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(Acts whose publication is not obligatory)

COUNCIL

COUNCIL DIRECTIVE

of 19 November 1973

on the approximation of the laws of the Member States relating to non-automatic weighing machines

(73/360/EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

HAS ADOPTED THIS DIRECTIVE:

Having regard to the Treaty establishing the European Economic Community, and in particular Article 100 thereof;

Having regard to the proposal from the Commission;

Having regard to the Opinion of the European Parliament;

Having regard to the Opinion of the Economic and Social Committee;

Whereas in the Member States the construction and methods of control of non-automatic weighing machines are subject to mandatory provisions which differ from one Member State to another and consequently hinder trade in such instruments; whereas it is therefore necessary to approximate these provisions;

Whereas the Council Directive of 26 July 1971 ⁽¹⁾ on the approximation of the laws of the Member States relating to provisions both for measuring instruments and methods of metrological control has laid down the EEC pattern approval and EEC initial verification procedures; whereas, in accordance with that Directive, the technical requirements for the design and functioning of non-automatic weighing machines should be laid down,

Article 1

This directive applies to non-automatic weighing machines.

Such machines are defined in points 1.2 and 2.1.1.2 of the Annex.

Article 2

Those non-automatic weighing machines which may bear EEC marks and symbols are described in the Annex.

They shall be subject to EEC pattern approval and shall be submitted to EEC initial verification.

Weighing machines listed under item 13 of the Annex shall however be exempt from EEC pattern approval.

Article 3

No Member State may refuse, prohibit or restrict the placing on the market or entry into service of non-automatic weighing machines bearing the EEC

⁽¹⁾ OJ No L 202, 6. 9. 1971, p. 1.

pattern approval symbol where required, and the EEC initial verification mark.

Article 4

1. Member States shall put into force the laws, regulations and administrative provisions needed in order to comply with this Directive within eighteen months of its notification, and shall forthwith inform the Commission thereof.

However, in the case of Ireland and the United Kingdom, this period shall be extended to five years.

2. Member States shall ensure that the tests of the main provisions of national law which they adopt in

the field covered by this Directive are communicated to the Commission.

Article 5

This Directive is addressed to the Member States.

Done at Brussels, 19 November 1973.

For the Council

The President

1b FREDERIKSEN

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CHAPTER I

GENERAL

1. GENERAL DEFINITION

1.1. Weighing

Determination of the value of the mass of a body.

1.2. Weighing machines

Machines which serve to determine the value of the mass of a body by using the action of gravity on this body.

They may also be used to determine other quantities, magnitudes, or characteristics in terms of mass.

In this Annex the term 'weighing machines' is abbreviated to 'machines'.

2. TERMINOLOGY

2.1. Classification of machines

2.1.1. — *according to their method of operation*

2.1.1.1. Automatic machines

Machines accomplishing a weighing operation without intervention by an operator and setting in motion an automatic process characteristic of the machine.

2.1.1.2. Non-automatic machines

Machines which require the intervention of an operator during the weighing process, especially to deposit on and/or remove from the loadreceptor of the machine the loads and also to determine the result.

2.1.2. — *according to their method of indication*

2.1.2.1. Non-graduated machines

Machines not fitted with a scale calibrated in units of mass.

2.1.2.2. Graduated machines

Machines enabling a direct reading of the complete or partial result of the weighing to be taken.

2.1.3. — *according to the method of obtaining equilibrium*

2.1.3.1. Non-self-indicating machines

Machines in which the position of equilibrium is obtained entirely by the operator.

2.1.3.2. Self-indicating machines

Machines in which the position of equilibrium is obtained without the intervention of the operator.

2.1.3.3. Semi-self-indicating machines

Machines in which the operator, only intervenes above a certain range, called range of self-indication or printing, in order to re-establish the function of self-indication.

- 2.2. **Construction of machines**
- 2.2.1. *Main Components*
- 2.2.1.1. Load receptor
Part of the machine intended to receive the load.
- 2.2.1.2. Load transmitting device
Part of the machine for transmitting to the load measuring device the force produced by the load acting on the load receptor.
- 2.2.1.3. Load measuring device
Part of the machine for measuring the mass of the load:
— by balancing the force transmitted by the load transmitting device, against a known force,
— by indicating the mass corresponding to the value of the balancing force.
- The result of the measurement is obtained by means of one or more of the following methods:
— value of regulation weights placed on the weight receptor taking into account the reduction ratio,
— reading of an indicating device,
— printed record delivered by a printing device.
- 2.2.1.3.1. Weights receptor
Part of the load measuring device intended to receive the regulation weights where equilibrium is obtained totally or partially by means of weights.
- 2.2.1.3.2. Indicating device
Part of the load measuring device on which the direct reading of the total or partial weighing result is obtained.
- 2.2.1.3.3. Printing device
Part of the load measuring device printing the weighing result.
- 2.2.1.3.4. Composition of the indicating device
- 2.2.1.3.4.1. Indicating element
Pointer indicating the equilibrium of the machine.
- 2.2.1.3.4.2. Scale marks
Lines or notches, the distance between which determines the scale spacing on continuous (analogue) scales.
Numbers on numerical scales are also considered as scale marks.
- 2.2.1.3.4.3. Scale base
Imaginary line through the mid-points of the shortest scale marks.
- 2.2.1.3.4.4. Auxiliary reading devices
- 2.2.1.3.4.4.1. Device for interpolation of reading
Device rigidly fixed to the indicating element sub-dividing without special adjustment the continuous (analogue) scale of machines (vernier, nonius etc).

2.2.1.3.4.4.2. Complementary reading device

Adjustable mechanism by means of which it is possible to measure in units of mass the distance between the position of a scale mark of the continuous (analogue) scale and the datum mark with an accuracy greater than that of visual interpolation, but without affecting the equilibrium of the machine.

2.2.2. *Supplementary components*

2.2.2.1. Levelling device

Device for setting a machine to the reference position.

2.2.2.2. Zero setting device

Device for setting the machine to the correct zero position.

2.2.2.3. Device for extending the range of self-indication or printing

Adjustable device incorporated in semi-self-indicating machines allowing the weighing of loads greater than the range of self-indication or printing up to the maximum capacity.

2.2.2.4. Tare devices

2.2.2.4.1. Tare adding device

Device for balancing the tare without intruding on the weighing range of the machine.

2.2.2.4.2. Tare subtracting device

Device for subtracting the tare from the weighing result, thus reducing the weighing range of the machine.

2.2.2.5. Locking device

Device for immobilizing all or part of the mechanism of a machine.

2.2.2.6. Selection mechanism for load receptors and load measuring devices

Mechanism for attaching, separately or simultaneously, one or more load receptors to one or more load measuring devices, whatever intermediate load transmitting devices are used.

2.2.2.7. Device for self-indication or printing of price

Device from which the indicated or printed price of a commodity is immediately obtainable (referred to as 'price-to-pay' in the text) on the basis of its mass and its price per kilogramme (referred to as 'unit price' in the text).

2.2.2.7.1. Price charts, coded or numbered

Device for bringing into line the scale of mass with the numbered or coded price-to-pay scales that relate to the various unit prices. When the indication or printing of the price-to-pay is discontinuous (digital) the result is rounded to the nearest scale division.

2.2.2.7.2. Computing device

Device providing automatically the price-to-pay, by multiplying the mass of the goods by its unit price.

- 2.2.2.7.2.1. **Analogue computing device**
A device in which at least one of the two parameters is continuous (analogue) the result being either continuous (analogue) or discontinuous (digital).
- 2.2.2.7.2.2. **Digital computing device**
A device in which the two parameters are discontinuous (digital) the result being discontinuous (digital).
- 2.3. **Metrological characteristics of the machines**
- 2.3.1. *Weighing capacity*
- 2.3.1.1. **Maximum capacity (Max)**
Maximum weighing capacity not taking into account the additive tare capacity.
- 2.3.1.2. **Minimum capacity (Min)**
Value of load below which the weighing results may be subject to excessive relative errors.
- 2.3.1.3. **Weighing range**
Range between minimum and maximum capacities.
- 2.3.1.4. **Self-indication or printing range**
Indication or printing range within the equilibrium position is obtained without the intervention of an operator.
- 2.3.1.5. **Maximum tare effect**
- 2.3.1.5.1. **Maximum additive tare effect (T = + ...)**
Maximum capacity of the tare adding device.
- 2.3.1.5.2. **Maximum effect of tare subtraction (T = - ...)**
Maximum capacity of the tare subtracting device.
- 2.3.1.6. **Maximum safe load**
Maximum load, fixed by the manufacturer, greater than the sum of the maximum capacity and the maximum additive tare effect, which can be carried by the machine without altering its metrological qualities.
- 2.3.2. *Scale division*
- 2.3.2.1. **Actual scale division**
- 2.3.2.1.1. **Value of scale division**
(referred to as 'scale interval' in the text):
Value expressed in legal units of mass:
— for continuous (analogue) indication or printing:
(d) of the smallest sub-division of the scale (referred to as 'continuous scale interval' in the text)
— for discontinuous (digital) indication or printing:
(d_d) of the difference between two consecutive values indicated or printed (referred to as 'discontinuous scale interval' in the text)
- 2.3.2.1.2. **Number of scale divisions (n)**
Quotient of the maximum capacity divided by the scale interval
$$n = \frac{\text{Max}}{d} \text{ or } n = \frac{\text{Max}}{d_d}$$

- 2.3.2.1.3. Length of scale division (i)
(Referred to as 'scale spacing' in the text)
Relative linear displacement of indicating element and scale corresponding to the value of the scale interval; this displacement is measured along the base of the scale.
- 2.3.2.2. **Conventional scale division**
- 2.3.2.2.1. Value of conventional scale division (d_c)
(referred to as 'conventional scale interval' in the text)
Conventional value expressed in legal units of mass as laid down in this Annex. The purpose of this interval is to equate non-graduated and graduated machines or act as an aid to classification of certain graduated machines according to classes of accuracy.
- 2.3.2.2.2. Number of conventional scale division (n_c)
Quotient of the maximum capacity divided by the conventional scale interval
$$n_c = \frac{\text{Max}}{d_c}$$
- 2.3.2.3. **Verification scale division**
- 2.3.2.3.1. Value of verification scale division (e)
(referred to as 'verification scale interval' in the text)
Value, expressed in legal units of mass, of the conventional scale interval used for the verification of machines.
- 2.4. **Metrological characteristics of a machine**
- 2.4.1. *Sensitivity (S)*
- 2.4.1.1. **Non-self-indicating machine**
Quotient of displacement ' Δl ' of the indicating element between two positions of equilibrium divided by the increase ' Δm ' of the load which produces it, the machine being placed under the best conditions for discrimination.
$$S = \frac{\Delta l}{\Delta m}$$
- 2.4.1.2. **Self-indicating or semi-indicating machines**
In practice, quotient of the scale spacing 'i' divided by its interval 'd' ie.
$$S = i/d$$
- 2.4.2. *Discrimination*
Quality which characterises the ability of a machine to react to small variations of load.
- 2.4.2.1. **Discrimination threshold for a given load**
Value of the smallest additional load which, when deposited without impact, causes a change in the state of equilibrium of the machine.
- 2.4.3. *Repeatability*
Ability of a machine to provide identical results for the same load deposited or moved several times on the load receptor.

