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Nitric acid for industrial use — Evaluation of the nitric acid concentration by measurement of density

Acide nitrique à usage industriel — Évaluation de la concentration en acide nitrique par mesurage de la masse volumique

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up 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.

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.

International Standard ISO 2990 was drawn up by Technical Committee ISO/TC 47, *Chemistry*, and circulated to the Member Bodies in November 1972.

It has been approved by the Member Bodies of the following countries :

Australia	India	Spain
Austria	Israel	Sweden
Belgium	Italy	Switzerland
Bulgaria	Netherlands	Thailand
Czechoslovakia	New Zealand	Turkey
Egypt, Arab Rep. of	Poland	United Kingdom
France	Portugal	U.S.S.R.
Germany	Romania	
Hungary	South Africa, Rep. of	

This International Standard has also been approved by the International Union of Pure and Applied Chemistry (IUPAC).

No Member Body expressed disapproval of the document.

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Nitric acid for industrial use — Evaluation of the nitric acid concentration by measurement of density

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a method for the approximate evaluation, by measurement of density, of the concentration of nitric acid for industrial use.

2 PRINCIPLE

Determination of the density at 20 °C by means of a hydrometer. Evaluation of the corresponding concentration of nitric acid (HNO_3).

3 APPARATUS

Ordinary laboratory apparatus and

3.1 Density hydrometer, graduated in 0,005 g/ml, calibrated at 20 °C. (See ISO/R 649.)

3.2 Glass cylinder, capacity at least 500 ml, diameter at least 25 mm greater than that of the density hydrometer and height at least 25 mm greater than the immersion level of the density hydrometer.

4 PROCEDURE

4.1 Determination of density

Place about 500 ml of the test sample in a glass cylinder, and bring the contents to a temperature of 20 ± 0,5 °C. Place the hydrometer (3.1) in the cylinder and, when it comes to rest, re-check that the temperature of the acid is 20 ± 0,5 °C. Read off the density indicated on the hydrometer scale.

4.2 Evaluation of the nitric acid concentration

Read from the table the concentration of nitric acid corresponding to the density indicated by the hydrometer.

5 EXPRESSION OF RESULTS

State the density, expressed in grams per millilitre, read on the hydrometer and the nitric acid concentration deduced from the table.

6 TEST REPORT

The test report shall include the following particulars :

a) the reference of the method used;

b) the results and the method of expression used;

c) any unusual features noted during the determination;

d) any operation not included in this International Standard, or regarded as optional.

TABLE – **Correspondence between density and concentration of aqueous solutions of nitric acid**

Density at 20 °C	HNO_3
g/ml	%(*m/m*)
1,005	1,25
1,010	2,20
1,015	3,10
1,020	4,00
1,025	4,90
1,030	5,80
1,035	6,65
1,040	7,55
1,045	8,40
1,050	9,25
1,055	10,10
1,060	10,95
1,065	11,80
1,070	12,65
1,075	13,50
1,080	14,30
1,085	15,15
1,090	15,95
1,095	16,75
1,100	17,60
1,105	18,40
1,110	19,20
1,115	20,00
1,120	20,80
1,125	21,60
1,130	22,40
1,135	23,15
1,140	23,95
1,145	24,70
1,150	25,50
1,155	26,25
1,160	27,00
1,165	27,75
1,170	28,50
1,175	29,25
1,180	30,00
1,185	30,75
1,190	31,50
1,195	32,25
1,200	33,00
1,205	33,70
1,210	34,40
1,215	35,15
1,220	35,90
1,225	36,70
1,230	37,45
1,235	38,25
1,240	39,00
1,245	39,80
1,250	40,60
1,255	41,35
1,260	42,15

Density at 20 °C	HNO_3
g/ml	%(*m/m*)
1,265	42,90
1,270	43,70
1,275	44,50
1,280	45,25
1,285	46,05
1,290	46,85
1,295	47,60
1,300	48,40
1,305	49,15
1,310	50,00
1,315	50,85
1,320	51,70
1,325	52,50
1,330	53,40
1,335	54,25
1,340	55,10
1,345	56,00
1,350	56,90
1,355	57,80
1,360	58,75
1,365	59,70
1,370	60,65
1,375	61,60
1,380	62,65
1,385	63,65
1,390	64,70
1,395	65,80
1,400	66,90
1,405	68,05
1,410	69,20
1,415	70,40
1,420	71,55
1,425	72,80
1,430	74,05
1,435	75,35
1,440	76,65
1,445	78,00
1,450	79,40
1,455	80,85
1,460	82,35
1,465	83,85
1,470	85,45
1,475	87,20
1,480	89,00
1,485	91,00
1,490	93,40
1,495	95,90
1,500	97,75
1,505	98,85
1,510	99,60
1,513	100,00

The intermediate values given in the table have been calculated, by graphical interpolation, from the values quoted in *International Critical Tables*, 1st edition, Volume 3, page 58.

ANNEX

This document forms part of the following series on methods of test for nitric acid for industrial use :

ISO/R 1980 — *Determination of total acidity — Volumetric method.*

ISO/R 1981 — *Determination of nitrous compounds — Volumetric method.*

ISO/R 1982 — *Determination of iron content — 2,2'-bipyridyl photometric method.*

ISO/R 1983 — *Determination of sulphated residue on ignition — Gravimetric method.*

ISO 2990 — *Evaluation of the nitric acid concentration by measurement of density.*

ISO 2991 — *Determination of ammoniacal nitrogen content — Spectrophotometric method.*

ISO 3328 — *Determination of sulphate content — Titrimetric method after reduction.*[1)]

1) At present at the stage of draft.