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Draft Indian Standard

Hand Held Metal Detectors for Use in Concealed Weapon and Contraband Detection — Specification

(*First Revision*)

ICS: XXXX

BUREAU OF INDIAN STANDARDS

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Alarms and Electronic Security Systems Sectional Committee, LITD 26

NATIONAL FOREWORD

(Formal clauses to be added later)

This Indian Standard (First Revision) will be adopted by the Bureau of Indian Standards on the recommendation of the Alarms and Electronic Security Systems Sectional Committee and approval of the Electronics and Information Technology Division Council.

This Indian Standard is based on National Institute of Justice (NIJ) Standard 0602.02 ‘Hand Held Metal Detectors for use in concealed weapon and contraband detection’. The object of this revised standard is to establish performance requirements and testing methods for active hand-held metal detectors used as weapons detectors used to find metal weapons and/or metal contraband carried on a person and/or concealed by a nonmetal object.

1. SCOPE

This Indian Standard establishes performance requirements and test methods for active hand-held metal detectors used to find metal weapons and/or metal contraband carried on a person and/or concealed by a nonmetal object.

2. REFERENCES

The standards given below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

3. TERMINOLOGY

3.1 Active Detector

An active detector is generally a device that generates energy for illuminating the target space. For the hand-held metal detector, the generated energy is in the form of a magnetic field. The interaction of this magnetic field with certain types of objects in the region around the detector and the ability to detect this interaction are the basis of operation for hand-held metal detectors.

3.2 Alarm Indication

A signal to warn of the detection of a metal object. The indication can be visual and/or auditory.

3.2.1 Positive Alarm Indication

The change in the alarm indication that corresponds to the detection of a metal object. Typically, the alarm indication is off until a metal object is detected.

3.2.2 Proportional Alarm Indication

An alarm indication proportional to the size, proximity, orientation, and/or material of an object.

3.3 Alarm Indicator

The device used to generate the alarm indication. This device can provide a visual, auditory, and/or vibratory indication. For a visual indication, the alarm generating device can be a light emitting diode, etc. For an auditory indication, the alarm generating device can be a buzzer or similar item.

3.4 Detection

The discovery or finding of a metallic object. The detection of a metallic object is transmitted to the operator by some type of alarm indicator, typically a visual or audible indicator.

3.5 Detector Axis

An imaginary line passing through and perpendicular to the detector plane that is located within the detector plane such that the magnetic field around the detector axis has the maximum symmetry. The detector axis is labeled as the "z" axis. The location of the detector axis relative to the detector shape and geometry is specified by the manufacturer. See figure 1.

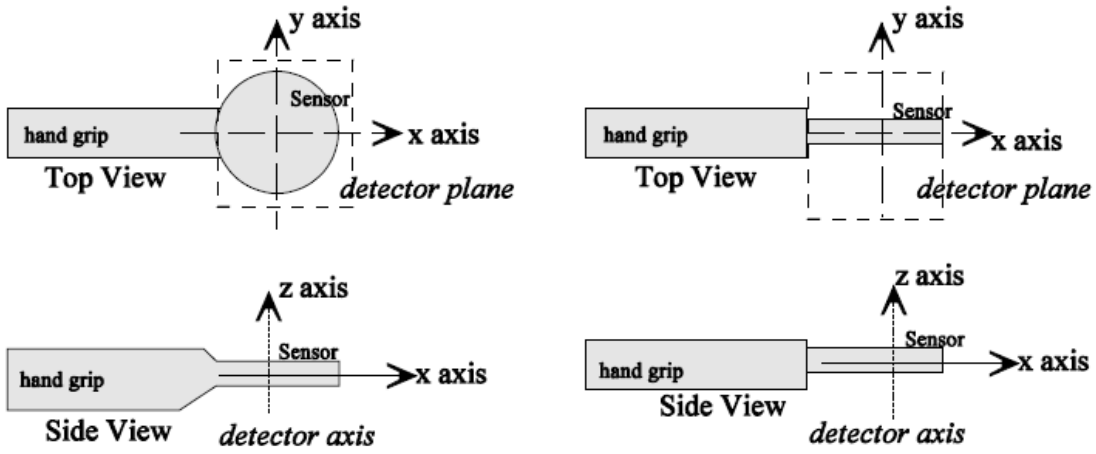


***Figure 1. Diagram of two different hand-held metal detectors showing the* detector plane *and the* detector axis**

3.6 Detector Holder

A nonconductive, nonmagnetic block that holds the hand-held metal detector for testing. The *detector holder* is supplied by the manufacturer and contains a *reference surface* that mates to the *reference surface* of the *detector positioner*. Figure 2 shows how the *detector holder* is used.

3.7 Detector Plane

An imaginary plane (two-dimensional surface) that passes through the center of the sensor region of the hand-held metal detector, bisects the sensor region into two symmetric halves, and is parallel to the plane of the sensing element. The *detector plane* contains two orthogonal axes labeled as the "x" axis and as the "y" axis. See figure 1.

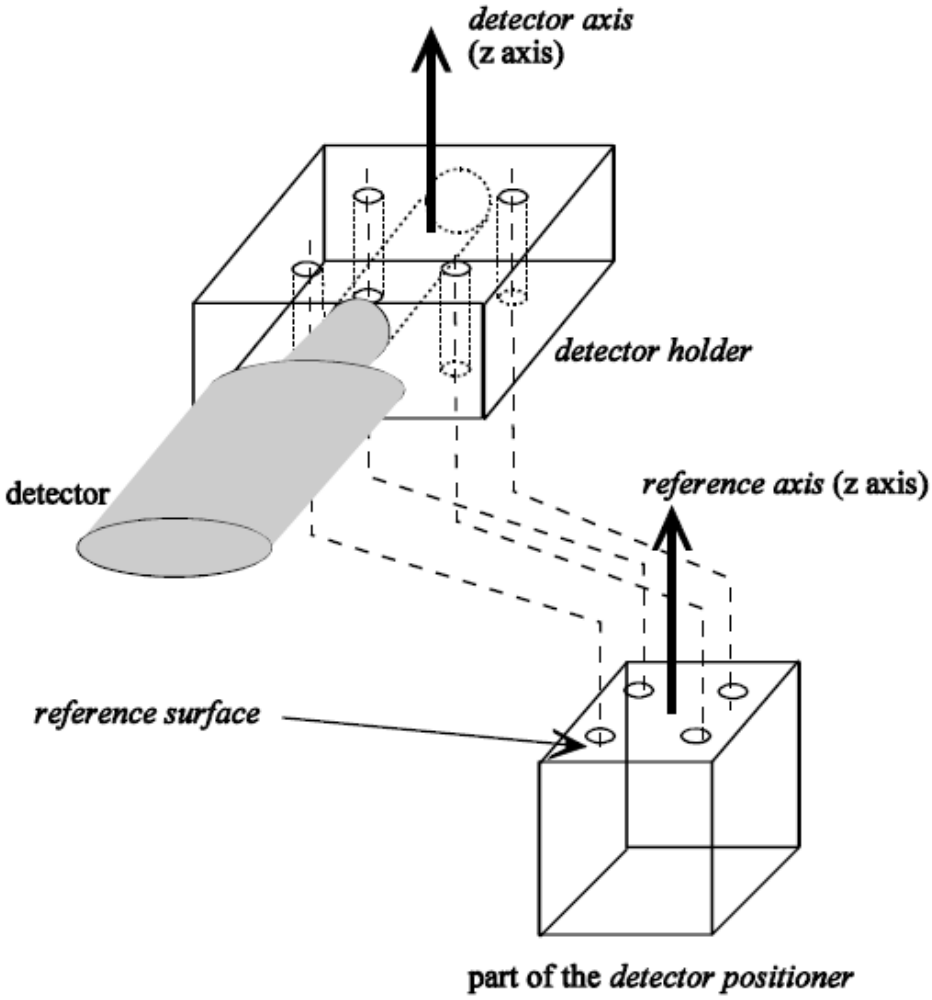


Figure 2. Drawing of the **detector holder** *and* **detector positioner** *showing attachment at the* **reference surface**

3.8 Detector Positioner

A nonconductive, nonmagnetic device that fixes the position of the *detector plane* and *detector axis* with respect to the *three-axes translation system*. The *detector positioner* includes a *reference surface* for attaching the *detector holder*. The *detector positioner* also includes a surface for attachment to the *three-axes translation system*.

3.9 Detector Response

The electrical signal generated by the sensor or sensor circuit of the detector that is caused by an object interacting with the magnetic field generated by the detector. The *detector response* is the basis on which an *alarm indication* is derived.

3.10 Measurement Coordinate System

A mutually orthogonal three-dimensional Cartesian coordinate system referenced to the *detector axis* and the *detector plane*. The three axes are labeled "x," "y," and "z," where the z axis is parallel to the *detector axis* and the x axis and the y axis are in the *detector plane*. The orientation of the test objects and the direction of the magnetic field is referenced to the *measurement coordinate system.* See figure 3.

3.11 Measurement Plane

An imaginary two-dimensional surface over which the hand-held metal detectors are tested. There may be more than one *measurement plane*. The *measurement plane*(s) is (are) referenced from the *detector plane*. See figure 4.

3.11.1 Large Object Size Measurement Plane

The *measurement plane* at a *test separation distance* of 15 cm from the *detector plane*.

3.11.2 Medium Object Size Measurement Plane

The *measurement plane* at a *test separation distance* of 7.5 cm from the *detector plane*.

3.11.3 Small Object Size Measurement Plane

The *measurement plane* at a *test separation distance* of 5 cm from the *detector plane*.

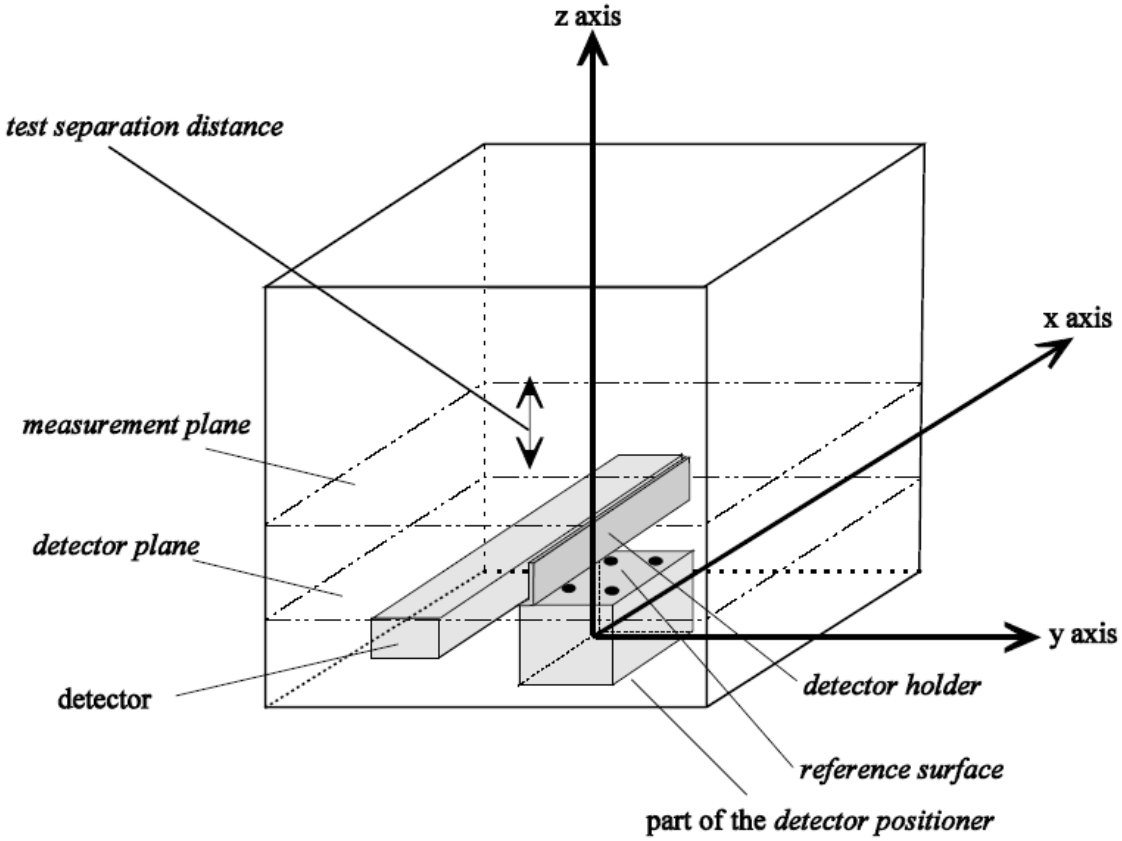


Figure 3. Diagram of the measurement coordinate system *showing the* measurement coordinate system *axes, one* measurement plane, *the* detector plane, *and the* reference surface, *where the* detector holder, *containing a detector, is unmounted*

3.11.4 Very Small Object Size Measurement Plane

The measurement plane at a test separation distance of 3 cm from the detector plane.

