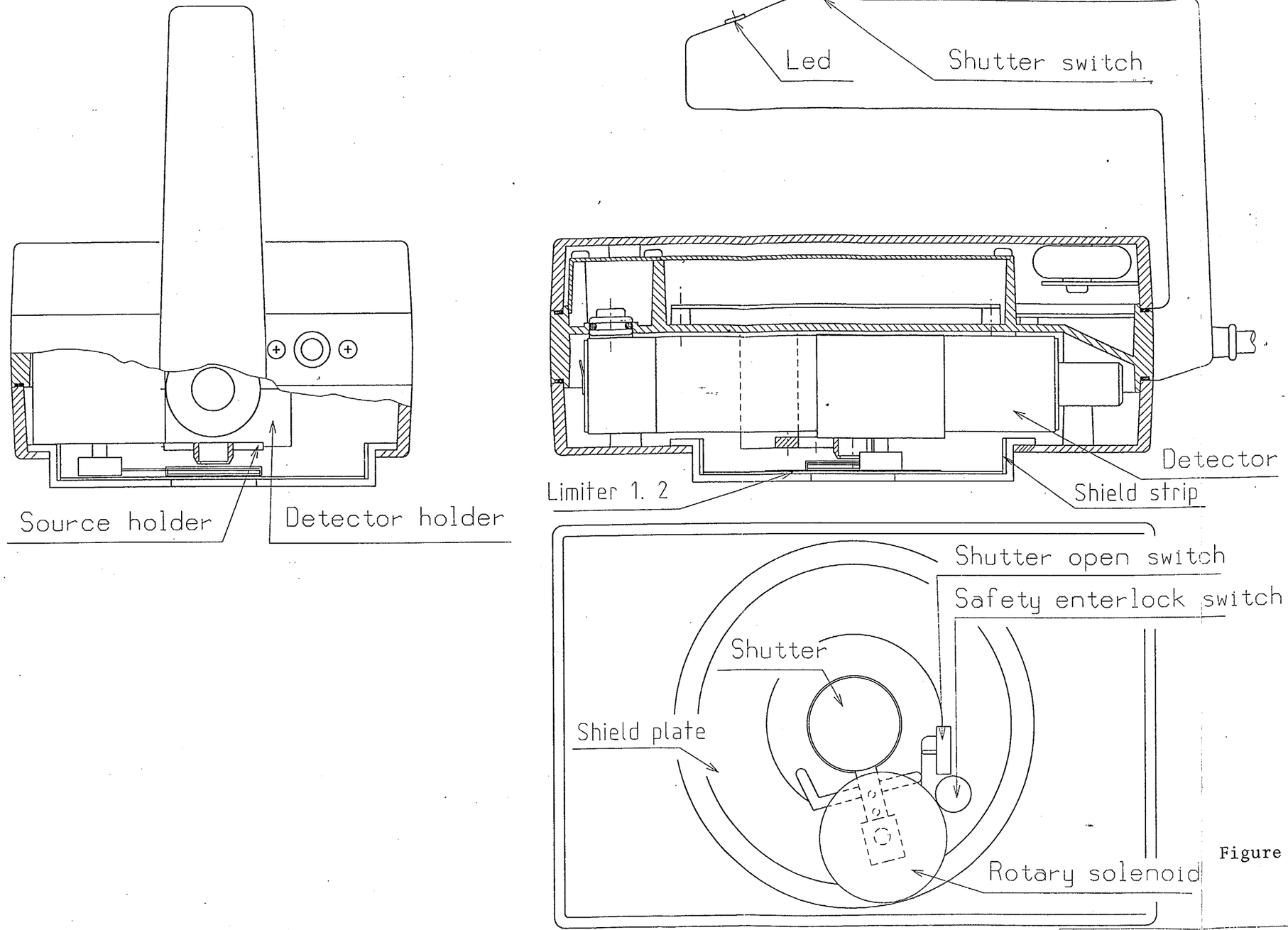
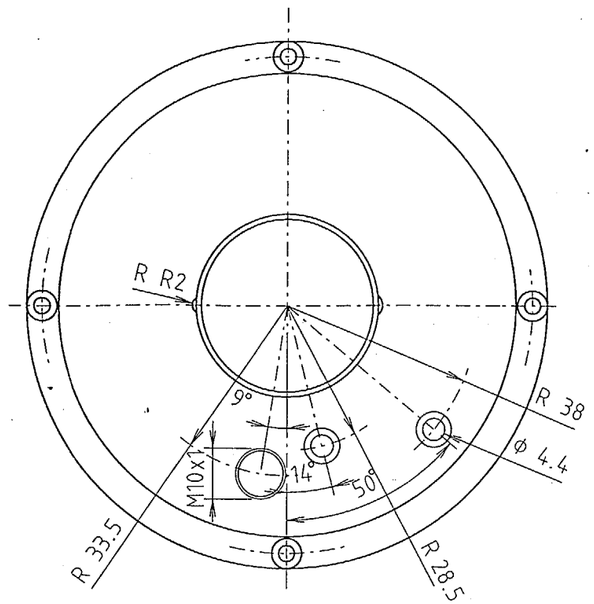
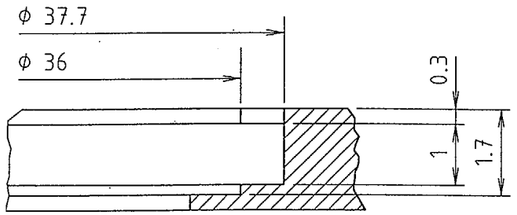

Led
Shutter switch
Source holder
Detector holder
Limiter 1. 2
Detector
Shield strip
Shutter open switch
Safety enterlock switch
Shutter
Shield plate
Rotary solenoid

Figure 42





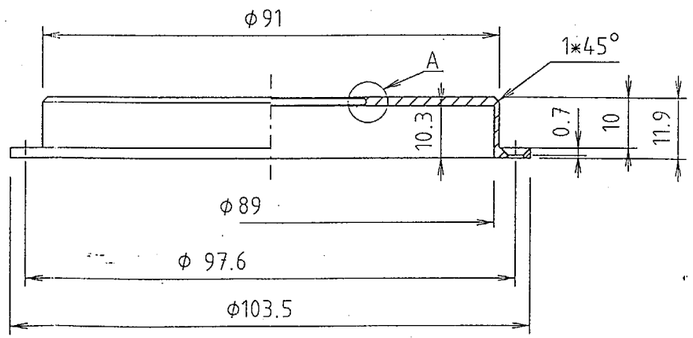


Figure 43.

REV.	MUUTOKSET REVISIONS	PVM DATE	PIIRT. DRAWN	HYV. APPR.

Aluminium alloy 606.1T6

OSA ITEM: OSAN NIMI, MITAT, MITTASTO., AINE, AINESTO. DESCRIPTION

PIIR.NO TAKO CODE

KPL QTY

YLEISTOLERANSSI TOLERANCE

SUUNN DESIGNED

PIIRT. DRAWN

TARK. CHECKED

HYV. APPROVED

SUHDE SCALE 1:1 (10:1)

LIITTYY NEXT ASSY SUPS 2476

TUOTE PRODUCT

OSALNO PART LIST 4100357-40

REV. 01

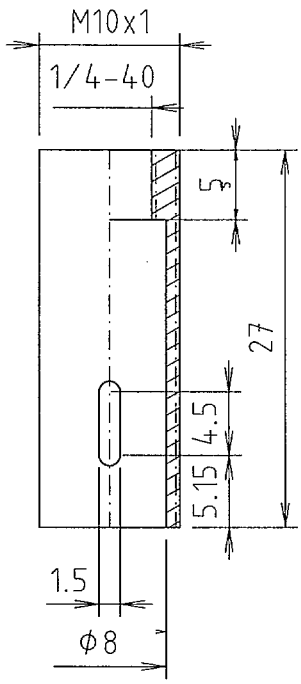
PIIR.N O CODE 4102 287-4M

Metorex

Mounting base

4	3	2	1

REV.	MUUTOKSET REVISIONS	PVM DATE	PIIRT. DRAWN	HYV. APPR.



