INTERNATIONAL STANDARD 902

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Aluminium oxide primarily used for the production of aluminium — Measurement of the angle of repose

Oxyde d'aluminium principalement utilisé pour la production de l'aluminium — Mesurage de l'angle du talus d'éboulement

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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.

Prior to 1972, the results of the work of the Technical Committees were published as ISO Recommendations; these documents are now in the process of being transformed into International Standards. As part of this process, Technical Committee ISO/TC 47 has reviewed ISO Recommendation R 902 and found it technically suitable for transformation. International Standard ISO 902 therefore replaces ISO Recommendation R 902-1968 to which it is technically identical.

ISO Recommendation R 902 was approved by the Member Bodies of the following countries :

Austria	Ireland	South Africa, Rep. of
Belgium	Israel	Spain
Bulgaria	Italy	Sweden
Canada	Japan	Switzerland
Czechoslovakia	Korea, Rep. of	Thailand
Egypt, Arab Rep. of	Netherlands	Turkey
France	New Zealand	United Kingdom
Germany	Norway	U.S.A.
Hungary	Poland	U.S.S.R.
India	Portugal	Yugoslavia
Iran	Romania	

No Member Body expressed disapproval of the Recommendation.

The Member Body of the following country disapproved the transformation of ISO/R 902 into an International Standard :

Egypt, Arab Rep. of

Printed in Switzerland

Aluminium oxide primarily used for the production of aluminium — Measurement of the angle of repose

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a conventional method for the measurement of the angle of repose of aluminium oxide primarily used for the production of aluminium.

2 REFERENCES

ISO 802, *Aluminium oxide primarily used for the production of aluminium — Preparation and storage of test samples.*

ISO 2927, *Aluminium oxide primarily used for the production of aluminium — Sampling.*

3 PRINCIPLE

Measurement of the angle at the base of the cone of aluminium oxide obtained by allowing a sample to fall through a fixed distance from a defined funnel onto a horizontal base plate.

4 APPARATUS

Only the dimensions given in the text are mandatory.

The apparatus (see the figure) consists of the following items :

4.1 Funnel, of stainless steel, having a nozzle of internal diameter 6 mm, fitted with a sieve of 1 mm mesh aperture held in position between two retaining plates. The funnel is screwed into its support (4.3).

4.2 Base-plate, of minimum length 270 mm and minimum width 200 mm. It shall be perfectly rigid and made of marble, stainless steel or other corrosion-resistant metal. On the polished surface of the base-plate, four straight lines are engraved at angles of 45° to each other; at their intersection is a locating pin to which the height block (4.4) can be fixed. It is provided with three adjustable levelling feet.

4.3 Funnel support, made in stainless steel and of substantial construction. It is designed so that the axis of the funnel is vertically over the central locating pin.

4.4 Height block, consisting of a metal cylinder with polished faces of height 40,0 mm. The base has a recess to engage the central locating pin of the base-plate.

5 PROCEDURE

5.1 Sample

Use the crude sample (see 3.2 of ISO 802), at a temperature of 22 ± 4 °C.

5.2 Determination

5.2.1 Level the base-plate (4.2) by means of the adjustable feet.

5.2.2 Put the height block (4.4) in position and adjust the funnel (4.1) until the nozzle is just in contact with the block. Secure the funnel in position and remove the height block.

5.2.3 Feed the aluminium oxide to the centre of the funnel from a height of about 40 mm, taking care not to vibrate the apparatus. Adjust the powder flow to between 20 and 60 g/min.

If the sieve is clogged, use a brush to clear it, taking care not to vibrate the apparatus. When the top of the cone reaches the nozzle of the funnel, cease feeding the aluminium oxide.

Using a pencil, mark the circumference of the base of the cone on the eight radii engraved on the base-plate.

Remove the aluminium oxide and measure the four marked diameters.

6 EXPRESSION OF RESULTS

The angle of repose, expressed in degrees, is given by the formula

$$\text{arctg}\frac{2h}{\overline{d}-d_i}$$

where

h is the height of the cone, i.e. the distance between the base-plate and the nozzle of the funnel;

$\overline{d}$ is the arithmetic mean of the four diameters measured as specified in 5.2.3;

d_i is the internal diameter of the nozzle of the funnel.

When the apparatus described in clause 4 is used, the formula for the calculation of the angle of repose becomes

$$\text{arctg}\frac{80}{\overline{d}-6}$$

7 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 in the International Standards to which reference is made, or regarded as optional.