3.12 Reference Axis

An imaginary line that is perpendicular to and centered in the *reference surface*. See figure 4.

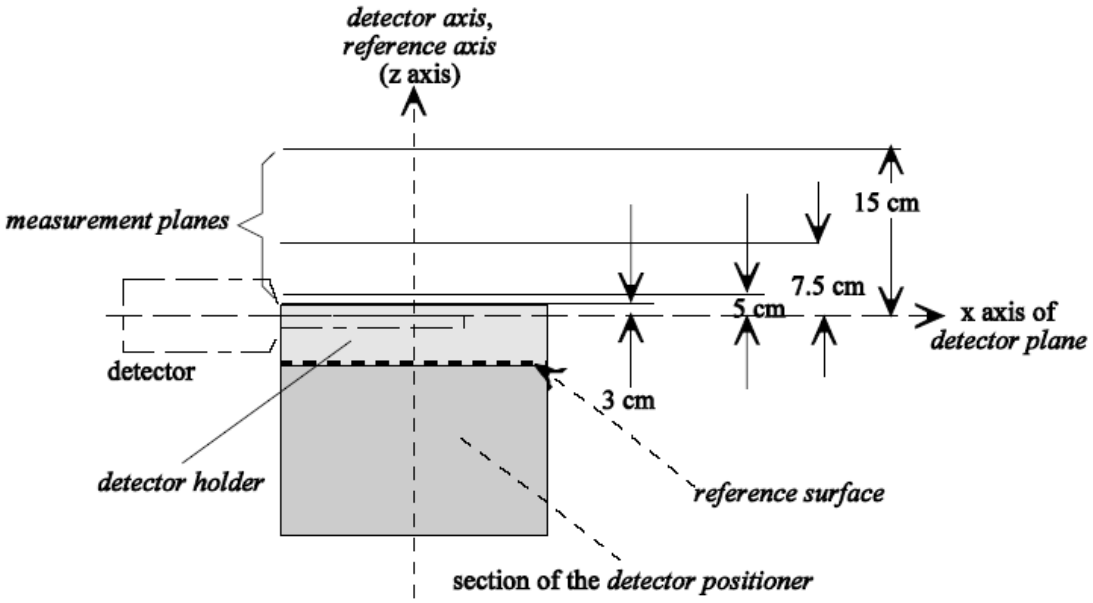


Figure 4. A schematic of the detector and the **detector positioner**, *with detector in place, where the* **detector holder** *is properly located on the* **detector positioner**; *that is, where the z axis of the* **measurement coordinate system**, *the* **detector axis**, *and the* **reference axis** *are collinear; the* **detector holder** *and* **detector positioner** *are in contact at their* **reference surfaces**; *and the long axis of the detector is collinear with the x axis of the* **measurement coordinate system**

3.13 Reference Surface

The planes located on the *detector holder* and *detector positioner* that are used to attach the *detector holder* and *detector positioner*. See figure 2.

3.15 Object Size classes

A classification method based on the ability to detect metal objects of a minimum size. A detector may meet the requirements for one or all *object size classes*, as defined below.

3.15.1 Large Object Size

The ability to detect handguns concealed on an individual that are constructed of either ferromagnetic or nonferromagnetic metal.

3.15.2 Medium Object Size

The ability to detect knives concealed on an individual that are constructed of either ferromagnetic or nonferromagnetic metal. Knives are defined for this purpose as having blade lengths exceeding 7.5 cm (3 in).

3.15.3 Small Object Size

The ability to detect small weapons and contraband items concealed on an individual that are constructed of either ferromagnetic or nonferromagnetic metal. Small weapons and contraband items are defined as items that can be used to injure another person or to defeat security devices.

3.15.4 Very Small Object Size

The ability to detect very small hard-to-find items that are concealed on an individual and considered a threat to officer and prisoner safety or that can be used to defeat security measures. These objects are constructed of either ferromagnetic or nonferromagnetic metal.

3.16 Test Object

An item that is used to test the hand-held detection performance. The *test object* is an encased replica of a metallic item. This item is either a weapon, can be used as a weapon, or can be used to defeat security devices. The shape of the encasement is a parallelepiped. The encasement has up to nine orientation holes that allow the replica to be oriented with respect to the *measurement coordinate system.* These nine orientation holes are distributed on no more than three surfaces of the *test object.* Each of these surfaces has no more than three orientation holes, and one of the orientation holes is used as a center of rotation.

3.16.1 Large Object Size Test Objects

Test objects that are used to test the *large object size* detection performance of hand-held metal detectors used as weapon detectors.

3.16.2 Medium Object Size Test Objects

Test objects that are used to test the *medium object size* detection performance of hand-held metal detectors used as weapon detectors.

3.16.3 Small Object Size Test Objects

Test objects that are used to test the *small object size* detection performance of hand-held metal detectors used as weapon detectors.

3.16.4 Very Small Object Size Test Objects

Test objects that are used to test the *very small object size* detection performance of hand-held metal detectors used as weapon detectors.

3.17 Test Object Axes

The three mutually orthogonal axes of the *test object* that are referenced to and have a one-to-one correspondence with the axes of the *measurement coordinate system.*

3.18 Test Separation Distance

The distance between the *measurement plane*(s) and the *detector plane* or as otherwise specified. The *test separation distances* are 3 cm, 5 cm, 7.5 cm, and 15 cm. See figure 4.

3.19 Three-Axes Positioning System

Also known as a Cartesian robot, the *three-axes positioning system* provides three mutually orthogonal directions of linear translation. The *three-axes positioning system* is used to place the *test objects* in the magnetic field of the detector.

4 GENERAL REQUIREMENTS

The Hand-held metal detectors shall comply with the following requirements:

4.1 Safety Requirements

4.1.1 Electrical

The detector shall comply with IS/IEC 61010-1.

4.1.2 Mechanical

4.1.2.1 The detector shall comply with IS/IEC 61010-1.

4.1.2.2 The detector shall not expose:

- any sharp corners or edges that can puncture, cut, or tear the skin or clothing or injure persons coming in contact with the detector;
- external wires and cables; or
- loose covers and cowlings.

4.1.3 Exposure

The level of the electromagnetic field generated by the detector shall be less than the exposure limits specified in IEC 61326-1.

4.1.4 Personal Medical Electronic Devices

The HHMD should be Safe for Heart pace maker, pregnant women & magnetic recording materials**.**

4.2 Electrical Requirements

4.2.1 Battery Condition

The manufacturer shall provide a visual or audible indicator to alert the operator of the battery condition as described in Clause 4.6.3.

4.2.2 Minimum Battery Life

The detector must be designed so that the battery life is at least 20 h when tested in accordance with Clause 5.5.

4.2.3 Battery Installation

The manufacturer shall provide instructions for battery installation and specify the type and quantity of batteries required.

4.3 Detection Performance Requirements

The detection performance specifications shall be tested using the detection sensitivity setting that is specified by the manufacturer to be appropriate for each *object size class* of the detector that is to be tested. The detector need only to qualify for the smallest *object size class* specified by the manufacturer; qualification to larger *object size classes* will be assumed.

4.3.1 Detection Sensitivity

The detector shall alarm for each *test object* of the appropriate *object size class* positioned in the appropriate *measurement plane* for each allowed orientation of the *test object axes* with respect to the *measurement coordinate system* for the *test object* moving at a speed of 1.0 m/s ± 0.05 m/s and as tested in accordance with Clause 5.2.3. (The appropriate *measurement planes* are the *large object size, medium object size, small object size,* and *very small object size measurement planes* as defined in 3.16).

4.3.2 Speed

The detector shall provide a *positive alarm indication* for each *test object* of the appropriate *object size class* positioned in the appropriate *measurement plane* for each allowed orientation of the *test object axes* with respect to the *measurement coordinate system* for the *test object* moving at the following speeds: 0.25 m/s ± 0.01 m/s, 0.5 m/s ± 0.01 m/s, and 1.0 m/s ± 0.01 m/s as tested in accordance with Clause 5.2.4.

4.3.3 Repeatability

The detector shall provide a *positive alarm indication* without failure for each *test object* of the appropriate *object size class* positioned in the appropriate *measurement plane* for each allowed orientation of the *test object axes* with respect to the *measurement coordinate system* for the *test*

object moving at a speed of 0.05m/s ± 0.01m/s for 50 consecutive trials under the following conditions:
a. The delay between subsequent trials of a given *test object* shall be no more than 10 s.
b. The detector sensitivity shall not be readjusted between trials of a given *test object* or between trials of the *test objects* of a given *object size class.*
The repeatability test shall be performed in accordance with Clause 5.2.4, and the results shall be recorded. The results of this test can also be called the probability of detection, P_d, with a required P_d of 1.00 (or 100 %).

4.4 Operating Requirements

4.4.1 Operator Controls

Only those controls indicated here shall be accessible by the operator. Other controls and adjustments that affect the detector performance shall be inaccessible to the operator.

4.4.1.1 Detector Sensitivity Programming (Optional)

If provided, the detector sensitivity shall be controlled by a discretely adjustable switch. The switch shall be located such that it is readily accessible by the operator or, upon request, to be within an enclosed area and inaccessible to the operator.

4.4.1.2 Power On/Off Switch

The detector shall have a power on/off switch.

4.4.1.3 Audible Alarm On/Off Switch

The detector shall have a means for selectively disabling the audible alarm.

4.4.2 Background Null/Automatic Adjust Feature

If any feature exists on the detector to automatically adjust for or null the detection signal caused by a large metal background.

4.4.3 Interference

4.4.3.1 Electromagnetic

4.4.3.1.1 Emission

The detector, when adjusted to meet the requirements of Clause 4.3.3, shall meet the requirements of IEC 61000-6-3, as amended, if applicable.

