INTERNATIONAL

RECOMMENDATION

OIML R 15

Edition 1974 (E)

Instruments for measuring the hectolitre mass of cereals

Instruments de mesure de la masse à l'hectolitre des céréales

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OIML R 15 Edition 1974 (E)

ORGANISATION INTERNATIONALE
DE MÉTROLOGIE LÉGALE

INTERNATIONAL ORGANIZATION
OF LEGAL METROLOGY

Foreword

The International Organization of Legal Metrology (OIML) is a worldwide, intergovernmental organization whose primary aim is to harmonize the regulations and metrological controls applied by the national metrological services, or related organizations, of its Member States.

The two main categories of OIML publications are:

- **International Recommendations (OIML R)**, which are model regulations that establish the metrological characteristics required of certain measuring instruments and which specify methods and equipment for checking their conformity ; the OIML Member States shall implement these Recommendations to the greatest possible extent;

- **International Documents (OIML D)**, which are informative in nature and intended to improve the work of the metrological services.

OIML Draft Recommendations and Documents are developed by technical committees or subcommittees which are formed by the Member States. Certain international and regional institutions also participate on a consultation basis.

Cooperative agreements are established between OIML and certain institutions, such as ISO and IEC, with the objective of avoiding contradictory requirements; consequently, manufacturers and users of measuring instruments, test laboratories, etc. may apply simultaneously OIML publications and those of other institutions.

International Recommendations and Inter-national Documents are published in French (F) and English (E) and are subject to periodic revision.

This publication – reference OIML R 15 (E), edition 1974 – which is under the responsibility of the OIML TC 9/SC 4 *Densities*, was submitted to the Third International Conference of Legal Metrology in October 1968 for formal sanction.

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INSTRUMENTS FOR MEASURING THE HECTOLITRE MASS OF CEREALS

This Recommendation defines :

1 the property of cereals known as the “HECTOLITRE MASS” ;

2 the measuring instrument used for determining this property and adopted as the STANDARD INSTRUMENT by the Member-States of the International Organization of Legal Metrology ;

3 the INDUSTRIAL and COMMERCIAL INSTRUMENTS of the type accepted by the International Organization of Legal Metrology and meant for day-to-day measurement of this mass.

1 Definition and determination of the hectolitre mass of cereals

1.1. Definition

The hectolitre mass of a given batch of grain is by definition :

the mass of that amount of grain required to fill a specified receptacle.

This property depends not only on the intrinsic quality of the grain in question, but also on its moisture content, the capacity, shape and dimensions of the receptacle used to measure its volume, and the way in which the receptacle is filled.

It is therefore determined :

from the mass of grain in a specified condition which is required to MI a receptacle of 20 litres and of specified shape and dimensions, the receptacle being filled with the grain under specified conditions. The hectolitre mass is then obtained by dividing the mass of the grain in kilograms by the volume of the receptacle in hectolitres ; it is thus expressed in kilograms per hectolitre.

1.2. The reference value

The ‘reference value’ * of the hectolitre mass of a cereal grain is that obtained by making the measurement with a national Standard Instrument.

* The mean of the values obtained from 6 consecutive measurements on the saine sample of grain.

2 Standard instruments

2.1. National standards

National standards must be made and used in accordance with the specifications in Appendix I to this Recommendation.

2.2. The International Standard

After agreement between all the Member States of the Organization (or by a substantial number of them), the National Standard of one of these countries may be selected as the International Reference Standard of these States.*

2.2.1. The National Standards of these countries will then be checked and adjusted by comparison with the International Reference Standard.**

3 Industrial and commercial measuring instruments of the OIML type

The industrial or commercial instruments of the OIML type for measuring the hectolitre mass of cereals are instruments with a capacity of 20 litres, which conform to the specifications laid down in Appendix II of this Recommendation.

3.1. Liability to metrological controls

When, in any country, instruments of the OIML type for measuring the hectolitre mass of cereals are subjected to State metrological controls, these controls must include, according to the internal legislation of that country, some or all of the following controls :

3.1.1. Pattern approval

3.1.1.1. Each pattern of instrument from each manufacturer to be subject to the pattern approval procedure.

Without spécial authorization, no modification may be made to an approved pattern.

