
Vozila za zbiranje odpadkov in pripadajoči iztresalniki - Splošne in varnostne zahteve - 4. del: Navodilo za merjenje hrupa vozil za zbiranje odpadkov

Refuse collection vehicles and their associated lifting devices - General requirements and safety requirements - Part 4: Noise test code for refuse collection vehicles

Abfallsammelfahrzeuge und die dazugehörigen Schüttungen - Allgemeine Anforderungen und Sicherheitsanforderungen - Teil 4: Geräuschprüfverfahren für Abfallsammelfahrzeuge

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Bennes de collecte des déchets et leurs lève-conteneurs associés - Exigences générales et exigences de sécurité - Partie 4 - Code d'essai acoustique des bennes de collecte des déchets

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**Refuse collection vehicles and their associated lifting devices -
General requirements and safety requirements - Part 4: Noise
test code for refuse collection vehicles**

Bennes de collecte des déchets et leurs lève-conteneurs
associés - Exigences générales et exigences de sécurité -
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Schüttungen - Allgemeine Anforderungen und
Sicherheitsanforderungen - Teil 4: Geräuschprüfverfahren
für Abfallsammelfahrzeuge

This European Standard was approved by CEN on 8 September 2007.

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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.

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Foreword

This document (EN 1501-4:2007) has been prepared by Technical Committee CEN/TC 183 "Waste management", the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by April 2008, and conflicting national standards shall be withdrawn at the latest by April 2008.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annexes ZA and ZB, which are an integral part of this document.

This European Standard is the fourth part of the series of co-ordinated standards of EN 1501 about "Refuse collection vehicles and their associated lifting devices - General requirements and safety requirements -" comprising the other following parts:

- *Part 1: Rear-end loaded refuse collection vehicles*
- *Part 2: Side loaded refuse collection vehicles*
- *Part 3: Front loaded refuse collection vehicles (under preparation)*
- *Part 5: Lifting devices for refuse collection vehicles (under preparation)*

It augments the above mentioned type C standards.

Its purpose is to provide a means for the determination and declaration of noise emission by RCVs falling within the scope of the standards of the EN 1501 series. The determination of noise emission values is a prerequisite for a manufacturer to assess the noise reduction obtained at the design stage.

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.

Introduction

EU Directive 2000/14/EC “Noise Emission in the Environment by Equipment for Use Outdoor” requires manufacturers within the EU and importers from outside the EU to mark and certify RCVs with a guaranteed sound power level.

This European Standard provides a procedure for the measurement and calculation of sound power emitted by RCVs thus enabling manufacturers and importers to mark and certify all three types of RCV in compliance with the above mentioned EU Directive.

This standard also covers the noise information requirements of EU Directive 98/37/EC relating to Machinery for the measurement of the sound pressure levels at the operator’s positions.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this document.

This document is a type C standard as stated in EN ISO 12100.

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C Standard.

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1 Scope

This European Standard specifies the method for measuring the noise emission, which is a significant hazard of refuse collection vehicles (RCVs).

Its goal is to obtain, on one hand, the emission sound pressure level at the operator's position(s) and, on the other hand, the sound power level of the RCV during waste collection. It specifies a standardized procedure for measurement and later comparison of RCVs noise emission, consisting of four operating conditions: chassis operation, compaction operation, lifting, tilting and lowering operation of a container and dumping of specified waste into the RCV.

Together with information concerning other parameters, the test results obtained in accordance with this standard are also applicable to the evaluation of the hazards generated by noise from RCVs.

This standard addresses the uncertainties due to measurement procedures.

This standard deals with the noise measurement conditions for the types of RCVs defined and described in the standards of the EN 1501 series.

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 840-1, *Mobile waste containers — Part 1: Containers with 2 wheels with a capacity up to 400 l for comb lifting devices, dimensions and design*

[SIST EN 1501-4:2008](https://standards.iteh.ai/catalog/standards/sist/bd745683-0997-4a22-9e17-05f04a83a2ad/sist-en-1501-4-2008)

EN 1452-2, *Plastics piping systems for water supply — Unplasticized poly (vinyl chloride) (PVC-U) — Part 2: Pipes*

EN 1501-1, *Refuse collection vehicles and their associated lifting devices - General requirements and safety requirements - Part 1: Rear-end loaded refuse collection vehicles*

EN 1501-2, *Refuse collection vehicles and their associated lifting devices — General requirements and safety requirements — Part 2: Side loaded refuse collection vehicles*

prEN 1501-3, *Refuse collection vehicles and their associated lifting devices — General requirements and safety requirements — Part 3: Front loaded refuse collection vehicles*

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

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 12100-1:2003, *Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology (ISO 12100-1:2003)*

EN ISO 12100-2:2003, *Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles (ISO 12100-2:2003)*

EN 1501-4:2007 (E)**3 Terms and definitions**

For the purposes of this document, the terms and definitions given in EN ISO 3744:1995, EN ISO 4871:1996, EN ISO 12100-1:2003, EN ISO 12100-2:2003, EN ISO 11201:1995 and in the series of standards EN 1501 apply, together with the following.