- 2.5. **Measurement of the load**
- 2.5.1. *Weighing result*
Value of the mass measured at the time of weighing.
- 2.5.2. *Methods of indication and printing*
- 2.5.2.1. **Balancing by weights**
Value of regulation weights which balance the load taking into account the reduction ratio of the load.
- 2.5.2.2. **Continuous (analogue) indication or printing**
Indication or printing of a scale allowing the evaluation of the equilibrium position to a fraction of the scale interval.
- 2.5.2.3. **Discontinuous (digital) indication or printing**
Indication or printing of a scale in which the scale marks, generally composed of a sequence of figures, do not permit interpolation to fractions of the scale interval.
- 2.5.3. *Principle of reading by simple juxtaposition*
Reading of the weighing result by simple juxtaposition of successive figures giving the weighing result without the need for calculation.
- 2.5.4. *Overall inaccuracy of reading on machines with continuous (analogue) indication or printing*
Root mean square deviation of the readings taken under normal conditions of use by several observers of the same continuous (analogue) indication or printing.
It is usual to take at least ten readings of the result.
- 2.5.5. *Minimum reading distance (L)*
The minimum reading distance is the shortest distance at which an observer is able to approach the indicating device to take the reading, under normal conditions.
The approach is considered to be free if a clear space exists in front of the indicator of at least 0.80 m.
- 2.5.6. *Rounding error on discontinuous (digital) indication or printing*
Difference between the discontinuous (digital) indication (or printing) and the result the machine would give if the indication (or printing) were continuous (analogue).
- 2.5.7. *Maximum permissible error on the mass*
Maximum difference, in excess or deficiency legally permitted between the weighing result and the mass of the load being weighed, the machine being previously at zero, at no-load and in the reference position (see 2.6).
The mass of the load weighed is the equivalent of this load in standard weights or standard masses.
- 2.6. **Reference position (commonly referred to as 'reference level')**
Position set according to the construction of the machine at which its operation may be adjusted.
- 2.7. **Verification device**
Device incorporated in the machine or independent of it, for testing the operation of one or more separate main devices.

3. DEFINITION OF THE VARIOUS CLASSES OF ACCURACY FOR WEIGHING MACHINES

3.1. Classes of accuracy

Machines are divided into four classes of accuracy, the names and identifying symbols of which are:

- special accuracy I
- high accuracy II
- medium accuracy III
- ordinary accuracy III

3.2. Classification

The division of machines into the four classes of accuracy depending on their characteristics as well as the provisions relating to maximum capacity, the lower limit on minimum capacity and the verification interval are given in tables 3.2.1 to 3.2.4, and 3.2.5 to 3.2.10.

The presence of a tare device or of a verification device on the machine does not affect the classification of the machine, which depends on its own characteristics. These devices are considered as belonging to the class of accuracy of the machine to which they are attached irrespective of their own characteristics.

	Maximum capacity 'Max'	Lower limit of the minimum capacity 'Min'	Scale interval 'd' (or 'da')	Number of divisions 'n'	Verification scale interval 'e'
3.2.1. SPECIAL ACCURACY I					
3.2.1.1. Non-graduated machines					
3.2.1.1.1.	$100 \text{ mg} \leq \text{Max} \leq 1 \text{ g}$	10 e			$\frac{0.1 \text{ mg}}{\text{Max}}$
3.2.1.1.2.	$1 \text{ g} < \text{Max} < 10 \text{ g}$	50 e			$\frac{10 \text{ 000}}{\text{Max}}$
3.2.1.1.3.	$10 \text{ g} \leq \text{Max} < 100 \text{ g}$	50 e			$\frac{1 \text{ mg}}{\text{Max}}$
3.2.1.1.4.	$100 \text{ g} \leq \text{Max}$	50 e			$\frac{10 \text{ 000}}{\text{Max}}$
3.2.1.2. Graduated machines ⁽¹⁾					
3.2.1.2.1.		d	$d \leq 0.005 \text{ mg}$	$10 \leq n$	d
3.2.1.2.2.	$1 \text{ mg} \leq \text{Max}$	10 d	$0.01 \text{ mg} \leq d \leq 0.05 \text{ mg}$	$100 \leq n$	d
3.2.1.2.3.	$10 \text{ mg} \leq \text{Max}$	50 d	$0.1 \text{ mg} \leq d \leq 0.5 \text{ mg}$	$100 \leq n$	d
3.2.1.2.4.	$100 \text{ g} \leq \text{Max}$	50 d	$1 \text{ mg} \leq d$	$100 \text{ 000} \leq n$	d
3.2.2. HIGH ACCURACY II					
3.2.2.1. Non-graduated machines					
3.2.2.1.1.	$1 \text{ g} \leq \text{Max} < 5 \text{ g}$	10 e			$\frac{\text{Max}}{1 \text{ 000}}$
3.2.2.1.2.	$5 \text{ g} \leq \text{Max} < 100 \text{ g}$	10 e			$\frac{5 \text{ mg}}{\text{Max}}$
3.2.2.1.3.	$100 \text{ g} \leq \text{Max} < 200 \text{ g}$	10 e			$\frac{\text{Max}}{20 \text{ 000}}$
3.2.2.1.4.	$200 \text{ g} \leq \text{Max}$	50 e			$\frac{\text{Max}}{20 \text{ 000}}$

⁽¹⁾ For machines fitted with a device for interpolation of reading and a complementary reading device, see 3.2.6. and 3.2.7.

	Maximum capacity 'Max'	Lower limit of the minimum capacity 'Min'	Scale interval 'd' (or 'da')	Number of divisions 'n'	Verification scale interval 'e'
3.2.2.2. Graduated machines ⁽¹⁾					
<i>3.2.2.2.1. Non-self indicating machines</i>					
3.2.2.2.1.1.	1 g ≤ Max < 50 g	10 d	1 mg ≤ d ≤ 5 mg	200 ≤ n < 50 000	d
3.2.2.2.1.2.	10 g ≤ Max < 50 g	50 d	10 mg ≤ d ≤ 50 mg	1 000 ≤ n < 5 000	5 mg
3.2.2.2.1.3.	50 g ≤ Max ≤ 500 g	10 d	1 mg ≤ d ≤ 5 mg	10 000 ≤ n ≤ 100 000	d
3.2.2.2.1.4.	50 g ≤ Max < 5 kg	50 d	10 mg ≤ d ≤ 500 mg	1 000 ≤ n < 10 000	$\frac{\text{Max}}{10\,000}$
3.2.2.2.1.5.	100 g ≤ Max ≤ 50 kg	50 d	10 mg ≤ d ≤ 500 mg	10 000 ≤ n ≤ 100 000	d
3.2.2.2.1.6.	5 kg ≤ Max	50 d	1 g ≤ d	5 000 ≤ n < 10 000	$\frac{\text{Max}}{10\,000}$
3.2.2.2.1.7.	10 kg ≤ Max	50 d	1 g ≤ d	10 000 ≤ n ≤ 100 000	d
<i>3.2.2.2.2. Self and semi-self indicating machines</i>					
3.2.2.2.2.1.	1 g ≤ Max ≤ 500 g	10 d	1 mg ≤ d ≤ 5 mg	200 ≤ n ≤ 100 000	d
3.2.2.2.2.2.	10 g ≤ Max ≤ 50 kg	50 d	10 mg ≤ d ≤ 500 mg	1 000 ≤ n ≤ 100 000	d
3.2.2.2.2.3.	5 kg ≤ Max	50 d	1 g ≤ d	5 000 ≤ n ≤ 100 000	d
3.2.3. MEDIUM ACCURACY (III)					
3.2.3.1. Non-graduated machines					
3.2.3.1.1.	20 g ≤ Max < 100 g	50 e			0.1
3.2.3.1.2.	100 g ≤ Max < 1 kg	50 e			$\frac{\text{Max}}{1\,000}$
3.2.3.1.3.	1 kg ≤ Max < 2 kg	50 e			1 g
3.2.3.1.4.	2 kg ≤ Max	50 e			$\frac{\text{Max}}{2\,000}$
3.2.3.2. Graduated machines					
<i>3.2.3.2.1. Non-self indicating machines</i>					
3.2.3.2.1.1.	20 g ≤ Max < 100 g	10 d	0.1 g or 0.2 g	200 ≤ n < 1 000	0.1
3.2.3.2.1.2.	100 g ≤ Max < 1 kg	20 d	0.2 g ≤ d ≤ 1 g	200 ≤ n < 1 000	$\frac{\text{Max}}{1\,000}$
3.2.3.2.1.3.	100 g ≤ Max ≤ 10 kg	20 d	0.1 g ≤ d ≤ 1 g	1 000 ≤ n ≤ 10 000	d
3.2.3.2.1.4.	400 g ≤ Max < 5 kg	50 d	2 g or 5 g	200 ≤ n < 1 000	$\frac{\text{Max}}{1\,000}$
3.2.3.2.1.5.	2 kg ≤ Max ≤ 50 kg	50 d	2 g or 5 g	1 000 ≤ n ≤ 10 000	d
3.2.3.2.1.6.	5 kg ≤ Max < 10 t	50 d	10 g ≤ d ≤ 10 kg	500 ≤ n < 1 000	$\frac{\text{Max}}{1\,000}$
3.2.3.2.1.7.	10 kg ≤ Max ≤ 100 t	50 d	10 g ≤ d ≤ 10 kg	1 000 ≤ n ≤ 10 000	d
3.2.3.2.1.8.	15 t ≤ Max < 100 t	1 000 kg	20 kg ≤ d ≤ 100 kg	750 ≤ n < 1 000	$\frac{\text{Max}}{1\,000}$
3.2.3.2.1.9.	20 t ≤ Max ≤ 1 000 t	1 000 kg	20 kg ≤ d ≤ 100 kg	1 000 ≤ n ≤ 10 000	d
3.2.3.2.1.10.	150 t ≤ Max	10 d	200 kg ≤ d	750 ≤ n < 1 000	$\frac{\text{Max}}{1\,000}$
3.2.3.2.1.11.	200 t ≤ Max	10 d	200 kg ≤ d	1 000 ≤ n ≤ 10 000	d

(1) For machines fitted with a device for interpolation of reading and a complementary reading device, see 3.2.6. and 3.2.7.

	Maximum capacity 'Max'	Lower limit of the minimum capacity 'Min'	Scale interval 'd' (or 'da')	Number of divisions 'n'	Verification scale interval 'e'
<i>3.2.3.2.2. Self and semi-self indicating machines</i>					
3.2.3.2.2.1.	$20 \text{ g} \leq \text{Max} \leq 10 \text{ g}$	10 d	$0.1 \text{ g} \leq d \leq 1 \text{ g}$	$50 \leq n \leq 10\,000$	d
3.2.3.2.2.2.	$400 \text{ g} \leq \text{Max} \leq 50 \text{ kg}$	20 d	2 g or 5 g	$200 \leq n \leq 10\,000$	d
3.2.3.2.2.3.	$5 \text{ kg} \leq \text{Max} \leq 200 \text{ kg}$	20 d	10 g or 20 g	$500 \leq n \leq 10\,000$	d
3.2.3.2.2.4.	$25 \text{ kg} \leq \text{Max} \leq 100 \text{ t}$	50 d	$50 \text{ g} \leq d \leq 10 \text{ kg}$	$500 \leq n \leq 10\,000$	d
3.2.3.2.2.5.	$15 \text{ t} \leq \text{Max} \leq 1000 \text{ t}$	1 000 kg	$20 \text{ kg} \leq d \leq 100 \text{ kg}$	$750 \leq n \leq 10\,000$	d
3.2.3.2.2.6.	$150 \text{ t} \leq \text{Max}$	10 d	$200 \text{ kg} \leq d$	$750 \leq n \leq 10\,000$	d
3.2.4. ORDINARY ACCURACY (III)					
<i>3.2.4.1. Non-graduated machines</i>					
3.2.4.1.1.	$1 \text{ kg} \leq \text{Max} < 2 \text{ kg}$	10 e			5 g
3.2.4.1.2.	$2 \text{ kg} \leq \text{Max}$	10 e			$\frac{\text{Max}}{400}$
<i>3.2.4.2. Graduated instrument machines</i>					
<i>3.2.4.2.1. Non-self indicating machines</i>					
3.2.4.2.1.1.	$1 \text{ kg} \leq \text{Max} < 2 \text{ kg}$	10 d	5 g or 10 g	$100 \leq n < 400$	5 g
3.2.4.2.1.2.	$2 \text{ kg} \leq \text{Max} < 4 \text{ t}$	10 d	$10 \text{ g} \leq d \leq 10 \text{ kg}$	$100 \leq n < 400$	$\frac{\text{Max}}{400}$
3.2.4.2.1.3.	$2 \text{ kg} \leq \text{Max} \leq 10 \text{ t}$	10 d	$5 \text{ g} \leq d \leq 10 \text{ kg}$	$400 \leq n \leq 1\,000$	d
3.2.4.2.1.4.	$4 \text{ t} \leq \text{Max}$	10 d	$20 \text{ kg} \leq d$	$200 \leq n < 400$	$\frac{\text{Max}}{400}$
3.2.4.2.1.5.	$8 \text{ t} \leq \text{Max}$	10 d	$20 \text{ kg} \leq d$	$400 \leq n \leq 1\,000$	d
<i>3.2.4.2.2. Self and semi-self indicating machines</i>					
3.2.4.2.2.1.	$1 \text{ kg} \leq \text{Max} \leq 10 \text{ t}$	10 d	$5 \text{ g} \leq d \leq 10 \text{ kg}$	$100 \leq n \leq 1\,000$	d
3.2.4.2.2.2.	$4 \text{ t} \leq \text{Max}$	10 d	$20 \text{ kg} \leq d$	$200 \leq n \leq 1\,000$	d

3.2.5. *Machines provided with a rider*

When a machine is provided with a rider its verification scale interval shall be the smaller of the two following scale intervals:

- verification scale interval of the machine not taking into account the rider,
- scale interval of the rider device.

