IS 571 (2000): Monosodium Phosphate [CHD 1: Inorganic Chemicals]

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भारतीय मानक

मोनोसोडियम फॉस्फेट — विशिष्टि

(दूसरा पुनरीक्षण)

Indian Standard

MONOSODIUM PHOSPHATE — SPECIFICATION

(*Second Revision*)

ICS 71.060.50

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

June 2000 **Price Group 5**

General Inorganic Chemicals Sectional Committee, CHD 03

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the General Inorganic Chemicals Sectional Committee had been approved by the Chemical Division Council.

This standard was originally published in 1954 and subsequently revised in 1969, incorporating analytical reagent grade monosodium phosphate in the standard.

In the present revision, the requirement for insolubles, calcium and ammonium hydroxide precipitates has been substituted by insolubles, calcium and other metal hydroxide precipitates. The method for iron determination has been modified.

This product is also known as sodium biphosphate, sodium dihydrogen phosphate, acid sodium phosphate, sodium phosphate monobasic and primary sodium phosphate.

Monosodium phosphate is used in baking powders, in boiler water treatment and in the preparation of radioactive sodium phosphate.

There is no ISO specification on this subject.

Composition of the Committee responsible for formulating this standard is given in Annex M.

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 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

MONOSODIUM PHOSPHATE — SPECIFICATION

(Second Revision)

1 SCOPE

This standard prescribes the requirements and methods of sampling and test for monosodium phosphate ($NaH_2PO_4.H_2O$).

2 NORMATIVE REFERENCES

The Indian Standards listed below contain provisions which through reference in this text, constitute provision of this Indian 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 Indian Standards indicated below:

IS No.	*Title*
264 : 1976	Nitric acid (*second revision*)
265 : 1993	Hydrochloric acid (*fourth revision*)
1070 : 1992	Reagent grade water (*third revision*)
2088 : 1983	Methods for determination of arsenic (*second revision*)
4905 : 1968	Methods for random sampling

3 GRADES

There shall be two grades of the material, namely,

a) Pure, and

b) AR (Analytical Reagent) .

4 REQUIREMENTS

4.1 Description

The material shall be in the form of white, slightly deliquescent crystals or granules.

4.2 The material shall also comply with the requirements given in Table 1 when tested in accordance with the methods prescribed in Annexes A to K. Reference to the Annexes is given in col 5 of Table 1.

5 PACKING AND MARKING

5.1 Packing

The material shall be packed as agreed to between the purchaser and the suppler.

5.2 Marking

5.2.1 The containers shall be legibly and indelibly marked with the following information:

a) Name and grade of the material,

b) Mass of the material,

c) Indication of the source of manufacture,

d) Month and year of manufacture, and

e) Lot number in code or otherwise to enable the batch of manufacture to be traced from records.

5.2.1.1 In case of analytical reagent grade, the analysis of the material in respect of the characteristics laid down in col 4 of Table 1 shall also appear on the label.

5.2.2 *BIS Certification Marking*

The packages may also be marked with the Standard Mark.

The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act,* 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

6 SAMPLING AND CRITERIA FOR CONFORMITY

6.1 The method of drawing representative samples of the material, number of tests to be performed and the criteria for determining the conformity of the material to the requirements of this specification shall be as prescribed in Annex L.

7 QUALITY OF REAGENTS

7.1 Unless specified otherwise, pure chemicals and reagent grade water (*see* IS 1070) shall be employed in tests.

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

Table 1 Requirements for Monosodium Phosphate

(*Clause* 4.2)

Sl No.	Characteristic	Requirement for Grade		Method of Test (Ref to Annex)
		Pure	AR	
(1)	(2)	(3)	(4)	(5)
i)	Loss on drying, percent by mass	10.0 to 15.0	10.0 to 15.0	A
ii)	Sodium phosphate (as NaH_2PO_4), on dry basis, percent by mass	98 to 102	99.5 to 101	B
iii)	Insolubles, calcium, and other metal hydroxide precipitates, percent by mass, *Max*	0.40	0.010	C
iv)	Chlorides (as Cl), percent by mass, *Max*	0.014	0.000 5	D
v)	Nitrogen compounds (as N), percent by mass, *Max*	—	0.001	E
vi)	Sulphates (as SO_4), percent by mass, *Max*	0.15	0.003	F
vii)	Arsenic (as As_2O_3), percent by mass, *Max*	0.000 3	0.000 1	G
viii)	Heavy metals (as Pb), percent by mass, *Max*	0.001	0.000 2	H
ix)	Iron (as Fe), percent by mass, *Max*	0.005	0.001	J
x)	*p*H	4.2 to 4.6	4.2 to 4.6	K

ANNEX A

[*Table* 1, *Sl No.* (i)]

DETERMINATION OF LOSS ON DRYING

A-1 PROCEDURE

Weigh accurately about 10 g of the material in a tared porcelain basin of 6 to 8 cm diameter and 1 to 3 cm depth. Dry the contents of the basin at 130°C ± 2°C. Cool and weigh to constant mass.