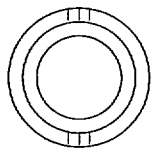


Figure 44

	Brass		
OSA ITEM	OSAN NIMI, MITAT, MITTASTD., AINE, AINESTD. DESCRIPTION	PIIR.N:O TAKO CODE	KPL QTY

YLEISTOLERANSSI TOLERANCES	SUUNN. DESIGNED	PIIRT. DRAWN
SUHDE SCALE 2:1	TARK. CHECKED	HYV. APPROVED
LIITTYY NEXT ASSY SUPS 2476	TUOTE PRODUCT	
Metorex	OSAL.N:O PART LIST 4100357-40	REV. 01
Push sleeve	PIIR.N:O CODE 4102 282-4M	

4	3	2	1

REV.	MUUTOKSET REVISIONS	PVM DATE	PIIRT. DRAWN	HYV. APPR.

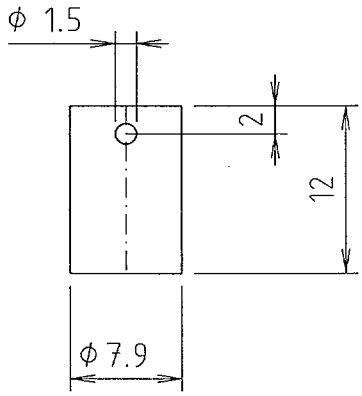


Figure 45

	Brass		
OSA ITEM	OSAN NIMI, MITAT, MITTASTO., AINE, AINESTO. DESCRIPTION	PIIR.N:O TAKO CODE	KPL QTY

YLEISTOLERANSSI TOLERANCES		SUUNN. DESIGNED	PIIRT. DRAWN
SUHDE SCALE 2:1	LIITTYY NEXT ASSY SUPS 2476	TARK. CHECKED	HYV. APPROVED
		TUOTE PRODUCT	
Metorex	Push pin	OSAL.N:O PART LIST 4100357-40	REV. 01
		PIIR.N:O CODE 4102 285-4M	

4	3	2	1

REV.	MUUTOKSET REVISIONS	PVM DATE	PIIRT. DRAWN	HYV. APPR.

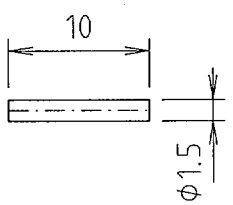


Figure 46

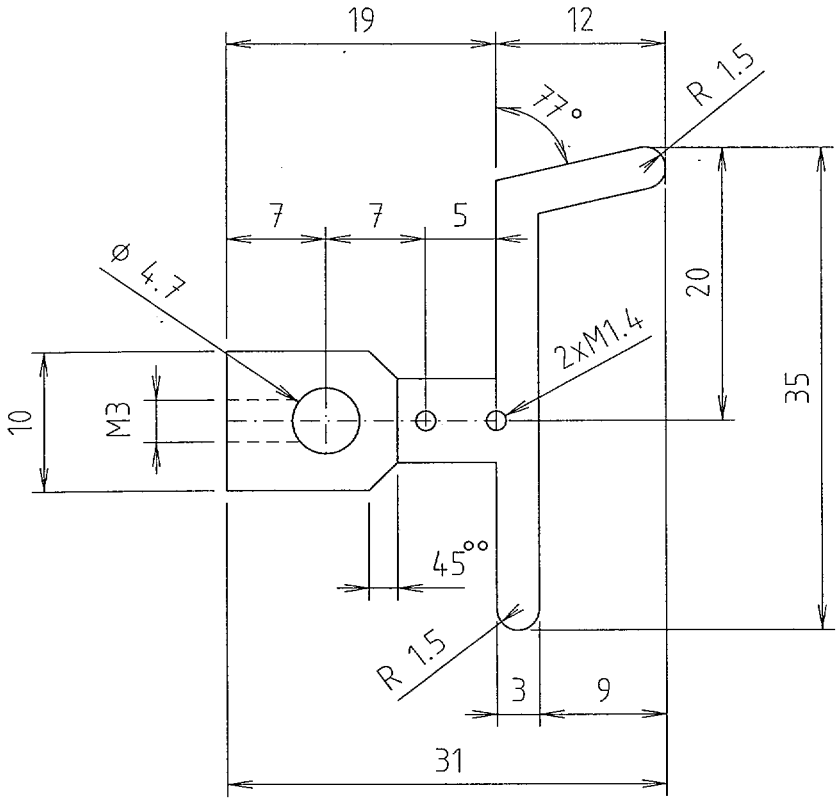
	Brass		
OSA ITEM	OSAN NIMI, MITAT, MITTASTD., AINE, AINESTD. DESCRIPTION	PIIR.N:O TAKO CODE	KPL QTY

YLEISTOLERANSSI TOLERANCES	SUUNN. DESIGNED	PIIRT. DRAWN
	TARK. CHECKED	HYV. APPROVED

SUHDE SCALE	LIITTYY NEXT ASSY	TUOTE PRODUCT	
2:1	SUPS 2476	OSAL.N:O PART LIST 4100357-40	REV. 01
Metorex	Lock pin	PIIR.N:O CODE 4102 206-4M	

4	3	2	1

REV.	MUUTOKSET REVISIONS	PVM DATE	PIIRT. DRAWN	HYV. APPR.



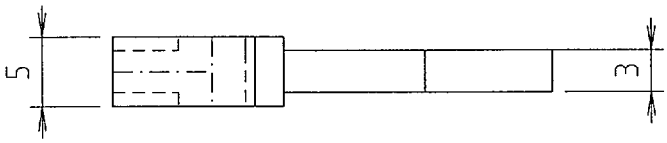


Figure 47

	Aluminium alloy 6061T6		
OSA ITEM	OSAN NIMI, MITAT, MITTASTD., AINE, AINESTD. DESCRIPTION	PIIR.N:O TAKO CODE	KPL QTY

YLEISTOLERANSSI TOLERANCES		SUUNN. DESIGNED	PIIRT. DRAWN
SUHDE SCALE 2:1	LIITTYY NEXT ASSY SUPS 2476	TARK. CHECKED	HYV. APPROVED
		TUOTE PRODUCT	
Metorex	Lever	OSAL.N:O PART LIST 4100357	REV. 01
		PIIR.N:O CODE 4102 280-4M	

4	3	2	1

REV.	MUUTOKSET REVISIONS	PVM DATE	PIIRT. DRAWN	HYV. APPR.

