*भारतीय मानक* **IS 1070 : 2023**

***Indian Standard***

# अभिकर्मक ग्रेड जल — विशिष्टि

*( चौथा पुनरीक्षण )*

# Reagent Grade Water — Specification

*( Fourth Revision )*

ICS 71.040.30



भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुर शाह ज़फर मार्ग, नई दिल्ली - 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI - 110002
www.bis.gov.in www.standardsbis.in

**June 2023** **Price Group 5**

Water Quality for Industrial Purposes Sectional Committee, CHD 13

FOREWORD

This Indian Standard (Fourth Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Water Quality for Industrial Purposes Sectional Committee had been approved by the Chemical Division Council.

Distillation, de-ionization, and reverse osmosis processes in a suitable arrangement can produce reagent water of desired quality.

Distillation removes water miscible organics and ionizable inorganic impurities, as well as colloidal solids from water. The quality of resulting distillate varies with the original source of the water, the material from which distillation apparatus was constructed and the number of distillations. Generally metal stills yield a product inferior to that obtained from borosilicate glass or vitreous silica. Multiple distillations from vitreous/silica usually required to obtain high purity water which is also relatively from organic traces.

Generally, reagent grade water means the distilled or de-ionized water with no detectable amount of the compound or the element to be analyzed at the detection limit of analytical procedure. It is important to prepare it in the laboratory or purchase from outside, the reagent grade water to be used for dilution of reagents and blank analysis.

This Indian Standard was first published in 1957 incorporating water purified by thermal distillation only. The first revision of this standard was published in 1960 in which water purified by other methods were incorporated. The second revision of this standard was published in 1977, in which the requirements for residue on ignition and specific conductivity were incorporated.

In the third revision published in 1992, the following modifications were incorporated:

a) Different grades of reagent water used for different purposes were covered;
b) Limits for three grades of water depending on their end uses were specified and the characteristics were suitably modified;
c) Requirement for silica content was incorporated; and
d) Requirements for chlorides, sulphates, ammonia, calcium, magnesium and heavy metals being more broadly reflected by the requirement of electrical conductivity, and therefore were not covered separately.

In this fourth revision the following modifications have been incorporated:

a) Requirement for total organic has been added;
b) References, ICS No. have been updated; and
c) Other editorial changes have been done to bring the standard in the latest style and format of Indian Standards.

The composition of committee responsible for the formulation of this standard is listed in Annex C.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’.

*Indian Standard*

# REAGENT GRADE WATER — SPECIFICATION

*( Fourth Revision )*

## 1 SCOPE

**1.1** This standard prescribes requirements and methods of test for reagent grade water for laboratory use. General guidelines for the storage of the reagent water are also given.

**1.2** It does not cover water used for biological or medical and organic trace analysis.

## 2 REFERENCES

The standards listed below contain provisions which through reference in this text, which constitute provisions of this standard. At the time of publications, 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 listed below:

| *IS No.* | *Title* |
|---|---|
| IS 1622 : 1981 | Methods of sampling and microbiological examination or water (*first revision*) |
| IS 3025 | Methods of sampling and test (Physical and Chemical) for water and waste water: |
| (Part 11) : 2022 | *p*H value (*second revision*) |
| (Part 14) : 2013 | Specific conductance (wheatstone bridge, conductance cell) (*second revision* ) |
| (Part 15) : 1984 | Total residue (total solids-dissolved and suspended) (*first revision*) |
| (Part 35) : 1988 | Silica *(first revision*) |
| (Part 73) : 2021/SO 20236 : 2018 | Instrument based method for determination of total organic carbon TOC dissolved organic carbon DOC total bound nitrogen TNb and dissolved bound nitrogen DNb |
| IS 4905 : 2015 | Random sampling and randomization procedures (*first revision*) |

## 3 GRADES

The reagent grade water shall be of the following three grades depending on their extent of purity:

a) **Grade 1** — For use in test methods requiring minimum interference and maximum precision and accuracy such as trace analysis. Reagent water may be prepared by distillation of feed water having maximum conductivity of 20 µmhos/cm at 25 °C followed by polishing with mixed bed deionizers and passage through 0.45 µm membrane filter;

b) **Grade** 2 — For use in the general laboratory analytical procedures where freedom from organic impurities is of more significance. It is not applicable for biological or medical analysis and organic trace analysis; and

c) **Grade** 3 — For use in washing of glasswares, preliminary rinsing of glassware and feed water for production of higher grade waters or where large quantity of water is required of low purity for makeup of synthetic test solutions.