A-2 CALCULATION

$$\text{Loss on drying, percent by mass} = 100 \times \frac{M_2 - M_1}{M_2}$$

where

M_2 = mass in g of the material taken for the test, and

M_1 = mass in g of the material after drying.

ANNEX B

[*Table* 1, *Sl No.* (ii)]

DETERMINATION OF SODIUM PHOSPHATE (NaH_2PO_4)

B-1 REAGENTS

B-1.1 Standard Sodium Hydroxide Solution

1 N.

B-1.2 Thymolphthalein Indicator Solution

Dissolve 0.1 g of thymolphthalein in 100 ml of 80 percent rectified spirit.

B-2 PROCEDURE

Weigh accurately about 4 g of the dried material obtained in **A-1**, dissolve in 100 ml of water and titrate against standard sodium hydroxide solution, using thymolphthalein as indicator until the blue colour appears.

B-3 CALCULATION

One millilitre of 1N sodium hydroxide solution is equivalent to 0.120 0 g of sodium phosphate.

$$\text{Sodium phosphate (as } NaH_2PO_4\text{), percent by mass (on dry basis)} = \frac{12 \times VN}{M}$$

where

V = volume in ml of standard sodium hydroxide solution consumed,

N = normality of standard sodium hydroxide solution, and

M = mass in g of the material taken for the test.

ANNEX C

[*Table* 1, *Sl No.* (iii)]

DETERMINATION OF INSOLUBLES, CALCIUM AND OTHER METAL HYDROXIDE PRECIPITATES

C-1 REAGENTS

C-1.1 Ammonium Oxalate Solution

10 percent (*m/v*).

C-1.2 Dilute Ammonium Hydroxide

15 percent (*m/v*).

C-2 PROCEDURE

Dissolve 10 g of the material, accurately weighed, in 100 ml of water and add 5 ml of ammonium oxalate solution. Make the mixture alkaline to litmus with dilute ammonium hydroxide. Add further 15 ml excess of dilute ammonium hydroxide and allow to stand overnight. Filter the precipitate, wash it with water and ignite at a low red heat. Weigh till constant mass is obtained.

C-3 CALCULATION

$$\text{Insolubles, calcium, and other metal hydroxide precipitates, percent by mass} = 100 \times \frac{M_1}{M_2}$$

where

M_1 = mass in g of the ignited residue, and
M_2 = mass in g of the material taken for the test.

ANNEX D

[*Table* 1, *Sl No.* (iv)]

DETERMINATION OF CHLORIDES

D-1 APPARATUS

D-1.1 Nessler Cylinders

50-ml capacity.

D-1.2 Graduated Pipette

2 ml capacity with graduation mark at each 0.1 ml.

D-2 REAGENTS

D-2.1 Concentrated Nitric Acid

See IS 264.

D-2.2 Standard Chloride Solution

Dissolve 1.649 g of sodium chloride in water and make up the volume to 1 000 ml. Pipette out 10 ml of the solution, dilute with water and make up the volume to 100 ml. One millilitre of this solution contains 0.1 mg of chloride (as Cl).

D-2.3 Silver Nitrate Solution

D-3 PROCEDURE

D-3.1 For Pure Grade

Dissolve 1 g of the material in 20 ml of water, add 2 ml of concentrated nitric acid and 1 ml of silver nitrate solution. Make up the solution to 50-ml mark. Carry out a control test in the other Nessler cylinder using 1.4 ml of standard chloride solution (1 ml containing 0.1 mg of chloride) and the same quantities of other reagents in the same total volume of the reaction mixture. Stir both the solutions with glass rod and compare the opalescence vertically produced in the two cylinders after 5 min.