Only machines of special or high accuracy may be fitted with a rider.

3.2.6. *Machine fitted with a device for interpolation of reading*

Only self and semi-self indicating machines of special or high accuracy may be provided with a device for interpolation of reading. This shall not be taken into account when determining the verification scale interval of the machine.

3.2.7. *Machines provided with a complementary reading device -*

Only self and semi-self indicating machines of special or high accuracy may be provided with a complementary reading device. The actual scale interval of the machine is that of the complementary reading device.

The conventional scale interval of the machine is that which corresponds to the penultimate significant figure of the result.

The verification scale interval is:

- either the actual scale interval,
- or the conventional scale interval; in which case the last figure must be differentiated from the other figures of the result.

The classification of the machines into accuracy classes and their minimum capacity, shall be determined in relation to the verification scale interval.

3.2.8. *Machines provided with several indicating or printing devices*

3.2.8.1. *Minimum capacity of the various devices*

Each of the indicating or printing devices has its own minimum capacity the value of which is determined according to the tables 3.2.1 to 3.2.4 depending on its particular metrological characteristics.

3.2.8.2. *Scale intervals*

Discontinuous (digital) indicating or printing devices must have the same scale interval.

The discontinuous (digital) scale interval must be at most equal to the smallest continuous (analogue) scale interval.

3.2.9. *Graduated tare devices*

On these tare devices the smallest scale interval of the graduated scale or scales must be equal to the smallest scale interval of the machine to which it is fitted.

The verification scale interval of these devices shall be equal to the smallest verification scale interval of the machine to which it is fitted.

3.2.10. *Machine fitted with a graduated verification device*

The scale interval of an incorporated graduated verification device must be at most equal to 1/5 of the scale interval of the machine.

CHAPTER II

PROVISIONS CONCERNING THE OPERATION OF WEIGHING MACHINES

4. MAXIMUM PERMISSIBLE ERRORS ON INITIAL VERIFICATION AND IN SERVICE

4.1. Values of the errors

The maximum permissible errors expressed in verification scale intervals shall be equal, plus or minus, to the values below.

These errors shall apply to all machines, whether graduated or not; they include any errors on the verification standards and verification devices.

For graduated machines with discontinuous (digital) indicating or printing devices they do not include the positive or negative errors arising from the rounding up or down of the result to the nearest whole number of scale divisions.

4.1.1. *Special accuracy*

Initial verification	In service	
0.5 e	1 e	(I) for increasing loads between the minimum capacity and 50 000 e inclusive and for decreasing loads between 50 000 e inclusive and zero;
1 e	2 e	for loads between 50 000 e exclusive and 200 000 e inclusive;
1.5 e	3 e	for loads greater than 200 000 e.

4.1.2. *High accuracy*

Initial verification	In service	
0.5 e	1 e	(II) for increasing loads between the minimum capacity and 5 000 e inclusive and for decreasing loads between 5 000 e inclusive and zero;
1 e	2 e	for loads between 5 000 e exclusive and 20 000 e inclusive;
1.5 e	3 e	for loads greater than 20 000 e.

4.1.3. *Medium accuracy*

Initial verification	In service	
0.5 e	1 e	(III) for increasing loads between the minimum capacity and 500 e inclusive and for decreasing loads between 500 e inclusive and zero;
1 e	2 e	for loads between 500 e exclusive and 2 000 e inclusive;
1.5 e	3 e	for loads greater than 2 000 e.

4.1.4. *Ordinary accuracy*

Initial verification	In service	
0.5 e	1 e	(III) for increasing loads between minimum capacity and 50 e inclusive and for decreasing loads between 50 e inclusive and zero;
1 e	2 e	for loads between 50 e exclusive and 200 e inclusive;
1.5 e	3 e	for loads greater than 200 e.

4.2. **Conditions of application of maximum permissible errors**

Maximum permissible errors specified in 4.1 shall be applicable under the following conditions:

4.2.1. *Machines with discontinuous (digital) indication or printing*

Maximum permissible errors of discontinuous (digital) indication or printing shall apply to the discontinuous (digital) indication or printing after correction by the rounding error.

In practice, the absolute value of the maximum permissible error of discontinuous (digital) indication or printing shall be increased by 0.2 of a discontinuous (digital) scale interval.

4.2.2. *Machines with several indicating or printing devices*

Maximum permissible errors of indication or printing for each of the devices shall be expressed in terms of the verification scale interval of each device.

4.2.3. *Machines with one or more tare devices*4.2.3.1. **Maximum permissible errors for the machines**

Maximum permissible errors for the machines shall apply to the net load for all possible tare values.

- 4.2.3.2. **Maximum permissible errors for graduated tare devices**
- Maximum permissible errors for graduated tare devices shall be, for all tare values, the same as those allowed for the machine for a load of the same value, taking into account the provision in 3.2.9.
- 4.2.4. *Separate main components*
- Maximum permissible errors for each of these components shall be equal to 0.7 times the maximum permissible errors for the complete machine.
- 4.2.5. *Machines of special accuracy with incorporated weights*
- When one or more incorporated weights are in use, the maximum permissible errors shall be increased by the maximum errors permissible for the weights of the appropriate accuracy class ⁽¹⁾ of a nominal value immediately greater than the load considered.
- 4.3. **Variations on results**
- 4.3.1. *Variations on indication or printing on several devices of the same machine*
- 4.3.1.1. **Association of indicating or printing devices**
- For the same load, the variation between the indications or printed results provided by different indicating or printing devices of the same machine taken two by two, may not be greater than the absolute value of the maximum permissible error for this load in relation to the largest verification interval (e) of the devices being compared. Before comparison, discontinuous (digital) indication or printing must be corrected by the rounding error.
- 4.3.1.2. **Machines fitted with a tare device**
- Variations between the graduated results provided separately for the same load by the machine and by the graduated tare device, must comply with the provisions in 4.3.1.1.
- 4.3.2. *Variation between two results obtained for the same load when the method of balancing the load is changed*
- Variation between two results obtained for the same load when in two consecutive tests the method of balancing the load is changed may not exceed the absolute value of the maximum permissible error for the load applied. (eg. machines incorporating devices for extending the range of self-indication or printing).
- 4.3.3. *Variation between two results for the same load kept on a machine*
- When the same load is kept on a machine under reasonably stable test conditions, the variation between the result obtained at the moment of placing the load and the indication or printing obtained eight hours later may not exceed the absolute value of the maximum permissible error for the load applied.
- This requirement does not apply to machines in the special accuracy class.
- 4.3.4. *Variation on returning to zero*
- Variation on returning to zero immediately after removal of a load which has remained on the machine for half an hour may not exceed half the verification scale interval.

⁽¹⁾ In accordance with the provisions of the relevant special Directive.

4.4. Adjustment and verification**4.4.1. Verification standards**

Standard weights or masses used for adjustment and verification of machines may not have an error greater than one third the corresponding maximum permissible error for the load applied on the machines being adjusted and verified.

These standard weights or standard masses shall be adjusted according to the provisions of the relevant special Directives.

4.4.2. Verification devices

For a particular load, the maximum permissible error on a verification device shall be equal to 0.2 times the maximum permissible error for this load on the machine, of which one or more separate main components shall be verified with the aid of this verification device.

5. REPEATABILITY**5.1. Machines of Special and High accuracy**

The root mean square deviation (standard deviation) of the results of several weighings obtained for the same load may not be greater than one third of the absolute value of the maximum permissible error for that load without taking into consideration the increase in the maximum permissible error allowed in 4.2.5.

Before comparison, the discontinuous (digital) indications or printed results must be corrected by the rounding error.

5.2. Machines of Medium and Ordinary accuracy

The difference between the results of several weighings obtained for the same load may not be greater than the absolute value of the maximum permissible error for that load.

Before comparison, the discontinuous (digital) indications or printed results must be corrected by the rounding error.

6. DISCRIMINATION AND SENSITIVITY**6.1. Discrimination and sensitivity of a non-self-indicating machine****6.1.1. Discrimination**

The test of discrimination shall be carried out, with or without load, by means of an extra load equal to 4/10 of the absolute value of the maximum permissible error for the load applied. The gentle placing of this extra load on the machine, unloaded or loaded, must produce a visible movement of the indicating element.

6.1.2. Sensitivity

Having eliminated the effect of lack of discrimination, the placing on a machine, unloaded or loaded, of an extra load equivalent to the absolute value of the maximum permissible error must cause a permanent displacement of the indicating element of at least:

1 mm, on machines of special or high accuracy,

2 mm, on machines of medium or ordinary accuracy, with a maximum capacity equal to or less than 30 kg,

5 mm, on machines of medium or ordinary accuracy, with a maximum capacity greater than 30 kg.

- 6.2. **Discrimination and sensitivity of self and semi-self-indicating machines**
- 6.2.1. *Discrimination*
- 6.2.1.1. **Continuous (analogue) indication or printing**
An extra load equivalent to the absolute value of the maximum permissible error, (without taking into consideration the increase in the maximum permissible error allowed in 4.2.5) placed gently on the machine at equilibrium, unloaded or loaded, must cause a permanent displacement of the indicating element corresponding to not less than 7/10 of the extra load.
- 6.2.1.2. **Discontinuous (digital) indication or printing**
An extra load equivalent to a digital scale interval placed gently on the machine at equilibrium with a test-load just causing a change of indication or printing, must cause half the sum of the test-load indications or printed results to be increased by one digital scale interval.
In practice the extra load may be increased without however exceeding 1.4 of the discontinuous (digital) scale interval.
- 6.2.2. *Sensitivity*
Sensitivity shall be determined according to the formula given in 2.4.1.2 ($S = i/d$).
- 6.2.2.1. **Minimum value i_0 of the scale spacing**
Value i of the scale spacing must be equal to or greater than the minimum value i_0 as laid down below:
- 6.2.2.1.1. **Special and high accuracy**
1 mm for indicating devices,
0.25 mm for machines with complementary reading devices, this value to be applied to the verification scale interval.
- 6.2.2.1.2. **Medium and ordinary accuracy**
1.25 mm for dial indicating devices,
1.75 mm for optical projection indicating devices,
5 mm for numerical analogue indicating devices with or without optical projection.
7. **METHODS OF APPLICATION OF TEST LOADS**
Conditions governing the maximum permissible errors laid down in section 4 must be observed, particularly when applying the test loads as specified below:
- 7.1. **General**
- 7.1.1. *Application of a load equal to the maximum safe load*
Before applying the test loads, machines which are marked with a maximum safe load shall be loaded and unloaded in a manner corresponding to their normal use by means of a load equivalent to the maximum safe load.
- 7.2. **Machines with a single load receptor**
- 7.2.1. *Machines with a freely suspended load*
Test loads shall be suspended from the machine up to the maximum capacity plus the maximum additive tare effect directly or by means of accessories set out in 11.3.

7.2.2. *Instruments with a load receptor freely suspended at one or two points*

Test loads shall be distributed over the central area of the load or weights receptor up to the maximum capacity plus the maximum additive tare effect.