3.1.2. Initial vérification

New, repaired and re-adjusted instruments must undergo the initial verification tests.

3.1.3 Periodic or subsequent cerifications

Instruments in service shall be checked to ensure that they retain their metrological qualities.

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* The International Reference Standard is reserved for the comparison of national standards, and will be replaced in its country of origin by another instrument, which will then become the National Standard.

** directly or, without being moved, by means of a transportable standard.

APPENDIX I

NATIONAL STANDARD INSTRUMENTS

A

COMPONENTS - DESIGN - FUNCTION

National Standard Instruments must comply generally with the following specifications and be similar to the drawing included in this document.

The instrument comprises, mounted on a chassis :

(a) the filling device, which includes in the same vertical axis :

(i) a hopper with a distributor for the flow of the grain ;

(ii) a collar to protect and guide the flow ;

(iii) a knife for levelling the grain at the rim of the measuring receptacle ;

(b) a stand to support the measuring receptacle ;

(c) a box for collecting the excess grain from the measuring receptacle ;

and separately :

(d) a pre-filling measure ;

(e) the measuring receptacle ;

(f) the equipment for weighing the grain in the measuring receptacle.

1 Pre-filling measure

The pre-flling measure has a capacity of 24 litres,

its internal shape is that of an upright cylinder, of circular cross-section, whose height is approximately equal to its diameter.

2 Filling hopper

2.1. The hopper is a frustum of a vertical circular cone, surmounted by a cylindrical rim.

It ends in an emptying outlet which is coaxial with the hopper. The core of this outlet tapers shghtly and has a greater diameter at the bottom.

The emptying process is controlled by a gate valve which is on hinges attached to the outlet, and which opens to levee the outlet completely clear.

2.2. It receives from the pre-filling measure a quantity of grain greater than that which the receptacle will hold.

3 Distributor

3.1. The distributor is shaped like a circular inverted mushroom joined by a strong tapered collar to the bottom end of a vertical stem fixed in the axis of the hopper.

3.1.1. The stem lowers the distributor into the tapered outlet to a level that can be varied upward or downward so that the instrument can be adjusted :

Lowering the distributor faciftates the fall of the grain, and it accumulates in larger amounts in the measuring receptacle so that the results obtained with the instrument are higher ; conversely they are lower when the distributor is raised.

4 Measuring receptacle

The measuring receptacle bas a capacity of 20 litres.

Its internal shape is that of an upright cylinder whose height is approximately equal to its diameter. Its top edge is smoothly ground.

5 Stand for the measuring receptacle

A stand running on rails supports the receptacle so that it can be placed under the hopper and locked in an axial position under it ;

or can be withdrawn from the frame and easily removed.

6 Collar for protecting and guiding the flow of the grain

6.1. A cylindrical collar of the same inside diameter as the measuring receptacle is fitted between the hopper and the receptacle.

Between its bottom edge and the top edge of the receptacle, there is a horizontal slit for the passage of the levelling knife.

6.2. The collar, together with a truncated conical turret on top of it, protects the fall of the grain during filling and retains the surplus grain at the end.

7 Levelling knife

7.1. The levelling knife is a plain steel strip, thin but rigid, sharpened in a V-edge which has its opening towards the front.

It is fixed horizontally in a frame carried on rollers and is drawn along on its own plane by a counterpoise.

7.2. The frame guides the knife closely across the grain, moving it through the opening between the collar and the edge of the receptacle.

The movement must be continuous and not jerky, and the knife must not touch either the edge of the collar or the rim of the receptacle.

7.3. In its movement the knife skims the grain to the level of the rim of the measuring receptacle and so isolates a definite volume.

8 Box for collecting the excess grain

8.1. At the same time as it levels the grain, the knife blocks the bottom of the collar, separating the receptacle from the excess grain.

8.2. When the knife is withdrawn after the removal of the receptacle, this excess grain falls into a collecting box under the stand, having been guided into it by an enveloping jacket.

9 Arrangement for the whole assembly

9.1. The entire instrument is mounted on a rigid chassis borne on jack screws for adjusting it to the vertical.

A plumb line or circular spirit level is used to check that it is vertical.