D-3.2 For AR Grade

Dissolve 20 g of the material in water and make up the volume to exactly 100 ml. Pipette out 10 ml of this solution in a Nessler cylinder. Add 1 ml of concentrated nitric acid and 1 ml of silver nitrate solution. Make up the solution to 50-ml mark. Carry out a control test in the other Nessler cylinder using 0.5 ml of standard chloride solution (1 ml containing 0.1 mg of chloride) and the same quantities of other reagents in the same total volume of the reaction mixture. Stir both the solutions with glass rods and compare the opalescence produced in the two cylinders after 5 min.

D-4 The limit prescribed in Table 1 shall be taken as not having been exceeded if the opalescence produced in the test with the material is not greater than that produced in the control test.

ANNEX E

[*Table* 1, *Sl No.* (v)]

DETERMINATION OF NITROGEN COMPOUNDS

E-1 APPARATUS

E-1.1 Nessler Cylinders

50 ml capacity.

E-2 REAGENTS

E-2.1 Sodium Hydroxide Solution

Approximately 10 percent (*m/v*).

E-2.2 Devarda's Alloy

Consisting of 50 parts of copper, 45 parts of aluminium, and 5 parts of zinc.

E-2.3 Nessler Solution

Dissolve 10 g of potassium iodide in 10 ml of ammonia-free water, and add to it slowly with stirring, saturated mercuric chloride solution until a slight permanent precipitate is formed. Add 30 g of potassium hydroxide and when it has dissolved, add 1 ml more of mercuric chloride solution, and dilute to 200 ml with ammonia-free water. Allow to settle overnight, decant off the clear solution and keep it in a bottle closed with a well-fitting rubber stopper.

E-2.4 Dilute Hydrochloric Acid

5 N.

E-2.5 Standard Ammonium Chloride Solution

Dissolve 0.382 g of ammonium chloride in water and make up to 100 ml. Take 10 ml of the solution and dilute to exactly 1 000 ml. One millilitre of this solution is equivalent to 0.01 mg of nitrogen (as N).

E-3 PROCEDURE

Weigh accurately 1.0 g of the material and dissolve in 50 ml of water. Add 20 ml of sodium hydroxide solution, 0.5 g of powdered Devarda's alloy and allow to stand for 2 h protected from loss or excess of ammonia in the distillation flask. Then, slowly distill 40-45 ml into 5 ml of water containing 1 drop of dilute hydrochloric acid. Transfer to a Nessler cylinder and add 1 ml of sodium hydroxide solution and 2 ml of Nessler solution. Make up the volume to 50-ml mark. Carry out a control test in another Nessler cylinder using for comparison 1 ml of standard ammonium chloride solution in place of the material and the same quantities of other reagents in the same total volume of the reaction mixture.

E-3.1 The limit prescribed in Table 1 shall be considered as not having been exceeded if the intensity of the colour produced in the test with the material is not greater than that produced in the control test.

ANNEX F

[*Table* 1, *Sl No.* (vi)]

DETERMINATION OF SULPHATES

F-1 REAGENTS

F-1.1 Dilute Hydrochloric Acid

Approximately 5 N.

F-1.2 Barium Chloride Solution

10 percent (*m/v*).

F-2 PROCEDURE

Dissolve 10 g of the material in 100 ml of water and 2 ml of dilute hydrochloric acid. Filter, if necessary, heat the filtrate to boiling, add slowly with constant stirring, 5 ml of barium chloride solution and allow to stand overnight. Filter through a tared Gooch crucible or a filter paper (Whatman No. 42 or equivalent). Wash the precipitate with hot water and ignite. Cool and weigh till constant mass is obtained.

F-3 CALCULATION

$$\text{Sulphates (as SO}_4\text{), percent by mass} = 41.15\,\frac{M_1}{M_2}$$

where

M_1 = mass in g of the precipitate, and

M_2 = mass in g of the material taken for the test.

ANNEX G

[*Table* 1, *Sl No.* (vii)]

DETERMINATION OF ARSENIC

G-1 PROCEDURE

Dissolve 1.0 g of the material, accurately weighed, in 10 ml of water. Carry out the test for arsenic as prescribed in IS 2088, using for comparison a stain obtained with 0.003 mg of arsenic trioxide (as As_2O_3) in case of pure grade and 0.001 mg in case of AR grade of the material.

G-1.1 The limit prescribed in Table 1 shall be taken as not having been exceeded if the length of the stain as well as the intensity of its colour produced in the test with the material are not greater than those produced in the control test.

ANNEX H

[*Table* 1, *Sl No.* (viii)]

DETERMINATION OF HEAVY METALS

H-1 APPARATUS

H-1.1 Nessler Cylinders

50-ml capacity.

