INTERNATIONAL STANDARD

ISO 8442-2

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

Part 2:
Requirements for stainless steel and silver-plated cutlery

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

Partie 2: Exigences relatives à la coutellerie et aux couverts en acier inoxydable et en métal argenté

Reference number
ISO 8442-2:1997(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 8442-2 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).

This first edition cancels and replaces ISO 8442:1988, which has been technically revised.

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*

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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*

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

Contents

Foreword

The text of EN ISO 8442-2:1997 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 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
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, Luxemburg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

This Standard, based on ISO 8442, is concerned with performance and does not include requirements for design, size, type of finish, blade flexibility, or similar characteristics which are matters of personal choice or which can be readily assessed by the purchaser at the point of sale. In this Standard the thickness of silver deposit is stipulated for each and every item, in contrast to traditional methods which relate to an average of 12 or 24 items, amongst which some items can have a significantly lower thickness of silver coating.

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 part of this Standard specifies material, performance requirements and test methods for table cutlery (knives, forks, spoons, carving sets, ladles, children's cutlery and other serving pieces).

This Standard is applicable to stainless steel cutlery and to silver-plated nickel silver, or silver-plated stainless steel, cutlery. It does not cover cutlery made wholly of precious metals, aluminium, non-stainless steel or that made entirely of nickel silver, nor does it cover gold-plated or chromium-plated cutlery.

Three minimum thicknesses of silver are specified for silver-plated cutlery.

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 backscatter 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)

3 Definitions

For the purposes of this Standard the definitions given in ISO 4481:1977 apply together with the following.

3.1 items of frequent use: Pieces of cutlery regularly used at the dining table. They are listed in ISO 4481 : 1977 as: coffee or teaspoon, soup spoon, dessert spoon, menu spoon, table spoon, dessert fork, menu fork, fish eating fork, table fork, dessert knife, menu knife, fish eating knife, table knife.

3.2 items of infrequent use: Pieces of cutlery which are occasionally used at the dining table. These items are defined in ISO 4481 : 1977 and exclude those listed in 3.1.

3.3 significant surfaces: Parts of cutlery in contact with a flat horizontal surface upon which they are laid; for spoons, forks and ladles this will be the convex face, i.e. their bowls or fork prongs are uppermost; for knives both sides are regarded as having significant surfaces.

3.4 unsharpened knives: Knives that do not have a sharpened blade because they are intended for use with soft foods and whose blades are therefore not made of martensitic stainless steel. This includes the following items: butter knife, fish serving knife, ice cream knife, fish eating knife, spreading knife.

3.5 monobloc knives: Knives made of one piece.

3.6 normal corrected vision: The naked eye corrected to normal vision if necessary.

NOTE. This is usually done by the wearing of spectacles.

4 Materials

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 release 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 Any parts of table cutlery made of nickel silver (copper zinc nickel alloy) shall be silver-plated (see clause 6).

4.2.3 Any parts of table cutlery made of stainless steel and claimed to be silver-plated shall conform with the requirements of clause 6.

5 Construction

5.1 General

Cutlery manufactured from the materials specified in clause 4 shall be so constructed that it meets all of 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 As far as is practicable, all cutlery shall be 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 , as far as is practicable, show no variation in dimension or form.

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

Table 1: Metals for table cutlery, composition limits

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. 0,15 max.	0,045 0,045	0,015 0,015	17,0 17,0	8,0 4,0	2,00		10,5
Guards and prongs of carving items	Ferritic stainless steel	0,07 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	
		Cu min.	Ni min.	Mn max.	Fe	Pb	Total impurities max. %	Zn	
Spoons, forks, ladles, unsharpened knives and carving forks	Nickel silver	60,0	9,0	0,50	0,30	0,05	0,50	24	
Coatings	Silver	Ag min. 98,5							

1) Two alternatives are given for austenitic stainless steel. Further chemical compositions are given in EN 10088-1.

2)Additions of Mo and V are optional.

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.

5.3 Hollow handles

The seams joining hollow handles together shall be watertight.

5.4 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 60°.

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.

5.5 Sprung fork guards

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

6 Silver-plated cutlery

6.1 General

All silver-plated surfaces shall comply with the requirements of 6.2, 6.3, 6.4 and 6.5.

6.2 Average thickness

The average thickness of silver 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 silver coating

Description	Symbol	Items for frequent use	Items for infrequent use
First class	I	min. 30 µm	min. 17 µm
Second class	II	min. 20 µm	min. 12 µm
Third class	III	min. 10 µm	min. 7 µm

6.3 Local thickness

The minimum local thickness of silver coating on significant surfaces (i.e. those parts of cutlery subject to the greatest wear; see 3.3) 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.

6.4 Minimum hardness of hard silver coatings

A silver coating claimed to be hard shall have a minimum hardness of 130 HV, measured after immersion in boiling water for 2 h.

6.5 Adhesion of silver coatings

Silver coatings shall show no signs of flaking, blistering or peeling when the cutlery is ball burnished for 40 min in a burnishing machine as described in annex E.