9.2. The hopper with its outlét and distributor, the collar and the receptacle must be co-axial and adjusted to vertical by the means referred to above, and the top edge of the measuring receptacle must then be horizontal.

10 Weighing equipment

The grain contained in the measuring receptacle is weighed on an equal-arm balance, the weights pan being adjusted so that the balance is in equilibrium when the receptacle is empty.

A simple weighing then gives the mass of the grain.

B

ESSENTIAL DIMENSIONS

The essential dimensions given belowfor various components must be rigorously adhered to.

Hopper			
top edge : inside diameter	390 ± 1		millimetres
height	120 ± 2		
conical part : top inside diameter	390 ± 1		millimetres
bottom inside diameter	84.5 ± 0.2		
height	240 ± 1		
outlet : top inside diameter	84.5 ± 0.2		millimetres
bottom inside diameter	86.5 ± 0.2		
length	80 ± 0.5		
Distributor			
diameter of stem	11 ± 0.2		millimetres
mushroom : diameter	33 ± 0.2		
height	5 ± 0.5		
radius of join to stem	16 ± 0.5		
distance of the under surface of the mushroom from the bottom edge of the outlet	14 ± 0.5		millimetres (*)
Levelling knife			
thickness of the blade	3 ± 0.2		millimetres
weight of counterpoise	5 ± 0.1		kilograms
Measuring receptacle			
volume to the ground top edge	20 ± 0.01		litres
inside diameter	295 ± 1		millimetres
inside height (about 292 mm) is adjusted to give the prescribed volume			
Stand for receptacle			
distance between the bottom of the receptacle and the bottom edge of the outlet	500 ± 2		millimetres
distance between the top edge of the receptacle and the under surface of the levelling knife	0.5 ± 0.2		millimetre
Protective collar and flow guide inside diameter	295 ± 1		millimetres
height	78 ± 2		
distance between the bottom edge of the collar and the lower surface of the levelling knife	0.5 ± 0.2		millimetre
Chassis			
length of plumb line for checking that the instrument is vertical (or a spirit level of the same sensitivity)	at least 500 millimetres		
Pre-filling measure			
volume to rim	24 ± 0.1		litres
inside diameter	300 ± 10		millimetres
inside height (about 340 mm) is adjusted to give the prescribed volume			

(*) For instruments not compared with the international standard: this distance is finally adjusted on construction to ± 0.5 mm ;

for instruments compared with the international standard: this distance is finally adjusted at the time of the comparison.

C

METHOD OF USE

1 Conditioning of the grain to be tested

1.1. The grain must be free from impurities

1.2. It must be in equilibrium with the temperature and humidity of the atmosphere at the place where the measurement is made ; this is achieved by spreading it out in a thin layer for 10 hours (overnight) in the place where the measurement is made. The relative humidity of the air must not exceed 60%.

2 Filling

Fill the pre-filling measure so that the grain is level with the rim, place the knife in its open position, with the gate valve on the outlet closed, empty the measure into the hopper, taking care not to jolt the instrument (particularly by touching the hopper with the measure).

Open the gate valve and let the grain flow into the measuring receptacle.

When the hopper is empty and the grain has filled the measuring receptacle, undo the bolt retaining the knife (this knife levels off the grain).

Remove the measuring receptacle, draw back the levelling knife, and the excess grain in the collar above the knife falls into the collecting box.

D

ARRIVING AT THE RESULT

1 By weighing the measuring receptacle full of grain

(the balance pan for the weights being tared to balance the empty receptacle)

The mass of grain, which is in equilibrium with the temperature and humidity of the air at the place where the measurement is made, and which fills a receptacle of definite shape and capacity, is obtained directly.

2 By convention

The “hectolitre mass” of the grain in question, is obtained by dividing the mass in kilograms, by 0.2 hectolitre (the equivalent of 20 litres), the result being expressed in kilograms per hectolitre.

3 The reference value

The reference value is the mean* of the results obtained with six successive measurements of the same sample of 24 litres of grain.

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* rounded off to the second decimal place.

E

METROLOGICAL CHARACTERISTICS

1 Accuracy

The maximum permissible error in the mass of grain weighed is ± 0.02 % of its mass.

