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# International Standard



# 2456

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## Surface active agents — Water used as a solvent for tests — Specification and test methods

*Agents de surface — Eau employée comme solvant pour les essais — Spécifications et méthodes d'essai*

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## Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 2456 was prepared by Technical Committee ISO/TC 91, *Surface active agents*.

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# Surface active agents — Water used as a solvent for tests — Specification and test methods

## 0 Introduction

This International Standard was established by Technical Committee ISO/TC 91, *Surface active agents*, because it was considered as primordial, for the physical tests of surface active agents, to define a grade of water different from those retained for the analysis of inorganic chemical products, such as those specified in ISO 3696.

## 1 Scope

This International Standard specifies the requirements for water intended for the preparation of solutions with which certain physical tests of surface active agents and of products containing them are carried out.

In addition, it describes the conditions for preparing and storing such water and, in annex, the test methods suitable for checking the requirements.

## 2 Field of application

This International Standard concerns only the grade of water for certain physical tests (for example, for the determination of surface tension, of foaming power, etc.)

NOTE — For the other grades of water for analytical use, it is necessary to refer to ISO 3696. For usual analytical work, water of grade 3 of ISO 3696 should be used, unless otherwise specified.

## 3 References

ISO 304, *Surface active agents — Determination of surface tension by drawing up liquid films*.

ISO 3696, *Water for laboratory use — Specifications and test methods*.<sup>1)</sup>

## 4 Requirements

The water shall have a very low content of organic, inorganic and colloidal contaminants, shall be suitable as a solvent for physical tests of surface active agents, and shall comply with the following requirements. Methods of test for compliance with the following requirements are given in the annex.

- a) Residue after evaporation on heating at 110 °C : 1,0 mg/kg max.
- b) Electrical conductivity at 25 °C : 1 µS/cm max.
- c) Oxidizable matter expressed in oxygen content (1/2 O<sub>2</sub>): 0,08 mg/l max.
- d) Absorbance at 254 nm and 1 cm cell optical path length: 0,01 absorbance units max.
- e) Reactive silica content (SiO<sub>2</sub>): 0,02 mg/l max.
- f) Surface tension at 20 °C : 71 to 72,8 mN/m min.

## 5 Preparation

Carry out in a nitrogen atmosphere a double distillation (if necessary, the first can be carried out with a 1 g/l solution of potassium permanganate), for example in a quartz or fused silica apparatus with ground glass joints without grease.

## 6 Storage

Contamination of water during storage in glass or inert plastic containers may arise principally from dissolution of soluble constituents from glass or plastic containers, or absorption of atmospheric carbon dioxide and of any other impurities present in the laboratory atmosphere.

1) At present at the stage of draft.

For this reason, its storage is not recommended, the water being prepared, as required, for immediate use. Nevertheless, in exceptional cases, the water may be stored in suitable inert, clean, air-tight, full containers and completely filled and closed with an air-tight seal.

The water shall be stored under nitrogen. The storage period is 1 week at the most.

## 7 Test method

The test report shall include the following indications :

- a) all details required for complete identification of the sample;
- b) reference of the methods used;
- c) the results and the method of expression used;
- d) details of any usual features noted in this International Standard;
- e) details of any operations not included in this International Standard or in the International Standards to which reference is made, or regarded as optional.

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## Annex

### Methods of test

(This annex forms an integral part of the Standard.)

**WARNING** — It is essential that these determinations shall be carried out in a fume cupboard with a dust-free atmosphere and that suitable precautions shall be taken to prevent any contamination of the sample and test portions.

#### A.1 Determination of residue after evaporation

Operate according to the method specified in sub-clause 7.5 of ISO 3696, with a test portion of 5 000 ml of the laboratory sample of water.

The content in residue after evaporation on heating at 110 °C, expressed in milligrams per kilogram, is equal to the mass, in milligrams, of the residue dried to constant mass divided by the mass, in kilograms, of the test portion.

#### A.2 Determination of electrical conductivity

##### A.2.1 Principle

Measurement of the conductivity at  $25 \pm 0,1$  °C using a conductivity meter.

##### A.2.2 Reagents

Unless otherwise stated, use only reagents of recognized analytical grade.

**A.2.2.1 Water**, complying with grade 1 in ISO 3696.

**A.2.2.2 Potassium chloride**, standard solutions.

From potassium chloride (KCl) previously dried at 105 °C for 2 h and cooled in desiccator, prepare the following solutions.

Store the solutions in glass flasks with ground glass stoppers and having a high hydrolytic resistance.

**A.2.2.2.1 Potassium chloride**, standard solution,  $c(\text{KCl}) = 0,01$  mol/l.

In a 1 000 ml one-mark volumetric flask, dissolve 0,745 6 g of potassium chloride (see A.2.2.2) with the water (A.2.2.1) and dilute to the mark at  $20 \pm 2$  °C.

**A.2.2.2.2 Potassium chloride**, standard solution,  $c(\text{KCl}) = 0,001$  mol/l.

Into a 1 000 ml one-mark volumetric flask, just before using, introduce 100 ml of the standard solution (A.2.2.2.1) and dilute to the mark at  $20 \pm 2$  °C with the water (A.2.2.1).