Eccentricity tests shall be carried out by means of a test load corresponding to 1/2 of the sum of the maximum capacity and the maximum additive tare effect distributed successively on the two halves of the load or weights receptor without excessive stacking or overlapping the edge.

7.2.3. *Other machines*

7.2.3.1. Maximum capacity equal to or less than 30 kg

Test loads shall be distributed over the central area of the load or weights receptor.

Eccentricity tests shall be carried out by means of a test load, corresponding to 1/3 of the sum of the maximum capacity and the maximum additive tare effect distributed successively on the edges of the load or weights receptor without excessive stacking or overlapping the edge.

7.2.3.2. Maximum capacity greater than 30 kg

7.2.3.2.1. Machines on which the load receptor cannot be loaded by a rolling load

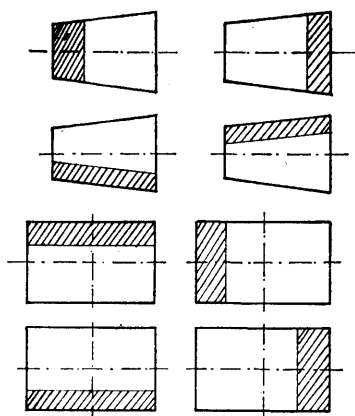
7.2.3.2.1.1 Machines with a special load receptor (tank hopper, etc.)

Test loads in standard weights or standard masses shall be distributed on the support set out in 11.4.

Make-up loads shall consist of loads similar to those normally weighed on the machine.

Eccentricity tests shall be carried out by means of a test load in standard weights or standard masses equal to 1/10 of the sum of the maximum capacity and the maximum additive tare effect. This load shall be distributed successively and individually on the abovementioned support at the positions of each point of support.

7.2.3.2.1.2. Other machines



Test loads up to the maximum capacity increased by the maximum additive tare effect shall be uniformly distributed on the load receptor.

Eccentricity tests shall be carried out by means of a test load corresponding to 1/3 of the sum of the maximum capacity and the maximum additive tare effect distributed successively and individually along each edge of the load receptor in turn, on an area not exceeding one quarter of the total area of the receptor as shown in adjacent diagrams.

7.2.3.2.2. Machines on which the load receptor can be directly loaded by a rolling load

7.2.3.2.2.1. Stability tests

Stability tests shall be carried out by rolling on to the load receptor, longitudinally and transversely, the load corresponding to the heaviest and most concentrated customary rolling load intended to be weighed.

The loading shall be carried out along the heaviest axis of the rolling load.

Transverse stability tests shall not be carried out on machines which cannot normally be loaded transversely.

7.2.3.2.2.2. Load at the points of support of the load receptor

At the position of each of n points of support of the load receptor, a test load equal to the fraction $\frac{1}{n-1}$ of the sum of the maximum capacity and the maximum additive tare effect shall be successively and individually distributed on an area of the same order as the fraction $\frac{1}{n+1}$ of the surface area of the receptor.

If this is not possible to achieve because the points of support are transversely too close together, a test load equal to the fraction $\frac{2}{n-1}$ of the sum of the maximum capacity and the maximum additive tare effect shall be distributed successively and individually, on both sides of each transverse axis joining two points of support, on an area of the same order as the fraction $\frac{2}{n+1}$ of the surface area of the receptor.

7.2.3.2.2.3. Load, up to the maximum capacity plus the maximum additive tare effect

Test loads equal at most to the maximum capacity plus the maximum additive tare effect shall in the normal manner be distributed over the load receptor.

7.2.3.2.2.4. Rolling test load

A rolling test load identical to that mentioned in 7.2.3.2.2.1 but not exceeding 8/10 of the sum of the maximum capacity and the maximum additive tare effect shall be placed successively at different points on the load receptor, the test load being turned lengthwise in one direction and then in the other direction.

7.2.3.2.2.5. Combination of methods of application of loads

The methods of application of loads specified in 7.1.1 and 7.2.3.2.2.1 to 7.2.3.2.2.4 may be combined in order to reduce the number of operations, keeping however to the same objective as laid down for each of these methods of application.

7.3. Machines with several load receptors

The methods of application of the test loads on each load receptor taking into account the maximum load intended and indicated for this device shall be those specified in 7.2 for a single load receptor at the corresponding load.

7.4. Machines with one or more load receptors fitted with one or more load carrying accessory devices

Taking into account the conditions of use of the machine and the maximum load intended and indicated for each load receptor and each load carrying accessory device, the methods of application of the test loads on each of the devices shall be those specified in 7.2 for a single receptor at the corresponding load.

8. INFLUENCE FACTORS AND RESTRAINTS**8.1. Tilting****8.1.1. *Machines excluded***

Machines in the special accuracy class,

Machines freely suspended or permanently installed in the other accuracy classes.

8.1.2. *Variations in indication or printing*

In relation to its reference position a machine must be able to be tilted longitudinally and transversely, up to:

— 1 part per 1 000 for machines of high accuracy,

— 2 parts per 1 000 for machines of medium and ordinary accuracy

without the resulting variation in the indication or printing being greater than:

- 2 verification scale intervals at zero load, the machine and its tare device having been set to zero in the reference position.

This provision shall only apply to machines of medium and ordinary accuracy.

- 1 verification scale interval at net load equal to the range of self-indication or printing and the maximum capacity, for all tare loads indicated by the device, the machine and the tare device having been set to zero at no-load in the reference position and in the tilt position.

8.2. Temperature

8.2.1. *Temperature limits*

If no special temperature is specified in the descriptive markings of a machine, it must satisfy the provisions in sections 4, 5 and 6 within the following temperature limits:

- from + 10 °C to + 30 °C for machines of special or high accuracy,
- from — 10 °C to + 40 °C for machines of medium or ordinary accuracy.

8.2.2. *Special temperature limits*

Machines for which special ranges of working temperature are specified in the descriptive markings must satisfy within these ranges the provisions in sections 4, 5 and 6.

These ranges must be equal to at least:

- 5 °C for machines of special accuracy
- 20 °C for machines of high accuracy
- 30 °C for machines of medium or ordinary accuracy

8.2.3. *Stability of zero indication*

Machines should be such that their indication at zero does not vary by more than one verification scale interval for a temperature variation of 1 °C for machines of the special accuracy class and of 5 °C for machines of the other accuracy classes.

8.2.4. *Stability of temperature*

The provisions in 8.2.1, 8.2.2 and 8.2.3 are meant to refer to stable temperature conditions, and also to variations of the ambient temperature not exceeding 5 °C per hour.

8.3. Effect of electrical supply

Machines which operate using electric energy must satisfy the provisions in sections 4 to 9 inclusive within the limits of variation of the electric power supply:

- from — 15 % to + 10 % of nominal voltage
- from — 2 % to + 2 % of nominal frequency

8.4. Other influence Factors and restraints in the free operation of the machine

Under normal conditions of use machines must satisfy the provisions in sections 4 to 9 inclusive, when they are affected by other influence factors or restraints in the free operation of the machine provided for in its construction;

for instance:

- magnetic fields
- electrostatic forces
- vibrations
- atmospheric conditions
- mechanical constraints
- other restrictions.

9. MAXIMUM PERMISSIBLE ERRORS ON INDICATION OR PRINTING OF PRICES

9.1. General

Maximum permissible error on the rounding of unit prices shall be equal to 2.5 %.

9.2. Devices with numbered or coded price-to-pay scales and devices with analogue calculators

Maximum permissible error on indication or printing of price-to-pay, before rounding if necessary, shall be equal to 1.5 times the product of the maximum permissible error on the mass, and the unit price, without being less than one half scale interval of the price-to-pay. The difference between the product of the indicated weight and the unit price and the indicated price-to-pay must at most be equal to the absolute value of the maximum permissible error on the price-to-pay.

In practice, when the price-to-pay is shown in discontinuous (digital) form the absolute value of the maximum permissible error on the price-to-pay shall be increased by 0.1 of the discontinuous (digital) scale interval of the price-to-pay.

9.3. Numerical calculating devices

The calculating device shall introduce no errors other than those of rounding of the discontinuous (digital) indication of the price-to-pay.

CHAPTER III

PROVISIONS CONCERNING THE CONSTRUCTION OF WEIGHING MACHINES

10. GENERAL PROVISIONS

10.1. Suitability

10.1.1 *Suitability for location*

Machines must be designed to suit their intended location of use.

10.1.2. *Suitability for use*

Machines must be solidly and carefully constructed in order to ensure that they maintain their metrological characteristics.

10.1.3. *Suitability for verification*

Machines must be designed to enable the test and inspection procedures set out in this Annex to be carried out.

In particular the design of the load receptors must enable the test loads to be deposited easily and in total safety under the conditions set out in this Annex.

10.2. Security of operation

10.2.1. *Absence of characteristics likely to facilitate fraudulent use*

Machines must have no characteristics likely to facilitate their fraudulent use.

10.2.2. *Impossibility of maladjustment or accidental breakdown*

Mechanical as well as electro-mechanical machines must be so constructed that any maladjustment or accidental breakdown cannot normally take place without the effect of the maladjustment or the accidental breakdown being clearly visible.

10.2.3. *Protection of the controls of the machine*

Controls of the machines must be so designed that they cannot normally come to rest in other positions than those intended by design unless during the manoeuvre all indication or printing is made impossible.

10.3. **Sealing**

Components of a machine, the dismantling or adjustment of which cannot be left to the user, must be protected, either by the fitting of sealing devices, or by enclosure in a housing that can be sealed.

10.4. **Weighing results**

10.4.1. *Quality and absence of ambiguity*

Reading of the weighing results must be reliable, easy and unambiguous.

10.4.2. *Maximum value of the overall reading inaccuracy*

Under normal conditions of use, the overall reading error may form only part of the maximum permissible error and may not exceed 0.2 of a verification scale interval.

10.4.3. *Reading by simple juxtaposition*

Weighing results given by the scales and figures on a graduated machine must comply with the principle of reading by simple juxtaposition.

10.4.4. *Figures forming the result*

The figures forming the result must be of a size, shape and clarity for reading to be easy under normal conditions of use.

The figures not to be taken into account on complementary reading devices must be clearly differentiated from the other figures.

10.4.5. *Quality of printing of results*

Printing of the results must be clear and virtually indelible.

10.4.6. *Form of actual scale intervals*

The actual scale interval must be in the form 1×10^n , 2×10^n or 5×10^n , the index n being a positive or negative whole number or zero.

10.4.7. *Names or symbols of the units of measurement*

Weighing results provided by graduated machines must contain the names or symbols of the legal units of measurement.

If printing takes place the name or the symbol as well as the result must be printed by the machine if the printed document is intended for the contracting parties.

10.4.8. *Limit of indication of the results*

Stops must limit the movement of the indicating element, while allowing it to pass below zero and above the range of self-indication.

10.4.9. *Limit of printing of the results*

Printing must be impossible:

- above the maximum capacity plus nine scale intervals,
- on self or semi-self-indicating machines when the machine is not stable equilibrium or not in equilibrium determined as a mean of the oscillations,

10.4.10. *Discontinuous (digital) indication*

Where the indication appears only after the operation of a special control this operation must be possible only when the machine is in stable equilibrium.

10.5. **Extending the range of automatic indication and printing**

On semi-self-indicating machines without weight receptors the extension interval of the range of automatic indication and printing must not exceed the value of this range.

10.6. **Levelling**

10.6.1. *Machines carrying an adjustable levelling device and a level indicator*

Machines must be fitted with an adjustable levelling device and a level indicator for all directions.

The following shall be exempted:

- freely suspended machines,
- machines installed in a fixed position,
- machines which satisfy the provisions of 8.1.2 while being tilted to at least 50 in 1 000.

10.6.2. *Quality of the level indicator*

10.6.2.1. *Machines of medium and ordinary accuracy*

Sensitivity of the level indicator must be such that when the machine is tilted, longitudinally or transversely, until the moving indicating part of the level indicator shows a displacement of 2 mm from the reference position

- (a) Zero load indication does not vary by more than two verification scale intervals
- (b) The variation between the results obtained for all loads, on the one hand in the reference position and on the other hand in the tilted position, does not exceed the maximum permissible error for the load concerned (the machine having been adjusted to zero at no-load both in the reference position and in the tilted position).