2 Accuracy of the results

For National Standards that are not compared with the International Standard :

the accuracy of construction determines the accuracy of the results.

For National Standards that are compared directly, or through the intermediary of a transportable standard*, with the International Standard :

the accuracy in relation to this Standard can be adjusted by regulating the level of the distributor.

After this adjustment the permissible residual error must not exceed ± 0.1 %.

3 Repeatability of the results

The repeatability error of the results given by the Standard must not exceed ± 0.1 % of the mean of six successive measurements on one sample of grain.

Note

If this degree of repeatability is not reached, the divergences may be due only to a lack of homogeneity in the grain or to its having been imperfectly conditionnd.

Before the fault is attributed to the instrument, an attempt should be made to homogenize the 24 litres of grain used by pouring it ten times in succession from one vessel to another before making a fresh series of measurements.

If this is unsuccessful the measurements should be made again after the whole batch of grain has been re-exposed for conditioning.

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* The transportable standard must comply with the specifications of this Appendix insofar as the filling equipinent and the measuring receptacle are concerned,

but the International Standard balance and the National Standard balance may be used.

When it is compared with the International Standard; the transportable standard must be adjusted as closely as possible, so that its error is less than ± 0.1 %.

APPENDIX II

COMMERCIAL AND INDUSTRIAL INSTRUMENTS

of the type of the International Organization of Legal Metrology

1 Design specifications

Industrial and commercial instruments of the OIML type used for determining the hectolitre mass of cereals must comply with the same general specifications in respect of components, design and function, and must be of the same essential dimensions, as the Standard Instruments.

2 Metrological specifications

(to be complied with both when the model is approved and also during initial and subsequent verifications)

2.1. Accuracy of weighings

The maximum permissible error in the mass of the grain

weighed on the balance used is : ..... ± 0.1 % of its mass.

2.2. Accuracy of the measuring receptacle :

The maximum permissible error in the capacity of

the 20 litre measuring receptacle is : ..... ± 0.04 litres.

2.3. Repeatability of the results

The maximum permissible repeatability error of

the results given by the instrument is : ..... ± 0.2 % of the mean of six successive determinations on the same sample of grain.

2.4. Accuracy of the result

The maximum permissible error in the Acuracy of

the results given by the instrument is : ..... ± 0.5 % of the 'reference value' of the hectolitre mass of the grain tested, as given by the National Standard Instrument.

3 Method of use

The method of use of industrial and commercial instruments must be the same in principle as the method of use of Standard Instruments.

Nevertheless, in everyday use, only one measurement of a single sample of grain is usually made and the batch of grain to be tested does not have to be conditioned beforehand.

4 Descriptive plate

A descriptive plate must be attached to the filling instrument in a prominent position, bearing in legible and indelible characters the following inscriptions :

(i) "Instrument for the measurement of the hectolitre mass of cereals" ;

(ii) the name and address of the manufacturer (or his mark) ;

(iii) the year of manufacture and a serial number (which is reproduced on the measuring receptacle and the pre-filling measure) ;

(iv) the method of use (or a reference to instructions for use) ; and,

(v) optionally, the cereal or cereals for which the instrument is intended.

5 Authentification of the metrological controls

The control marks, if any, and the seals necessary to protect parts affecting the properties of the instrument, shall be affixed as directed in the national regulations of each country.

APPENDIX III
CHECKING OF DIMENSIONS - VERIFICATION OF OPERATION – CALIBRATION AND ADJUSTMENT

(standard instruments and industrial or commercial instruments)

CHECKING OF DIMENSIONS

1 Essential dimensions

The essential dimensions must be checked with the accuracy necessary to ensure that they are within the limits of the tolerances specified (Appendices I.B and II.1).

VERIFICATION OF THE OPERATION OF AN INSTRUMENT

1 Parameter characterising the operation of an instrument

The operation of a given instrument depends on the repeatability error which affects the results obtained.

2 The procedure for verifying the operation of an instrument

The check consists of a comparison between the results obtained when six successive measurements of the same sample of 24 litres of grain are made, and the mean of these results.

This sample must be taken once and for all front a batch of previously conditioned “wheat” (Appendix I.C.1).

