
DU_jfbY'bUdfUj Y!'J UfbcghdU_jfb] `bUdfUj '!- "XY.'A YrcXY'a Yf]hj Y\ fi dU'dU_jfb] glfc^j ždU_jfb] `]b^]b'dca cjbYcdfYa Y!'F UhfYXUlc bcghj'&]b"

Safety of packaging machines - Part 9: Noise measurement methods for packaging machines, packaging lines and associated equipment, grade of accuracy 2 and 3

Sicherheit von Verpackungsmaschinen - Teil 9: Verfahren zur Geräuschmessung bei Verpackungsmaschinen, Verpackungslinien und Hilfseinrichtungen - Genauigkeitsklassen 2 und 3

Sécurité des machines d'emballage - Partie 9 : Codes d'essai bruit pour machines d'emballage, ligne d'emballage et équipements associés - Méthode de catégorie 2 et 3

Ta slovenski standard je istoveten z: **EN 415-9:2009**

ICS:

17.140.20	Emisija hrupa naprav in opreme	Noise emitted by machines and equipment
55.200	Pakirni stroji	Packaging machinery

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 415-9

August 2009

ICS 17.140.20; 55.200

English Version

**Safety of packaging machines - Part 9: Noise measurement
methods for packaging machines, packaging lines and
associated equipment, grade of accuracy 2 and 3**

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zur Geräuschmessung bei Verpackungsmaschinen,
Verpackungslinien und Hilfseinrichtungen -
Genauigkeitsklassen 2 und 3

This European Standard was approved by CEN on 10 July 2009.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 415-9:2009) has been prepared by Technical Committee CEN/TC 146 "Packaging machines safety", the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2010, and conflicting national standards shall be withdrawn at the latest by February 2010.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

The standard EN 415 consists of the following parts:

- *Packaging machines safety – Part 1: Terminology and classification of packaging machines and associated equipment*
- *Packaging machines safety – Part 2: Pre-formed rigid container packaging machines*
- *Safety of packaging machines – Part 3: Form, fill and seal machines*
- *Safety of packaging machines – Part 4: Palletisers and depalletisers*
- *Safety of packaging machines – Part 5: Wrapping machines*
- *Safety of packaging machines – Part 6: Pallet wrapping machines*
- *Safety of packaging machines – Part 7: Group and secondary packaging machines*
- *Safety of packaging machines – Part 8: Strapping machines*
- *Safety of packaging machines – Part 9: Noise measurement methods for packaging machines, packaging lines and associated equipment, grade of accuracy 2 and 3.*

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

EN 415-9:2009 (E)**1 Scope**

This standard specifies all the information necessary to carry out efficiently and under defined conditions the determination, information and verification of airborne noise emission from packaging machine covered by EN 415-1.

This measurement method specifies procedures for the determination of emission sound pressure levels at work station, at other specified positions and the sound power level on the basis of both the sound pressure level method and the sound intensity method. It also specifies installation and operating conditions.

This standard applies to machines covered by EN 415-1 as well as for any other packaging machine which are not covered by any other specific noise test code as well as for machines being part of packaging line. In such cases, all information relating to the assembly, installation and to the operating conditions as well as the arrangement of the work station shall be recorded and reported in the test report.

Noise emission characteristics include the following data:

- emission sound pressure level at work station and at other specified positions;
- sound power emitted by machine.

Both can be used:

- to determine the noise emitted by machine;
- to inform on the noise emitted by the machine;
- to verify the noise emitted by the machine.

Noise emission values permit comparison of packaging machines on the market.

The use of this standard ensures the reproducibility of the determination of the characteristic noise emissions values within specific limits which will be determined by the grade of accuracy of the noise emission measuring method used.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 415-1:2000, *Packaging machines safety – Part 1: Terminology and classification of packaging machines and associated equipment*

EN ISO 3740:2000, *Acoustics – Determination of sound power levels of noise sources – Guidelines for the use of basic standards (ISO 3740:2000)*

EN ISO 3744:1995, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Engineering method in an essentially free field over a reflecting plane (ISO 3744:1994)*

EN ISO 3746:1995, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Survey method using an enveloping measurement surface over a reflecting plane (ISO 3746:1995)*