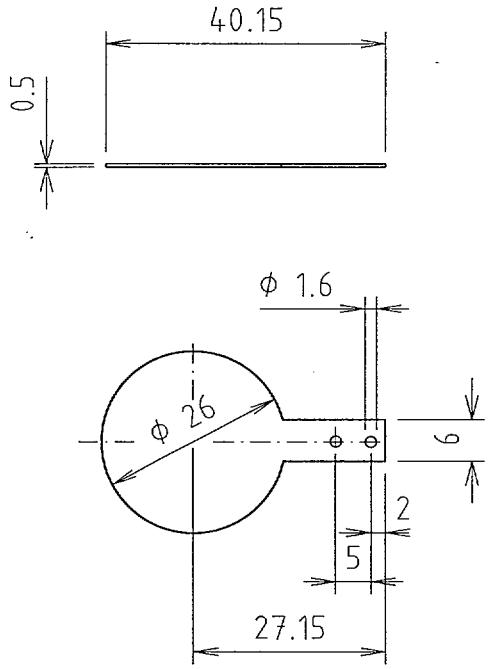


Figure 48

	SS 316 0.5mm		
OSA ITEM	OSAN NIMI, MITAT, MITTASTD., AINE, AINESTO. DESCRIPTION	PIIR.N:O TAKO CODE	KPL QTY

YLEISTOLERANSSI TOLERANCES	SUUNN. DESIGNED	PIIRT. DRAWN
SUHDE SCALE 1:1	TARK. CHECKED	HYV. APPROVED
LIITTYY NEXT ASSY SUPS 2476	TUOTE PRODUCT	
Metorex Absorber base plate	OSAL.N:O PART LIST 4100357-40	REV. 01
	PIIR.N:O CODE 4102 279-4M	

4	3	2	1

REV.	MUUTOKSET REVISIONS	PVM DATE	PIIRT. DRAWN	HYV. APPR.

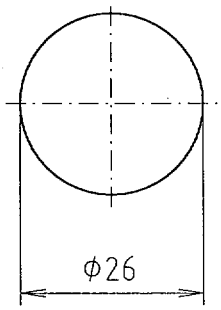


Figure 49

OSA ITEM	OSAN NIMI, MITAT, MITTASTD., AINE, AINESTD. DESCRIPTION	PIIR.N:O TAKO CODE	KPL QTY
	Lead 99.0 % pure 1mm		

YLEISTOLERANSSI TOLERANCES	SUUNN. DESIGNED	PIIRT. DRAWN
	TARK. CHECKED	HYV. APPROVED

SUHDE SCALE	LIITTYY NEXT ASSY	TUOTE PRODUCT	
1:1	SUPS 2476		
Metorex	Shutter assembly Radiation shield	OSAL.N:O PART LIST 4100357-40	REV. 01
		PIIR.N:O CODE 4102 278-4M	

4	3	2	1

REV.	MUUTOKSET REVISIONS	PVM DATE	PIIRT. DRAWN	HYV. APPR.

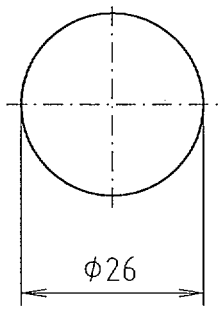


Figure 50

OSA ITEM	OSAN NIMI, MITAT, MITTASTO., AINE, AINESTO. DESCRIPTION	PIIR.N:O TAKO CODE	KPL QTY
	Copper 99.99 % 0.5mm		

YLEISTOLERANSSI TOLERANCES	SUUNN. DESIGNED	PIIRT. DRAWN
	TARK. CHECKED	HYV. APPROVED

SUHDE SCALE	LIITTYY NEXT ASSY	TUOTE PRODUCT
1:1	SUPS 2476	

Metorex	Shutter assembly Gain reference	OSAL.N:O PART LIST 4100357-40	REV. 01
		PIIR.N:O CODE 4102 277-4M	

4	3	2	1

REV.	MUUTOKSET REVISIONS	PVM DATE	PIIRT. DRAWN	HYV. APPR.

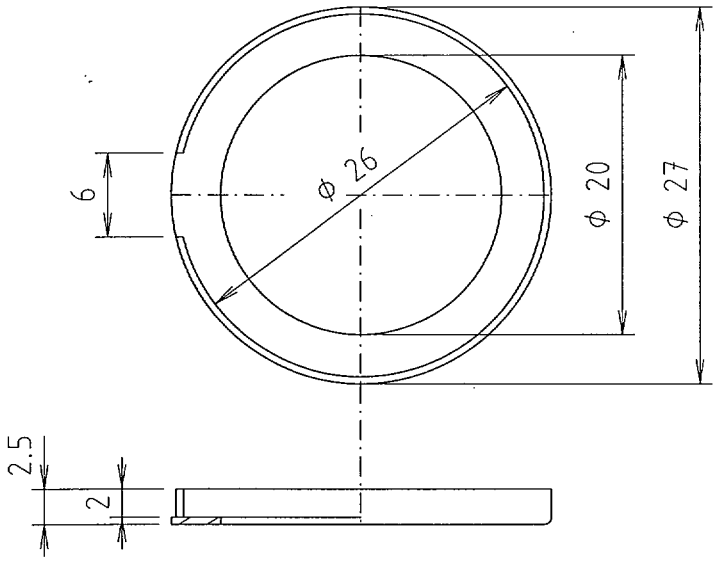


Figure 51

	Aluminium 99.99 % pure		
OSA ITEM	OSAN NIMI, MITAT, MITTASTD., AINE, AINESTD. DESCRIPTION	PIIR.N:O TAKO CODE	KPL QTY

YLEISTOLERANSSI TOLERANCES	SUUNN. DESIGNED	PIIRT. DRAWN
SUHDE SCALE 2:1	TARK. CHECKED	HYV. APPROVED
LIITTYY NEXT ASSY SUPS 2476	TUOTE PRODUCT	
Metorex Mounting ring	OSAL.N:O PART LIST 4100357-40	REV. 01
	PIIR.N:O CODE 4102 281-40	

4	3	2	1

REV.	MUUTOKSET REVISIONS	PVM DATE	PIIRT. DRAWN	HYV. APPR.

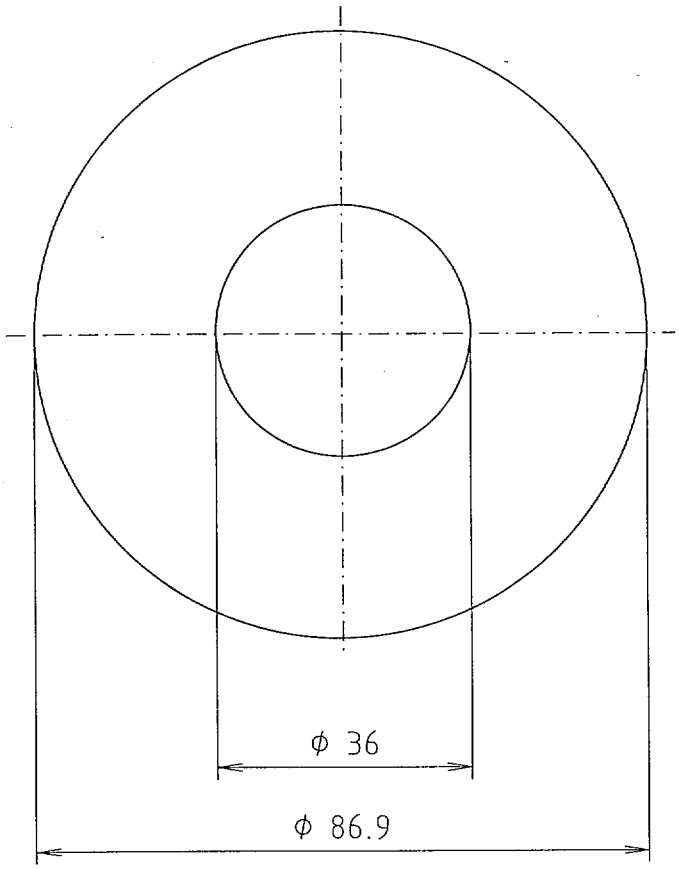


Figure 52

	Lead 0.7mm		
OSA ITEM	OSAN NIMI, MITAT, MITTASTD., AINE, AINESTD. DESCRIPTION	PIIR.N:O TAKO CODE	KPL QTY

YLEISTOLERANSSI TOLERANCES	SUUNN. DESIGNED	PIIRT. DRAWN
SUHDE SCALE 1:1	TARK. CHECKED	HYV. APPROVED
LIITTYY NEXT ASSY SUPS 2476	TUOTE PRODUCT	
Metorex Shield plate	OSAL.N:O PART LIST 4100357-40	REV. 01
	PIIR.N:O CODE 4102 276-4M	

4	3	2	1

REV.	MUUTOKSET REVISIONS	PVM DATE	PIIRT. DRAWN	HYV. APPR.