The measurements must be made in accordance with the method of use of the instrument, and before each new measurement the grain in the measuring receptacle should be thoroughly mixed with that which has fallen into the collecting box when the previous measurement was made (Appendix I.C.2).

3 Repeatability error

The repeatability error is the greatest of the differences between each of the six results and the mean of them.

This error shall not exceed the “maximum” permissible repeatability error fixed for the instrument in question (Appendices I.E.3 and II.2.2.3).

CALIBRATION AND ADJUSTMENT

1 Calibration

The calibration of an instrument, I, in relation to a standard instrument, E, is calculated by comparing the respective means of six measurements made with each of the instruments on the same sample of 24 litres of grain.

1.1. The system of the successive measurements

The measurements shall be made in the following order :

	1	2	3	4	5	6
order of measurements :	E-I	I-E	E-I	I-E	E-I	I-E

2 Error in accuracy

The error in the instrument 1 relative to the Standard Instrument E is the difference between the mean of the six I measurements and the six E measurements.

This error shall not exceed the “maximum permitted error in accuracy” fixed for the instrument in question (Appendices I.E.2 and II.2.2.4).

3 Adjustment

Adjustment to within the limits of the maximum permitted error in accuracy of the calibrated instrument is effected by altering the height of the efflux distributor of the grain inside the outlet of the filling hopper.

Note: lowering the distributor increases the results the instrument gives, and raising it reduces them (Appendix I.A. 3.1.1).

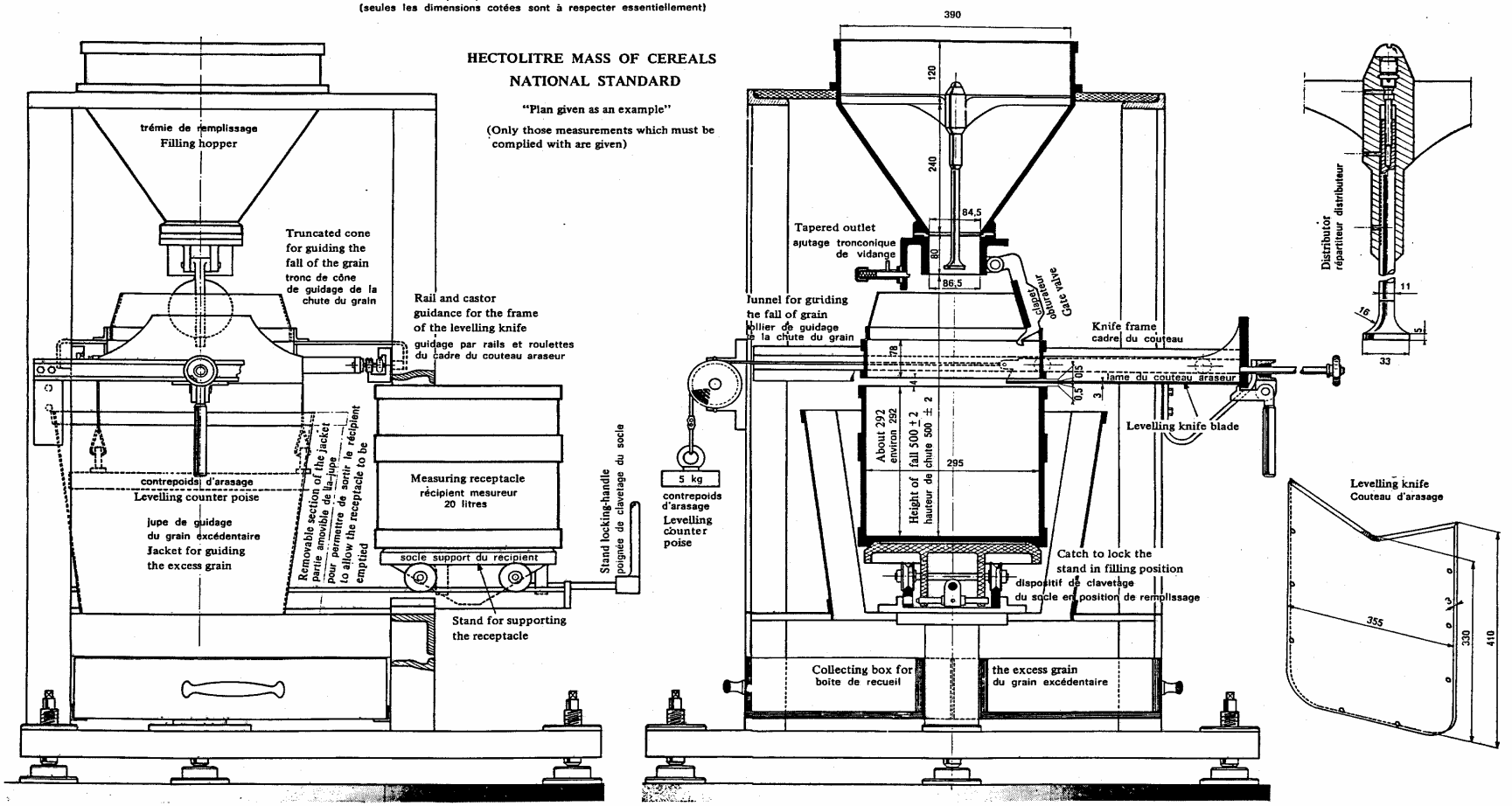
MASSE à l'HECTOLITRE des CÉRÉALES
ÉTALON NATIONAL