EN ISO 3747:2000, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Comparison method for use in situ (ISO 3747:2000)*

EN ISO 4871:1996, *Acoustics – Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

EN ISO 9614-2:1996, *Acoustics – Determination of sound-power levels of noise sources using sound intensity – Part 2: Measurement by scanning (ISO 9614-2:1996)*

EN ISO 11200:1995, *Acoustics – Noise emitted by machinery and equipment – Guidelines for the use of basic standards for the determination of emission sound pressure levels at a work station and other specified positions (ISO 11200:1995)*

EN ISO 11201:1995, *Acoustics – Noise emitted by machinery and equipment – Measurement of emission sound pressure levels at a work station and at other specified positions – Engineering method in an essentially free field over a reflecting plane (ISO 11201:1995)*

EN ISO 11202:1995, *Acoustics – Noise emitted by machinery and equipment – Measurement of emission sound pressure levels at a work station and at other specified positions – Survey method in situ (ISO 11202:1995)*

EN ISO 11203:1995, *Acoustics – Noise emitted by machinery and equipment – Determination of emission sound pressure levels at a work station and at other specified positions from the sound power level (ISO 11203:1995)*

EN ISO 11204:1995, *Acoustics – Noise emitted by machinery and equipment – Measurement of emission sound pressure levels at a work station and at other specified positions – Method requiring environmental corrections (ISO 11204:1995)*

EN ISO 12001:1996, *Acoustics – Noise emitted by machinery and equipment – Rules for the drafting and presentation of a noise test code (ISO 12001:1996)*

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3 Terms and definitions

For the purposes of this document, the following terms and definitions apply in addition to those given in EN ISO 12001:1996 and the basic standards (B-standards) for the determination of emission sound pressure levels at work station and other specified positions: EN ISO 11200:1995, EN ISO 11201:1995, EN ISO 11202:1995, EN ISO 11203:1995, EN ISO 11204:1995; and in the basic standards for the determination of sound power levels: EN ISO 3740:2000, EN ISO 3744:1995, EN ISO 3746:1995, EN ISO 9614-2:1996.

3.1

very large machine

machine or packaging line where the greatest linear dimension exceeds 7 meters (Figure C.6, Annex C of EN ISO 3744:1995 or Figure C.6, Annex C of EN ISO 3746:1995)

NOTE See Figure 1.

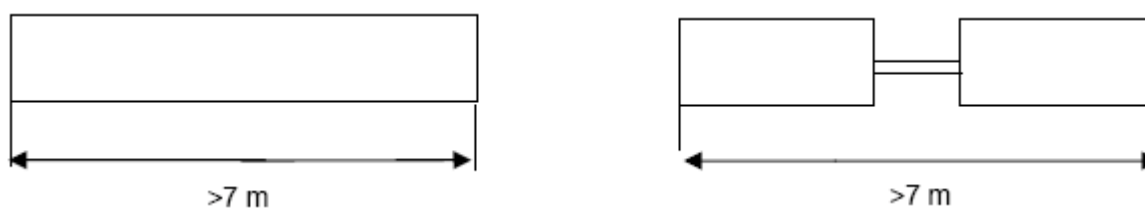


Figure 1 — Very large machines

EN 415-9:2009 (E)**4 Description of machine under test**

The machines specified in this standard are listed in EN 415-1, and, for machines not listed, the manufacturer shall describe them in the test report.

The packaging machine described by Annex D (informative) of this document includes any equipment, electric cabinet and optional devices, delivered with the machines, which contribute to the overall noise emission.

5 Determination of the emission sound pressure level at work station**5.1 Sound pressure level measurement at work station**

The A-weighted emission sound pressure level at the workstation L_{pA} shall be determined in compliance with EN ISO 11201, EN ISO 11202, EN ISO 11203 or EN ISO 11204.

The appropriate standard shall be selected by using Annex A (normative).

The positions of the work stations and of other specified positions shall be defined by the manufacturer in compliance with Annex D (informative).

In all cases the microphone shall be located directly above the reference point on the ground plane on which the operator normally stands, at a distance of 1 m from the machine, at a nominal height of 1,6 m without an operator being present, and the microphone shall be directed towards the machine.