H-2 REAGENTS

H-2.1 Acetic Acid

Approximately 33 percent (*v/v*).

H-2.2 Dilute Ammonium Hydroxide

Approximately 10 percent (*v/v*).

H-2.3 Hydrogen Peroxide

Approximately 6 percent (*v/v*).

H-2.4 Potassium Cyanide Solution

Dissolve 10 g of potassium cyanide in 90 ml of water, add 2 ml of hydrogen peroxide, allow to stand for 24 h and make up to 100 ml with water.

H-2.5 Concentrated Nitric Acid

See IS 264.

H-2.6 Standard Lead Solution

Dissolve 1.60 g of lead nitrate [$Pb(NO_3)_2$] in water and dilute to 1 000 ml in a volumetric flask. Pipette out 10 ml of the solution and dilute again to exactly 100 ml with water. One millilitre of this solution contains 0.1 mg of lead (Pb).

H-2.7 Sodium Sulphide Solution

Approximately 10 percent (*m/v*).

H-3 PROCEDURE

Weigh 7.0 g of the material into a Nessler cylinder and dissolve in 30 ml of hot water. Add 5 ml of acetic acid. Make it alkaline to litmus by gradual addition of dilute ammonium hydroxide solution and add 1 ml of potassium cyanide solution. Carry out a control test in the other Nessler cylinder using 2.0 g of the material, 0.5 ml of standard lead solution in case of the pure grade and 0.1 ml in case of AR grade and the same quantities of other reagents. Filter both the solutions, if they are turbid, and if the colours of the solutions differ, equalize by the addition of a few drops of a highly diluted solution of burnt sugar or other non-reactive substance. Dilute both the solutions with water and make up the volume of each to 50 ml. Add 2 drops of sodium sulphide solution, mix thoroughly and compare the colours developed in the two cylinders after 5 min.

The limits prescribed in Table 1 shall be taken as not having been exceeded if the colour produced in the test with the material is not deeper than that produced in the control test.

ANNEX J

[*Table* 1, *Sl No.* (ix)]

DETERMINATION OF IRON

J-1 OUTLINE OF THE METHOD

Iron is determined colorimetrically by measuring the transmittance of reddish-violet colour produced by ferrous and ferric ion with thioglycollic acid at *p*H 10.

J-2 APPARATUS

J-2.1 Photoelectric Absorptiometer

J-3 REAGENTS

J-3.1 Dilute Hydrochloric Acid

Approximately 5 N.

J-3.2 Sodium Citrate Solution (1M)

or

Ammonium Citrate Solution (2 M)

J-3.3 Ammonium Hydroxide

Approximately 16 N.

J-3.4 Thioglycollate Reagent

Add 20 ml of ammonium hydroxide to 30 ml of water, and then add a mixture of 10 ml of thioglycollic acid and 40 ml of water.

J-3.5 Standard Iron Solution

Dissolve 0.491 1 g of ferrous ammonium sulphate [$FeSO_4$ $(NH_4)_2$ $SO_4.6H_2O$] in water, add 10 ml of dilute sulphuric acid (10 percent *v/v*). Dilute to exactly 100 ml in a volumetric flask. One millilitre of this solution contains 0.1 mg of iron (as Fe_2O_3).

J-4 PROCEDURE

Weigh accurately 1 g of the material into a 150 ml beaker. Add 30 ml of water and 5 ml of dilute hydrochloric acid. Introduce a glass rod, cover with a watch glass and boil gently for 15 to 20 min. Cool and transfer to a 100 ml volumetric flask and dilute to about 70 ml. Place 5 ml of dilute hydrochloric acid and 65 ml of water in a second flask as blank.

J-4.1 To each flask add 4 ml of sodium citrate solution (or 2 ml of ammonium citrate solution), 5 ml of thioglycollate reagent and 15 ml of ammonium hydroxide, swirling after each addition. Dilute to the mark and mix well.

J-4.2 Balance the absorptiometer at blank using green filter No. 4 and 4-cm cells. (Use 1-cm if the colour is too strong.) Find the reading with the sample solution. Read off milligram iron from the standard calibration graph (*see* **10.3.3**).

J-4.3 Standard Calibration Graph

Pipette out known volumes of standard iron solution into each of 100-ml volumetric flasks containing 5 ml of dilute hydrochloric acid. Proceed as in **J-4.1**. Suitable aliquots are 0, 1.0, 1.5, 2.0, 2.5 and 3.0 ml. Take the readings. Plot graph with milligram iron as ordinates and absorptiometer readings as abscissae. Draw a line through the points and extend through the origin. Label the graph with particulars of filters and cells used.