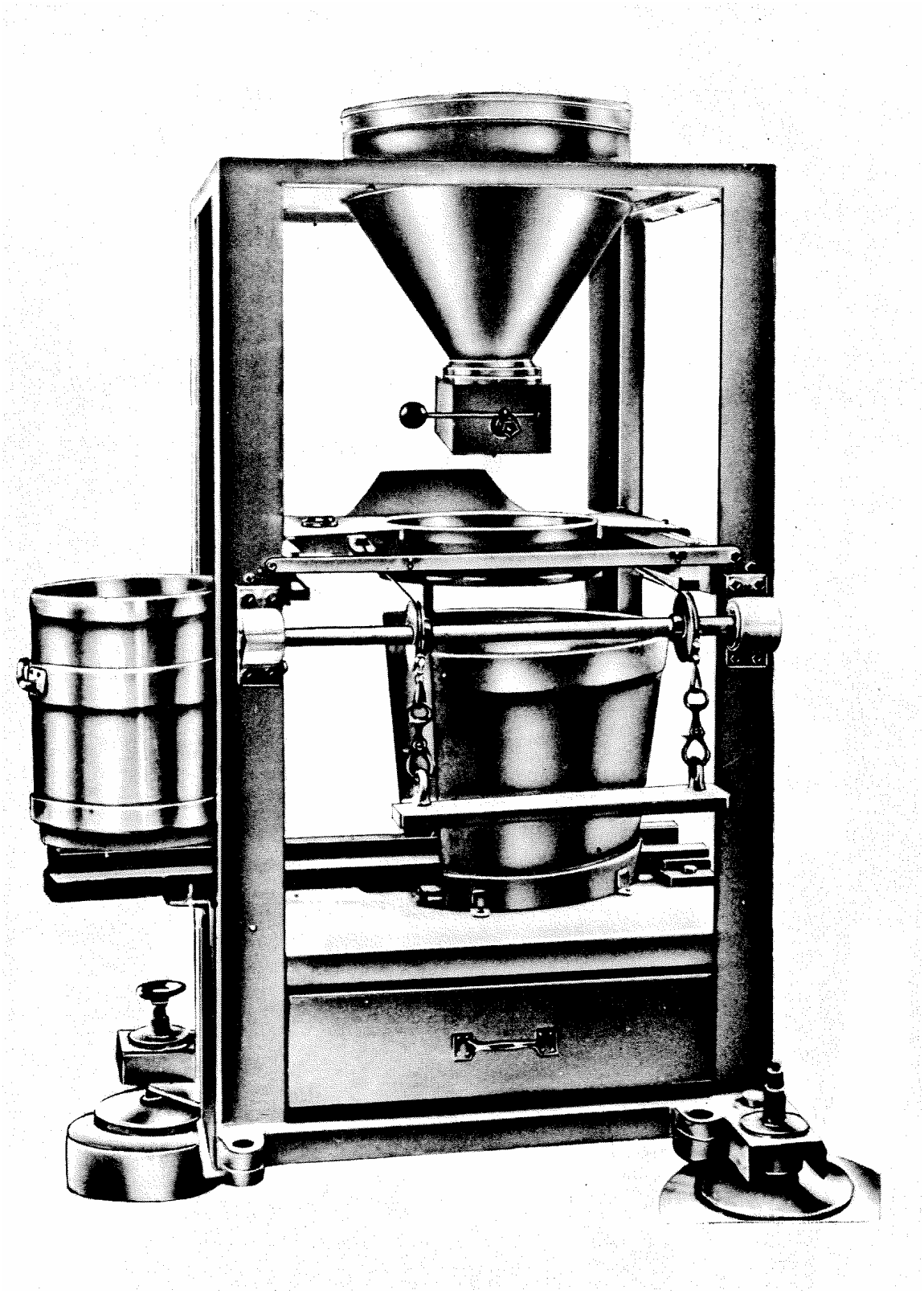
« plan présenté à titre d'exemple »
(seules les dimensions cotées sont à respecter essentiellement)