The emission sound pressure level at the work station and at other specified positions shall be determined, over a typical period of operation of the machine under test. The measurement time shall be at least 30 s and represent a minimum of 5 cycles.

For steady noise further measurement time can be reduced as stable value has been reached according to the characteristics of the instrument used.

For unsteady noise levels it is important to specify carefully the period of observation; in particular an appropriate measuring period shall be selected and stated in the test report.

For machines operating in a production line noise measurement shall be carried out after commissioning.

5.2 Background noise correction K_1

Details about the evaluation of quantities related to the determination of the background noise correction K_1 are provided in Annex B (normative).

5.3 Local environmental correction K_3

Details about the evaluation of quantities related to the determination of the environmental correction K_2 and of the local environmental correction K_3 are provided in Annex B (normative).

6 Determination of the sound power level**6.1 General method**

Sound power level shall be determined in compliance with one of the following standards: EN ISO 3744, EN ISO 9614-2, EN ISO 3746, EN ISO 3747. See Annex C (normative) for guidance on the selection of the standard.

6.2 Alternative method for very large machines

For very large machines, instead of the sound power level, it is permissible to determine and declare emission sound pressure levels at specified measurement points around the machine.

Such points shall be specified along a path around the machine at a height of 1,6 m above the ground plane on which the operator normally stands and at a distance of 1 m from the machine.

7 Assembly and installation conditions

The machine shall be assembled and installed in compliance with the manufacturer's instructions. If several modes are possible, a typical condition shall be recommended by the manufacturer and a detailed description shall be stated in the test report.

The assembling and installation conditions of the machine shall be identical for determining both the emission sound pressure level at the work places and other specified measuring points and the sound power level as specified in Annex D (informative).

Care shall be taken to avoid a significant amount of sound energy caused by the installation, the mounting system, set platforms, electrical conduits, piping or air ducts connected to the machine for the test. If an associated equipment necessary for operation of the machine under test is not supplied with the machine, it shall be located outside the test environment or, where this is not possible, its noise emission shall be considered as background noise.

If resilient mounts are interposed between the machine and the foundation to reduce any structure borne noise transmission, technical specifications shall be given for these resilient mounts and their application shall be stated in the test report.

8 Operating conditions

The definition of operating and environmental conditions is essential in order to determine the noise emission values. These operating conditions shall be representative of the intended use of the machine and shall be identical for determining both the emission sound pressure level at the work places and other specified measuring points and the sound power level, even where operating conditions are not defined. The operating conditions shall be stated in the test report as described in Annex D (informative).

There are two different type of operating conditions:

- a) a constant noise emission level: this operating condition shall then be used for the measurement;
- b) a non-constant noise emission level: if so, the time of the principal work cycle shall be divided in a few parts, defined sub-cycles.

Where work cycles are used for measurement and fluctuations of the A-weighted sound pressure level occurring during such cycles exceed 5 dB(A), the cycles shall be divided into operational sub-cycles during which specific operating conditions exist and Subclause 5.1 applies. Where subdividing the work cycle into sub-cycles is not possible, and the time-averaged sound pressure level shall be determined for the whole work cycle and be reported.

The machine under test shall be measured in typical usage with product intended to be used by the machine, at the nominal production speed as specified by the manufacturer, to reproduce the sound pressure level representative of normal use.

If there are difficulties regarding a continuous operation of the machine with original product, e.g. unavailable products, perishable products, etc., the measurements shall be done with an artificial product, with the same noise emission characteristics as the foreseen product. Where this is not possible, the measurements shall be carried out, under the same conditions, without product.

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On machine with varying applications, separate noise measurements shall be taken for the specific applications intended in compliance with Annex D (informative).

In the case of machine or packaging line where final assembling can only be completed at the user's production environment, the sound pressure level measurements shall be done in this final environment. The test report shall indicate all information concerning the machine or packaging line conditions, the environment and the type of product used for the measurements.

9 Measurement uncertainty

The measurement uncertainty of the noise emission values will comply with the accuracy grade of the method applied. Accuracy grades are specified in the standards for determining emission sound pressure levels (see Clause 5) and sound power levels (see Clause 6).

The standard deviation of reproducibility σ_R is expected as shown in Table 1.

