



Australian Government

**National Measurement
Institute**

Bradfield Road, West Lindfield NSW 2070

General Certificate of Approval

NMI 4/10/0A

Issued by the Chief Metrologist under Regulation 60
of the
National Measurement Regulations 1999

This is to certify that an approval for use for trade has been granted in respect of the instruments herein described.

Measuring Instruments to Determine the Bulk Density of Grain

NOTE: This Certificate relates to the suitability of the pattern of the instrument for use for trade only in respect of its metrological characteristics. This Certificate does not constitute or imply any guarantee of compliance by the manufacturer or any other person with any requirements regarding safety.

This approval is issued upon completion of a review of General Certificate 4/10/0.

This approval becomes subject to review on **1/05/17**, and then every 5 years thereafter.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern approved – certificate issued	27/04/12

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with approval number 'NMI 4/10/0A' and only by the manufacturer or their agents.

It is the responsibility of the manufacturer or their agents to ensure that all instruments to be tested and marked with this approval number are constructed in accordance with this General Certificate of Approval and its Technical Schedule. Failure to comply with this Condition may attract penalties under Section 19B of the National Measurement Act.

Signed by a person authorised by the Chief Metrologist to exercise his powers under Regulation 60 of the *National Measurement Regulations 1999*.

A handwritten signature in black ink, consisting of a series of loops and a long horizontal stroke at the bottom.

TECHNICAL SCHEDULE No 4/10/0A

1. Description of Pattern **approved on 27/04/12**

A measuring instrument to determine the bulk density of a sample of grain (#).

(#) This characteristic may also be referred to as 'hectolitre mass' or 'test weight'.

1.1 Design

The density measuring instrument consists of a measure to provide volume information and a weighing instrument to provide mass information for bulk density determination calculations. The measure (which may also be known as a 'chondrometer') consists of a filling hopper, a measuring container and a levelling blade (straightedge).

Every measure shall stand firmly on its base.

The capacity is the volume that is marked on the measure, which is the volume of the measuring container formed by the internal surfaces of the container and the lower surface of a straightedge.

(a) Filling Hopper

The filling hopper is made of suitably rigid material and of a shape that allows the grain to fall into the measuring container to produce a repeatable bulk density.

(b) Measuring Container

The volume of the measuring container is formed by the internal surfaces of the container and the lower surface of a straight edge. The wall of the measuring container is made of a suitably rigid material in the shape of a straight-sided cylinder, open at the top and closed at the base. The nominal volume of the measuring container shall be either 0.5 or 1.0 litres.

(c) Straightedge (levelling blade)

The straight edge is made of a suitable material which allows the grain captured (for weighing) to occupy a constant volume.

(d) Weighing Instrument

Any NMI approved weighing instrument with a verification scale interval of 0.1 g or better may be used to provide mass information for bulk density determination calculations.

1.2 Descriptive Markings

Instruments carry the following markings, together in one location:

Manufacturer's mark, or name written in full
Pattern approval mark for the instrument	NMI No 4/10/0A
Maximum capacity	Max L
Serial number of the instrument

1.3 Verification Provision

Provision is made for the application of a verification mark.

TEST PROCEDURE No 4/10/0A

Measures shall be tested when standing on a level surface.

The weighing instrument shall be verified in accordance with the National Instrument Test Procedures.

Bulk density of grain is normally expressed in kg/hL; care needs to be exercised during volume to bulk density calculations to take account of the volume of the measure (0.5 or 1.0 L).

Volume to Density Conversion Factors

$$\text{Bulk density (kg / hL)} = \frac{\text{Mass of grain captured (in kg)}}{\text{Volume of measuring container (in L)}} \times 100$$

$$\text{Bulk density (kg / hL)} = \frac{\text{Mass of grain captured (in g)}}{\text{Volume of measuring container (in L)}} \times 0.1$$

$$\text{Bulk density (kg/hL)} = \text{Mass of grain captured (g)} \times 0.2 \quad (\text{for 0.5 L container})$$

$$\text{Bulk density (kg/hL)} = \text{Mass of grain captured (g)} \times 0.1 \quad (\text{for 1 L container})$$

Testing at Verification

Verification of the instrument shall be carried out by comparison with a reference chondrometer (instruments designated as either Franklin, Kern or Schopper are acceptable).

NOTE: NMI may publish further traceability requirements for reference chondrometers in due course.

The procedure shall be carried out using a grain sample that is free from impurities and under the same ambient conditions of temperature and humidity where measurements are normally made.

Take one test sample large enough to fill the filling hopper. (#)

Carry out three measurements on both the instrument and the reference chondrometer using the same test sample of grain. For each measurement, determine the density of the sample of grain. The mean value of the density should then be determined for each instrument.

The discrepancy of the two mean values shall be within ± 0.5 kg/hL.

(#) When the two chondrometers to be compared differ in size, first take a test sample sufficient for the larger device. The sample for the smaller device will be a portion of the original test sample.

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