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**Materials and articles in contact with
foodstuffs — Cutlery and table holloware —**

Part 4:

Requirements for gold-plated cutlery

*Matériaux et objets en contact avec les denrées alimentaires — Coutellerie
et orfèvrerie de table —*

Partie 4: Exigences relatives à la coutellerie et aux couverts dorés



Reference number
ISO 8442-4:1997(E)

Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 8442-4 was prepared by the European Committee for Standardization (CEN) in collaboration with ISO Technical Committee TC 186, *Cutlery and table and decorative metal hollow-ware*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

ISO 8442 consists of the following parts, under the general title *Materials and articles in contact with foodstuffs — Cutlery and table holloware*:

- *Part 1: Requirements for cutlery for the preparation of food*
- *Part 2: Requirements for stainless steel and silver-plated cutlery*
- *Part 3: Requirements for silver-plated table and decorative holloware*
- *Part 4: Requirements for gold-plated cutlery*

Further parts are proposed with the following titles:

- *Part 5: Specific cutting test*
- *Part 6: Lacquered lightly silver-plated table and decorative holloware*

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International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet central@iso.ch
X.400 c=ch; a=400net; p=iso; o=isocs; s=central

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- *Part 7: Specification for table cuttlery made of precious metals and their alloys, especially silver cuttlery*
- *Part 8: Specification for silver table and decorative holloware*

Annexes A to E form an integral part of this part of ISO 8442. Annex F is for information only.

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Foreword

The text of EN ISO 8442-4:1997 has been prepared by Technical Committee CEN/TC 194 "Utensils in contact with food", the secretariat of which is held by BSI, in collaboration with Technical Committee ISO/TC 186 "Cutlery and table and decorative metal hollow-ware".

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 1998, and conflicting national standards shall be withdrawn at the latest by June 1998.

EN ISO 8442 consists of the following parts:

- Part 1: Requirements for cutlery for the preparation of food
- Part 2: Requirements for stainless steel and silver-plated cutlery
- Part 3: Requirements for silver-plated table and decorative holloware
- Part 4: Requirements for gold-plated cutlery

Further parts are proposed with the following titles:

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- Part 6: Lacquered lightly silver-plated table and decorative holloware
- Part 7: Specification for table cutlery made of precious metals and their alloys, especially silver cutlery
- Part 8: Specification for silver table and decorative holloware

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

This Standard does not cover those features of cutlery which are matter of personal choice for the user: such as the design, size, type of finish, blade flexibility or similar characteristics which can be readily identified by the purchaser at the point of sale.

Attention is drawn to Directives of the European Community concerning materials and articles in contact with food, in particular to Directives EC 89/109 and EC 90/128.

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1 Scope

This Standard specifies the following requirements for gold plated cutlery:

- a) performance requirements for table cutlery (for example, knives, forks, spoons, carving sets, ladles, and other serving pieces);
- b) composition limits for base metals for cutlery;
- c) tests for resistance to permanent deformation, firmness of handle attachment, hardness of blades, resistance to corrosion and the thickness and adhesion of gold coatings;
- d) three minimum thicknesses of gold plating: a first class, a second class, and a third class.

This Standard specifies the method of defining gold deposits for each and every item and also test methods.

This Standard does not apply to table cutlery which has only small areas of gold plate as inlays in non gold plated decoration.

2 Normative references

This Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

ISO 1463	Metallic and oxide coatings - Measurement of coating thickness - Microscopical method
ISO 2177	Metallic coatings - Measurement of coating thickness - Coulometric method by anodic dissolution
ISO 3497	Metallic coatings - Measurement of coating thickness - X-ray spectrometric methods
ISO 3543	Metallic and non-metallic coatings - Measurement of thickness - Beta scatter method
ISO 4481 : 1977	Cutlery and flatware - Nomenclature
ISO 6508 : 1986	Metallic materials - Hardness test - Rockwell test (scales A - B - C - D - E - F - G - H - K)
EN ISO 8442-2	Materials and articles in contact with foodstuffs - Cutlery and table holloware - Part 2: Requirements for stainless steel and silver plated cutlery (ISO 8442-2:1997)

3 Definitions

For the purposes of this Standard the definitions given in ISO 4481:1977 and EN ISO 8442-2 apply together with the following.

3.1 hard gold plating: Refined gold plating containing elements which increase the hardness.