**A.2.2.2.3 Potassium chloride**, standard solution,  $c(\text{KCl}) = 0,000 5$  mol/l.

Into a 1 000 ml one-mark volumetric flask, just before using, introduce 50 ml of the standard solution (A.2.2.2.1) and dilute to the mark at  $20 \pm 2$  °C with the water (A.2.2.1).

**A.2.2.2.4 Potassium chloride**, standard solution,  $c(\text{KCl}) = 0,000 1$  mol/l.

Into a 1 000 ml one-mark volumetric flask, just before using, introduce 10 ml of the standard solution (A.2.2.2.1) and dilute to the mark at  $20 \pm 2$  °C with the water (A.2.2.1).

**Table 1 — Electrical conductivity of standard solutions of potassium chloride<sup>1)</sup>**

Concentration of potassium chloride, $c(\text{KCl})$	Electrical conductivity at 25 °C
mol/l	$\mu\text{S/cm}$
0,01	1 413,60
0,001	146,95
0,000 5	73,89
0,000 1	14,89

1) The indicated values exclude the electrical conductivity of the water used for the preparation of the solutions.

##### A.2.3 Apparatus

**A.2.3.1 Conductivity meter**, calibrated in resistance and/or conductance units.

**A.2.3.2 Cell**, flow-through or in-line, able to permit a flow of 0,3 m/s.

The recommended cell constants can be chosen from table 2 for each electrical conductivity range.

**Table 2 — Recommended cell constants for each electrical conductivity range**

Electrical conductivity range	Recommended cell constant
$\mu\text{S/cm}$	$\text{cm}^{-1}$
0,05 to 20	0,01
1 to 200	0,1
10 to 2 000	1

**A.2.3.3 Precision thermometer** STL/0,1/ -5/ +25, complying with the requirements of ISO 653.

**A.2.3.4 Water bath**, controlled at  $25,0 \pm 0,1$  °C.

**A.2.4 Procedure**

**A.2.4.1 General**

Prepare the conductivity meter (A.2.3.1) and the cell (A.2.3.2) in accordance with the manufacturer's operating instructions and check that the meter is fitted with the measuring cell with the appropriate constant within the electrical conductivity range (see table 2).

Determine accurately, if necessary, the cell constant as indicated in A.2.4.2, using the appropriate potassium chloride standard solutions (A.2.2.2) for each electrical conductivity range.

Carry out the measurement of electrical conductivity when the sample and the cell have attained the equilibrium temperature of  $25,0 \pm 0,1$  °C, thus eliminating a major source of error due to temperature compensation devices or mathematical corrections.

**A.2.4.2 Determination of cell constant**

Rinse the conductivity cell several times with the water (A.2.2.1) and then at least twice with the potassium chloride standard solution (A.2.2.2) having a conductivity nearest to that of the water under test (see table 1). Check that the temperature of the solution is  $25,0 \pm 0,1$  °C. Measure the resistance or the conductance of the cell. Repeat the measurement on additional new portions of the standard solution until the resistance or the conductance remains constant to within 0,2 %.

The cell constant  $J$ , expressed in reciprocal centimetres, is given either by the equation

$$J = 10^{-6} R_{KCl} (\gamma_{KCl} + \gamma_{H_2O})$$

or by the equation

$$J = 10^{-6} \frac{(\gamma_{KCl} + \gamma_{H_2O})}{G_{KCl}}$$

where

$R_{KCl}$  is the resistance, in ohms, of the cell containing the potassium chloride standard solution;

$\gamma_{KCl}$  is the conductivity, in microsiemens per centimetre, of the potassium chloride standard solution (see table 2);

$\gamma_{H_2O}$  is the conductivity, in microsiemens per centimetre, of the water used to prepare the potassium chloride standard solution;

$G_{KCl}$  is the conductance, in siemens, of the cell containing the potassium chloride standard solution.

**A.2.4.3 Determination**

Adjust the sample stream in the cell and the temperature to  $25,0 \pm 0,1$  °C. After reaching equalization of temperature, record the resistance or the conductance read on the conductivity meter.

**A.2.5 Expression of results**

The conductivity of the sample,  $\gamma$ , expressed in microsiemens per centimetre, is given either by the equation

$$\gamma = 10^6 \frac{J}{R_x}$$

or by the equation

$$\gamma = 10^6 J G_x$$

where

$J$  is the cell constant, in reciprocal centimetres, determined as in A.2.4.2;

$R_x$  is the resistance, in ohms, of the cell, determined as in A.2.4.3;

$G_x$  is the conductance, in siemens, of the cell, determined as in A.2.4.3.

**A.3 Limit test for oxidizable matter**

Operate according to the method specified in sub-clause 7.3 of ISO 3696 with a test portion of 1 000 ml of water.

**A.4 Measurement of absorbance**

Operate in accordance with the method specified in sub-clause 7.4 of ISO 3696.

**A.5 Limit test for reactive silica**

Operate in accordance with the method specified in sub-clause 7.6 of ISO 3696 with a test portion of 270 ml of water.

**A.6 Determination of surface tension**

Operate in accordance with the method specified in ISO 304, after cleaning the liquid surface two or three times, and carry out the measurement of the surface tension at two different times after creation of a new liquid surface.