## 4 REQUIREMENTS

### 4.1 Description

The material shall be suitably treated by thermal distillation or ion exchange method and purified subsequently if necessary. It shall be clear, colourless, odourless and tasteless.

**4.2** The material shall also comply with the requirements as given in Table 1.

## 5 STORAGE

**5.1** Contamination of water during storage may arise mainly from dissolution of suitable constituents from glass or plastic containers or absorption of atmospheric carbon dioxide and or any other impurities present in the laboratory atmosphere. For this reason, the storage of grade 1 and grade 2 water is not recommended. It is desirable to prepare, as required for immediate use.

NOTE — In case it is required to store grade 1 and grade 2 water it can be done with proper storage systems having carbon dioxide breather and with seal arrangement.

**5.2** However, grade 2 water may be prepared in reasonable quantity and stored in suitable, inert, clear, tight full containers which have been thoroughly pre-washed with water of same grade.

**5.3** The storage of grade 3 water possess little problem, and should be stored in containers that do not affect the quality for the desired purpose. Let the

containers and storage conditions should be the same as those used for the storage of grade 2 water.

NOTE — It is recommended that storage container be reserved exclusively for the storage of grade 3 water.

## 6 PACKING AND MARKING

### 6.1 Packing

The material shall be packed in clean glass, polyethylene or other suitable plastic container which do not affect the quality of water. The containers shall be securely closed.

### 6.2 Marking

**6.2.1** The containers shall bear legibly and indelibly the following information:

a) Name of the material;

b) Indication of source of manufacture;

c) Volume of the material in l;

d) Date of manufacture; and

e) Batch number.

**6.2.2** *BIS Certification Marking*

The product(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 there under, and the products may be marked with the Standard Mark.

## 7 SAMPLING

Representative samples of the material shall be drawn as prescribed in Annex B.

**Table 1 Requirement for Reagent Grade Water**
(*Clause* 4.2)

| Sl No. | Characteristics | Requirements | | | Method of Test, Ref to |
|---|---|---|---|---|---|
| | | Grade 1 | Grade 2 | Grade 3 | |
| (1) | (2) | (3) | (4) | (5) | (6) |
| i) | Specific conductivity µmhos/cm at 25 °C, *Max* | 0.1 (*see* Note 1) | 1.0 (*see* Note 1) | 5.0 | IS 3025 ( Part 14 ) |
| ii) | *p*H, at 25 °C | (*see* Note 2) | (*see* Note 2) | 5.0-8.0 | IS 3025 ( Part 11 ) |
| iii) | Total solids or non volatile residue at 105°C, mg/l *Max* | (*see* Note 3) | 1.0 | 2.0 | IS 3025 ( Part 15 ) |
| iv) | Silica ( as $SiO_2$ ), mg/l, *Max* | 0.01 | 0.1 | 1.0 | IS 3025 ( Part 35 ) |
| v) | Colour retention of $KMnO_4$, at 27 ± 2 °C Min | 60 | 10 | 10 | Annex A |
| vi) | Organics, Total Organic Carbon (TOC),ppb | < 20 | < 50 | < 200 | IS 3025 (Part 73) |
| vii) | Bacteria, (CFU/mL) | < 1 | < 100 | < 1 000 | IS 1622 |

NOTES

**1** The requirement for specific conductivity for grade 1 and grade 2 apply to freshly prepared water. During storage it is possible for contaminants like atmospheric carbon dioxide and alkalies from glass containers to be dissolved leading to changes in conductivity.

**2** Because of the difficulties associated with measurement of the *p*H value of high purity water, and the doubtful significance of the value obtained, limits for the *p*H of grade 1 and grade 2 water have not been specified.

**3** The limit for oxidizable matter and residue after evaporation for grade 1 water is not specified because of the difficulty of testing for compliance at this level of purity, the quality of grade 1 water is, however, assured, by compliance with the other requirements and by its method of preparation

## 8 TESTS

**8.1** Tests shall be carried out according to methods prescribed in Annex A and as indicated in **col 6** of Table 1.

### 8.2 Quality of Reagents

Unless specified otherwise, pure chemicals and distilled or deionized water shall be employed in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

## ANNEX A

[*Table* 1, *Item* (v)]

(**COLOUR RETENTION TIME (OXIDIZABLE MATTER)**

### A-1 REAGENT

**A-l.1 Sulphuric Acid —** Concentrated AR grade (specific gravity 1.84).

**A-1.2 Potassium Permanganate Solution**

Dissolve 0.316 g of potassium permanganate in reagent grade water and dilute to 1 litre.