Table 1 — Expected standard deviation of reproducibility σ_R

Applied Standard & Grade	σ_R (dB)	Applied Standard & Grade	σ_R (dB)
EN ISO 11201, grade 2	< 2,5	EN ISO 3744, grade 2	< 1,5
EN ISO 11202, grade 3	< 5	EN ISO 3746, grade 3	< 4
EN ISO 11203, grade 2 or 3	According to sound power level standard	EN ISO 3747, grade 3	< 4
EN ISO 11204 grade 2	< 2,5	EN ISO 9614-2, grade 2	< 1,5
EN ISO 11204 grade 3	< 5,0	EN ISO 9614-2, grade 3	< 4

The estimate of the uncertainty affecting the measurement can be done accordingly with Subclause A.2.2 of EN ISO 4871:1996, starting from the values of standard deviation of reproducibility shown above.

10 Information to be recorded

The information to be recorded covers all the technical requirements of this standard. Any deviation shall be recorded with the technical justification.

11 Information to be reported

The test report of the noise measurements shall include the following information:

- a) Test data
 - 1) place and date;
 - 2) basic standard applied and the accuracy grade;
 - 3) person responsible for the test;
- b) Machine data

- 1) manufacturer;
 - 2) type and model;
 - 3) serial number;
 - 4) year of manufacture;
 - 5) dimensions;
 - 6) installation conditions;
- c) Machine operating conditions
- 1) running speed;
 - 2) description of product;
 - 3) location of machine in the test environment;
- d) Instrumentation
- 1) manufacturer, type, serial number and last calibration;
 - 2) windscreen type (if used);
- e) Environmental parameters
- 1) physical parameter and dimensions;
 - 2) description of walls, ceiling and floor;
 - 3) acoustical qualification of room;
- f) Measurement conditions
- 1) reference surface dimensions;
 - 2) distance of measurement and number of points;
 - 3) measurement surface dimensions and area S;
 - 4) background noise correction;
 - 5) drawing of machine arrangement (lay-out) with work station;
 - 6) drawing of machine arrangement (lay-out) with all measuring points;
- g) Sound pressure level:
- 1) background noise correction K_{1A} ;
 - 2) environmental correction K_{2A} ;
 - 3) local environmental correction K_{3A} ;
 - 4) A-weighted emission sound pressure level at work station L_{pA} ;
 - 5) if required, C-weighted peak emission sound pressure level at work station L_{pCpeak} ;

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- 6) uncertainty;
 - 7) if required, impulse noise content at work station according to Annex D of EN ISO 3744:1995 or EN ISO 3746:1995;
 - 8) when work cycles are split into sub-cycles, measuring results that shall be provided for each sub-cycle;
- h) Sound power level, if required:
- 1) A-weighted emission sound pressure levels at each measuring point;
 - 2) A-weighted sound pressure levels of the background noise at each measuring point;
 - 3) A-weighted surface-averaged sound pressure level;
 - 4) measurement surface value:

$$L_s = 10 \lg \left(\frac{S}{S_0} \right)$$

where

$$S_0 = 1 \text{ m}^2$$

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- 5) A-weighted sound power level L_{WA} ;
 - 6) A-weighted emission sound pressure levels at each measuring point if Subclause 6.2 is used;
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 - 7) uncertainty <https://standards.iteh.ai/catalog/standards/sist/8e2b52ee-652e-432b-9008-8fb56035fd5e/sist-en-415-9-2010>

12 Information and verification of noise emission values

The information of the noise emission values is the sole responsibility of the manufacturer or his appointed representative. According to EN ISO 4871, dual number method shall be applied (see Annex B.2 of EN ISO 4871:1996). If machine specific values for the uncertainty K are unavailable, respective values shall be taken from A.2.2 of EN ISO 4871:1996, with $K = 1,645 \sigma_R$ where σ_R depends on used reference standards.

The verification shall be done using the same assembly, installation and operating condition of the initial determination noise emission values.

If this is not possible, the verification shall be carried out at condition being as close as possible to initial ones. Any divergences shall be documented.

According to EN ISO 4871 dual number method, the uncertainty shall be only considered as a quality indicator of the measurement and shall not affect the noise measurement value indicated by the manufacturer.