4 Materials and their application

4.1 General

The cutlery shall be made from materials that enable the finished product to meet all of the performance requirements of this standard.

NOTE: The cutlery should not under foreseeable conditions of use transfer any substance likely to be detrimental to health or to have any detrimental organoleptic effects.

4.2 Metals

4.2.1 The composition of metal parts of table cutlery shall be as given in table 1.

4.2.2 All gold plated parts of table cutlery shall be in accordance with the requirements of clause 6.

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Table 1: Metals for table cutlery, compositions limit

Applications	Materials	Chemical composition ¹⁾								
		C	P max.	S max.	Cr min.	Ni min.	Mo max. ²⁾	V max. ²⁾	Mn max.	
Spoons, forks, ladles, unsharpened knives, handles of knives and carving forks	Austenitic stainless steel	0,07 max.	0,045	0,015	17,0	8,0	2,0			
		0,15 max.	0,045	0,015	17,0	4,0				10,5
Guards and prongs of carving items	Ferritic stainless steel	0,08 max.	0,040	0,015	16,0		1,30			
Guards and prongs of carving items	Martensitic stainless steel (low carbon)	0,16 min.	0,040	0,015	12,0					
Knife blades handles of monobloc knives	Martensitic stainless steel (higher carbon)	0,26 min.	0,040	0,015	12,0		1,30	0,20		
		Ag min.	Cu min.	Ni min.	Zn	Mn max.	Fe	Pb	Total impurities max. %	
Spoons, forks, ladles, unsharpened knives and carving forks	Silver 800	80,0	20,0							
	Silver 925	92,5	7,5							
Coatings	Nickel-silver		60,0	9,0	24,0	0,50	0,30	0,05	0,50	
	Gold Silver					Au min. 98,5 Ag min. 98,5				
1) See EN 10088-1 for additional chemical compositions 2) Additions of Mo and V are optional.										

5 Construction

5.1 General

Cutlery manufactured from the materials specified in clause 4 shall be so constructed that it meets all the relevant performance requirements of this standard.

5.2 Alignment, uniformity and absence of defects

5.2.1 All surfaces shall be free from cracks, pits and other defects.

5.2.2 All cutlery shall be essentially straight and symmetrical except when the lack of straightness or symmetry is an intentional feature of the design.

5.2.3 Identical items within a batch shall show no variation in dimension or form.

5.2.4 All edges, including the edges of spoons, forks, ladles and the insides of fork prongs, shall be free from burrs and the roughness of blanked edges shall have been removed by a suitable operation.

5.2.5 Table knives shall be balanced such that when the knife is pivoted on its bolster, or at the junction of the handle and blade if no bolster is present, the handle shall be heavier than the blade.

5.2.6 Compliance with the requirements for 5.2.1 to 5.2.5 shall be checked by touch or by visual inspection using normal corrected vision.

5.3 Hollow handles

The seams joining hollow handles together shall be watertight.

5.4 Knife blades

Stainless steel knife blades shall not be gold plated.

5.5 Knife edges

The cutting edge of sharpened table knives shall be either scalloped or serrated or shall be whetted to an included angle not greater than 50°.

The cutting edges of a carving knife blade shall be whetted to an inclined angle not greater than 40° and shall not be thicker than 0,46 mm when measured 1 mm from the external side of the edge.

5.6 Sprung fork guards

When fitted, sprung fork guards shall have a positive opening and closing snap action.

6 Gold plated cutlery

6.1 General

Items of cutlery claimed to be gold plated shall comply with the additional requirements of 6.2 and 6.3.

6.2 Average thickness

The average thickness of gold coating on each and every finished item when measured in accordance with the methods described in annex A (weight of coating) and annex B (area of coating) shall be as specified in table 2.

Table 2: Average thickness of classes of gold coating			
Description	Symbol	Items for frequent use	Items for infrequent use
First class	I	min. 4,5 μm	min. 2,5 μm
Second class	II	min. 2 μm	min. 1 μm
Third class	III	min. 0,2 μm	min. 0,1 μm

6.3 Local thickness

The minimum local thickness of gold coating on significant surfaces (i.e. those parts of cutlery subject to the greatest wear; see 3.4) of articles of frequent use shall not be less than 60 % of the average thickness deemed to be on the item.