NOTE: Alternative methods of determining the adhesion of silver coatings can be used, provided the results obtained are in correlation with those given by ball burnishing.

7 Performance requirements

7.1 Resistance to corrosion

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

a) no transverse cracks shall have developed and no longitudinal cracks of a length exceeding 1,5 mm shall have developed;

b) there shall not be more than three pits or zones of intergranular corrosion 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 mm^2) elsewhere;

c) there shall be no pits or zones of intergranular corrosion having an area greater than a circle of 0,75 mm diameter (0,442 mm^2) on any part.

7.2 Strength

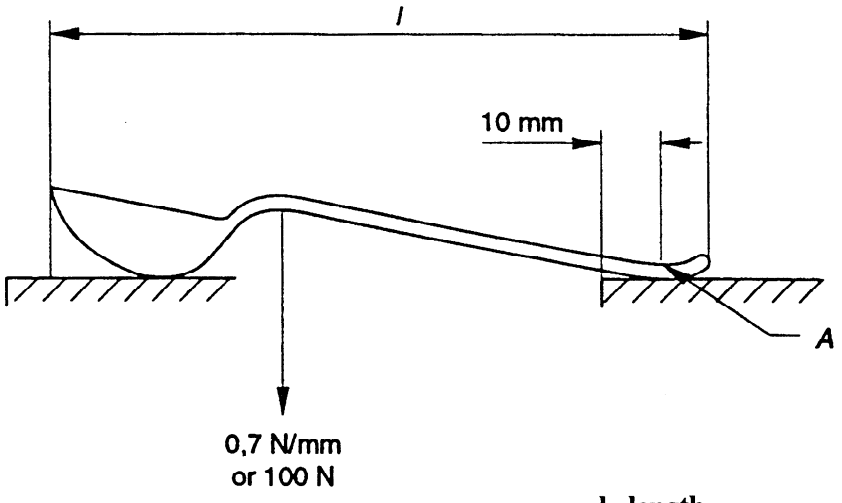
7.2.1 Knives with martensitic stainless steel blades and carving forks

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

7.2.2 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.



l length
A point of rest

Figure 1: Example of a strength test showing a spoon

7.3 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^{0}_{-5} °C[1]), the item is subjected to

a) a pulling force of (180^{0}_{-10})N for 10 s;

b) a torque of ($4{,}5^{0}_{-0{,}2}$) Nm, for items whose handles have a surface area of 37 cm^2 or more, or a torque of ($3{,}7^{0}_{-0{,}2}$) 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^{0}_{-5} °C[1]) immediately before the application of each force.

7.4 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.

[1] Boiling water

8 Marking and labelling

8.1 Marking

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 responsible supplier;

b) A reference to this Standard in combination with either the following roman numerals (see 6.2):

I for first class silver coating;
II for second class silver coating;
III for third class silver coating.

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

c) for unplated stainless steel cutlery the reference to this Standard shall be accompanied by identification of the average percentage chromium content of the steel or, for austenitic stainless steel, by the identification of the average percentage chromium and nickel content of the steel, e.g. 18/10.

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 silver-plated cutlery, whether the silver coating is of first, second or third class and whether the base metal is of ferritic stainless steel or of austenitic stainless steel or of nickel silver;

c) for unplated stainless steel cutlery (other than blades made from martensitic stainless steel) whether it is of ferritic stainless steel or of austenitic stainless steel.

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.

Annex A (normative)

Test method for average thickness of silver coating

Warning: This method involves the use of concentrated acids or sodium cyanide; it is assumed that only experienced persons familiar with such materials and taking appropriate safety precautions will undertake such testing.

A.1 Principle

The silver coating is chemically or electrochemically dissolved from the item without attacking the substrata. The average thickness of the coating is calculated from its surface area, the mass of silver and the density of the coating.

A.2 Stripping solutions

A.2.1 For silver-plated nickel silver without an undercoat of nickel, a chemical stripping solution consisting of 19 parts by volume of concentrated sulphuric acid = 1,84 g/ml and 1 part by volume of nitric acid = 1,42 g/ml.

A.2.2 For silver-plated stainless steel or nickel silver with an undercoat of nickel, an electrolyte for anodic stripping comprising 90 g of sodium cyanide and 15 g of sodium hydroxide in 1 l of demineralized or distilled water.

A.3 Procedure

A.3.1 General

Degrease the test specimen thoroughly and, if necessary, rinse and dry it. Weigh the sample. Use the appropriate stripping solution (see either A.2.1 or A.2.2) to remove the silver coating. Thoroughly rinse in running water, dry and reweigh the test specimen. Neutralise by briefly dipping in 250 g/l solution of chromium trioxide.

A.3.2 Chemical stripping

Ensure that the parts to be stripped are thoroughly dry and that water is kept out of the solution. Immerse the sample in the acid mixture (see A.2.1) maintained at 80 °C ± 2 °C until all of the coating is removed.