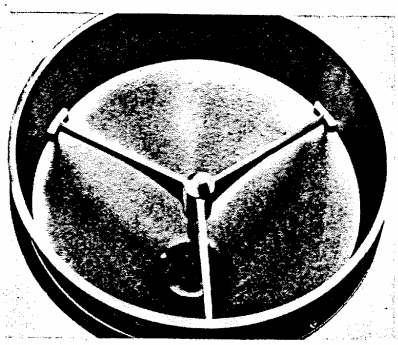
HECTOLITRE MASS OF CEREALS
NATIONAL STANDARD

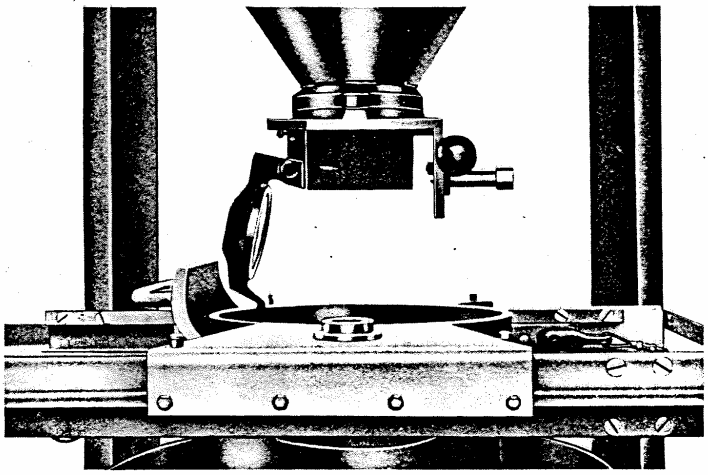
"Plan given as an example"

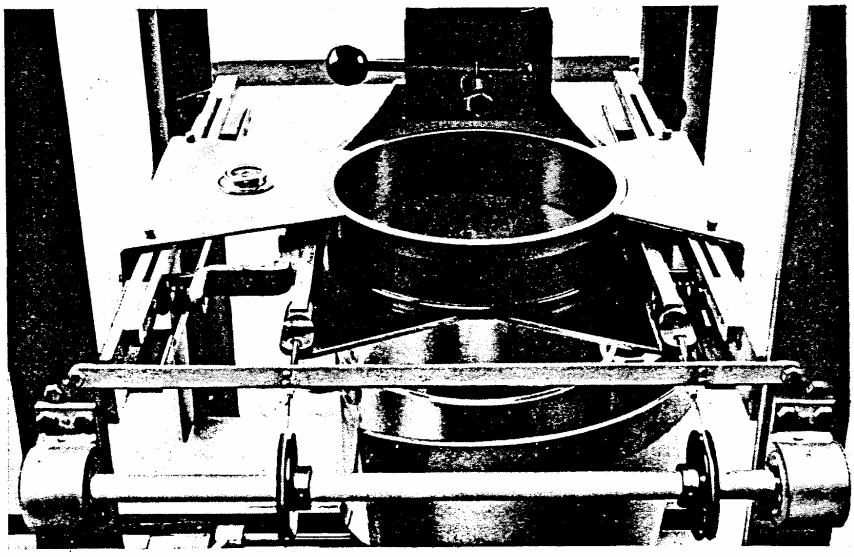
(Only those measurements which must be complied with are given)