The minimum local thickness shall be measured in accordance with one of the methods specified in ISO 2177, ISO 1463, ISO 3497 or ISO 3543. In case of dispute the thickness shall be measured in accordance to ISO 1463.

7 Performance requirements

7.1 Minimum hardness of hard gold coatings

Gold coatings deemed to be hard shall contain 0,2 % minimum of Co or Ni or Fe or any other element which increases the hardness.

7.2 Resistance to corrosion

The surfaces of stainless steel table knives shall comply with the requirements a) to c) when tested in accordance with the method described in annex C:

- no transverse cracks shall have developed and no longitudinal cracks of a length exceeding 1,5 mm shall have developed;
- there shall not be more than three pits each having an area greater than a circle of 0,4 mm diameter on the handle, and not more than three pits each having an area greater than a circle of 0,4 mm diameter (0,126 mm²) elsewhere;
- there shall be no pits having an area greater than a circle of 0,75 mm diameter (0,442 mm²) on any part.

7.3 Strength

7.3.1 Knives with martensitic stainless steel blades

A knife shall not crack or break and shall not acquire a permanent deformation of more than 3° when tested in accordance with the method described in annex D. In addition, the handle blade joint shall not become loose.

7.3.2 Spoons, forks, ladles and unsharpened knives

An item shall not have a permanent deformation of more than 1 mm when tested as follows:

An item shall be laid on a plane with the highest point of the handle facing upward. A force shall be applied equivalent to 0,7 N for each millimetre of overall length or 100 N whichever is the lesser for 10 s (see figure 1 for a spoon). During the application of this force the point of rest of the handle (A in figure 1) shall not be more than 10 mm from the edge of the supporting surface.

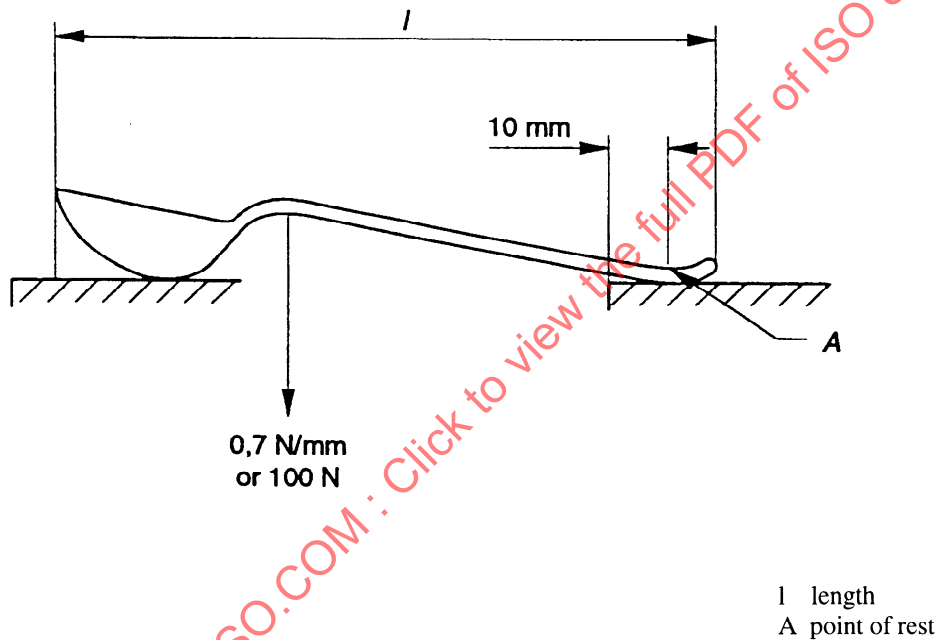


Figure 1: Strength test for a spoon

7.4 Firmness of handle attachment

Handles that are not an integral part of the rest of the item shall be attached by a method that prevents the handle turning relative to the rest of the item or pulling away from the blade when, immediately after being immersed for 10 min in water at a temperature of $(100 \pm 5) ^\circ\text{C}^{1)}$, the item is subjected to

- a) a pulling force of $(180 \pm 10) \text{ N}$ for 10 s;
- b) a torque of $(4,5 - 0,2) \text{ Nm}$ for items whose handles have a surface area of 37 cm^2 or more, or a torque of $(3,7 \pm 0,2) \text{ Nm}$ for items whose handles have a surface area of less than 37 cm^2 . The torque shall be applied for 10 s.