Dimensions in millimetres

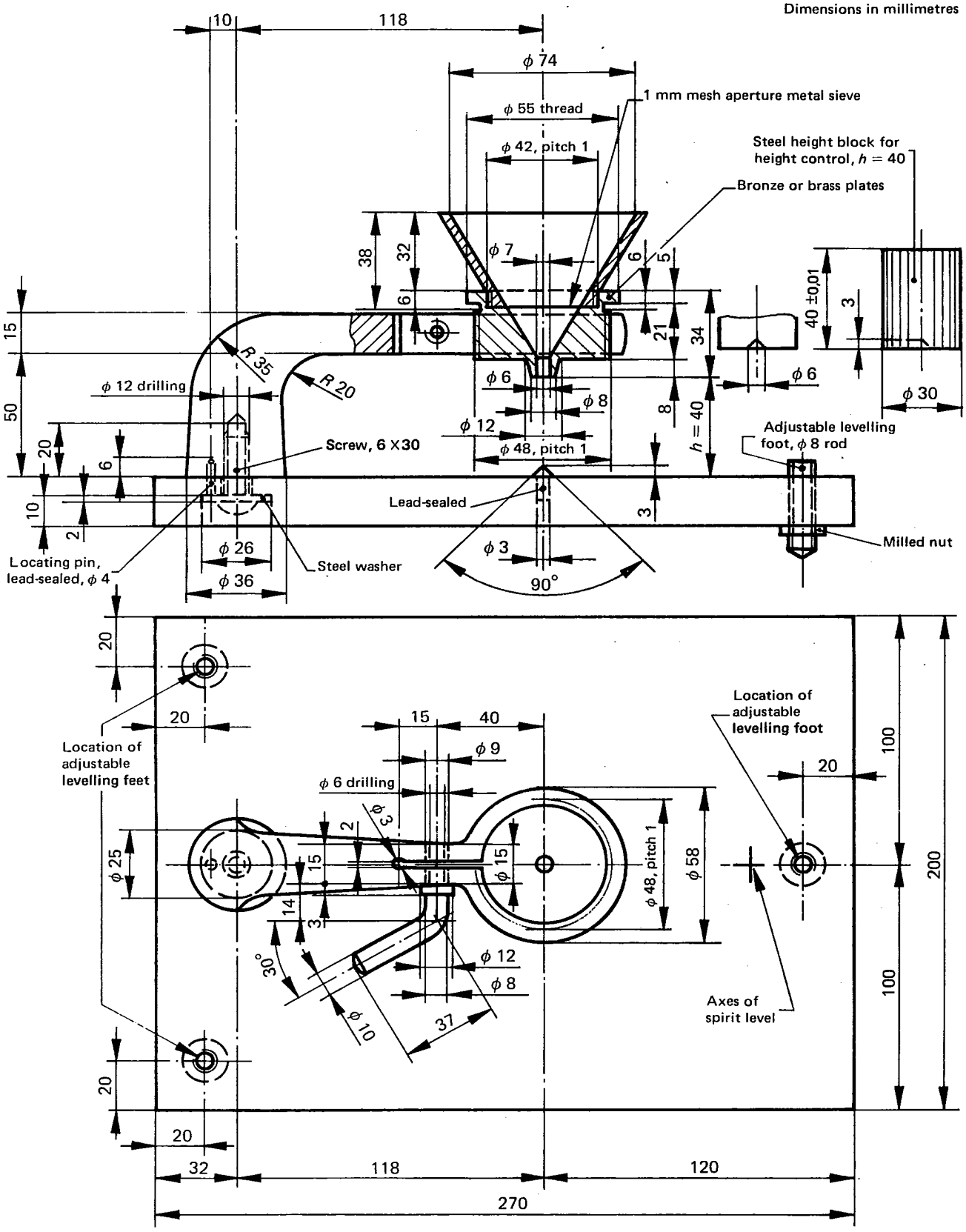

FIGURE — **Apparatus for the measurement of the angle of repose**

ANNEX

ISO PUBLICATIONS RELATING TO ALUMINIUM OXIDE PRIMARILY USED FOR THE PRODUCTION OF ALUMINIUM

ISO 802 – Preparation and storage of test samples.

ISO 803 – Determination of loss of mass at 300 °C (conventional moisture).

ISO 804 – Preparation of solution for analysis – Method by alkaline fusion.

ISO 805 – Determination of iron content – 1,10-Phenanthroline photometric method.

ISO 806 – Determination of loss of mass at 1 000 and 1 200 °C.

ISO 900 – Determination of titanium content – Diantipyrylmethane photometric method.

ISO 901 – Determination of absolute density – Pyknometer method.

ISO 902 – Measurement of the angle of repose.

ISO 903 – Determination of untamped density.

ISO 1232 – Determination of silica content – Reduced molybdosilicate spectrophotometric method.

ISO 1617 – Determination of sodium content – Flame emission spectrophotometric method.

ISO 1618 – Determination of vanadium content – *N*-Benzoyl-*N*-phenylhydroxylamine photometric method.

ISO 2069 – Determination of calcium content – Flame atomic absorption method.

ISO/R 2070 – Determination of calcium content – Spectrophotometric method using naphthalhydroxamic acid.

ISO 2071 – Determination of zinc content – Flame atomic absorption method.

ISO/R 2072 – Determination of zinc content – PAN photometric method.

ISO 2073 – Preparation of solution for analysis – Method by hydrochloric acid attack under pressure.

ISO 2828 – Determination of fluorine content – Alizarin complexone and lanthanum chloride spectrophotometric method.

ISO 2829 – Determination of phosphorus content – Reduced phosphomolybdate spectrophotometric method.

ISO 2865 – Determination of boron content – Curcumin spectrophotometric method.

ISO 2926 – Particle size analysis – Sieving method.

ISO 2927 – Sampling.

ISO 2961 – Determination of an adsorption index.

ISO 3390 – Determination of manganese content – Flame atomic absorption method.