4.4.3.1.2 Susceptibility/Immunity

4.4.3.1.2.1 General Immunity Requirements

The detector, when adjusted to meet the requirements of Clause 4.3.3, shall not provide a *positive alarm indication* when tested in accordance with IEC 61000-6-1, as amended, if applicable.

4.4.3.2 Metal

The detector shall not produce a *positive alarm indication* when operated near metal walls, as tested in accordance with Clause 5.4, but shall produce a *positive alarm indication* for each appropriate *test object* of the appropriate *object size class* positioned in the appropriate *measurement plane* for each allowed orientation of the *test object axes* with respect to the *measurement coordinate system* for the *test object* moving at a speed of 0.05m/s ± 0.01m/s as tested according to Clause 5.2.4.

4.4.3.3 Body

The detector shall not produce a *positive alarm indication* when operated at a distance from the body equal to the appropriate *test separation distance,* as tested in accordance with Clause 5.2.5, but shall produce a *positive alarm indication* for each *test object* of the appropriate *object size class* positioned in the appropriate *measurement plane* for each allowed orientation of the *test object axes* with respect to the *measurement coordinate system* for the *test object* moving at a speed of 0.05m/s ± 0.01m/s as tested according to Clause 5.2.4. The *test separation distances* shall be 15 cm for *test objects* of the *large object size* class, 7.5 cm for *test objects* of the *medium object size* class, 5 cm for *test objects* of the *small object size* class, and 3 cm for *test objects* of the *very small object size* class.

4.4.4 Environmental Ranges and Conditions

The detector or all of its components and their interconnections shall meet all of the requirements listed in this section. The requirements of Clause 4.1 and Clause 4.5 shall not be affected by the tests described in this section. The requirements given in this section shall be applied appropriately for either indoor or indoor/outdoor detector models. The requirements of this section shall be exhibited by no less than the first production unit for each unique detector model and for any physical modifications to that model. The tests listed in Clause 4.4.4 shall be performed on the same unit. The detector, if tested for any of the tests listed in Clause 4.4.4, shall exhibit no observable changes in the detection performance specification given in Clause 4.3.

4.4.4.1 Temperature Stability and Range

4.4.4.1.1 Indoor

The HHMD shall have the ability to function correctly over the ambient temperature range of at least 0 °C to 46 °C (32 °F to 115 °F) in indoor service environments. The detector shall be tested in accordance with IEC 60068-2-2 at 46 °C ± 3°C after being exposed to that temperature continuously for 24h ± 1h. The detector then shall be cooled to 0 °C ± 3 °C within 4 h ± 0.5 h and

tested in accordance with IEC 60068-2-1 at 0 °C ± 3 °C after being exposed to that temperature continuously for 24 h ± 1 h.

4.4.4.1.2 Indoor/Outdoor

The HHMD shall have the ability to function correctly over the ambient temperature range of at least – 37 °C to 65 °C (-35 °F to 149 °F) in outdoor service environments. The detector shall be tested in accordance with IEC 60068-2-2 at 65 °C ± 3°C after being exposed to that temperature continuously for 24h ± 1h. The detector then shall be cooled to -37 °C ± 3 °C within 4 h ± 0.5 h and tested in accordance with IEC 60068-2-1 at -37 °C ± 3 °C after being exposed to that temperature continuously for 24 h ± 1 h.

4.4.4.1.3 Relative Humidity Stability and Range

The HHMD shall have the ability to function correctly at high relative humidity (without condensation), which can occur for short periods in the anticipated service environment. The detector shall be tested in accordance with the requirements of IEC 60068-2-78.

4.4.4.2 Environmental Protection

The detector shall have at least IP54 or better degree of protection as specified in IS/IEC 60529.

4.5 Mechanical Requirements

4.5.1 Dimension and Weight

The detector shall be capable of being gripped by a single hand, shall weigh less than 1 kg (2.2 lb), and be designed to reduce operator fatigue during long-term use.

4.5.2 Durability/Ruggedness

The detector or all of its components and their interconnections shall meet the following requirements. The requirements of section 4.1 and section 4.4 shall not be affected by the tests described in this clause. All tests listed in this clause shall be performed on the same unit. The detector, if tested for any of the tests listed in section 4.5.2, shall exhibit no observable changes in the detection performance specification given in Clause 4.3.3.

4.5.2.1 Shock

The detector shall be tested in accordance with the requirements of IEC 60068-2–27, as amended, using the half-sine pulse shape with a nominal peak acceleration of 30 g (300 m/s^2) and a nominal pulse duration of 6 ms.

4.5.2.2 Free Fall

The detector shall be tested in accordance with the requirements of Clause 5.2 (Procedure 1) of IS 9000 (Part 7/Sec 3)/ IEC 60068-2-31, for each direction of the *detector axes,* a fall height of 1 m, and for two drops for each direction of the orthogonal axes depicted in Fig. 3.

4.5.2.3 Pressure Resistance

The detector shall be capable of withstanding a force of 600 N (135 lb) over any 1 cm x 1cm (0.4 in x 0.4 in) area on the detector for a sustained period of 1 min.

4.6 Functional Requirements

4.6.1 Audible Alarms

All audible indicators (other than an earphone) shall produce an alarm-state sound pressure level 0.8 m ± 0.08 m from the detector of 55 dB_{SPL} ± 5 dB_{SPL} measured in accordance with Clause 5.3.2. For status indicators, the audible alarm shall be a two-state audible alarm: active (alarm state) and inactive (nonalarm state). For metal object warning, the audible alarm shall be a frequency-proportional audible alarm or, optionally, a two-state audible alarm.

4.6.1.1 Alarm Indicator for Metal Object Detection

The detector shall have either a frequency-proportional *alarm indicator* (see clause 4.6.1.1.1) or a two-state *alarm indicator* (see clause 4.6.1.1.2).

4.6.1.1.1 Frequency-Proportional Alarm Indicator for Metal Object Detection

The frequency-proportional *alarm indicator* shall provide an audible *alarm indication* with an audio frequency output that is continuously proportional to the detection signal. The frequency-proportional *alarm indication* shall have a quiescent state frequency drift rate, measured in accordance with Clause 5.3.3, of not more than 5 Hz/s. The *proportional alarm indication* shall vary by at least 2000 Hz within the frequency range of 500 Hz to 4000 Hz for objects varying in size from the smallest *test objects* of the appropriate *object size class* to the metal test panel described in Clause 5.4.1.

4.6.1.1.2 Two-State Alarm Indicator for Metal Object Detection

The two-state *alarm indicator* shall provide a two-state audible *alarm indication* to alert the operator about the presence of a metal object. The two-state alarm indicator shall produce no sound in the nonalarm state and shall produce an audio frequency alarm within the range of 500 Hz to 4000 Hz and a frequency drift of less than 5 Hz/s and less than 1 % of the selected operating frequency over any 2 h period.

4.6.2 Visual Indicators

Any visible *alarm indication* shall be readily perceptible when tested in accordance with Clause 5.3.4. The visual *alarm indicators* shall be a two-state visual alarm: active (illuminating) and inactive (non-illuminating).

4.6.2.1 Metal Object Detection

The detector shall have a visual alarm indicating the presence of a metal object in the *target space*. The alarm state for the metal-object-detection visual *alarm indicator* shall be active (illuminating), and the nonalarm state shall be inactive (non-illuminating). The metal-object detection visual *alarm indicator* shall be distinct from any other visual *alarm indicators.*

4.6.3 Battery Condition Indicator

The detector shall have a visual or audible alarm indicating the condition of the battery and shall be activated if the battery condition drops to a level that can cause a degradation of the detection performance required by this standard.

4.6.4 Interchangeability

Any model detector manufactured by the same manufacturer shall be compatible with previous revisions of the same model (backwardly compatible). In particular, the components shall be backwardly compatible.

4.7 Detector Holder

The manufacturer shall provide with each detector, if requested, a holder for mounting the detector on the *reference surface* (see fig. 5) of the measurement system (see figs. 2 and 3). The *detector holder* shall comply with section 4.1.2 and shall meet the following specifications:
a. Relative permeability = 1.0 ± 0.001.
b. Electrical conductivity < 10^{-8} Siemens/m.
c. Mass ≤ 2 kg (4.5 lb).
d. Surface flatness ± 0.5 mm (0.041 in).
e. Firmly holds the detector.
f. Mates with the *reference surface.*
g. Fastener holes align with each of the four 1/4-20 fastener holes of the *reference surface* (see figs. 2, 3, and 5).
h. Holds the detector so that the *detector axis* and *reference axis* are collinear.
i. Holds the detector so that the longest axis of the detector that is parallel to the *detector plane* is collinear with the x axis of the *measurement coordinate system.*
j. Holds the detector so that the *detector plane* is 10 cm ± 0.1 cm from the *reference surface*.
k. The top surface should be located less than 2.5 cm from the *detector plane.* If the detector is of such shape and geometry that access to the *measurement plane* at a *test separation distance* of 2.5 cm is not possible, then the *test separation distance* for the closest possible *measurement plane* shall be reported.
l. Holds the detector such that no part of the detector is above the *measurement plane* at a *test separation distance* of 2.5 cm.

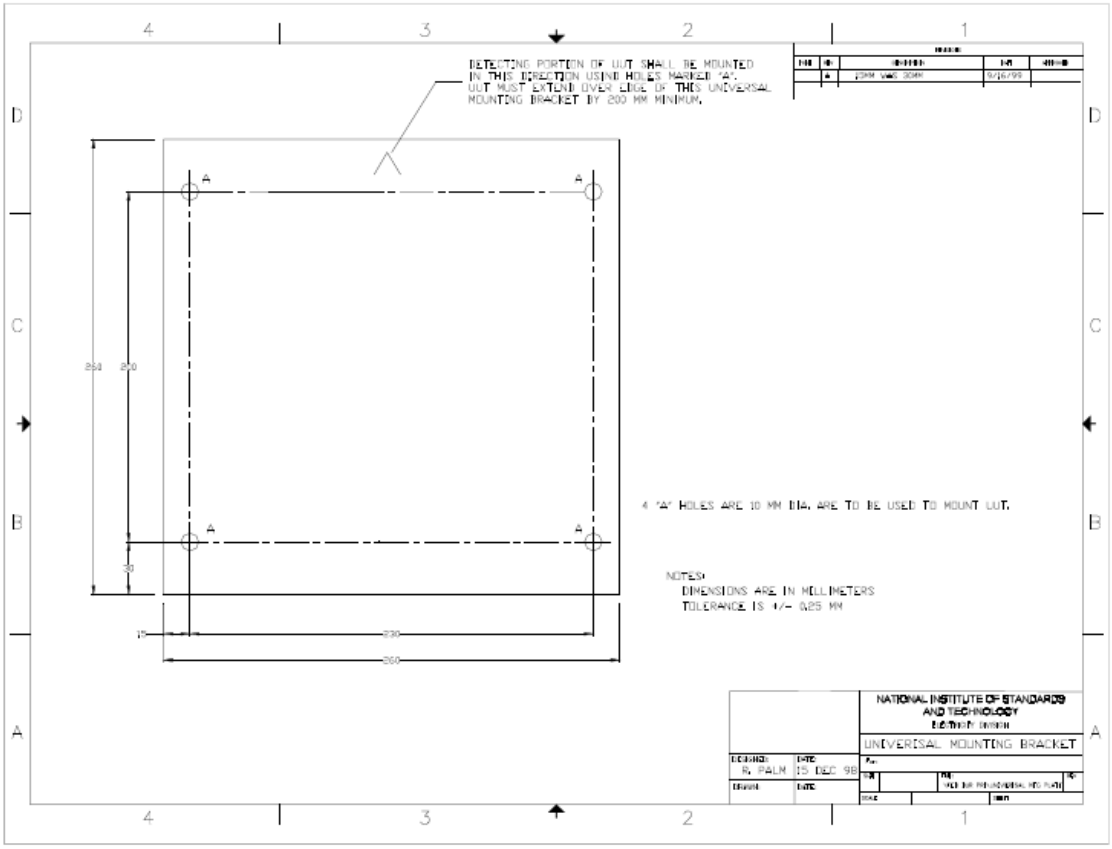


***Figure 5. Mechanical drawing of the* reference surface**

4.9 Documentation

The manufacturer shall provide the following list of deliverable items with each detector unless otherwise indicated.