The pulling force and torque shall be applied successively, immersing the handles for 10 min in water at $(100 \pm 5) ^\circ\text{C}$ immediately before the application of each force.

7.5 Hardness of knife blades

Knife blades made from martensitic stainless steel shall have a minimum hardness of 48 HRC when tested in accordance with ISO 6508:1986. Readings shall be taken not less than 40 mm from the handle.

Carving knife blades shall have a minimum of 52 HRC.

7.6 Adhesion of gold coatings

Gold plated table cutlery shall not show any sign of abrasion of the gold coating after polishing for 40 min by a silver polishing machine, using an ordinary polishing solution (see test in annex E).

8 Marking and labelling

8.1 Marking

8.1.1 Each item of cutlery shall be legibly and indelibly marked with the following:

- a) name and/or trade mark or other means of identifying the manufacturer or supplier;
- b) A reference to this Standard in combination with the following roman numerals (See 6.2):
 - I for first class gold coating;
 - II for second class gold coating;
 - III for third class gold coating.

Note : National marks already in use may also be used if required.

¹⁾ Boiling water

8.2 Labelling

The following information shall be made available at the point of sale:

- a) the number of this Standard and a statement that the cutlery meets the requirements of the standard;
- b) for gold plated cutlery, whether the gold coating is of first, second or third class and whether the base metal is of ferritic stainless steel or of austenitic stainless steel or nickel-silver or solid silver;
- c) if there is an undercoat of silver, whether the silver coating is of first, second or third class. (see EN ISO 8442-2)

This information may be provided as leaflets on the packaging or by means of labelling or on a display card or in any other suitable form.

8.3 Marking, labelling and advertising the fineness of gold content of the coating

There shall be no indication of the fineness of the gold content.

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Annex A**(normative)****Test method for average thickness of gold coating****A.1 Principle**

The gold coating is chemically dissolved from the item. Then the gold content of the solution is measured by means of the Atomic absorption spectroscopy (AAS). The calculated factor is reduced to the surface.

A.2 Stripping solution

For removing the gold coating from gold plated stainless steel or nickel-silver use a suitable stripping solution²⁾

A.3 Procedure

Degrease the item with a dishwashing detergent, rinse in water and put into the stripping solution prepared as prescribed. After the gold coating has been completely removed, wash down the item with completely distilled water above the retort in order to measure also the stripping solution which is still sticking to the item. After refilling to a defined volume the determination is done by the AAS-flame-method.

A.4 Expression of results

Calculate the average thickness of gold coating, δ , in μm by the following formula:

$$\delta = \frac{m \times 10000}{A \times 19,3}$$

where:

m is the measured gold content of the stripping solution in g;

A is the area in cm^2 (see annex B);

19,3 is the specified weight of the gold.

²⁾ Stripping solution 645 is the trade name of a product supplied by Degussa Ag, Office : Electroplating, Klarenbergstr. 53-79, D-73525 Schwaebisch Gmuend. Enstrip Au-78 is the trade name of a product supplied by Enthone-OMI (Germany) GmbH, Niermannsweg 3-5, D-40699 Erkrath. This information is given for the convenience of users of this standard and does not constitute an endorsement by CEN of the products named. Equivalent products may be used if they can be shown to lead to the same results.

Annex B**(normative)****Schlegel method of determining surface area****B.1 Principle**

Under controlled conditions, the test item is coated with an adhesive and dipped in a fluidized bed of water-repellent or perfectly dry glass beads of uniform size; the mass of beads adhering to the item is proportional to the surface area of the test item.

The relationship between the mass of beads and the surface area of the item is determined by applying the test to a standard specimen of known area, i.e. a regular shape whose area can be measured easily.

B.2 Apparatus and materials

B.2.1 Fluidized bed, bed of glass beads (see B.2.5) with a supply of fluidizing air and means for heating the incoming air if water repellent beads are not used; this may be in the form of an electric heating element, near to the bottom of the bed, regulated by a voltage control, and sufficient to raise the temperature of the fluidized beads to between 50 °C and 80 °C.

NOTE: It is not advisable to control bead temperature by means of a thermostatic device because, when the power supply is disconnected from the heating element, the beads may pick up moisture from the air supply.

B.2.2 Laboratory balance, capable of weighing to an accuracy of ± 2 mg.