10.6.2.2. *Machines of special and high accuracy*

Sensitivity of the level indicator must be such that the moving part of the indicator shows a displacement of at least 2 mm for a tilt of 2 in 1 000.

For high accuracy machines the provision in 10.6.2.1 (b) shall apply.

10.6.3. *Fitting the level indicator*

The level indicator must be fixed firmly on the machine in a place easily visible.

10.7. Zero setting10.7.1. *Zero setting device*

In accordance with the relevant provisions machines must either be fitted with a zero setting device or not.

10.7.2. *Maximum effect of the device*

The effect of the zero-setting device must be at most equal to 4 % of the maximum capacity of the machine.

This provision shall not apply to machines of ordinary accuracy.

10.7.3. *Accuracy in zero setting*

It must be possible to carry out zero setting to within $\frac{1}{4}$ of the smallest verification scale interval of the machine.

10.7.4. *Control of the zero setting device*

Control of the zero setting device must be separate from that of the tare device.

This provision shall not apply to machines of ordinary accuracy.

10.7.5. *Zero indicating device on machines with discontinuous (digital) indication or printing*

When a machine with discontinuous (digital) indication or printing is not fitted with a continuous (analogue) indication or when the continuous (analogue) scale interval is greater than the discontinuous (digital) scale interval it must possess a zero setting and a zero indicating device with a scale of at least one scale interval on either side of zero.

— If this scale is continuous (analogue) its scale interval must be equal to the discontinuous (digital) scale interval of the machine.

— If it is discontinuous (digital) its scale interval must be at most equal to half of the discontinuous (digital) scale interval of the machine.

10.7.6. *Automatic zero setting device*

Operation of an automatic zero setting device must be impossible when the tare adding device or the device for extending the range of self-indication or printing is not at zero.

10.8. Tare compensation10.8.1. *General*10.8.1.1. *Construction*

Tare devices shall be subject to the same provisions as main devices of similar construction.

10.8.1.2. *Accuracy of setting*

It must be possible to adjust tare devices to within $\frac{1}{4}$ of the smallest verification scale interval of the machine.

10.8.1.3. *Reading by simple juxtaposition*

When a machine is fitted with several numbered scales of tare it must be possible to obtain the tare value by simple juxtaposition of the results provided by these scales.

10.8.1.4. *Operating zone*

Tare devices must be such that they cannot be used below their zero effect or above their maximum indicated effect.

- 10.8.1.5. **Visibility of operation**
Operation of tare devices must be visibly indicated.
- 10.8.2. *Subtraction of tare*
- 10.8.2.1. **Visibility of the residual capacity on machines fitted with a tare subtracting device**
When the use of a tare subtracting device obscures the value of the residual weighing range a device shall prevent the use of the machine above its maximum capacity or indicate that this capacity has been reached.
- 10.9. **Locking**
- 10.9.1. *Prevention of weighing outside the 'weigh' position*
If a machine is fitted with one or more locking devices weighing must only be possible in the 'weigh' position.
- 10.9.2. *Indications of position*
The locked and weigh positions must be clearly shown.
- 10.10. **Damping**
- 10.10.1. *Number of single oscillations*
Indication must be stable after approximately 3, 4 or 5 single oscillations.
- 10.10.2. *Adjustment*
Oscillation dampers whose efficiency depends on temperature must be fitted with an automatic compensator or an easily accessible manual adjustment device.
- 10.11. **Device for selection (or switching) between various load receptors and load measuring devices**
- 10.11.1. *Compensation for the difference in the no-load effect of various load receptors and load transmitting devices on the load measuring device*
Selection devices must compensate for the difference in the no-load effect of various load receptors and load transmitting devices on the load measuring device.
- 10.11.2. *Zero setting of the indicating or printing device of each load measuring device*
Zero setting of a machine with any multiple combination of different load measuring devices and load receptors must be possible without ambiguity and in accordance with the provisions in 10.7.
- 10.11.3. *Impossibility of weighing during use of the selection device*
Weighing must be impossible while the selection device is being used.
- 10.11.4. *Identification of the combinations used*
Combinations of load receptors and load measuring devices used must be easily identifiable.
- 10.12. **Verification devices**
- 10.12.1. *Construction*
Verification devices shall be subject to the same provisions as main devices of similar construction.

10.12.2. *Devices with one or more weights platforms*

Nominal value of the ratio or ratios between the load on the weights platform or platforms and the corresponding load to be weighed may not be less than 1/5000 and must be visibly indicated in an appropriate position near each platform.

The value of the standard weights to be placed on the weights platform to balance the value of one verification scale interval must be a whole number of tenths of a gram.

10.13. **Price charts and automatic price indicating or printing devices**

10.13.1. *Price charts*

Price charts allowing simultaneous reading of several prices-to-pay corresponding to several unit prices, such as fan charts, are not subject to the provisions of this Directive.

10.13.2. *Automatic price indicating or printing devices*

10.13.2.1. **General**

10.13.2.1.1. **Fixing of the price-to-pay**

Automatic price indicating or printing devices must supply the price-to-pay directly on the basis of the mass of the merchandise and its unit price.

10.13.2.1.2. **Application of certain provisions in 10.4. concerning the weighing results**

Provisions in 10.4.1, 10.4.3, 10.4.4, 10.4.5, and 10.4.6 concerning the weighing results shall apply to the indication and printing of prices.

10.13.2.1.3. **Scale intervals of unit prices**

Taking into account the provision in 9.1 the scale intervals of unit price must permit the choice of any of the unit prices required by the use of the machine.

10.13.2.1.4. **Maximum value of the overall reading error on the price-to-pay**

Under normal conditions of use the overall reading error on the price-to-pay may not exceed 1/5 of the maximum permissible error on the price-to-pay.

10.13.2.1.5. **Form of the printed result**

When the price-to-pay is printed the machine must also print the mass, unit price and the identification mark of the machine.

10.13.2.1.6. **Use of standard symbols**

Standard symbols of the monetary unit must accompany the indication and printing of the price-to-pay and the unit price. This latter must also include the symbol of the legal unit of mass to which it refers. The symbols and the figures must be printed by the machine on records to be used by contracting parties.

10.13.2.1.7. **Position of the price indication**

Indications of unit price and price-to-pay must be positioned near to the indication of mass.

10.13.2.1.8. **Production of identical printed copies**

Production of identical printed copies of mass, price-to-pay and unit price must only be possible by a special operation.

10.13.2.1.9. **Printing below the minimum capacity**

Printing below the minimum capacity must only be possible by a special operation.

10.13.2.2. **Devices with numbered or coded price-to-pay scales and analogue computing devices**

10.13.2.2.1. **Design of the unit price scale**

The unit price scale may be made up of one or more zones; each zone must have a constant scale interval.

10.13.2.2.2. **Uniformity of the scale interval on the same price-to-pay scale**

The scale interval must have a constant value on the same price-to-pay scale.

10.13.2.2.3. **Scale intervals of price-to-pay**

For a given unit price the scale interval of price-to-pay may not exceed:

- 10 times the product of the scale interval of mass and the minimum unit price, when the unit price in question is less than or equal to 4 times the minimum unit price ($20 \times d_u$);
- $10/4$ times the product of the value of the scale interval of mass and the unit price in question, when this unit price is greater than 4 times the minimum unit price ($20 \times d_u$).

10.13.2.2.4. **Prevention of indication or printing of the price-to-pay for a unit price less than the minimum unit price**

It must not be possible to indicate or print prices-to-pay for unit prices less than the minimum unit price.

110.13.2.3. **Digital computing devices**

10.13.2.3.1. **Minimum number of figures on discontinuous (digital) indication and printing of price-to-pay**

Discontinuous (digital) indication or printing of the price-to-pay must include at least four figures.

10.13.2.3.2. **Security of operation of devices indicating or printing the price-to-pay**

Devices indicating or printing the price-to-pay must not normally function when:

- the product of the weighed mass and its unit price is greater than the maximum price that can be indicated or printed,
- the mass of the load to be weighed is greater than the maximum capacity.

10.14. **Descriptive markings**

10.14.1. **Basic markings**

Machines must carry as far as necessary, the following basic markings:

10.14.1.1. **Basic markings expressed in full**

10.14.1.1.1. **Obligatory in all cases**

- Manufacturer's identification

10.14.1.1.2. **Obligatory when relevant:**

- identification of the importer of imported machines;
- serial number of self or semi-self indicating machines;
- identification mark on each unit of machines made up of separate connected units.

10.14.1.2. Basic markings expressed in code

10.14.1.2.1. Obligatory in all cases

- EEC pattern approval sign
- indication of accuracy class in the form of a Roman figure in an oval field:

for special accuracy 

for high accuracy 

for medium accuracy 

for ordinary accuracy 

- maximum capacity in the form Max ...
- minimum capacity in the form Min ...
- verification scale interval in the form e = ...

10.14.1.2.2. Obligatory when relevant

- continuous (analogue) scale interval in the form d = ...
- discontinuous (digital) scale interval in the form d_d = ...
- scale interval of unit prices in the form d_u = ...
- scale interval of the price-to-pay in the form d_p = ..
- tare interval in the form d_T = ..
- maximum additive tare effect in the form T = +...
- maximum subtractive tare effect in the form T = -...
- maximum safe load in the form Lim ...
- particular temperature limits within which the machine can function in accordance with legal requirements in the form ... °C ./... °C
- electrical supply voltage in the form ... V
- electrical supply frequency in the form ... Hz
- counting ratio on counting machines in the form .../... or
...:...

10.14.2. Supplementary markings

One or more of the following markings may be required on machines according to their particular use:

- not to be used for direct selling to the public
- to be used exclusively for: ...
- verification stamp does not guarantee: ...
- to be used exclusively as: ...

10.14.3. Presentation of descriptive markings

Descriptive markings must be indelible and have a size, form and clarity allowing easy reading under normal conditions of use of the machine.

They must be grouped together in an easily visible location on the machine, either on a nameplate fixed to the machine or on the machine itself.

The markings Max ..., Min ..., e = ..., d = ... (or d_d = ...) must also be shown close to the indication of the results if all the descriptive markings are not located there.

It must be possible to seal the plate bearing the markings unless it cannot be removed without being destroyed; in this case it must be possible to apply the EEC partial verification mark.

- 10.14.4. *Machines consisting of separate constituent units*
The serial number of each unit must also be shown in the descriptive markings.
- 10.14.5. *Machines comprising devices of patterns separately approved*
The different approval signs must be shown grouped together in the descriptive markings.
- 10.14.6. *Machines having several load receptors and load measuring devices*
Each load measuring device must carry the following markings:
- in respect of:
 - maximum capacity,
 - minimum capacity,
 - verification scale interval
 - continuous (analogue) and/or discontinuous (digital) scale interval;
 - in respect of each load receptor to which it may be connected:
 - identification mark,
 - maximum capacity,
 - maximum additive tare effect (if applicable),
 - maximum safe load (if applicable).
- 10.14.7. *Other markings*
Markings other than those specified in this Annex may be required or authorized by the EEC pattern approval certificate.
- 10.14.8. *Exemptions*
Exemptions from the provisions in 10.14.1 are set out in 13.1.16 for machines exempt from EEC pattern approval.
- 10.15. **Verification marks**
- 10.15.1. *Location*
A special place for the application of verification marks must be provided on the machines and their separate constituent units subject to verification in several stages.
This location must
- be clearly visible to anyone who wishes to inspect the verification marks,
 - enable the mark to be easily applied without affecting the metrological characteristics of the machine,
 - as far as possible be away from any part of the machine that is liable to become too quickly covered in dirt,
 - be such that the part to which it is fixed forms an integral part of the machine.
- For certain machines the location is specified in the EEC pattern approval certificate.
- 10.15.2. *Mounting*
- 10.15.2.1. **General**
Verifications marks must be applied to a stamping plate fixed to the machine.
Machines on which the fixing of a stamping plate is not necessary (13.1.17) or in practice impossible, must have a cavity filled with lead or any other material recognized as having similar qualities, or some other system, allowing the indelible application of the verification mark.