4.9.1 Operating Instructions

An operator's manual shall be supplied by the manufacturer or distributor with each detector and shall contain at least the following information:
a. The purpose of the detector.
b. A description of operator controls.
c. A list of operating features.
d. A description of detection principles and detector capabilities.
e. A block diagram showing the major internal functional components.
f. An exposure warning that states, "This Device May Affect Personal Medical Electronic Devices" until such time some other competent agency requires a different warning or has determined that no such warning is necessary.

4.9.3 Technical Manual

A technical manual that contains all of the information that could be required by a technician to troubleshoot, maintain, and repair the equipment to the component level shall be provided upon request.

4.9.4 Technical Training Manual and Videotape or CD–ROM

A self-study training package shall be provided upon request for use by site maintenance technicians.

5. TESTS

The detector shall meet the detection performance requirements for each object size class in which it is required to operate. The detection performance shall be evaluated by the test methods described in this section.

5.1 General Test Conditions

5.1.1 Test Location

The distance between any metal object other than a test object and the closest part of the detector shall be greater than 0.8 m (31 in).

5.1.2 Environment

At the time of the tests, the ambient temperature shall be in the range specified in Clause 4.4.4.1 for the appropriate application (indoor or indoor/outdoor); the relative humidity shall be noncondensing.

5.1.3 Preparations

New batteries of the type listed in the operator's manual shall be installed at the beginning of the tests and as instructed in any test method. Any setup or calibration adjustments specified in the operator's manual shall be performed if required.

5.2 Detection Performance Tests

5.2.1 Object Size Classes

If the detector can be adjusted to provide an *alarm indication* for more than one *object size class*, the detection performance tests shall be performed for each *object size class.* The detection performance shall be evaluated by the test methods described here. The distinction in testing between the different *object size classes* is the difference in the *test separation distance* of the *measurement plane* and the *test objects.*

5.2.2 Equipment
5.2.2.1 Test Objects

Test objects shall be as described in Clause 7. There are up to three orientation holes on up to three surfaces of the test object (encased replica of a threat item). The tapped hole on each surface of the test objects is labeled with an "A" (see mechanical drawings in Clause 7 showing the encased test object) and is the center of rotation of the different orientations. The test objects shall be oriented such that the orienting holes being used are facing the three-axes positioning system as the test objects pass by the detector and that the hole labeled "A" is below the other orientation hole being used. The measurement plane shall pass through the test object at the point labeled "A" and be parallel to the bottom surface of the test object. If the detector is of such shape and geometry that access to the measurement plane at a test separation distance of 3 cm is not possible, then the test separation distance for the closest possible measurement plane shall be reported. Labeling for the *test object* orientation shall use two characters: the first character indicates in which quadrant of the mechanical drawing the specified orientation can be found, and the second character indicates the position of the unused hole relative to the hole labeled "A." The quadrant designations are given as follows:

a. "1" indicates bottom left.
b. "2" indicates bottom right.
c. "3" indicates top left.
d. "4" indicates top right.

Not all quadrants are used. For the second character, "L" indicates that the unused hole is to the left of the hole labeled "A," and "R" indicates that the unused hole is to the right of the hole labeled "A."

5.2.2.2 Three-Axes Positioning System

The *three-axes positioning system* shall meet the following requirements:

a. Displacement, x and y axes: ≥1 m.
b. Displacement, z axis: ≥ 2 m.
c. Position accuracy, each axis: 1 mm.
d. Position repeatability, each axis: 1 mm.
e. Maximum slew speed, y axis: ≥ 2 m/s.

5.2.2.3 Microphone (Audible *Alarm Indicators*)

The microphone is the audible *alarm indication* detector. It shall be used to detect an audible *positive alarm indication,* be capable of detecting the audible *alarm indication* as described in Clause 4.6.1, and provide an analog output that can be interfaced to the computer controller (see Clause 5.2.2.6).

5.2.2.4 Light Detector (Visible *Alarm Indicators*)

The light detector is the visible alarm indication detector. It shall be used to detect a visible positive alarm indication, be capable of being attached directly to the visual alarm indicator, and provide an analog electrical output that can be interfaced to the computer controller (see Clause 5.2.2.6).

5.2.2.5 Detector positioner

The detector positioner is a nonmagnetic, nonconductive device that provides a surface on which to securely attach the detector holder and that places the detector at a fixed location in the measurement coordinate system relative to the three-axes positioning system. A diagram of the detector holder showing the reference axis, reference surface, and x, y, and z measurement coordinate system axes is given in figure 4. A detailed mechanical drawing of the reference surface is provided in figure 5.

5.2.2.6 Computer Controller

The computer controller shall have installed and operational all necessary hardware and software for providing instrument control and data acquisition.

5.2.3 Detection Sensitivity

5.2.3.1 Initial Procedures

Ensure that the alarm indication detector and positioning system are connected to the computer controller. Turn on the alarm indication detector, computer controller, and positioning system and verify proper operation of the measurement system. Ensure that the hand-held metal detector is securely held by the detector holder and fasten the detector holder to the detector positioner. Attach the test object with the proper orientation to the positioning system. Turn on the hand-held metal detector and ensure that its output is functioning properly by noting a change in the alarm indication detector output as a metal object is brought near the hand-held metal detector. Ensure that the test object does not hit any objects while in motion.

5.2.3.2 Performing the measurement

Set the computer program to perform an x-y scan in the specified measurement plane at the specified speed. Set the x-axis position to -10 cm ± 0.1 cm relative to the detector axis and scan the y axis. Record any positive alarm indication using the alarm indication detector as the y-axis scan is being performed. Increment the x-axis position by 2 cm ± 0.1 cm and perform a y-axis scan. Repeat the x-axis increment and y-axis scan until the x-axis position is approximately 10 cm ± 0.1 cm. The center for the y-axis scans shall be the detector axis, and the scans shall each be 20 cm ± 0.1 cm long.

5.2.4 Speed

5.2.4.1 Initial Procedures

Ensure that the alarm indication detector and three-axes positioning system are connected to the computer controller. Turn on the alarm indication detector, computer controller, and three axes positioning system and verify proper operation of the measurement system. Ensure that the hand-held metal detector is securely held by the detector holder and fasten the detector holder to the detector positioner. Attach the test object with the proper orientation to the three-axes positioning system. Turn on the hand-held metal detector and ensure that the detector output is functioning properly by noting a change in the alarm indication detector output as a metal object is brought near the hand-held metal detector. Ensure that the *test object* does not hit any objects while in motion.

5.2.4.2 Performing the measurement

Set the computer program to perform a y-axis scan passing through the *detector axis* in the appropriate *measurement plane* at the specified speed. Record any *positive alarm indication* with the *alarm indication* detector as the y-axis scan is being performed. The center of the y-axis scan shall be the *detector axis* in the appropriate *measurement plane*, and the y-axis scan shall be 20 cm ± 0.1 cm long.

5.2.5 Body Interference

5.2.5.1 Initial Procedures

Select a person (the tester), whose hand and wrist are void of any metal objects, to hold the detector. The tester shall hold the detector such that the *detector plane* is parallel to the palm of the tester, the palm of the tester shall face the detector, and the arms of the tester shall extend fully away from the body. Turn on the *alarm indication* detector and the hand-held metal detector and ensure that the hand-held metal detector output is functioning properly by noting a change in the *alarm indication* detector output as a metal object is brought near the hand-held metal detector.

5.2.5.2 Performing the measurement

Position the hand-held metal detector at the appropriate test separation distance from the palm of the tester and note any positive alarm indication.

5.3 Alarm Indication Tests

5.3.1 Equipment

5.3.2 Sound Pressure Level Test

Perform the test in an anechoic chamber or at an outdoor location at least 6 m from any large object, where the ambient sound pressure level at the time of the test is not more than 53 dB_{SPL}. Position the sound pressure level meter microphone 0.80 m ± 0.02 m from the detector. Measure the sound pressure level with the detector power applied and the alarm indicator in the nonalarm

state. Then position the appropriate test object at a test separation distance of approximately 5 cm to produce an alarm, and again measure the sound pressure level.

5.3.3 Frequency Stability Test

After the detector has been off for at least 5 min, turn the detector on and complete any operator adjustments specified in the operator's manual within 10 s. Measure the frequency at 15 s ± 1 s and again at 45 s ± 1 s after the detector has been turned on. Compute the average frequency drift rate by taking the difference between the measured frequencies and dividing by 30 s. Perform the procedure three more times and compute the mean of the average frequency drift rates.

5.3.4 Visible Alarm Indicator Test

Position the detector with its alarm indicator 0.80 m ± 0.02 m from the eyes, at a test site where the ambient illumination is 10 000 lm/m^2 ± 1000 lm/m^2. After waiting at least 3 min to allow for eye accommodation, turn on the detector and move a metal object near the detector to cause an alarm. Observe the indication. Repeat the test at a test site where the ambient illumination is 25 lm/m^2 ± 2.5 lm/m^2.

5.4 Test for operation near a Metal Wall

5.4.1 Metal Test Panel

The metal test panel shall be cold-finished sheet carbon steel UNS G10150 to G10200, 1 m ± 0.1 m by 1 m ± 0.1 m by 0.75 mm ± 0.13 mm thick. The panel shall be mounted or supported in a manner that keeps the panel flat.

5.4.2 Procedure

Position the detector with its detector plane parallel to and 0.5 m ± 0.01 m from the plane of the test panel and with the detector axis centered with respect to the test panel. Turn on the detector and adjust its controls as specified in the operator's manual. Note the alarm indicator response.

5.5 Battery Life Test

Install in the detector new or fully charged batteries of the type specified by the manufacturer. Turn the detector on and leave it on for a continuous 40 h ± 1 h period. Within 1 h from the end of this period and without changing the batteries, test the detector in accordance with Clause 4.3 for the *test object* of the appropriate *object size class*, its material, and its orientation (see Clause 5.2.2.1) given below:

a. *Large object size:* Handgun: material, zinc; orientation, 3L.
b. *Medium object size:* Knife: material, aluminum; orientation, 3L.
c. *Small object size:* Stainless steel knife: orientation, 3L.
d. *Very small object size:* Razor blade: orientation, 3L.

5.6 Burn-In Test

Turn the detector on (such that it is ready to detect a metal object) for a period of 160 h ± 5 h. Replace the battery once every 40 h ± 1 h, if necessary. Without turning the detector off, test the detector in accordance with Clause 4.3 for the *test object* of the appropriate *object size class,* its material, and its orientation (see Clause 5.2.2.1) given below:

a. *Large object size:* Handgun: material, zinc; orientation, 3L.
b. *Medium object size:* Knife: material, aluminum; orientation, 3L.
c. *Small object size:* Stainless steel knife: orientation, 3L.
d. *Very small object size:* Razor blade: orientation, 3L.