A.3.3 Anodic stripping

Using a stainless steel cathode and the test specimen as anode, immerse the test specimen in the electrolyte (see A.2.2) at room temperature and apply a potential of 2 V to 8 V until all the coating is removed.

A.4 Expression of results

A.4.1 Method of calculation

Calculate the average coating thickness, δ, in micrometres, by the formula

$$\delta = \frac{\Delta m \times 10\,000}{A \times 10{,}5}$$

where

Δm is the loss in mass, in grams, after stripping;

A is the surface area, in square centimetres, of the silver coating (see annex B);

10,5 is the density, in grams per cubic centimetre, of silver. The surface area of that part of the item coated with silver shall be determined by the method specified in annex B.

A.4.2 Accuracy

The method is capable of an accuracy of ± 3 % including the accuracy for the method given in annex B. It can be checked that the loss in mass corresponds to that of the silver coating by determining the content of silver in the stripping bath.

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 regular shape and known area.

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, which is 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 can 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 mm to 250 mm, 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) a cylinder, of approximately 16 mm diameter and 110 mm in length, to indicate the mass of glass beads per square centimetre picked up by hollow handles;

b) 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, shall 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 between 50 °C and 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 specimen with a loop for suspension during weighing etc.

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

B.3.4 Dip the test specimen in the adhesive (see B.2.4) and withdraw at a rate of 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 specimen 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 specimen to the nearest 2 mg.

B.3.7 Immerse and continuously agitate the test specimen 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 specimen to the nearest 2 mg.

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

B.4 Expression of results

B.4.1 Method of calculation

Calculate the area, A, in square centimetres, of the test specimen using the formula

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

where

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

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 specimens are intermittently immersed in a 1 % solution of sodium chloride (NaCl) maintained at 60 °C ± 2 °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 or 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 can 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 test specimens thoroughly in hot soapy water. Thoroughly rinse and then degrease the test specimens 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 °C ± 2 °C. Maintain at this temperature. Do not allow the temperature of the solution to exceed 62 °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 may be conveniently maintained at 60 °C ± 2 °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 test specimen 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 test specimens 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 test specimens and examine for corrosion.

NOTE: Products of corrosion that impede visual examination of corrosion pits should 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 and number of pits per test specimen and the length of longitudinal cracks 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.

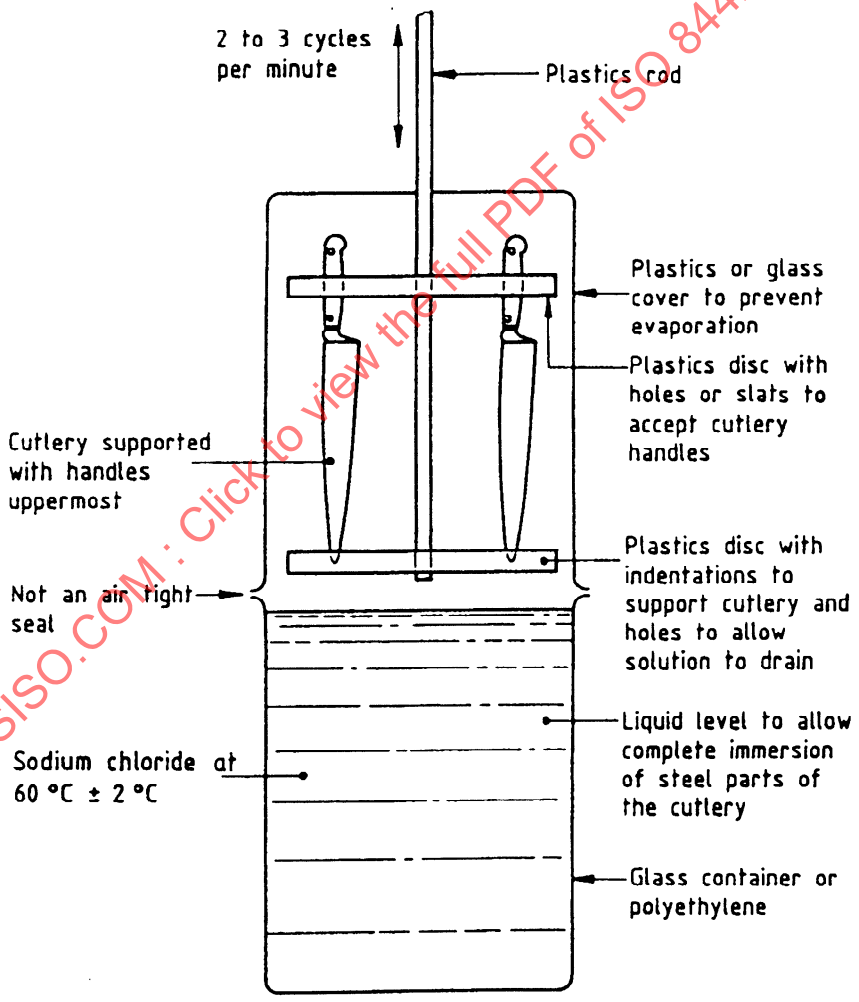


Figure C.1: Apparatus for corrosion test