10.15.2.2. Stamping plate

10.15.2.2.1. Design

The stamping plate must conform with one of the two patterns shown on the attached drawing or with a pattern, considered equivalent by the Weights and Measures Services.

It must consist of a frame of sufficiently malleable rust resistant metal, cast or stamped, into which is pressed a rectangular strip of lead or any other material recognized as having similar qualities for this purpose.

If the frame has to be polished or covered by a thin decorative coating of metal, this operation must take place before the strip is driven in.

It must be possible to bend the finished plate to fit the curvature of its location.

The dimensions shown in the drawing must be observed.

10.15.2.2.2. Fixing

The plate must be fixed on the machine by means of two screws similar to the one shown in the drawing.

The fixing holes provided in the machine must be tapped, the depth of thread being at least 4 mm; the use of nuts is not allowed. After tightening the fixing screws they must be sealed by means of lead caps to which the EEC partial verification mark is applied.

11. MANDATORY SUPPLEMENTARY PROVISIONS APPLICABLE TO CERTAIN MACHINES**11.1. Self- or semi-self-indicating comparator machines****11.1.1. *Distinction between '+' and '-' zones***

The zones situated on either side of zero must be distinguished by '+' and '-' signs.

11.1.2. *Design of the scale*

Comparator machines must have at least one scale division on either side of zero.

The value in units of mass of this scale division must be marked on the dial.

11.1.3. *Special provisions*

Semi-self-indicating comparator machines are not required to comply with the provisions in 10.5 concerning the extension of the range of self-indication or printing.

11.2. Counting machines**11.2.1. *Machines without a weighing scale***

To permit verification, counting machines without a weighing scale must have at least one scale division on either side of zero.

The value in units of mass of this scale division must appear on the dial in the form $e = \dots$

11.2.2. *Descriptive markings*

In accordance with the provisions in 10.14.1.2.2, the indication of the ratios used must appear in the descriptive markings.

In addition an indication of its ratio must appear clearly visible in an appropriate position near each platform or each counting scale mark.

11.3. Machines with a freely suspended load

Accessories used for suspending or applying the test loads must be suitable for this use and must provide a guarantee of safety.

11.4. Machines with a special load receptor (tank, hopper, etc.)

Where it is normally impossible, difficult or dangerous to place standard weights or standard masses on the special load receptor, machines must be provided with a solid support fixed to the load receptor allowing the easy and safe deposit of standard weights or standard masses, taking into account the provision in 7.2.3.2.1.1 concerning the method of application of test loads appropriate to this kind of machine and the provisions in 19 concerning test loads.

If for practical reasons it is impossible to fit the machine with such a support this may be replaced by a removable support satisfying the same conditions of use. This removable support must be easy to attach to the machine by means of permanent fixtures provided and must be capable of being balanced to zero.

- 11.5. **Machines intended to be used 'for direct selling to the public'**
(Machines intended to be used in the presence of the public)
- 11.5.1. *Regulations applicable to all these machines*
- 11.5.1.1. **Differentiation of the minimum capacity**
On dials with continuous (analogue) indication the weighing range between zero and the minimum capacity must be clearly differentiated from the rest of the scale (e.g. by a different colour).
On discontinuous (digital) printing devices, printing below the minimum capacity must only be possible by a clearly apparent special operation.
- 11.5.1.2. **Counting machines**
Counting machines without a weighing scale are only permitted with counting ratios of 1/10 or 1/100.
- 11.5.2. *Machines with a maximum capacity of at most 30 kg*
- 11.5.2.1. **Visibility of the weighing results**
Indicating devices and any accessories, particularly the zero indicating device referred to in 10.7.5, must be such that the weighing results appear on the two opposite sides of the machine.
This also applies to the indication of unit price, and of the price-to-pay when the machines are fitted with an automatic price indicating device. These indications must remain as long as the load being weighed remains on the load receptor.
On machines to be used with weights it must be possible to distinguish their values.
- 11.5.2.2. **Security of weighing**
- 11.5.2.2.1. **Prohibition of certain components of devices**
Adjustable devices for setting the zero without tools are prohibited.
- 11.5.2.2.2. **Hydraulic dashpots**
Hydraulic dashpots must be constructed so that the fluid they contain must normally not spill even if the machine is inclined at 45°
- 11.5.2.2.3. **Tare devices**
Tare devices on machines with two platforms are prohibited.
Tare devices are allowed on machines with a single platform on the condition that:
For non-automatic devices
— the value of their maximum effect does not exceed 5 % of the maximum capacity,
— they allow the public to see:
— whether they are in use or not,
— whether their position is altered during the course of the weighing
— the progressive effect does not exceed:
— two scale intervals per turn if fitted with a rotating control,
— one half of a scale interval of the machine if fitted with a discontinuous (digital) control.
For automatic devices
— the indication of the value of the tare appears on the two opposite sides of the machine,
— this indication remains for the duration of the weighing.

11.5.2.2.4. Security of operation

It must be impossible to weigh or to guide the indicating element during the normal locking operation or during the normal operation of adding or subtracting weights.

11.5.3. *Machines with a maximum capacity greater than 30 kg*

11.5.3.1. Tare devices

Indication of the tare value or of the signal T referred to in 12.6.3 must be visible to the public when tare device is in use.

11.5.4. *Exemptions for machines of special and high accuracy*

The provisions in 11.5.1, 11.5.2 and 11.5.3 shall not apply to machines of special and high accuracy.

11.6. **Machines required to be marked: 'Not to be used for direct selling to the public'**

Machines identical to those which are normally used in the presence of the public but which do not satisfy the provisions in 11.5. must be marked:

'not to be used for direct selling to the public'

under the conditions set out in 10.14.2 and 10.14.3.

12. RECOMMENDED PRACTICAL PROVISIONS

Machines which satisfy the following provisions, where applicable, shall be considered as complying with the corresponding general provision specified in 10.

12.1. **General**12.1.1. *Machines to be used wholly or partly with weights*

— the reduction ratio must be in the form 10^n , n being a whole number or equal to zero;

— removable weights must be regulation weights.

12.1.2. *Sensitivity adjustment controls*

With the exception of special accuracy machines the controls for sensitivity adjustment may not be left to the discretion of the user.

12.2. Load measuring devices on mechanical non-self-indicating machines

12.2.1. *Legibility of results*

Figures of the results of load measuring devices on graduated mechanical non-self-indicating machines must comply with the provisions in 12.3.1.4 concerning the figures of results of load measuring devices on self- and semi-self-indicating machines.

12.2.2. *Accessible sliding poise devices*12.2.2.1. *Minimum value of scale spacing*

Distances between scale marks or notches on major and minor bars must be at least 2 mm and be of sufficient value for the normal machining tolerance on the scale marks or notches not to cause an error in the weighing result of more than 0.2 of a verification scale interval.

- 12.2.2.2. **Uniformity of scale spacing on each major or minor bar**
On each major or minor bar distances between scale marks or notches must be equal.
- 12.2.2.3. **Limitation of displacement of the sliding poises and minor bar**
Sliding poises and minor bars must only be able to move within limits of the graduated part.
- 12.2.2.4. **Impossibility of accidental displacement of sliding poises and minor bars**
Accidental displacement of the sliding poises and minor bars must be impossible.
- 12.2.2.5. **External shape of sliding poises and minor bars**
Sliding poises and minor bars must not have any cavities in which any extra load may be concealed.
- 12.2.2.6. **Invariability of the centre of gravity of movable parts**
Movement of moveable parts with the exception of the normal displacement of the sliding poises and minor bars, must not be able to alter the centre of gravity of these parts or of the moveable groups of parts which they form among themselves.
- 12.2.2.7. **Practical impossibility of removal of moveable parts**
It must be possible to seal moveable parts and their components if they are removable.
- 12.2.2.8. **Security of positioning of printing sliding poises and their minor bars**
Sliding poises provided with a printing device must be so constructed that it is impossible to print when the sliding poise or any one of the bars is not in a position corresponding to a whole number of scale divisions.
- 12.2.3. ***Devices with sliding poises operated from outside the housing***
- 12.2.3.1. **Application to these devices of certain provisions concerning devices with accessible sliding poises**
The provisions in 12.2.2.1 — 12.2.2.4 inclusive and 12.2.2.6 for devices with accessible sliding poises shall apply to devices with sliding poises enclosed in a housing, the operation of which is effected from outside the housing by mechanical controls.
- 12.2.3.2. **Security of printing**
Printing must only be possible when the machine is in equilibrium and when the sliding poise and the minor bars are in a position corresponding to a whole number of scale divisions.
- 12.2.3.3. **Sealing of the housing**
It must be possible to seal the housing.
- 12.2.4. ***Weight changing arrangements***
- 12.2.4.1. **Security of printing**
Printing must only be possible when the machine is in equilibrium.
- 12.2.4.2. **Sealing of the housing**
It must be possible to seal the housing.

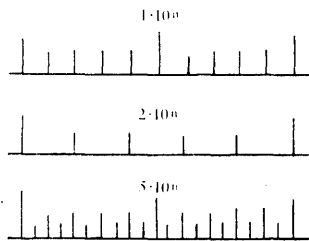
12.3. Load measuring devices on self and semi-self-indicating machines

12.3.1. Devices with continuous (analogue) indication or printing

12.3.1.1. Design of scale marks

The scale marks must consist of lines of equal thickness, between 1/10 and 1/4 of the scale spacing, but at least equal to 0.2 mm.

12.3.1.2. Arrangements of scale marks



The scale marks must be situated on one side of a real or imaginary line concentric or parallel with the base of the scale and passing through the edges of most of the scale marks.

The scale marks must be laid out in accordance with one of the three sketches shown.

12.3.1.3. Value of scale spacing (i)

Scale spacing (i) in millimetres shall be determined in terms of the minimum value of the scale spacing (i_0) in millimetres as defined in 6.2.2.1 and the numerical value (l) of the minimum reading distance (L) in metres.

It must be greater than or equal to $(l + 0.5) i_0$ where (l) is greater than or equal to 0.5. When the minimum reading distance is less than 0.5 m, (l) shall be taken as equal to 0.5.

12.3.1.4. Minimum value of height of figures

Minimum value of the height of figures in millimetres must be greater than or equal to three times the minimum reading distance (L) in metres, without being less than 2 mm.

12.3.1.5. Indicating element

The width of the indicating element must be virtually equal to the thickness of the scale marks.

The indicating element must cover at least half the length of the shortest scale marks.

12.3.1.6. Limitation of parallax error

Indicating devices must be designed for maximum limitation of the parallax error.

Therefore the maximum distance between the indicating element and the plane of the scale marks may not exceed a value equivalent to the scale spacing without however exceeding 2 mm.

12.3.1.7. Circular dials

12.3.1.7.1. Equidistance of scale marks

Scale marks must be virtually equidistant.

12.3.1.7.2. Blank zone

Circular scales on machines with a single revolution pointer must have a blank zone between the two ends of the graduated scale sufficient to allow the pointer to pass each end by at least four scale spacings before reaching a stop, the whole of the pointer remaining within the blank zone.

12.3.1.8. Optical projection indicating devices

12.3.1.8.1. Equidistance of scale marks

Scale marks must be virtually equidistant within the projected zone.