5.7 Power Cycling Test

Turn the detector power on and off 100 times ± 2 times within 300 s ± 30 s and immediately (within 60 s) test the detector in accordance with Clause 4.3 for the *test object* of the appropriate *object size class,* its material, and its orientation (see Clause 5.2.2.1) given below:

a. *Large object size:* Handgun: material, zinc; orientation, 3L.
b. *Medium object size:* Knife: material, aluminum; orientation, 3L.
c. *Small object size:* Stainless steel knife: orientation, 3L.
d. *Very small object size:* Razor blade: orientation, 3L.

6 FIELD TESTING PROCEDURES

6.1 Large Object Size

The detector shall provide a *positive alarm indication* when passed approximately 10 cm (4 in) from the *large object size test objects* described in Clause 7.1. Repeat this test three times at pass-by speeds ranging from approximately 0.5 m/s to approximately 1.5 m/s to ensure proper detector performance.

6.2 Medium Object Size

The detector shall provide a *positive alarm indication* when passed approximately 7.5 cm (3 in) from the *medium object size test objects* described in Clause 7.2. Repeat this test three times at pass-by speeds ranging from approximately 0.5 m/s to approximately 1.5 m/s to ensure proper detector performance.

6.3 Small Object Size

The detector shall provide a *positive alarm indication* when passed approximately 5 cm (2 in) from the *small object size test objects* described in Clause 7.3 Repeat this test three times at pass-by speeds ranging from approximately 0.5 m/s to approximately 1.5 m/s to ensure proper detector performance.

6.4 Very Small Object Size

The detector shall provide a *positive alarm indication* when passed approximately 3 cm (1.2 in) from the *very small object size test objects* described in Clause 7.4. Repeat this test three times at pass-by speeds ranging from approximately 0.5 m/s to approximately 1.5 m/s to ensure proper detector performance.

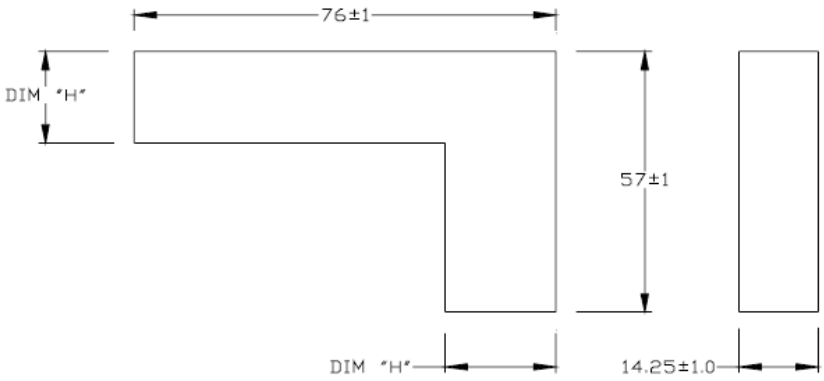
7. TEST OBJECTS DESCRIPTION

This clause contains mechanical drawings of the test objects. The test objects are encased replicas of threat items. All dimensions in the mechanical drawings are given in units of millimeters (mm).

7.1 Large Object Size Test Objects

The following mechanical drawings are of replicas of the *large object size* item that is considered a threat to an officer, a prisoner, an inmate, and public safety. The *large object size* threat item is a handgun. The mechanical drawings are arranged in the following order: the replica of the handgun and the location of the replica within the encasement. Three replicas are made and encased, one from each of the materials indicated in the drawings.

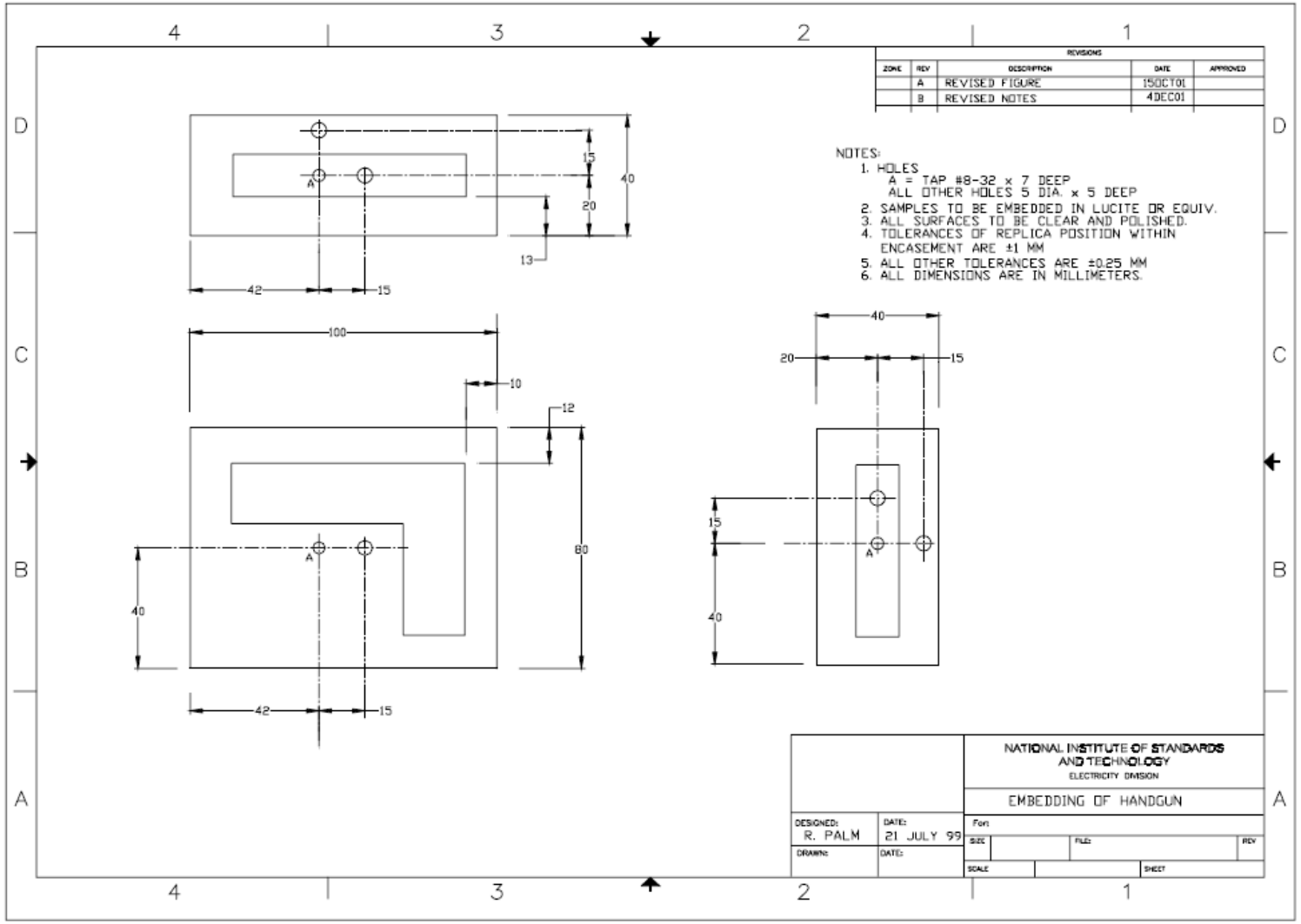
RevNo	Revision note	Date	Signature	Checked
A	ADDED TABLE WITH MATERIAL SPECIFICATIONS	18JUL01		



ALL DIMENSIONS ARE IN MILLIMETERS (MM)

PART NO.	MATERIAL	DIM "H"
-3	ZINC ALLOY PER UNS Z35530	28±1
-2	STEEL PER UNS G41400	20±1
-1	ALUMINUM PER UNS A96061	28±1

Itemref	Quantity	Title/Name, designation, material, dimension etc			Article No./Reference	
DRAWN BY: R. PALM		CHECKED BY: N. PAULTER	APPROVED DATE	FILENAME	DATE 7 JAN 99	SCALE 1:1
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY		HANDGUN			REV 0	SHEET 1/1