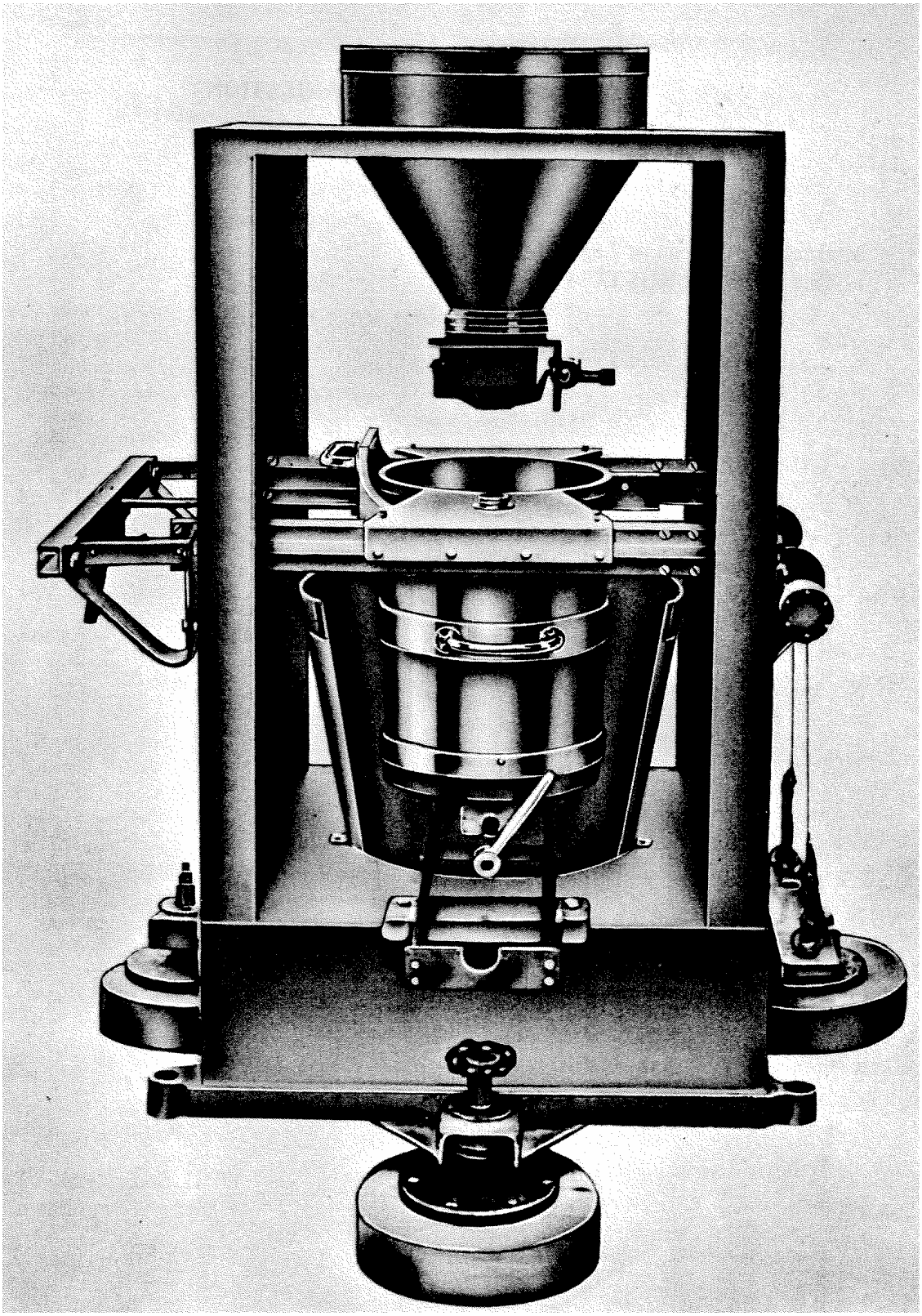












Contents