- 12.3.1.8.2. **Absence of ambiguity**
At least two whole numbers must appear in the projected zone.
- 12.3.2. *Discontinuous (digital) indicating or printing devices*
- 12.3.2.1. **Application of the same provisions as for continuous (analogue) indicating or printing devices**
Depending on the structural design, discontinuous (digital) indicating or printing devices must comply with the relevant provisions in 12.3.1 for continuous (analogue) indicating or printing devices.
However, the height of the figures of indication may not be less than 5 mm.
- 12.4. **Price indicating or printing devices**
The provisions in 12.3 concerning indication and printing of mass shall apply to the indication and printing of price.
- 12.5. **Devices for extending the range of automatic indication or printing**
- 12.5.1. *Accessible sliding poise devices*
- 12.5.1.1. **Applicability to load measuring devices**
Provisions in 12.2.2 for accessible sliding poise load measuring devices shall apply to sliding poise devices for extending the range of automatic indication or printing.
- 12.5.1.2. **Scale interval**
The scale interval of the device for extending the range must be equal to the value of the range of automatic indication or printing of the machine.
- 12.5.2. *Enclosed devices with sliding poises or additive and subtractive masses*
- 12.5.2.1. **Indication of extension**
The extension must be indicated by an adequate change of the figures
- 12.5.2.2. **Sealing**
It must be possible to seal the housing of the device as well as the adjusting cavities of the sliding poises and masses.
- 12.6. **Tare adding devices**
- 12.6.1. *Applicability of tare adding devices to load measuring devices of the same construction*
Depending on their structural design, tare adding devices must comply with the relevant provisions in 12.2 and 12.3 for load measuring devices.
- 12.6.2. *Sealing of devices with additional masses*
When a tare adding device has additional masses it must be possible to seal the housing enclosing these masses as well as their adjusting cavities.
- 12.6.3. *Visibility of operation*
The use of a tare adding device must be indicated by:
— the indication of the tare value, or
— the appearance on the machine of a letter 'T'.

12.7. Tare subtracting devices**12.7.1. *Devices with a moving dial*****12.7.1.1. Stop at zero**

There must be a stop at the zero position of the moving dial scale.

12.7.1.2. Non-graduated fixed dial

The non-graduated fixed dial must have zero and capacity of indication scale-marks.

12.7.1.3. Graduated fixed dial

The scale of the graduated fixed dial must have the same scale interval as the scale of the moving dial, whether the scale marks of the two scales are in the same direction or not.

12.8. Locking devices — Visibility of positions

Locking and weighing positions must be clearly shown.

On self or semi-self-indicating machines these positions must be indicated by visible signals, red for locking and green for weighing.

13. MANDATORY COMPLEMENTARY PROVISIONS APPLICABLE TO MACHINES OF MEDIUM AND ORDINARY ACCURACY EXEMPT FROM EEC PATTERN APPROVAL

Machines that comply with the relevant general provisions, including those set out in section 12 and those applicable in section 13, shall be exempted from EEC pattern approval.

13.1. General**13.1.1. *A list of machines exempted from EEC pattern approval***

- simple equal arm beams (suspended or supported)
- simple beams with a ratio of 1/10 (suspended or supported)
- simple steelyards
- Roberval and Béranger balances
- platform machines with a ratio of 1/10
- machines with a load measuring device with accessible sliding poises and a maximum capacity greater than 10 kg and not exceeding 5 t.

Machines listed above which differ in all or part from the conditions in section 13, shall remain subject to EEC pattern approval.

13.1.2. *Equilibrium indicating pointer*

Machines must be provided with two pointers or a pointer and a fixed mark, the respective position of which indicates the position of equilibrium.

The pointers and scale marks must be irremovably fixed to their support and must be visible on both sides of the machine.

13.1.3. *Knives and bearings*

Connections between levers, between levers and their fulcrums and between load receptors and levers must be effected by means of knives and bearings.

- 13.1.4. *Straightness and parallelism of knife-edges*
Direct contact between knives and bearings must be along a line which is practically straight.
The edges of the knives on a lever must be virtually parallel and situated in the same plane.
- 13.1.5. *Fixing of knives*
Knives must be positioned only on the levers.
They must be rigidly and securely fixed but may not be welded, plugged or glued.
- 13.1.6. *Invariability of lever arm ratio*
It must not be possible to alter the ratios of lever arms.
- 13.1.7. *Relative lateral displacement between knives and bearings*
Relative lateral displacement between knives and bearings must be limited by friction plates.
Contact between the knife and the friction plate must be reduced to a single point situated on the extension of the line of contact between the knife and the bearing.
- 13.1.8. *Construction of friction plates*
Friction plates must form a plane around the point of contact with the knife, perpendicular to the line of contact between the knife and the bearing. It must not be possible to alter the amount of play between the knife and the friction plate whilst the machine is being used.
- 13.1.9. *Prohibition to weld bearing and friction plates*
Bearings and friction plates must not be welded to each other or to their supports.
- 13.1.10. *Interlevers*
Interlevers may be connected to supports or levers only by means of knife-edges.
- 13.1.11. *Bearing retainers*
Retainers must prevent the loss of contact between knives and bearings that can occur on impact or during transport or use of the machine.
- 13.1.12. *Minimum hardness*
Contact parts of knives, bearings, stops, interlevers and interlever supports and links, must have a hardness corresponding to at least 58 units on the Rockwell C hardness scale.
- 13.1.13. *Behaviour of parts during normal use of the machine*
Parts subject to stresses by the application of the load should not in practice lose shape or move during the normal use of the machine.
- 13.1.14. *Protective coatings*
With the exception of pivots, parts liable to corrosion or deterioration owing to the action of external agents must receive an effective protective coating. If the pivots have a protective coating this must not be applied to the parts in contact if there is any risk of changing the metrological qualities.
- 13.1.15. *Prohibition of tare devices*
Machines exempt from EEC pattern approval may not be fitted with tare devices.

13.1.16. *Descriptive markings*

Descriptive markings on these machines shall be reduced to the following:

- manufacturer's identification,
- maximum capacity,
- minimum capacity,
- accuracy class,
- verification scale interval in the form specified in 10.14,
- if applicable, the value of the weight platform ratio, in the form specified in 13.3.1, 13.6.2 and 13.7.3.

13.1.17. *Substitution of the stamping plate by a cavity*

On machines with a maximum capacity of less than 30 kg the stamping plate required in 10.15 may be replaced by a cavity of 8 mm minimum diameter in which lead or any other material recognized as having similar qualities for this purpose can be inserted.

This cavity is located in the beam.

13.2. **Simple equal-arm beams (suspended or supported)**13.2.1. *Symmetry of the beam*

The beam must have two symmetrical planes, one longitudinal (perpendicular to the knife-edges) and the other transversal (perpendicular to the common plane of the knife-edges).

13.2.2. *Removable parts occurring in pairs*

The beam must be able to be balanced with or without the pans. Removable parts occurring in pairs must be interchangeable and of equal mass.

13.2.3. *Zero setting devices*

If the machine is provided with a zero setting device it must take the form of an adjusting cavity under the pan.

It must be possible to seal this cavity.

13.3. **Simple beams with a ratio 1/10 (suspended or supported)**13.3.1. *Indication of the ratio*

The ratio must be marked legibly and indelibly on the beam in the form 1 : 10 or 1/10.

13.3.2. *Symmetry of the beam*

The beam must be on a longitudinal plane of symmetry perpendicular to the knife-edges.

13.3.3. *Zero setting device*

If the machine has a zero setting device, this must consist of an adjusting cavity under the weight pan.

It must be possible to seal this cavity.

13.4. **Simple steelyards**13.4.1. *Scale marks*

Scale marks must consist of:

- either lines
- or notches:
 - at an angle,
 - on the flat.

The minimum distance shall be 2 mm between notches and 4 mm between lines.

- 13.4.2. *Pivots*
The maximum load per unit length on the knife-edges shall be 10 kg/mm.
Bores of bearings in the form of an annulus must have a minimum diameter equal to $1\frac{1}{2}$ times the largest dimension of the cross-section of the knife.
- 13.4.3. *Equilibrium index*
The length of the equilibrium index taken from the edge of the knife of suspension of the machine must be at least equal to $1/15$ th of the length of the graduated part of the steelyard.
- 13.4.4. *Distinctive mark*
The head and the sliding poise of machines with detachable sliding poises must bear the same distinctive mark.
- 13.4.5. *Machines with single capacity*
- 13.4.5.1. *Minimum distance between knife-edges*
The minimum distance between knife-edges shall be:
— 25 mm for maximum capacity ≤ 30 kg,
— 20 mm for maximum capacity > 30 kg.
- 13.4.5.2. *Zero indication*
The steelyard must be provided with a scale mark corresponding to the zero indication.
- 13.4.5.3. *Zero setting device*
If the machine is provided with a zero setting device it must be a captive screw or nut arrangement with a maximum effect of 4 verification scale intervals per revolution.
- 13.4.6. *Machines with a dual scale*
- 13.4.6.1. *Minimum distance between knives*
The minimum distance between knife-edges shall be:
— 45 mm for the lower capacity,
— 20 mm for the higher capacity.
- 13.4.6.2. *Differentiation of components*
The suspension mechanism of the machine must be differentiated from the load suspension mechanism.
- 13.4.6.3. *Numbered scales*
Numbered scales on both sides of the steelyard must:
— be continuous; in this case the highest value on the numbered scale corresponding to the lowest capacity must be equal to the lowest value on the numbered scale corresponding to the highest capacity
— or have a common part of a value at the most equal to $1/5$ th of the highest value on the lowest numbered scale.
- 13.4.6.4. *Scale intervals*
Scale intervals must be constant on each side of the steelyard.
- 13.4.6.5. *Prohibition of zero setting devices*
Zero setting devices are prohibited.

13.5. Roberval and Béranger balances**13.5.1. *Removable parts occurring in pairs***

Removable parts occurring in pairs must be interchangeable and of equal mass.

13.5.2. *Zero setting device*

If the machine is provided with a zero setting device it must consist of an adjusting cavity under the fixed part of the support of one of the pans.

It must be possible to seal this cavity.

13.5.3. *Length of the load knife-edges*

Length of the load knife-edges must be at least equal to the diameter of the bottom of the pan.

13.5.4. *Length of the central knife-edge*

Length of the central knife-edge must be at least equal to 0.7 times the length of the load knife-edges.

13.6. Machines with ratio platform 1/10**13.6.1. *Maximum capacity***

Maximum capacity of the machine must be greater than 30 kg.

13.6.2. *Indication of the ratio*

The ratio must be marked legibly and indelibly on the beam in the form 1 : 10 or 1/10.

13.6.3. *Zero setting device*

The machine must have a zero setting device consisting of:

- either a cup with a highly convex cover,
- or a captive screw or nut arrangement with a maximum effect of 4 verification scale intervals per revolution.

13.6.4. *Complementary balancing device*

If the machine is provided with a complementary device which avoids the use of weights of very low value this device must consist of a graduated steelyard fitted with a sliding poise and a maximum effect of 10 kg.

13.6.5. *Locking device*

The machine must have a manually operated device for locking the beam.

13.6.6. *Provisions concerning wooden parts*

When certain parts of these machines such as the frame, the platform or the backboard are made of wood this must be hard, firm, dry and free from defects. It must be covered with paint or an efficient protective varnish.

Nails are not allowed in the final stage of assembly of wooden parts.

13.6.7. *Vibrations of bearings*

Bearings must be able to vibrate slightly in all directions on their support or in their retainers.

13.7. **Machines with a load measuring device with accessible sliding poises of maximum capacity greater than 10 kg and not exceeding 5 tons**

13.7.1. *Zero indication*

The steelyard or steelyards must be provided with a scale mark corresponding to the zero indication.

13.7.2. *Minimum scale spacing*

The scale spacing must have a minimum value as follows:

Minimum scale spacing on the various steelyards of sliding poise devices in millimetres

Scale interval of machine	Scale intervals on steelyard																
	1 g	2 g	5 g	10 g	20 g	50 g	100 g	200 g	500 g	1 kg	2 kg	5 kg	10 kg	20 kg	100 kg	1 t	
1 g	2			2			5			50							
2 g		2		2			2.5			25							
5 g			2	2			2			10			100				
10 g				2			2			5			50				
20 g					2		2			2.5			25				
50 g						2	2			2			10				
100 g							2			2			5		50		
200 g								2		2			5		25		
500 g									2	2			5		10	100	
1 kg										2			5		5	50	
2 kg											5		5		5	25	
5 kg												5	5		5	10	
10 kg													5		5	5	
20 kg														5	5	5	

13.7.3. *Ratio platform for increasing capacity*

When the machine is fitted with a ratio platform for increasing capacity the ratio must be 1/10, 1/100, or 1/1000 and must be marked legibly and indelibly on the beam in a position near to the ratio platform, in the form:

1 : 10, 1 : 100, 1 : 1000 or 1/10, 1/100, 1/1000.