4
3
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REVISIONS
ZONE | REV | DESCRIPTION | DATE | APPROVED
A | REVISED FIGURE | 15OCT01
B | REVISED NOTES | 4DEC01
NOTES:
1. HOLES
A = TAP #8-32 x 7 DEEP
ALL OTHER HOLES 5 DIA. x 5 DEEP
2. SAMPLES TO BE EMBEDDED IN LUCITE OR EQUIV.
3. ALL SURFACES TO BE CLEAR AND POLISHED.
4. TOLERANCES OF REPLICA POSITION WITHIN ENCASEMENT ARE ±1 MM
5. ALL OTHER TOLERANCES ARE ±0.25 MM
6. ALL DIMENSIONS ARE IN MILLIMETERS.
15
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100
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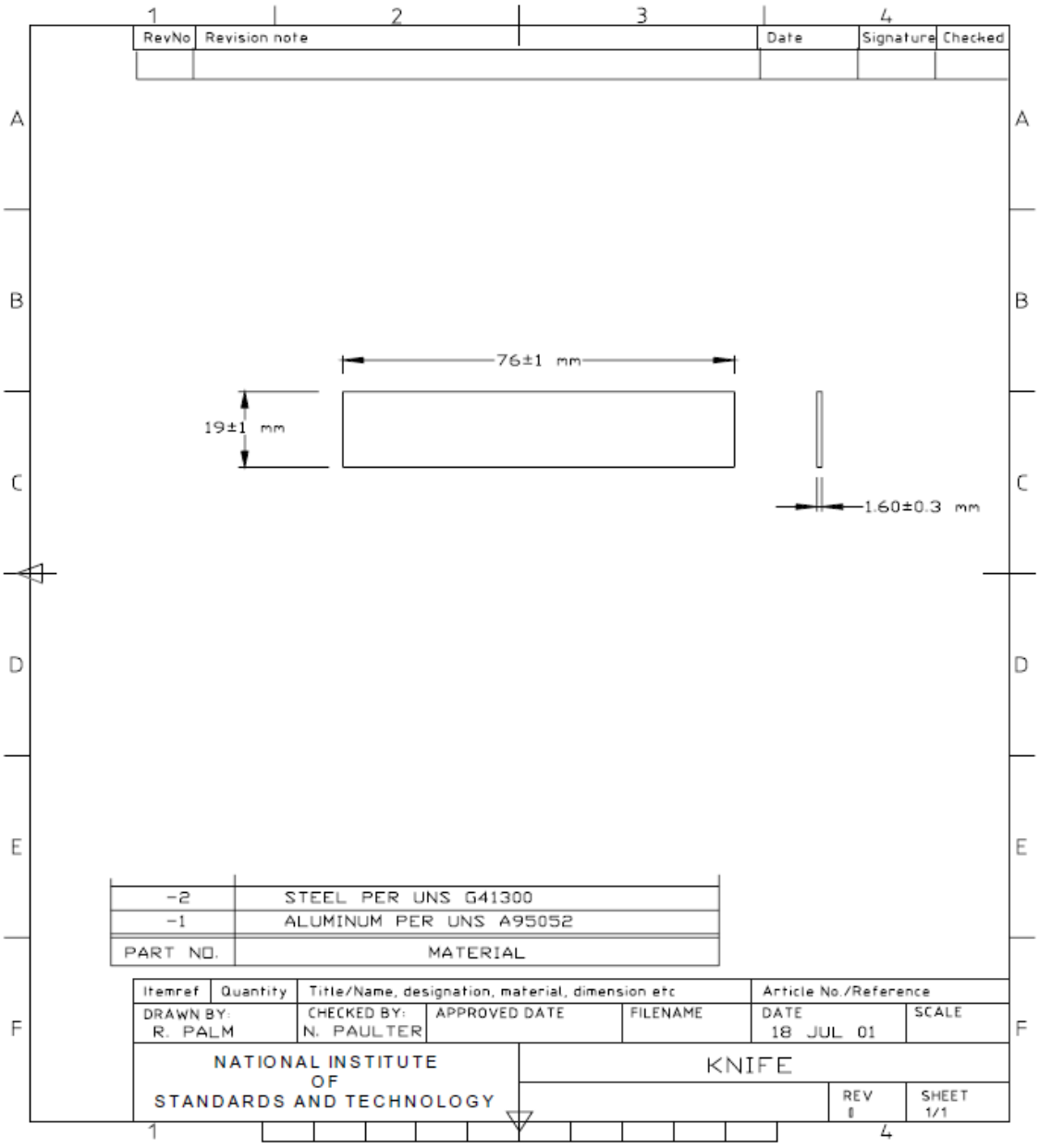
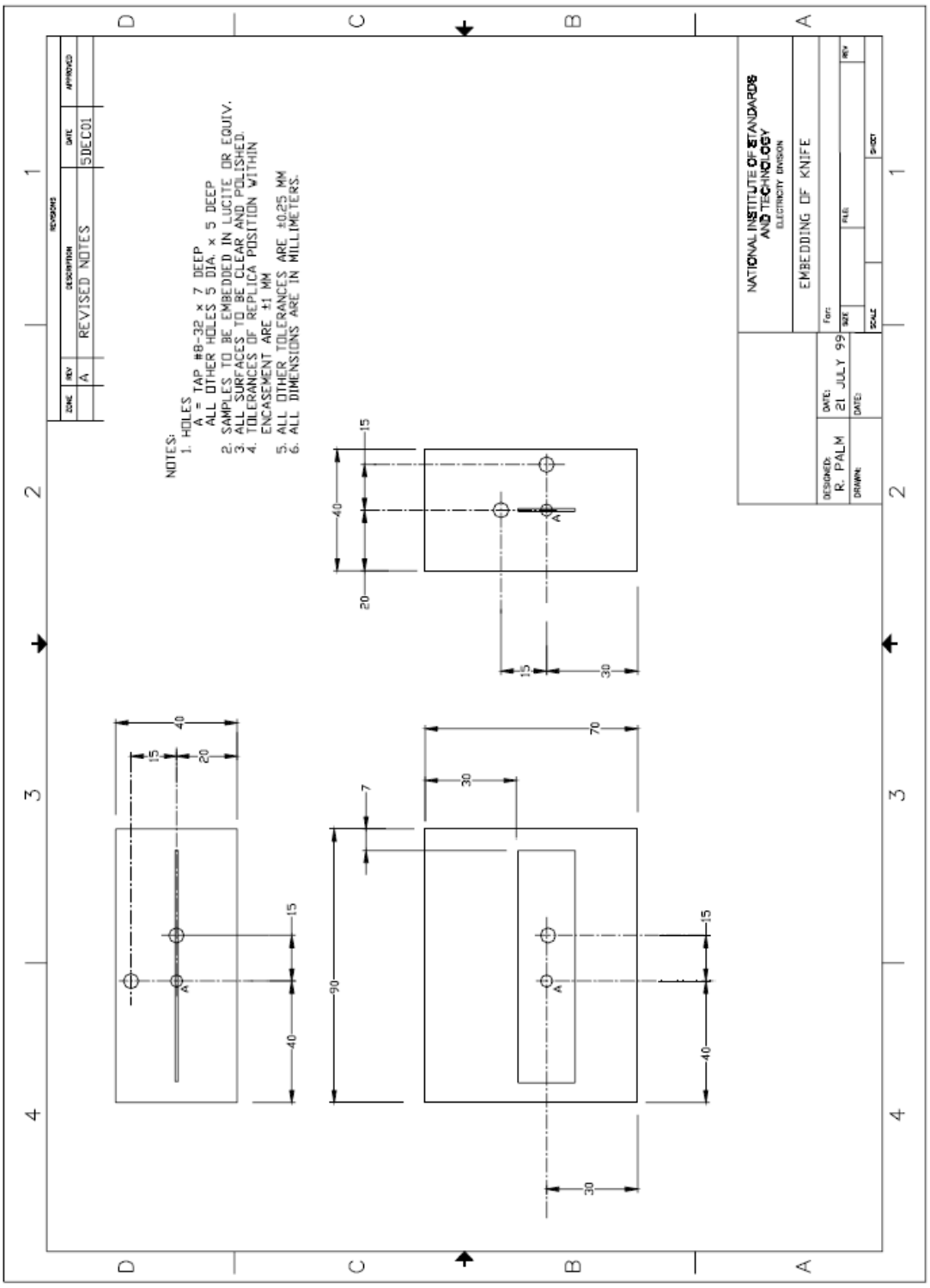
15
15
40
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
ELECTRICITY DIVISION
EMBEDDING OF HANDGUN
DESIGNED: R. PALM
DATE: 21 JULY 99
DRAWN:
DATE:
For:
SIZE
FILE:
REV
SCALE
SHEET

7.2 Medium Object Size Test Objects

The following mechanical drawings are of the replicas of the *medium object size* item that is considered a threat to an officer, a prisoner, an inmate, and public safety. The *medium object size* threat item is a knife. The mechanical drawings are arranged in the following order: the replica of the knife and the location of the replica within the encasement. Two replicas are made and encased, one from each of the materials indicated in the drawings.





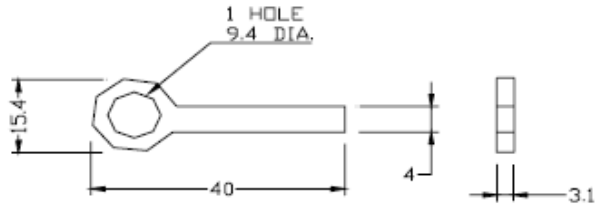
7.3 Small Object Size Test Objects

The following mechanical drawings are replicas of the *small object size* items that are considered a threat to officer and prisoner safety and that can be used to defeat security measures. These items are replicas of a handcuff key, a nonferromagnetic stainless steel knife, and a 22-Caliber Long Rifle cartridge.

7.3.1 Handcuff Key

This clause contains mechanical drawings of the replica of a handcuff key, a *small object size test object.* The mechanical drawings are arranged in the following order: the replica of the handcuff key and the location of the replica within the encasement.

RevNo	Revision note	Date	Signature	Checked
A	REVISED SIZE	6/29/99		
B	REVISED MATERIAL SPEC.	7/18/01		
C	ADDED MATERIAL TABLE	10/15/01		



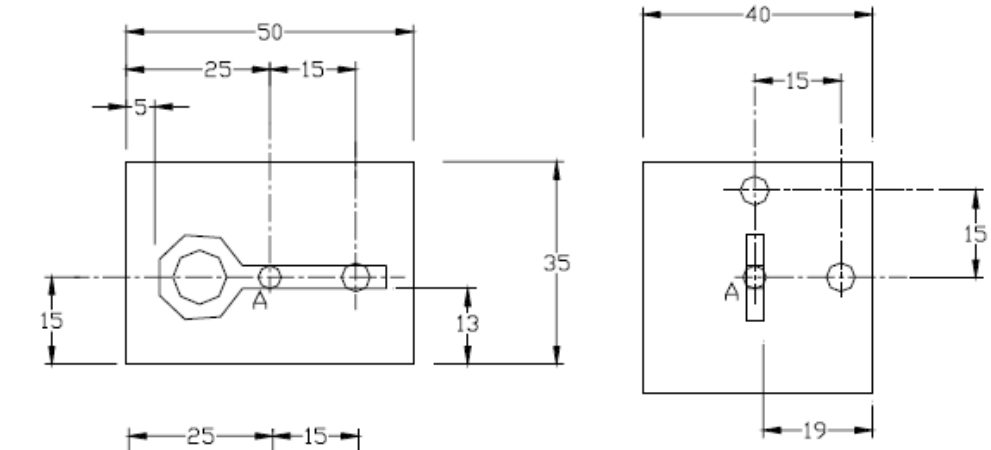
PART NO.	MATERIAL:
-1	STEEL PER UNS G10180

DIMENSIONS ARE IN MILLIMETERS (MM)

UNLESS OTHERWISE SPECIFIED TOLERANCE IS +/- .75

Itemref	Quantity	Title/Name, designation, material, dimension etc		Article No./Reference	
Designed by R. PALM	Checked by N. PAULTER	Approved by - date		Date 4 JUNE 98	SCALE
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY		HANDCUFF KEY		Edition EDITION	Sheet SHEET

RevNo	Revision note	Date	Signature	Checked
A	BLOCK SIZE WAS 60 X 40 X 40	5NOV01		
B	REVISED NOTES	5DEC01		



NOTES:

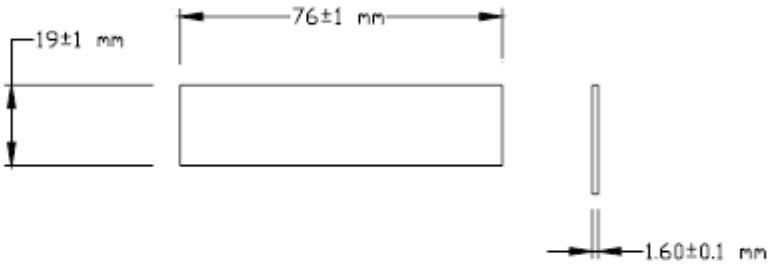
1. HOLES
   A = TAP #8-32 x 7 DEEP
   ALL OTHER HOLES 5 DIA. x 5 DEEP
2. SAMPLES TO BE EMBEDDED IN LUCITE OR EQUIV.
3. ALL SURFACES TO BE CLEAR AND POLISHED.
4. TOLERANCES OF REPLICA POSITION WITHIN ENCASEMENT ARE ±1 MM
5. ALL OTHER TOLERANCES ARE ±0.25 MM
6. ALL DIMENSIONS ARE IN MILLIMETERS.

Itemref	Quantity	Title/Name, designation, material, dimension etc			Article No./Reference	
DRAWN BY: R. PALM		CHECKED BY: N. PAULTER	APPROVED DATE	FILENAME	DATE 11 DEC 98	SCALE 1:1
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY		EMBEDDING OF HANDCUFF KEY			REV B	SHEET 1/1

7.3.2 Nonferromagnetic Stainless Steel Knife

This clause contains mechanical drawings of the replica of a nonferromagnetic stainless steel knife, a small object size test object. The mechanical drawings are arranged in the following order: the replica of the knife and the location of the replica within the encasement.