### A-2 PROCEDURE

To 500 ml of water sample add 1 ml of concentrated sulphuric acid and 0.2 ml of potassium permanganate solution in a stoppered bottle of chemically resistant glass. Sample is considered to pass the test if the permanganate colour does not disappear completely after standing for the indicated period of time at room temperature. This test should be run against a blank using water known to be free from organic substances.

## ANNEX B
(*Clause* 7)

## SAMPLING

### B-l GENERAL REQUIREMENTS

**B-1.0** In drawing, preparing, storing and handling samples, the following precautions and directions shall be observed.

**B-l.1** Samples shall not be taken in an exposed place.

**B-1.2** The sampling instruments shall be clean. Before use, these shall be washed several times with the material to be sampled.

**B-1.3** Precautions shall be taken to protect the samples, the material being sampled, the sampling instruments and the containers for samples from adventitious contamination.

**B-1.4** To draw a representative sample, the contents of each container selected for sampling shall be mixed as thoroughly as possible by suitable means.

**B-l.5** The samples shall be placed in a clean and airtight glass bottle or other suitable containers on which the material has no action and which have been previously washed several times with the material to be sampled.

**B-1.6** The sample container shall be of such size that they are filled by the sample leaving an ullage of 10 percent.

**B-1.7** Each sample container shall be sealed airtight after filling, and marked with full details of sampling, the date of sampling and the year of manufacture of the material.

### B-2 SCALE OF SAMPLING

#### B-2.1 Lot

All containers in a single consignment of the material drawn from a single batch of manufacture shall constitute a batch. If a consignment is declared or known to consist of different batches of manufacture, the batches shall be marked separately and the groups of containers in each batch shall constitute separate lots.

**B-2.2** For ascertaining conformity of the material in a lot to the requirements of this specification, sample shall be tested for each lot separately. The number of containers to be selected at random from lots of different sizes shall be in accordance with Table 2.

**B-2.2.1** The containers shall be selected at random from the lot and in order to ensure the randomness of selection, the random sampling methods given in IS 4905 may be followed.

**Table 2 Number of Containers to be selected from Lots of Different Sizes**
(*Clause* B-2.2)

| Sl No. | Lot Size | Sample Size |
|---|---|---|
| | N | n |
| (1) | (2) | (3) |
| i) | Up to 15 | 3 |
| ii) | 16 to 25 | 4 |
| iii) | 26 to 50 | 5 |
| iv) | 51 to 100 | 7 |
| v) | 101 to 150 | 8 |
| vi) | 151 and above | 10 |

### B-3 PREPARATION OF TEST SAMPLES

**B-3.1** The containers shall be selected according to **B-2.2.1**, equal portions of the material shall be taken out so that the total quantity collected from all the containers is about 15 litre. This shall be the composite sample.

**B-3.2** The composite sample shall be divided into three test samples not less than 5 litre each. These test samples shall be transferred immediately to thoroughly washed bottles and sealed airtight with glass stoppers and marked with the particulars of sampling as given in **B-1.7.** One test sample shall be sent to the purchaser and one to the supplier. The third test sample bearing the seals of the purchaser and the supplier shall constitute the reference sample, to be used in case of dispute.

### B-4 NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

**B-4.1** All the characteristics given in Table 1 shall be tested on the composite sample.

**B-4.2** The lot shall be declared as conforming to the requirements of this specification if all the test results on the composite sample meet the relevant requirements given in Table 1, otherwise not.

**ANNEX C**
(*Foreword*)

**COMMITTEE COMPOSITION**

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**BUREAU OF INDIAN STANDARDS**

**Headquarters:**

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
*Telephones*: 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.gov.in

| **Regional Offices:** | | *Telephones* |
|---|---|---|
| Central | : 601/A, Konnectus Tower -1, 6th Floor, DMRC Building, Bhavbhuti Marg, New Delhi 110002 | 2323 7617 |
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