13.7.4. *Zero setting device*

The machine must have a zero setting device consisting of:

- either a cup with a highly convex cover
- or a captive screw or nut arrangement with a maximum effect of 4 verification scale intervals per revolution.

13.7.5. *Locking device*

The machine must have a manually operated device for locking the beam.

13.7.6. *Provisions concerning wooden parts*

When certain parts of these machines such as the frame, the platform or the backboard are made of wood, this must be hard, firm, dry, and free from defects. It must be covered with paint or an efficient protective varnish.

Nails are not allowed in the final stage of assembly of wooden parts.

13.7.7. *Vibrations of bearings*

Bearings must be able to vibrate slightly in all directions on their support or in their retainers.

CHAPTER IV

EEC PATTERN APPROVAL

EEC pattern approval of weighing machines shall be carried out in accordance with the requirements of the Council Directive of 26 July 1971 on the approximation of the laws of the Member States relating to common provisions for both measuring instruments and methods of metrological control.

Certain of these requirements are summarized in this chapter.

14. APPLICATION FOR EEC PATTERN APPROVAL

Application for EEC pattern approval must contain the following information and special documents

14.1. Metrological characteristics

14.1.1. *General*

Descriptive markings such as those specified 10.14.

14.1.2. *Mechanical machines — special requirements*

- the value of the direct balancing force at zero load and at maximum capacity;
- where applicable the ratio of successive lever arms;
- for self and semi-self indicating machines with multiple positions of equilibrium:
 - the amount of displacement of the point of application of the force on the load measuring device corresponding to the total amount of travel of this device;
 - where appropriate the characteristics of the verification device.

14.1.3. *Electro-mechanical machines — special requirements*

Electrical characteristics of the measuring components:

- resistance or impedance;
- value of the frequency, nature and value of the voltage supply. Variation allowed;
- ratio of output voltage to input voltage and output frequency to input frequency at maximum capacity;
- value of lowest measurable voltage or frequency ('electrical discrimination');
- permissible load per component;
- ratio between dead and live loads;
- sensitivity to temperature;
- sensitivity to tilting.

14.2. Descriptive documents

14.2.1. *Performance documents*

A plan or sketch of the assembly.

Where applicable plans, sketches, photographs or models showing details of metrological interest (levers, linkages, pendulum systems, balancing springs, graduated steelyards and dials, sliding poises, balancing weights . . .).

14.2.2. *Schematic drawings and photographs*

Schematic drawings must show clearly the operation of the machine. For example, with mechanical machines, levers should be represented by lines, knives and bearings by their outlines, shackles by circles etc.

A schematic drawing of an electro-mechanical machine must at least show the main supply, sensing and measuring circuits.

Photographs of the assembled machine with and without cover removed.

15. LIMITED EEC PATTERN APPROVAL

Limited EEC pattern approval decisions may be granted in order to permit the performance of tests under natural conditions of use.

These decisions shall lay down the number of machines to be authorized and limit the validity of the authorization to at most three years.

They may require the place of installation of such machines to be notified to the competent authorities of the Member State concerned.

16. EEC PATTERN APPROVAL EXAMINATION

16.1. Place of testing

If the machines being considered for EEC pattern approval are to be examined and possibly submitted for testing, they may be installed:

- either on the premises of the Metrological Service with which the application has been lodged,
- or in any place judged suitable by agreement between the Metrological Service concerned and the submittor.

16.2. Checking that the construction complies with legal requirements

Machines must comply with the general requirements of construction specified in section 10 and possibly in section 11.

However, if the machines conform to certain practical provisions specified in section 12, they shall be considered as complying with the corresponding general provisions specified in section 10.

16.3. Provision of material requirements

Material requirements which the metrological service may demand from the submittor are mainly the test loads, the mechanical equipment and the personnel required to handle those and to perform the tests. Test loads necessary for the EEC approval tests shall be identical to those required in section 19 for initial verification.

16.4. EEC pattern approval tests

From zero load to the maximum capacity and for all possible tare values the machines must comply with the conditions of operation specified in chapter II.

Tests of operation must also take into account any special conditions of use appropriate to the machines being tested.

The following tests shall normally be carried out:

16.4.1. *Determination of the overall reading error*

On self and semi-self indicating machines with constituent parts which enable the weighing results to be read but do not comply with the practical provisions set out in 12.3 tests must be carried out to ensure that the overall reading error as defined in 2.5.4 does not exceed the maximum value set out in 10.4.2 and where appropriate in 10.13.2.1.4.

16.4.2. *Testing of strength*

Where a machine must be able to support a limiting safe load (Lim) greater than the maximum capacity plus the maximum additive tare effect a test of robustness shall be carried out before the operational tests set out in 7.1.1.

16.4.3. *Discrimination and sensitivity tests*

Tests of discrimination and sensitivity must be carried out in the manner specified in section 6.

16.4.4. *Repeatability*

Repeatability tests shall be carried out on at least three different loads, including zero load, normally repeating 10 times each of the different weighings. During these tests machines must comply with the conditions set out in section 5.

16.4.5. *Plotting the error curve*

Error curves shall be plotted for increasing loads and for decreasing loads with different values of tare, mainly at zero tare and with maximum additive tare effect.

Readings must be taken mainly for special loads such as those where there is some alteration in the balancing device (additive or subtractive masses — dropweights).

Test loads must be arranged according to the methods of application set out in section 7.

16.4.6. *Tests of tare device or devices*

Tests of tare device or devices shall be identical to the tests for main devices or similar construction.

16.4.7. *Testing the variations of results*

Tests for variations of results shall be carried out in the cases set out in 4.3.

16.4.8. *Tests with eccentric loads*

Tests with eccentric loads shall be carried out in accordance with the procedure set out in section 7 whilst taking into account the special conditions of use of the machines being tested.

16.4.9. *Fatigue tests*

If possible, fatigue tests must be carried out in order to ensure that the machine can retain its metrological characteristics during at least two years' use.

16.4.10. *Tests of the effects of influence factors or restraints resulting from the normal recruitments of use*

Tests set out in 16.4.1 to 16.4.9 must in compliance with the provisions in section 8, be carried out by submitting machines as far as possible to the effects of influence factors or restraints which may arise during use.

Special tests concerning tilting are set out in 16.4.10.1 below:

16.4.10.1. *Tilt tests on machines not freely suspended or installed in a fixed manner*

16.4.10.1.1. *Sensitivity of the machine itself to tilting*

Given the conditions set out in 8.1 and 10.6.1 the object of these tests is to determine into which group the machine shall be classified:

- (a) machine to be rejected,
- (b) machine which must be provided with an adjustable levelling device and a multi-direction level indicator,
- (c) machines exempt from the requirement 'b' above.

- 16.4.10.1.2. Sensitivity of the level indicator
Tests must be carried out in order to ensure that the conditions specified in 10.6.2 are satisfied.
- 16.4.11. *Testing of indication and printing of the price-to-pay*
- 16.4.11.1. Devices with a numbered or coded price-to-pay scale and analogue computing devices
Testing must be carried out on a sufficient number of prices-to-pay for various unit prices and for loads ranging between the maximum and the minimum capacity.
- 16.4.11.2. Digital computing devices
Testing must be carried out on loads between the maximum and the minimum capacity by choosing a spread of unit prices between the lowest and the highest price. When the indication or printing of the price-to-pay is discontinuous (digital) each figure must be checked at least once.
- 16.5. **Test report for EEC pattern approval**
The approval test report shall include the error curves and variations noted during the tests accompanied, if necessary, by an explanatory note.
The report shall also mention:
— the results of the tests of discrimination, sensitivity and repeatability;
— the behaviour of the machine when submitted to the effects of tilting and other influence factors and restraints resulting from the normal requirements of use;
— all useful findings resulting from various tests particularly the tests of the security of operation devices.
The report shall reach a conclusion for or against EEC pattern approval.
- 16.6. **Special conditions required by the EEC pattern approval**
When the approval requires the machines to comply with special conditions these must be shown on the EEC pattern approval certificate.

CHAPTER V

EEC INITIAL VERIFICATION

EEC initial verification of weighing machines shall be carried out in accordance with the requirements of the Council Directive of 26 July 1971 on the approximation of the laws of the Member States relating to common provisions for both measuring instruments and methods of metrological control.

These requirements shall be supplemented by the following special provisions:

17. **PLACE OF EEC INITIAL VERIFICATION**
Verification shall be carried out in the following manner:
- 17.1. **Machines verified in one stage**
- 17.1.1. *Machines not permanently installed*
At the choice of the Metrological Service concerned:
— at the verification office or
— on the premises of the manufacturer or his agent.

17.1.2. *Machines permanently installed*

At the place of installation.

17.2. **Machines verified in several stages**

17.2.1. *First stage*

At the location set out in 17.1.1.

17.2.2. *Last stage*

By the competent local Metrological Service at the place of installation.

18. **METHODS OF TESTING THE PERFORMANCE**

18.1. **Provision of material requirements**

Material requirements which the Metrological Service may demand from the submitter are mainly the test loads, the mechanical equipment and the personnel required to handle these and to perform the tests.

The test loads are specified in section 19.

18.2. **Machines verified in one stage**

Tests of performance shall be carried out on completely assembled machines.

18.3. **Machines verified in several stages**

Tests of performance shall be carried out during the last stage, even if, during the other stages one or more preliminary tests of performance were completed.

18.4. **Preliminary testing**

Tests on individual main devices or a test of the whole of a provisionally assembled machine may be carried out.

18.4.1. *Individual main devices*

Testing shall be carried out in accordance with the provisions in 4.2.4 by means of a verification device.

The verification device must at least comply with the provisions in 4.4.2 and 10.12 concerning verification devices.

18.4.2. *Provisionally assembled machines*

Testing of the whole of the provisionally assembled machine shall be carried out under the same conditions as for a finally assembled machine.

19. **TEST LOADS**

19.1. **Total value of test loads**

The total value of test loads must reach the maximum capacity plus the maximum additive tare effect.

19.2. **Constitution of the test loads**

In theory, test loads should be made up entirely of standard weights or standard masses. In practice, they may be made up of standard weights or standard masses and any other loads in the following proportions:

- 19.2.1. *Minimum load in standard weights or standard masses*
- 19.2.1.1. Machines with the maximum capacity plus maximum additive tare effect less than or equal to 5 tons
- The load required in standard weights or standard masses shall be equal to the maximum capacity plus the maximum additive tare effect.
- 19.2.1.2. Machines with the maximum capacity plus maximum additive tare effect greater than 5 tons
- 19.2.1.2.1. General
- Without being less than 5 tons, the minimum load required in standard weights or standard masses, shall be equal to $\frac{1}{2}$ of the sum of the maximum capacity and the maximum additive tare effect.
- During the transition period of the first five years immediately following the date of enforcement of the provisions of this Directive this load need not exceed 20 tons.
- 19.2.1.2.2. Exceptions
- Without being less than 5 tons, the minimum load required in standard weights or standard masses may be reduced to $\frac{1}{10}$ of the sum of the maximum capacity and the maximum additive tare effect for machines whose main components have been preliminarily tested by means of a verification device.
- 19.2.2. *Any loads*
- The difference between the maximum capacity increased by the maximum additive tare effect and the load in standard weights or standard masses must be made good by any loads whose composition ensures no change of weight during the course of the verification.
20. TESTS
- 20.1. Principle
- Tests to be carried out to check the performance of these machines must in principle be identical to those laid down for EEC pattern approval in 16.4 subject to the following points:
- the tests set out in 16.4.1 concerning the overall reading error and in 16.4.9 concerning fatigue shall not be carried out;
 - for machines of medium or ordinary accuracy, the tests set out in 16.4.4 concerning repeatability need be repeated more than twice only in doubtful cases;
 - among the tests set out in 16.4.7 concerning the variations between results the tests relating to the provision set out in 4.3.3 and 4.3.4 must be carried out only doubtful cases.
- 20.2. Adaptation
- Test procedures may be reduced or combined if necessary provided that they result in a non-contestable conclusion.