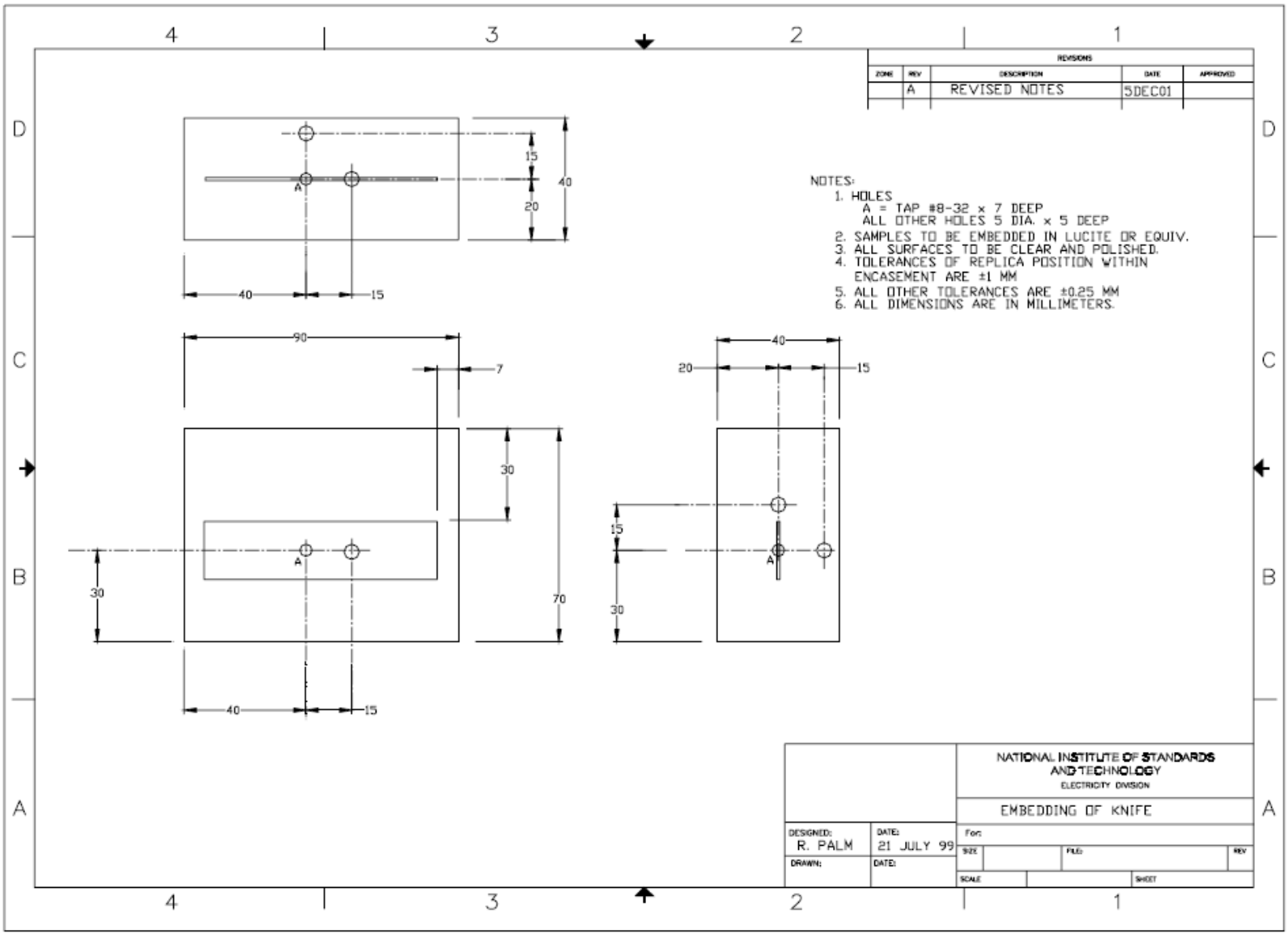
RevNo	Revision note	Date	Signature	Checked



MATERIAL: STAINLESS STEEL PER UNS S30400

Itemref	Quantity	Title/Name, designation, material, dimension etc			Article No./Reference	
DRAWN BY: R. PALM		CHECKED BY: N. PAULTER	APPROVED DATE	FILENAME	DATE 7 JAN 99	SCALE 1:1

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY	SS KNIFE		
		REV I	SHEET 1/1


4
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REVISIONS
ZONE | REV | DESCRIPTION | DATE | APPROVED
A | REVISED NOTES | 5DEC01
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NOTES:
1. HOLES
A = TAP #8-32 x 7 DEEP
ALL OTHER HOLES 5 DIA. x 5 DEEP
2. SAMPLES TO BE EMBEDDED IN LUCITE OR EQUIV.
3. ALL SURFACES TO BE CLEAR AND POLISHED.
4. TOLERANCES OF REPLICA POSITION WITHIN ENCASEMENT ARE ±1 MM
5. ALL OTHER TOLERANCES ARE ±0.25 MM
6. ALL DIMENSIONS ARE IN MILLIMETERS.
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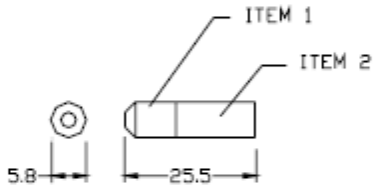
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
ELECTRICITY DIVISION
EMBEDDING OF KNIFE
DESIGNED: R. PALM
DATE: 21 JULY 99
DRAWN:
DATE:
For:
SIZE
FILE:
REV
SCALE
SHEET

7.3.3 Firearm Cartridge (22-Caliber Long Rifle)

This section contains mechanical drawings of the replica of a firearm cartridge, a *small object size test object.* The mechanical drawings are arranged in the following order: the cartridge assembly, the bullet portion of the replica, the case portion of the replica, and the location of the replica within the encasement.

RevNo	Revision note		Date	Signature	Checked



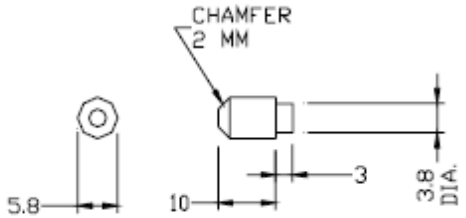
	BULLET	1	CASING	1
PART	ITEM 1 DRAWING NAME	QTY	ITEM 2 DRAWING NAME	QTY

DIMENSIONS ARE IN MILLIMETERS (MM)

UNLESS OTHERWISE SPECIFIED TOLERANCE IS +/- .75

Itemref	Quantity	Title/Name, designation, material, dimension etc		Article No./Reference	
DESIGNED_BY R. PALM		CHECKED_BY N. PAULTER	APPROVED_BY_DATE	DATE 4 JUNE 1998	SCALE
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY		SMALL CALIBER ROUND		Edition EDITION	Sheet SHEET

RevNo	Revision note	Date	Signature	Checked
A	REVISED SIZE	6/29/99		
B	REVISED MATERIAL SPEC.	7/19/01		



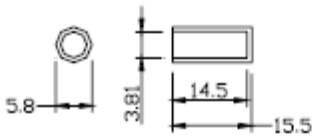
MATERIAL: LEAD PER UNS L50045

DIMENSIONS ARE IN MILLIMETERS (MM)

UNLESS OTHERWISE SPECIFIED TOLERANCE IS +/- .25

Itemref	Quantity	Title/Name, designation, material, dimension etc			Article No./Reference	
Designed by R. PALM		Checked by N. PAULTER	Approved by - date	FILENAME	DATE 4 JUNE 98	SCALE
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY		BULLET			Edition	Sheet

RevNo	Revision note	Date	Signature	Checked
A	REVISED SIZE	6/29/99		
B	REVISED MATERIAL SPEC.	7/19/01		



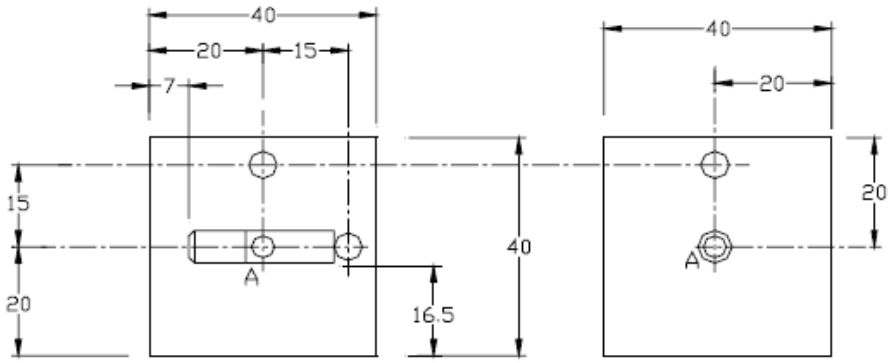
MATERIAL: BRASS PER UNS C26000

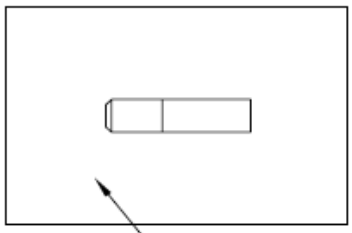
DIMENSIONS ARE IN MILLIMETERS (MM)

UNLESS OTHERWISE SPECIFIED TOLERANCE IS +/- .25

Itemref	Quantity	Title/Name, designation, material, dimension etc		Article No./Reference	
DESIGNED_BY R. PALM		CHECKED_BY N. PAULTER	APPROVED_BY_DATE	DATE 4 JUNE 98	SCALE
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY		CASING			
				Edition EDITION	Sheet SHEET

RevNo	Revision note	Date	Signature	Checked
A	BLOCK WAS 60 X 40 X 40	5NOV01		
B	REVISED NOTES	5DEC01		





NO HOLES DRILLED ON THIS SIDE

NOTES:

1. HOLES
   A = TAP #8-32 x 7 DEEP
   ALL OTHER HOLES 5 DIA. x 5 DEEP
2. SAMPLES TO BE EMBEDDED IN LUCITE OR EQUIV.
3. ALL SURFACES TO BE CLEAR AND POLISHED.
4. TOLERANCES OF REPLICA POSITION WITHIN ENCASEMENT ARE ±1 MM
5. ALL OTHER TOLERANCES ARE ±0.25 MM
6. ALL DIMENSIONS ARE IN MILLIMETERS.

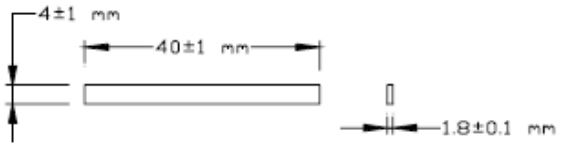
Itemref	Quantity	Title/Name, designation, material, dimension etc			Article No./Reference	
DRAWN BY: R. PALM		CHECKED BY: N. PAULTER	APPROVED DATE	FILENAME	DATE: 11 DEC 98	SCALE: 1:1
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY		EMBEDDING OF SMALL CALIBER ROUND			REV: 0	SHEET: 1/1

7.4 Very Small Object Size Test Objects

7.4.1 Pen Refill

This clause contains mechanical drawings of the replica of a pen refill, a very small object size test object. The mechanical drawings are arranged in the following order: the replica of the pen refill and the location of the replica within the encasement.