J-5 CALCULATION

$$\text{Iron (as } Fe_2O_3\text{), percent by mass} = \frac{M_1}{10 \times M}$$

where

M_1 = mass in mg of iron (Fe_2O_3) read off from the graph, and

M = mass in g of the material taken for the test.

ANNEX K

[*Table* 1, *Sl No.* (x)]

DETERMINATION OF *p*H

K-1 PROCEDURE

Dissolve 2.8 g of the material in 100 ml of freshly boiled and cooled water and determine *p*H of the solution by means of a *p*H meter using glass electrodes.

ANNEX L

(*Clause* 6.1)

SAMPLING OF MONOSODIUM PHOSPHATE

L-1 GENERAL REQUIREMENTS OF SAMPLING

L-1.1 In drawing, preparing, storing and handling samples, the following precautions and directions shall be observed.

L-1.2 Samples shall not be taken in an exposed place.

L-1.3 The sampling instrument shall be clean and dry when used.

L-1.4 Precautions shall be taken to protect the samples, the material being sampled, the sampling instrument and the containers for samples from adventitious contamination.

L-1.5 To draw a representative sample the contents of each package selected for the sampling shall be mixed as thoroughly as possible by suitable means.

L-1.6 The samples shall be placed in clean, dry and air-tight glass or any other suitable containers on which the material has no chemical action.

L-1.7 Each sample container shall be suitably stoppered and sealed air-tight after filling and marked with full particulars of the material (*see* **4.2**) and the date of sampling.

L-1.8 Samples shall be stored in a cool and dry place.

L-2 SCALE OF SAMPLING

L-2.1 Lot

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

L-2.2 For ascertaining the conformity of the material in a lot to the requirements of this specification, samples shall be tested for each lot separately.

L-2.3 The number (n) of containers to be selected at random from the lots shall depend on size (N) of the lot and shall be in accordance with Table 2.

L-2.4 These containers shall be chosen at random from the lot and in order to ensure randomness of selection, random number tables may be used (*see also* IS 4905). In case, such tables are not available, the following procedure may be adopted:

> Starting From any container, count them in the order 1, 2, 3..., up to r where r is the integral part of N/n. Every rth container thus counted shall be withdrawn to form the sample.

Table 2 Number of Containers to be Selected for Sampling

(*Clause* L-2.3)

Lot Size N	Sample Size n
3 to 25	3
26 " 100	4
101 " 300	5
301 " 500	6
501 " 1 000	7
1 001 and above	8

L-3 INDIVIDUAL SAMPLES AND COMPOSITE SAMPLES

L-3.1 From each of the containers selected according to **L-2.4**, a representative portion of the material shall be drawn with the help of appropriate sampling instrument. The amount so withdrawn from each container shall be sufficient for carrying out all the tests specified under **L-4**, and shall constitute the individual sample.

L-3.2 From each of the individual samples, a small but equal quantity of the material shall be taken and thoroughly mixed to constitute a composite sample.

L-3.3 Each of the individual samples and the composite sample shall be transferred to separate bottles and labelled with full identification particulars.

L-4 NUMBER OF TESTS

L-4.1 Tests for determination of sodium phosphate content and loss on drying shall be carried out on each of the individual samples.

L-4.2 Tests for the determination of the remaining characteristics prescribed in **4.1** and Table 1 shall be performed on the composite sample.

L-5 CRITERIA FOR CONFORMITY

L-5.1 For Individual Samples

For those characteristics which are tested on individual samples, the mean and the range of test results shall be computed as follows:

$$\text{Mean } \overline{X} = \frac{\text{sum of individual test results}}{\text{number of test results}}$$

Range (R) = difference between the maximum and the minimum values of test results

L-5.1.1 For declaring the conformity of the lot:

$\overline{X} + 0.6\,R$ shall be less than or equal to the maximum specified requirements, and

$\overline{X} - 0.6\,R$ shall be greater than or equal to the minimum specified requirements.

L-5.2 For Composite Sample

For declaring the conformity of the lot to the requirements of all the characteristics tested on the composite sample, the test results shall satisfy the corresponding specified requirements.

ANNEX M

(*Foreword*)

COMMITTEE COMPOSITION

General Inorganic Chemicals Sectional Committee, CHD 3

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Ms Chitra Gupta
Deputy Director (Chem), BIS

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Review of Indian Standards

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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