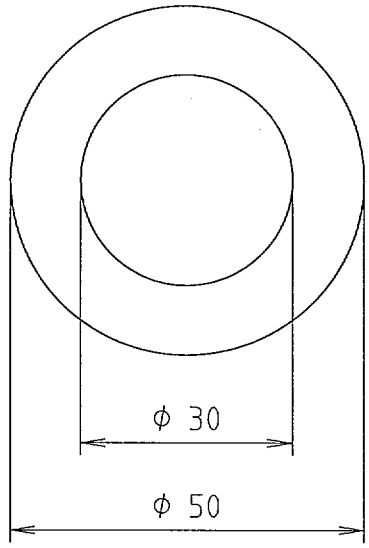


Figure 53

	99.95 % iron 0.05mm		
OSA ITEM	OSAN NIMI, MITAT, MITTASTO., AINE, AINESTO. DESCRIPTION	PIIR.N:O TAKO CODE	KPL QTY

YLEISTOLERANSSI TOLERANCES		SUUNN. DESIGNED	PIIRT. DRAWN
SUHDE SCALE 1:1	LIITTYY NEXT ASSY SUPS 2476	TARK. CHECKED	HYV. APPROVED
		TUOTE PRODUCT	
Metorex	Limiter 1	OSAL.N:O PART LIST 4100357-40	REV. 01
		PIIR.N:O CODE 4102 274-4M	

4	3	2	1

REV.	MUUTOKSET REVISIONS	PVM DATE	PIIRT. DRAWN	HYV. APPR.

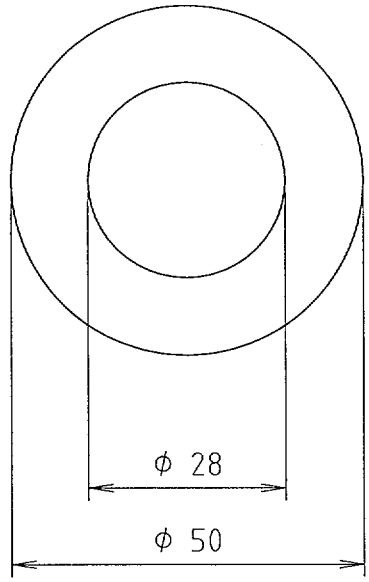


Figure 54

	99.95 % aluminium 0.25mm		
OSA ITEM	OSAN NIMI, MITAT, MITTASTD., AINE, AINESTO. DESCRIPTION	PIIR.N:O TAKO CODE	KPL QTY

YLEISTOLERANSSI TOLERANCES		SUUNN. DESIGNED	PIIRT. DRAWN
SUHDE SCALE 1:1	LIITTYY NEXT ASSY SUPS 2476	TARK. CHECKED	HYV. APPROVED
		TUOTE PRODUCT	
Metorex	Limiter 2	OSAL.N:O PART LIST 4100357-40	REV. 01
		PIIR.N:O CODE 4102 275-4M	

4	3	2	1

REV.	MUUTOKSET REVISIONS	PVM DATE	PIIRT. DRAWN	HYV. APPR.

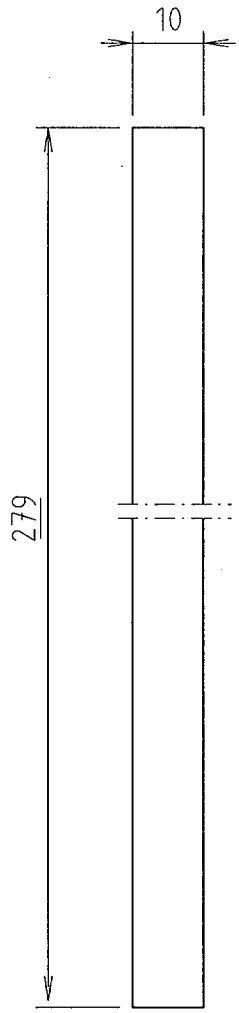


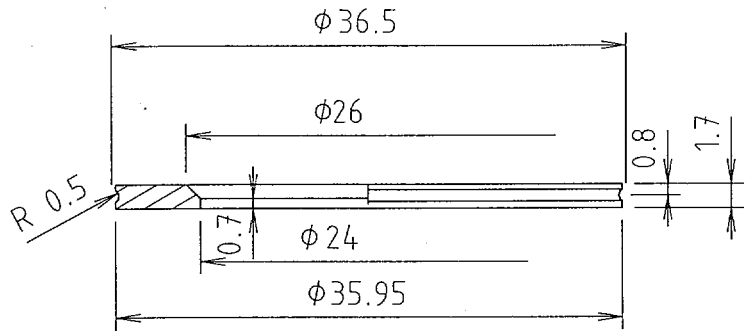
Figure 55

OSA ITEM	OSAN NIMI, MITAT, MITTASTO., AINE, AINESTO. DESCRIPTION	PIIR.N:O TAKO CODE	KPL QTY
	Lead 1mm		

YLEISTOLERANSSI TOLERANCES		SUUNN. DESIGNED	PIIRT. DRAWN
SUHDE SCALE 1:1	LIITTYY NEXT ASSY SUPS 2476	TARK. CHECKED	HYV. APPROVED
		TUOTE PRODUCT	
Metorex	Shield strip	OSAL.N:O PART LIST 4100357-40	REV. 01
		PIIR.N:O CODE 4102 284-4M	

4	3	2	1

REV.	MUUTOKSET REVISIONS	PVM DATE	PIIRT. DRAWN	HYV. APPR.



Black anodized

Figure 56

	Aluminium alloy 6061T6		
OSA ITEM	OSAN NIMI, MITAT, MITTASTD., AINE, AINESTD. DESCRIPTION	PIIR.N:O TAKO CODE	KPL QTY

YLEISTOLERANSSI TOLERANCES		SUUNN. DESIGNED	PIIRT. DRAWN
SUHDE SCALE 2:1	LIITTYY NEXT ASSY SUPS 2476	TARK. CHECKED	HYV. APPROVED
		TUOTE PRODUCT	
Metorex	Aperture	OSAL.N:O PART LIST 4100357-40	REV. 01
		PIIR.N:O CODE 4102 283-4M	

D C B A

May 5, 2000

RADIATION PROFILES AROUND THE SUPS PROBE

The radiation profiles were measured using the following two sources

- Am241 :1110 MBq, s/n 9887LX, made by Amersham International plc
- Cm244 :2220 Mbq, s/n 3506LM, made by Amersham International plc

The monitor that was used to measure the radiations was a series 900 mini monitor made by Mini-Instruments, s/n 027999, probe 42B having a 47 mg/cm2 thick Be window and NaI scintillation crystal of size 23mm dia by 1mm thick. It detects gamma radiation down to 4-5 keV.