RevNo	Revision note	Date	Signature	Checked
A	REVISED MATERIAL SPEC	18JUL01		

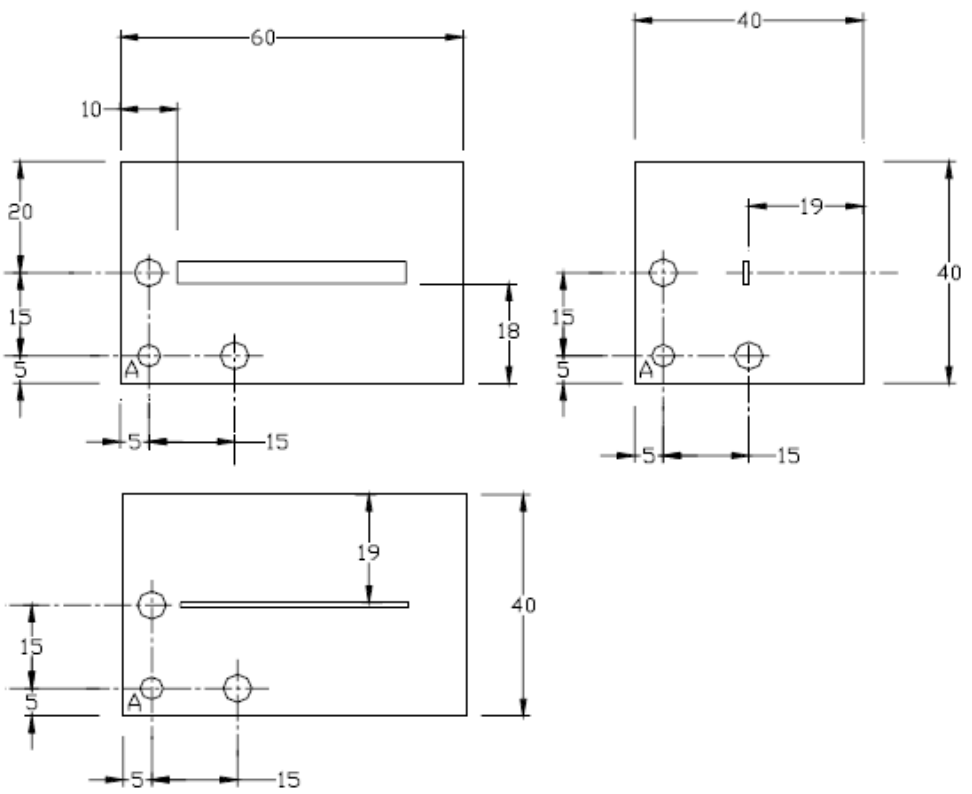


MATERIAL: BRASS PER UNS C36000

Itemref	Quantity	Title/Name, designation, material, dimension etc			Article No./Reference	
DRAWN BY: R. PALM		CHECKED BY: N. PAULTER	APPROVED DATE	FILENAME	DATE 29 JUNE 99	SCALE

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY	BALL POINT PEN REFILL		
		REV 0	SHEET 1/1

RevNo	Revision note	Date	Signature	Checked
A	REVISED HOLE LOCATIONS	5NOV01		
B	REVISED NOTES	5DEC01		



NOTES:

1. HOLES
   A = TAP #8-32 x 7 DEEP
   ALL OTHER HOLES 5 DIA. x 5 DEEP
2. SAMPLES TO BE EMBEDDED IN LUCITE OR EQUIV.
3. ALL SURFACES TO BE CLEAR AND POLISHED.
4. TOLERANCES OF REPLICA POSITION WITHIN ENCASEMENT ARE ±1 MM
5. ALL OTHER TOLERANCES ARE ±0.25 MM
6. ALL DIMENSIONS ARE IN MILLIMETERS.

Itemref	Quantity	Title/Name, designation, material, dimension etc		Article No /Reference	
DRAWN BY: R. PALM		CHECKED BY: N. PAULTER	APPROVED DATE	FILENAME	DATE: 22 JUL 99 / SCALE: 1:1

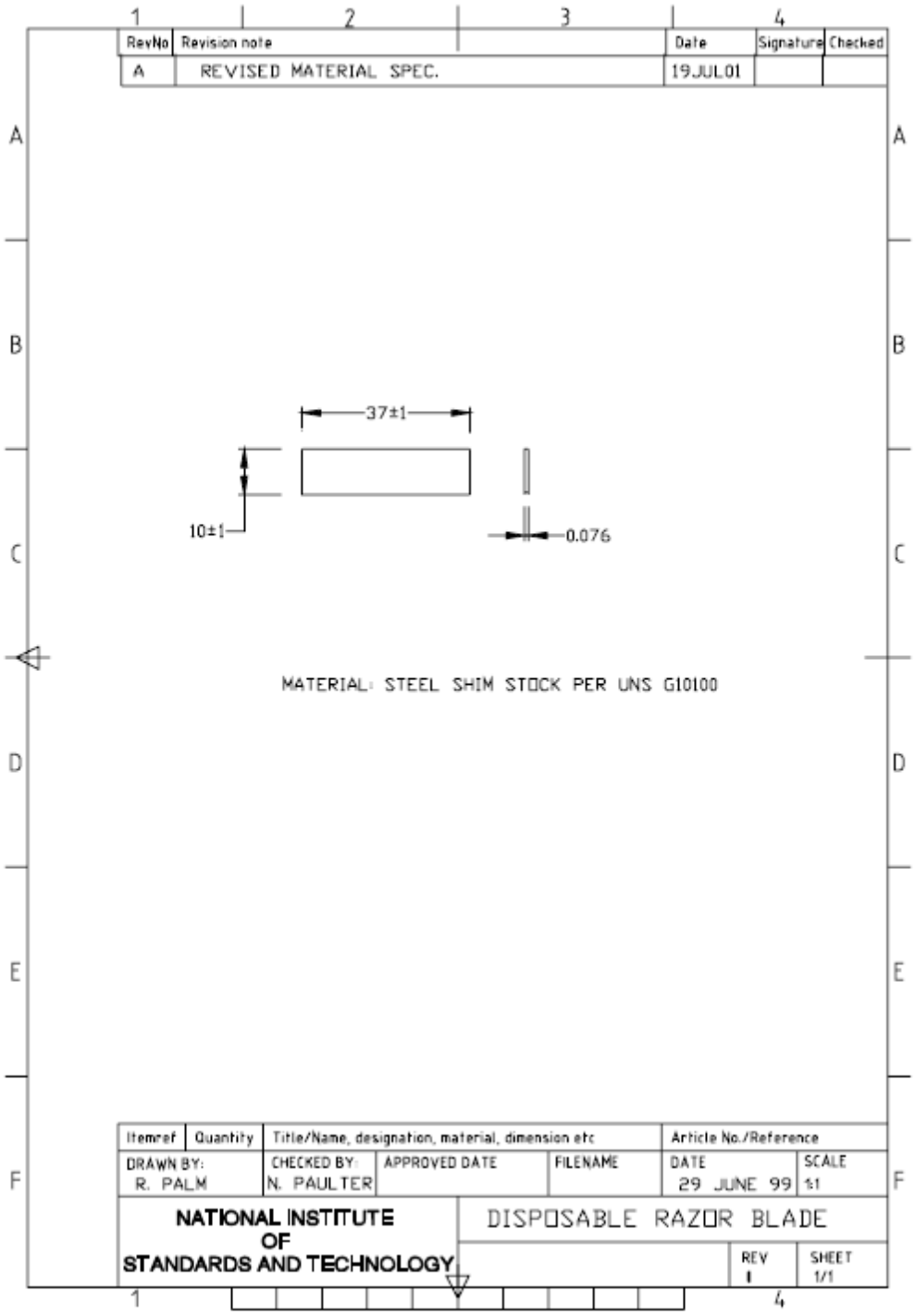
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

EMBEDDING OF BALL POINT PEN REFILL

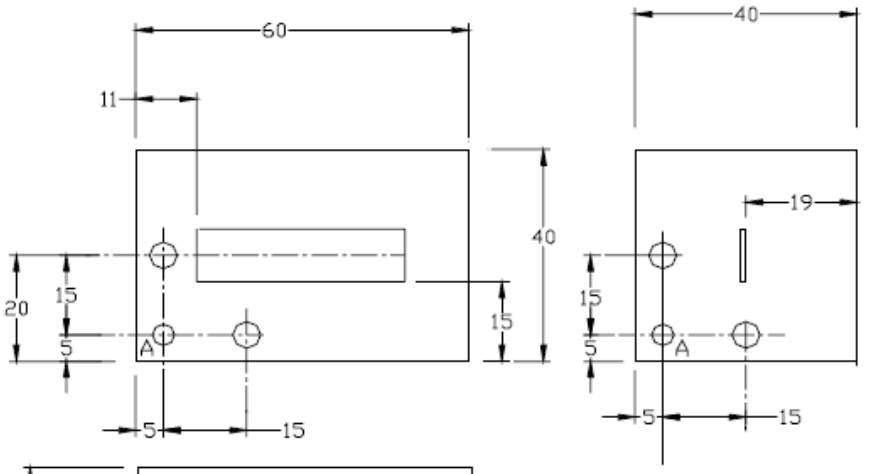
REV: 0 | SHEET: 1/1

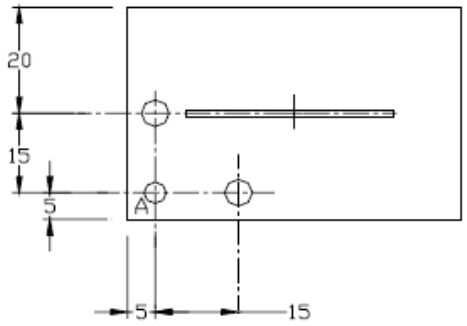
7.4.2 Disposable Razor Blade

This clause contains mechanical drawings of the replica of a disposable razor blade, a very small object size test object. The mechanical drawings are arranged in the following order: the replica of the razor blade and the location of the replica within the encasement.



RevNo	Revision note	Date	Signature	Checked
A	REVISED HOLE LOCATIONS	5NOV01		
B	REVISED NOTES	5DEC01		





NOTES:

1. HOLES
   A = TAP #8-32 x 7 DEEP
   ALL OTHER HOLES 5 DIA. x 5 DEEP
2. SAMPLES TO BE EMBEDDED IN LUCITE OR EQUIV.
3. ALL SURFACES TO BE CLEAR AND POLISHED.
4. TOLERANCES OF REPLICA POSITION WITHIN ENCASEMENT ARE ±1 MM
5. ALL OTHER TOLERANCES ARE ±0.25 MM
6. ALL DIMENSIONS ARE IN MILLIMETERS.

Itemref	Quantity	Title/Name, designation, material, dimension etc			Article No./Reference	
DRAWN BY: R. PALM		CHECKED BY: N. PAULTER	APPROVED DATE	FILENAME	DATE 22 JUL 99	SCALE 1:1

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

EMBEDDING OF DISPOSABLE RAZOR BLADE

REV 0 | SHEET 1/1

7.4.3 Hypodermic Needle, Disposable Syringe (Optional)

A mechanical drawing is not included because this is an optional small object size test object. It is suggested that the actual object be used for this optional small object size test object. This optional test object should be a stainless steel hypodermic needle with ferrule, typically found on disposable insulin syringes.

8 Marking

8.1 Each detector shall be indelibly marked with the following instructions:
(a) Manufacturer's name, trade-name of detector (if any) and number;
(b) Country of manufacture

8.1.1 The manufacturer shall provide a detailed listing of all relevant specifications of the detector. The list shall include at a minimum:

(a) Detector object size class
(b) Mechanical drawings of the detector with dimensions in metric units
(c) Max. weight of the detector
(d) Allowable range of ac line power supply voltage
(e) Battery type, quantity and life
(f) Operating ambient temperature range

8.2 Certification Marking

8.2.1 The detector may also be marked with the Standard Mark.

8.2.2 The products (s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the Bureau of Indian Standards Act, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the standard mark.