B.2.3 Hoist, for withdrawing the test item from the adhesive at 20 mm/min.

B.2.4 Adhesive, composed of

alkyd resin	1 part by mass
toluene (sulphur free)	1 part by mass

B.2.5 Glass beads, graded from 200 μm to 250 μm , preferably of water repellent type.

NOTE: Commercially available glass beads nominally graded to these limits may contain an undesirable proportion outside the limits; normally they should be regraded.

B.2.6 Specimens of known area, (at least two) in stainless steel, as follows:

- a cylinder, of approximately 16 mm diameter and 100 mm in length, to indicate the mass of glass beads per square centimetre picked up by hollow handles;
- a rectangle, of approximately 100 mm x 30 mm x 1 mm, to indicate the mass of glass beads per square centimetre picked up by areas other than hollow handles.

B.3 Procedure

B.3.1 Ensure that the glass beads (see B.2.5), not of the water-repellent type, are thoroughly dry so that they do not adhere to each other. Beads, not of the water-repellent type, may be dried and prevented from reabsorbing moisture from the air supply by preheating them in the fluidized bed at between 50 °C and 80 °C until no beads will adhere to a clean, dry item of cutlery that is dipped into them. Usually a drying time of 1 h is adequate.

NOTE: It has been found that once any moisture has been eliminated the beads will stay dry while the heating element remains switched on.

Maintain the temperature of the fluidized bed of glass beads at 50 °C to 80 °C until the procedure described in B.3.8 has been reached. If water-repellent beads are used, the bed may be used at ambient temperature for the procedure described in B.3.7.

B.3.2 Attach a thin wire hanger to the test item with a loop for suspension during weighing etc.

B.3.3 Thoroughly clean the test item in methylated spirits.

B.3.4 Dip the test item in the adhesive (see B.2.4) and withdraw at 20 mm/min using the hoist (see B.2.3). If the surface area of the handle only is to be measured, only the handle should be immersed in the adhesive. Do not allow the test item surface to come into contact with anything until stage B.3.7 is reached.

B.3.5 Allow the adhesive to dry for 60 min ± 5 min.

B.3.6 Weigh the test item to the nearest 2 mg.

B.3.7 Immerse and continuously agitate the test item in the fluidized bed of glass beads for 10 s ± 1 s. During immersion the air flow should be vigorous enough to raise mounds of beads to a height of at least 40 mm above the bed of fluidized beads. Do not immerse more suspension wire than necessary.

B.3.8 Reweigh the test item to the nearest 2 mg.

B.3.9 Carry out a duplicate test on each item; include at least two specimens of known area (see B.2.6) in each batch of items tested.

B.4 Expression of results

B.4.1 Method of calculation

Calculate the area, A , in square centimetres, of the item using the formula

$$A = \frac{m}{Q_A}$$

where

m is the mean mass, in grams, of beads adhering to the test item;

Q_A is the mean surface mass density, in grams per square centimetre, of beads corresponding to the mass adhering to the relevant specimen of known area.

B.4.2 Accuracy

The method is capable of an accuracy of ± 1,5 % for all sizes and items of cutlery.

Annex C

(normative)

Test method for corrosion resistance of unplated stainless steel cutlery

C.1 Principle

The test samples are intermittently immersed in a 1 % solution of sodium chloride (NaCl) maintained at $60\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ for 6 h. The number and size of any pits that have formed are measured visually with the aid of a microscope lens.

C.2 Reagents

During the test, unless otherwise stated, use only reagents of recognised analytical grade and only distilled water or water of equivalent quality.

Sodium chloride, 1 % (m/m) solution consisting of one part by mass sodium chloride in 99 parts demineralised/distilled water.

C.3 Apparatus

A suitable apparatus is shown in figure C.1, and comprises a glass or plastics container and a cover, which may be glass or plastics, and a plastics specimen rack with means to raise and lower this into the container.

Note: Other methods of specimen support may be used provided that there is a minimal contact of the specimen with the supporting means.

Calibrated microscope or lens of at least 4 times magnification.

C.4 Procedure

C.4.1 Wash the selected samples thoroughly in hot soapy water. Thoroughly rinse and then degrease the samples in acetone or methylated spirits.