The instrument was originally calibrated in 1993 against a SmartION, Model 2100, s/n 002144 made by Mini-Instruments Ltd, England. (This instrument is owned by the Finnish Radiation and Nuclear Authority, earlier called the Finnish Centre for Radiation and Nuclear Safety, and it was calibrated in the same year at Winfrith NACRAC Laboratory, the calibration certificate number is 06934297.) Detector is of ion chamber type, window is aluminized polyester with total density of 7 mg/cm2, in front of the window a slide of density 1000 mg/cm2. Response curves given from 10 keV upwards.

The calibration measurements were made so that 2 Am241 sources of different activity, 2 Cm244 sources of different activity, 2 Cd109 sources of different activity, 1 Fe55 source and 1 Cs137 source were used. Dose rates were measured with both instruments at the same different distances from the sources using either aluminium or stainless steel plates of different thicknesses as absorbers or no absorber at all. The absorbers were used both to get different dose rates at the same distances and to take into account the effect of the hardening of nonmonoenergetic radiation passing through absorbers. Thus it was possible to get reasonably good estimates for dose rates under various conditions using the above fairly simple monitor. After the described calibration the condition of the monitor has been checked once a year based on known radiation sources and the same absorbers as above. The readings of the monitor have remained constant to better than +/- 15%. The latest check was made in February 1999.

Measurements of the radiation profiles

Count rates were measured in two perpendicular planes at distances of 5, 10 and 30 cm from either the probe window or the closest accessible surface in the directions shown in figure 57, p78 using each of the 2 sources. Readings were taken with the shutter closed and next shutter open and a 2.5 mm thick stainless steel sample present in the normal sample positions. In directions F and H the maximum readings were looked for even that the angle or the location might have deviated from the

nominal one. In some directions and especially close to the probe even small differences in the measuring position may change the reading by 10-20%.

In all the measurements the probe and the monitor were about 35 cm above the table surface in horizontal position so that there was air between the probe and monitor. Thus scattering from the table and and other surroundings was minimized.

The results are given in the following tables. In the tables "not applicable" means that the dose rate would have indicated only the properties of the sample, not the probe.

The following correspondence between the readings and dose rates are used:

Maximum reading of 5000 c/s corresponds to the following superficial dose rates :

Source	Dose rate
Am241	.28 mrem/h
Cm244	0.8 mrem/h

The value taken for Cm244 may in some cases be too high, but because it is difficult to evaluate what the originally heteroenergetic spectrum might look like after various scattering phenomena, a conservative estimate has been chosen. At least it should not underestimate the dose rates. (If there were nothing but air between the source and the monitor, the value would be 15).

PROBE 0484

Am241 source; plane I: dose rate in mrem/h

Direction	Shutter closed			Shutter open / Steel sample		
	5cm	10cm	30cm	5cm	10cm	30cm
A	.003	<.002	<.002	.006	.003	<.002
B	.045	.011	.002			
C	.45*	.11	.014	not applicable		
D	.045	.011	.002			
E	.003	<.002	<.002	.009	.005	<.002
F	.003	<.002	<.002	.017	.011	.004
G	.006	.003	<.002	.022	.011	.003
H	.003	<.002	<.002	.014	.006	.003

Am241 source; plane II: dose rate in mrem/h

Direction	Shutter closed			Shutter open / Steel sample		
	5cm	10cm	30cm	5cm	10cm	30cm
A	.005	.003	<.002	.014	.008	<.002
B	.028	.008	<.002			
C	.45*	.11	.014	not applicable		
D	.055	.017	.002			
E	.006	.003	<.002	.022	.011	.003
F	.16	.067	.014	.017	.011	.022
G	.005	.002	<.002	.014	.011	.003
H	.11	.067	.014	.084	.034	.008

*) the value is extrapolated

Cm244 source; plane I: dose rate in mrem/h

Direction	Shutter closed			Shutter open / Steel sample		
	5cm	10cm	30cm	5cm	10cm	30cm
A	.015	.005	.002	.015	.005	.002
B	.050	.015	.003			
C	.080	.030	.005	not applicable		
D	.050	.015	.003			
E	.015	.005	.002	.015	.005	.002
F	.040	.015	.002	.030	.010	.005
G	.055	.025	.010	.050	.025	.005
H	.015	.010	.002	.015	.010	.002

Cm244 source; plane II: dose rate in mrem/h

Direction	Shutter closed			Shutter open / Steel sample		
	5cm	10cm	30cm	5cm	10cm	30cm
A	.015	.010	.003	.015	.010	.003
B	.050	.015	.003			
C	.080	.030	.005	not applicable		
D	.050	.015	.003			
E	.015	.010	.003	.015	.010	.003
F	.080	.040	.010	.080	.040	.010
G	.050	.030	.005	.050	.030	.005
H	.080	.040	.010	.080	.040	.010

PROBE 2476

Am241 source; plane I: dose rate in mrem/h

Direction	Shutter closed			Shutter open / Steel sample		
	5cm	10cm	30cm	5cm	10cm	30cm
A	.003	<.002	<.002	.003	.003	<.002
B	.085	.017	<.002			
C	.28	.075	.010	not applicable		
D	.085	.011	<.002			
E	.003	<.002	<.002	.005	.003	<.002
F	.040	.017	.008	.022	.008	<.002
G	.006	.003	<.002	.017	.011	<.002
H	.03	.011	.006	.028	.017	.003

Am241 source; plane II: dose rate in mrem/h

Direction	Shutter closed			Shutter open / Steel sample		
	5cm	10cm	30cm	5cm	10cm	30cm
A	.011	.006	<.002	.011	.008	<.002
B	.085	.017	<.002			
C	.28	.073	.010	not applicable		
D	.085	.0017	.03			
E	.055	.028	.002	.028	.011	.006
F	.11	.056	.011	.17	.084	.017
G	.006	.003	<.002	.017	.011	<.002
H	.067	.035	.006	.084	.034	.008

Cm244 source; plane I: dose rate in mrem/h

Direction	Shutter closed			Shutter open / Steel sample		
	5cm	10cm	30cm	5cm	10cm	30cm
A	.013	.011	.003	.025	.015	.003
B	.050	.020	.003			
C	.080	.030	.005	not applicable		
D	.050	.020	.003			
E	.025	.011	.002	.020	.010	.002
F	.040	.025	.02	.015	.008	.005
G	.055	.032	.006	.055	.032	.006
H	.013	.010	.003	.032	.020	.003

Cm244 source; plane II: dose rate in mrem/h

Direction	Shutter closed			Shutter open / Steel sample		
	5cm	10cm	30cm	5cm	10cm	30cm
A	.032	.024	.003	.040	.016	.003
B	.055	.020	.003			
C	.080	.030	.005	not applicable		
D	.055	.020	.003			
E	.055	.024	.003	.040	.024	.005
F	.065	.032	.006	.065	.032	.008
G	.055	.032	.006	.055	.032	.006
H	.055	.024	.005	.055	.032	.006

Dose rates in the primary radiation field

The radiation in front of unshielded sources were not measured in this connection, but because if the shutter is opened and there is no sample at the window, the source is in practice on the surface of the probe without any shield. This situation has been met in earlier tests and the results can be taken from them. The following values were measured by the Finnish Radiation and Nuclear Authority in 1994. Dose rates are given in mrem/hr (uSv/h).

Radiation source	Distance from the surface of the probe			
	5cm	10cm	30cm	100cm
Am241; 30 mCi (1110 MBq)	66 (660)	29 (290)	5 (50)	.5 (5)
Cm244; 60 mCi (2200 MBq)	155.0 (1550)	50 (500)	7.5 (75)	1.0 (10)

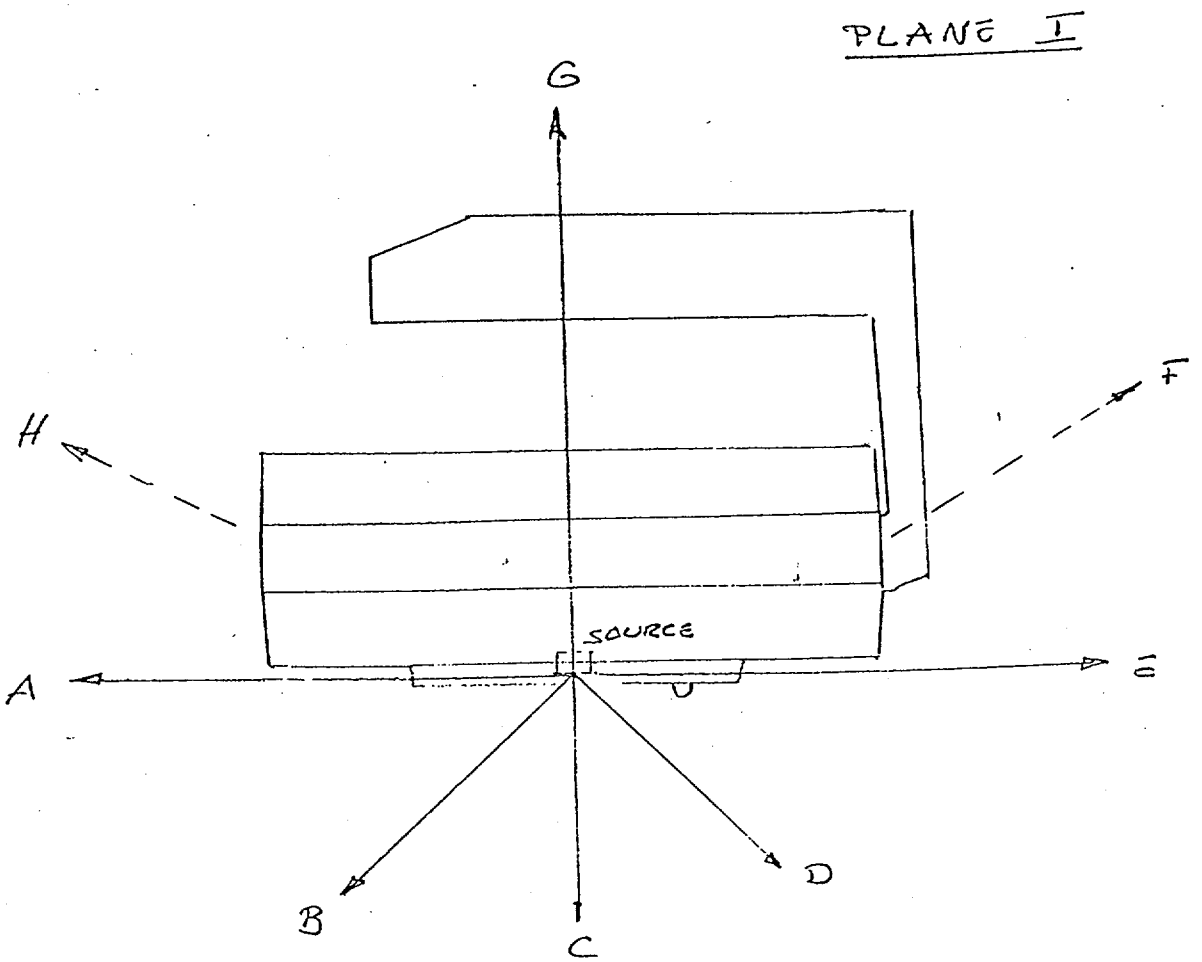
Exposure Dose

Reviewing the table the highest dose a user would receive in the normal operation of the unit using a Cm source would be in the handel area. At this location the dose rate is 0.05 mrem/hr (at the surface of the probe in direction F&H the dose rate is slightly higher, however, the user would not be expected to have his hand at that location and at 10 cm, approximatly the same distance as the handle, the dose is similar. Thus, if we assume that the user operates the unit 5 days a week for 50% of an 8 hour shift, the total dose would be 14.3 mrem per calander quarter (0.055 mrem/hr for 8 hours at 50%).

In operation the maximum exposure an operator might receive is that from having the instrument pointed at him from a distance of 10 cm (a highly unlikely seniero). At this distance, the probe with the Am-241 source would result in an exposure of 0.11 mrem/hr. If the user were exposed to this level of radiation for the entire 8 hour work shift, the total exposure would be 220 mrem, substantialy below 10% of the 5 rem requirement of 10 CFR 20.1201(a)1i.

In a worst case accident, if the source were released from its holder, the user could move the source safetly to a shielded pig using tongs and maintaining a distance of about 10 cm. In this case, if the source were the Cm-244, and the move took 30 minutes (again, a highly unlikely sinerio) the total exposure would be 25 mrem. To the hands and considerably less to the body or eyes. This is substantialy below the 200 rem allowed by 35(a)(2)(iii) and below the 15 rem allowed for the whole body and eyes.

DIRECTIONS OF DOSE RATE MEASURING POINTS



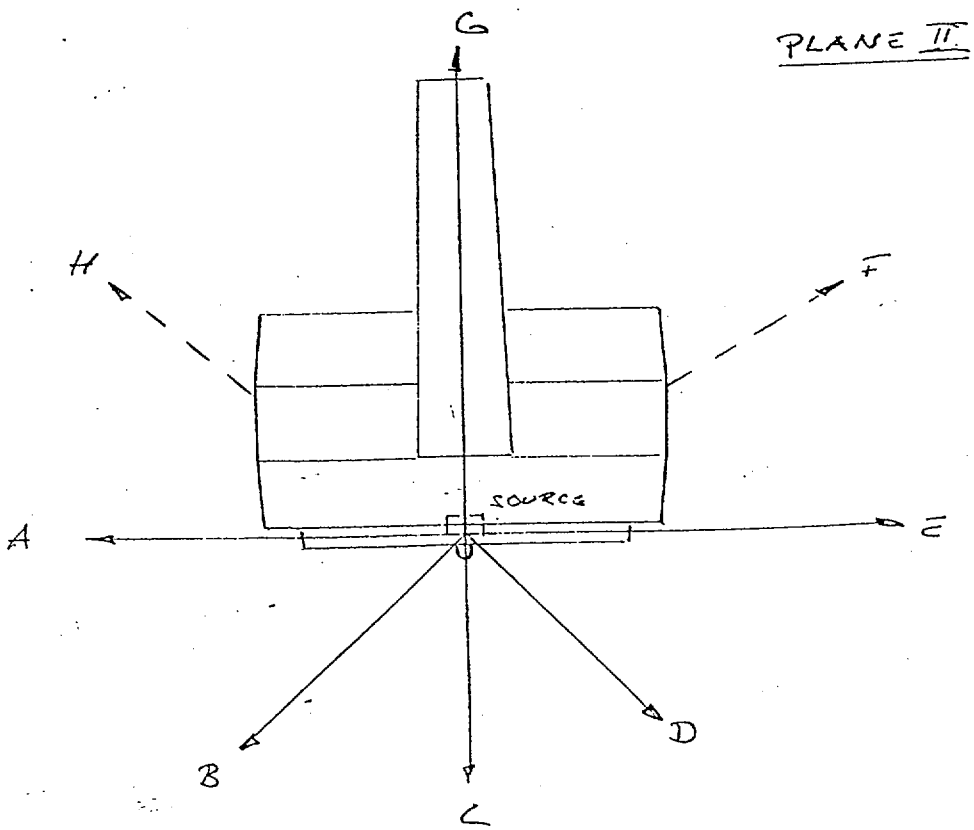


Figure 57

COPY

CERTIFICATE

No. **1017-02**

(First issue 1993-12-07)