C.4.2 Fill the container with the sodium chloride solution (see C.2) using at least 1 litre of solution for every square decimetre of area of the stainless steel parts of the samples. Bring the container and contents to $60\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$. Maintain at this temperature. Do not allow the temperature of the solution to exceed $62\text{ }^{\circ}\text{C}$ at any time, even before the start of the test. Use a fresh sodium chloride solution for each test.

NOTE: The temperature of the sodium chloride solution can be conveniently maintained at $60\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ by positioning the apparatus in a thermostatically controlled water bath, the level of which is maintained at approximately the same level as that of the sodium chloride solution.

C.4.3 Place the sample in the rack and, in the case of knives with stainless steel handles, support the handles in such a way that they do not come into contact with the rack. Replace the cover.

C.4.4 Completely immerse and completely withdraw the samples from the solution at the rate of from two to three times per minute for 6 h.

C.4.5 At the conclusion of the test period, thoroughly wash and rinse the samples and examine for corrosion.

NOTE: Products of corrosion that impede visual examination of corrosion pits can be removed by hand rubbing the surface of the cutlery with a stainless steel polishing paste applied with a soft cloth.

C.5 Expression of results

Assess the size of pits and the length of longitudinal cracks per test specimen visually with the aid of a calibrated microscope or lens of at least four times magnification. Where two pits have obviously merged together they shall be assessed as two separate pits.

NOTE: The use of wires of diameter 0,4 mm and 0,75 mm respectively, placed in contact with the sample surface, provides a convenient method of assessing the size of pits with a hand lens.

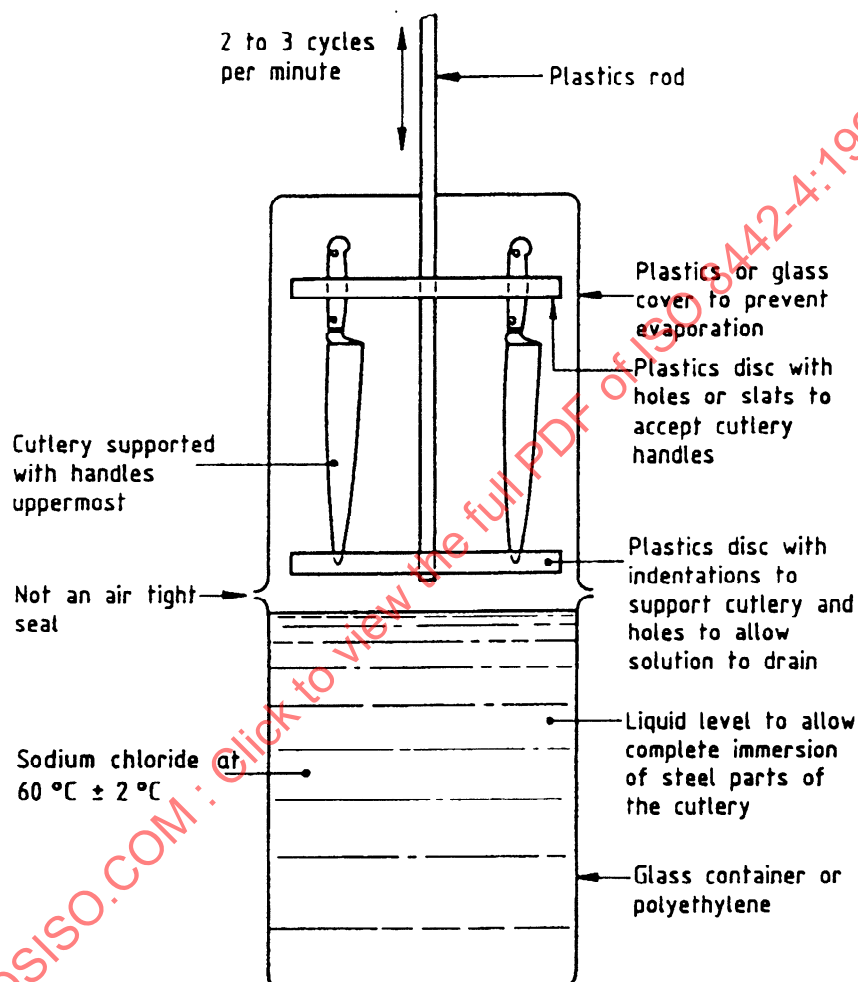


Figure C.1: Apparatus for corrosion test