The Finnish Standards Association SFS has granted this certificate as proof that the quality system of

Metorex International Oy
Espoo

complies with the requirements of the standard

SFS-EN ISO 9001

Certification covers

Development, production and marketing of material analyzers for field, workshop and in-process applications. Development, production and marketing of detection equipment for security applications.

Certification is based on the following audit report

SFS96079

The certificate is awarded on the condition that the company's quality system remains in constant compliance with the aforementioned standard and the General Regulations ABC 200.

Helsinki 1996-02-19

Kari Kaartama, Managing Director

S002

Finnish Standards Association SFS
Maistraatinportti 2,FIN-00240 Helsinki

MEMBER

SFS-SERTIFIOINTI OY
SFS-CERTIFICATION

VAKUUTUS
CONFIRMATION

COPY

2000-03-09

TÄMÄ TODISTAA, että
laatujärjestelmäsertifikaatti

THIS IS TO CONFIRM that the Quality System Certificate

Nro/No. 1017-02
1996-02-19
(Alkuperäinen myönnetty 1993-12-07)
(First issue 1993-12-07)

joka on myönnetty yritykselle:

granted to:

Metorex International Oy
Espoo

on voimassa.

is valid.

Sertifiointiprosessiin kuuluu kaksi seuranta-arviointia vuodessa. Yllämainitussa yrityksessä viimeisin seuranta-arviointi on tehty

The certification procedure includes follow-up audits twice a year. In the company above the latest follow-up audit was carried out

2000-02-17.

Se osoitti, että laatujärjestelmä vastaa standardin SFS-EN ISO 9001 ja yleisten ohjeiden ABC 200 vaatimuksia.

It proved that the quality system complied with the requirements of SFS-EN ISO 9001 and the General Regulations ABC 200.

SFS-SERTIFIOINTI OY

SFS-CERTIFICATION

Eeva Parviainen
johtaja
Director

IQNet
MEMBER

General Test and QC Procedure
Applies to All New Probes Containing Sources

1. Inspect Probe/Instrument:

    a. Insure that current leak test is available for probe.
    b. Visually inspect probe and instrument for scratches, dents or other damage.
    c. Attach probe to analyzer and determine that shutter and On/Off mechanism function properly.
    d. Run operational checks (specifics depend on probe type).
    e. Insure that tamper proof element is in place.

2. Label probe:

    a. Complete and attach source label(s)
    b. Determine if the probe will be Generally or Specifically Licensed
        i. If Generally Licensed complete and attach gold "General License Label"
        ii. If Specifically Licensed insure that Metorex has a copy of the License and do not attach the "General License Label".

3. Pack probe/instrument:

    a. Insure that the following are included:
        i. Current Leak test certificates
        ii. Instruction manuals
        iii. Technical Passport received with the instrument
    b. If the probe is Generally Licensed include the "General License Manual"
    c. Provide the Sales Administrator:
        i. Probe and Instrument Serial Numbers
        ii. Source isotope, strength, date and serial number.
    d. Pack the instrument in the appropriate carton
    e. With a handheld meter, perform a radiation check to insure that the radiation does not exceed 0.5 mrem/hr at contact with any surface of the shipping carton.

Revised: May 26, 2000

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE
(Amended in its Entirety)

NO: NR-136-S-154-S DATE: JAN 23 1984

SOURCE TYPE: Low Energy Photon Source

MODEL: AMC.D2, (formerly AMC.61, AMC.62, AMC.63, AMC.64)

MANUFACTURER/DISTRIBUTOR: Amersham Corporation
2636 South Clearbrook Drive
Arlington Heights, IL 60005

MANUFACTURER/DISTRIBUTOR:

ISOTOPE: Americium-241 MAXIMUM ACTIVITY: 35 millicuries

LEAK TEST FREQUENCY: 6 months

PRINCIPAL USE: (U) X-Ray Fluorescence

CUSTOM DEVICE: _____ YES __x__ NO

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE
(Amended in its Entirety)

NO: NR-136-S-154-S DATE: JAN 2 3 1984 PAGE 2 OF 4

SOURCE TYPE: Low Energy Photon Source

DESCRIPTION:

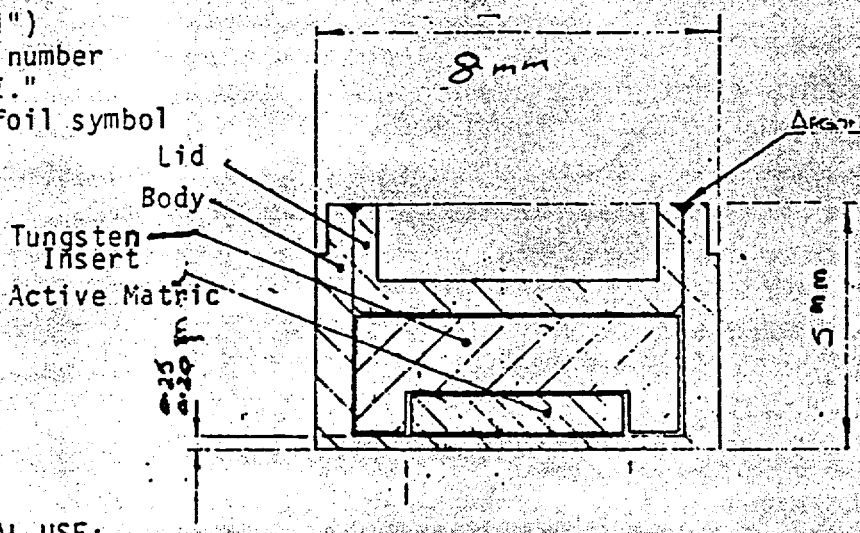
The Americium-241 oxide is present as a ceramic matrix with a melting point in excess of 800°C. The ceramic is bonded to a tungsten alloy insert which is assembled into a stainless steel capsule and sealed by argon arc welding. This gives a singly encapsulated source with dimensions of 8 mm diameter by 5 mm high.

LABELING:

The capsule lid is permanently engraved with the following information:

- Activity
- Nuclide ("Am-241")
- A unique serial number
- The letters "A.I."
- A radiation trefoil symbol

DIAGRAM:



CONDITIONS OF NORMAL USE:

The source may be used in a variety of industrial and research environments. Within industry, the source may be mounted in a protective radiation shield and used as part of a transmission gauge. In research, the source may be used in a laboratory environment for stimulation of fluorescent X-rays as part of a chemical analysis procedure.

PROTOTYPE TESTING:

The manufacturer reported that the source type has been tested in accordance with ANSI guide N542-1977 and has achieved a rating of C64545.

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
-- SAFETY EVALUATION OF SEALED SOURCE
(Amended in its Entirety)

NO: NR-136-S-154-S DATE: JAN 2 3 1984 PAGE 3 OF 4

SOURCE TYPE: Low Energy Photon Source

EXTERNAL RADIATION LEVELS:

Americium-241 emits alpha particles, X-rays, and 60 KeV gamma rays. The design of the X10 capsule, however, prevents the emission of almost all the alpha particles and X-rays as well as a proportion of the 60 KeV gamma photons.

The reported dose rates from a 30 mCi source are as follows:

5 cms	150 mR/hour
10 cms	35 mR/hour
30 cms	4 mR/hour

QUALITY ASSURANCE AND CONTROL:

All materials used in the fabrication of the capsule and source are checked against suppliers' specifications prior to manufacture. Finished sources are checked for freedom from leakage and contamination by bubble, wipe and immersion testing. The removable activity must be less than 0.005 microcurie before the source can be released. The customer is provided with a certificate documenting the leak results and the radiation emission measurements.

LIMITATIONS AND/OR OTHER CONSIDERATIONS OF USE:

- o The source shall be distributed only to persons specifically licensed by the NRC or an Agreement State.
- o The source shall be leak test at six month intervals using techniques capable of detecting 0.005 microcurie of removable contamination.
- o Handling, storage, use, transfer, and disposal: To be determined by the licensing authority.
- o This registration sheet and the information contained within the reference shall not be changed or transferred without the written consent of the NRC.

SAFETY ANALYSIS SUMMARY:

Based on our review of the information and test data cited below, that the source design was the previously approved Model AMC.61 through AMC.64 that this amendment combi these old models to form a new model No. AMC.D2, we continue to conclude that the source design is acceptable for licensing purposes. Furthermore, we conclude that the source design would be expected to maintain its containment integrity for normal conditions of use and accidental conditions which might occur during uses specified in this certificate.

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE
(Amended in its Entirety)

NO: NR-136-S-154-S DATE: JAN 2 3 1984

SOURCE TYPE: Low Energy Photon Source

REFERENCES:

The following supporting documents for the AMC.D2 photon source design are hereby incorporated by reference and are made a part of this registry document:

- o Amersham Corporation letters dated July 11, 1977 and September 23, 1983. with enclosures thereto.
- o Supersedes document No. NR-136-S-154-U dated February 10, 1978.

ISSUING AGENCY:

U.S. Nuclear Regulatory Commission

Date: JAN 2 3 1984 Reviewer: _____

Date: JAN 2 3 1984 Concurrence: Joseph W. Brown Jr.

REGISTRY OF RADIOACTIVE SEALED SOURCES AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE
(AMENDED COPY)

NO: NR-136-S-135-S DATE: October 15, 1984 PAGE 1 OF 4

SOURCE TYPE: Gauge Source

MODEL: AMCL, CLCL, PPCL

MANUFACTURER/DISTRIBUTION: Amersham Corporation
2636 S. Clearbrook Drive
Arlington Heights, IL 60005

ISOTOPE:	MAXIMUM ACTIVITY:
Americium-241	100 millicuries
Plutonium-238	100 millicuries
Curium-244	300 millicuries

LEAK TEST FREQUENCY: 6 months

PRINCIPAL USE: (D) Gamma Gauges

CUSTOM SOURCE: ____YES __x__NO

REGISTRY OF RADIOACTIVE SEALED SOURCE AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE

No: NR-136-S-135-S DATE: October 15, 1984 PAGE 2 OF 4

SOURCE TYPE: Gauge Source

DESCRIPTION:

Amersham Searle Corp. sources Model AMCL contains americium-241, sealed sources Model CLCL contains curium-244 and sealed sources Model PPCL contains plutonium-238. A basic capsule design is common to the three sources. As an oxide, the radioactive material is bound in a high fired ceramic substrate which is melted (.900° C) and bonded to a stainless steel insert. The insert is placed into a heavy walled monel capsule which is sealed on the back side by welding a backing plug and monel lid to the capsule wall. The window side of the crucible consists of a beryllium disc of 1.0 mm thickness which butts against a shoulder in the capsule wall and is firmly fixed in position by silver solder (M.P. 960°C). The window is protected by a 0.5 mm recess from the end of the capsule. Capsule diameters may vary from 8.0 mm to 15 mm and the length is 5 mm.

LABELING:

Each source is labeled with the radiation symbol, model number and manufacturer's logo. Space permitting, the source will be labeled with the isotope and activity.

DIAGRAM:

See Attachment 1

CONDITIONS OF NORMAL USE:

The source is designed for use in industrial gauging devices. See a device model number for a set of use conditions.

PROTOTYPE TESTING:

Prototype sources have been tested by the manufacturer and a classification of C44344 has been demonstrated pursuant to the USASI (ANSI) Standard N5. 10-1968 but with an improved method for puncture testing of the capsule window. The capsule has been pressure tested which, together with an engineering aria" analysis, indicates that the fuel capsule would contain the fuel and helium for a period of 25 years. Examination of prototype substrate materials after 5 years of shelf testing indicates that the substrate will not crack nor swell and will bind the radioactive material to the insert. The manufacture reports that the sources have been tested and achieved the "Special Form" designation.

REGISTRY OF RADIOACTIVE SEALED SOURCE AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE

NO: NR-136-S-135-S **DATE:October** 15, 1984 PAGE 3 of 4

SOURCE TYPE : Gauge Source

QUALITY ASSURANCE AND CONTROL:

In addition to the helium leak test, immersion, bubble tests on capsules in the fabrication process, each capsule is visually inspected and wipe tested to 0.005 microcurie sensitivity limit prior to shipment. The quantity of radioactive material in each source is confirmed using a Si(Li) detector.

LIMITATION AND/OR OTHER CONSIDERATIONS OF USE:

- The source shall be distributed to persons specifically licensed by the NRC or an Agreement State.
- Handling, storage, use, transfer, and disposal: To be determined by the licensing authority.
- The source shall not be subjected to environmental or other conditions of use which exceed ANSI classification C44344.
- The source shall be leak tested at six (6) month intervals using techniques capable of detecting 0.005 microcurie of removable contamination.
- This registration sheet and the information contained within the references shall not be changed or transferred without the written consent of the NRC.

SAFETY ANALYSIS SUMMARY:

Based on our review of the information and test data cited below, the claimed ANSI N542 classification) that the source has been in use since 1975, we continue to conclude that the source design is acceptable for licensing purposes. This amendment only increases the activity of curium-244 from 200 to 300 millicuries. This action does not have an effect on the containment integrity of the source. Furthermore, we conclude that the source design would be expected to maintain its integrity for normal conditions of use and accidental conditions which might occur.

REFERENCES:

The following supporting documents for the Amersham Models listed above are hereby incorporated by reference and are made a part of this registry document.

REGISTRY OF RADIOACTIVE SEALED SOURCE AND DEVICES
SAFETY EVALUATION OF SEALED SOURCE

NO: NR-136-S-135-S DATE: October 15, 1984

SOURCE TYPE: Gauge Source

- Amersham Corporation letters dated December 10, 1974, February 25, 1975, September 8, 1980 and October 10, 1984 with enclosures thereto.
- Supersedes document No. NR-136-D-135-U dated March 28, 1975.

ISSUING AGENCY:

United States Nuclear Regulatory Commission

DATE: _____ Reviewer: _____

DATE: 10/15/84 Concurrence: Joseph M. Brown Jr.