3.1 shaking mode
part of the lifting cycle where the waste container, in its tilted position, is moved back and forth and/or hits a mechanical stop device, either by a specific command or automatically, in order to get all the waste out of it

4 Preparation of the RCV for measurements**4.1 Test environment**

For the test site, test environment and measurement conditions, the requirements of EN ISO 11201:1995 and EN ISO 3744:1995 shall be fulfilled.

4.2 Choice of the RCV

Measurements shall be carried out on a sample RCV that has the noise emission characteristics of a series of produced RCVs or of a specific RCV class or group (see the note in Clause 9 and Annex C).

4.3 Position of the RCV during measurement

The RCV shall be tested in a stationary position.

The RCV shall be positioned with its longitudinal axis along the x-axis of the co-ordinate system used to fix the microphone positions and with its mid-length over the origin (see Figure B.2).

5 Operating conditions (before and) during measurement**5.1 RCV conditions**

The engine and hydraulic system shall be warmed up in accordance with the instructions and safety requirements. The information specified in the information for use manual shall also be observed.

No signalling device such as warning horn or reverse auditory signal (buzzer) shall be operated during the test.

If the RCV is fitted with several engines, they shall work simultaneously during the tests. If this is not possible, each possible combination of engines shall be tested.

For measurements inside the cab, the doors and windows shall be closed and any noisy in-cab equipment (fan, radio, air conditioner, etc) off.

5.2 Presetting the engine speed

For all four noise measurement operations of chassis, compaction, lifting, tilting and lowering of an empty waste container and dumping of waste into the hopper, the engine speed shall be that provided by the automatic engine accelerator which has been preset by the RCV manufacturer.

The engine speed shall be measured for each of the four operations.

If the measured engine speed is lower than the preset speed provided by the RCV manufacturer by more than 5 %, the engine speed shall be increased by the cab accelerator to the intended preset speed.

If the engine speed for any of the four operations is not provided by the RCV manufacturer or if the vehicle is not provided with an automatic accelerator, the engine speed shall be set up at 1 200 rpm by the cab accelerator.

5.3 Fan speed

5.3.1 General

If the engine of the RCV and/or its hydraulic system are (is) fitted with one or more fan(s), they (it) shall operate during the test. The fan speed to be used shall be in accordance with one of the following conditions (5.3.2 to 5.3.4), depending on the conditions set by the manufacturer of the equipment, and shall appear in the test report, this speed being used in further measurements.

5.3.2 Fan drive directly connected to the engine

If the fan drive is directly connected to the engine and/or hydraulic equipment (e.g. by belt drive) it shall operate during the test.

5.3.3 Fan drive with several distinct speeds

If the fan can work at several distinct speeds, the test shall be carried out:

- either at its maximum speed,
- or in a first test with the fan set at zero speed and in a second test with the fan set at maximum speed.

5.3.4 Fan drive with continuous variable speed

If the fan can work at continuous variable speed, the test shall be carried out either according to 5.3.3) or with the fan speed set by the manufacturer at no less than 70 % of the maximum speed.

NOTE If the fan speed is automatically regulated by the engine temperature and if preliminary noise measurement investigations have shown that the influence of the fan speed measured at microphone positions is less than 1 dB (A), then only one fan speed condition can be used.

5.4 Selection of operations

The noise emission of the RCV is determined considering four operating conditions:

- chassis operation,
- compaction operation,
- lifting, tilting and lowering operation of an empty waste container,
- dumping operation of specified waste into the hopper.

This standard does not address the discharge operation as this operation is short in time (1 % of the working period) and the noise emission is of the same order of magnitude as the noise emission of the main operation (compaction).

EN 1501-4:2007 (E)**5.5 Chassis operation**

The noise measurements for chassis operation shall be carried out without operating the compaction and lifting mechanisms. The engine speed shall be set up in accordance with 5.2.

5.6 Compaction system operation

For noise measurements with the compaction system operating, the body and the hopper shall be empty.

The engine speed shall be set up in accordance with 5.2.

5.7 Lifting, tilting and lowering of a container operation**5.7.1 General**

For noise measurements during the lifting, tilting and lowering operation, the following procedures shall be carried out.

5.7.2 Comb lifting devices

The lifting device shall run up and down, with an empty waste container on. The container shall be two-wheeled, with a 240 l capacity, made of plastic and shall comply with EN 840-1. If such a container is not available, one with a capacity of $240 \text{ l} \pm 10 \%$ shall be used for this operation.

The engine speed shall be set up in accordance with 5.2.

5.7.3 Other lifting devices

The lifting device shall run up and down, with an empty waste container on. The smallest container with a capacity as near as possible to 240 l shall be used for this operation.

The engine speed shall be set up in accordance with 5.2.

5.8 Dumping of specified waste into the hopper**5.8.1 Materials to be used**

For noise measurements during the waste falling operation, the materials to be used shall comprise 30 tubes of PVC-U, each with a 0,4 kg approximate mass and with the following dimensions, according to EN 1452-2.

- length: $150 \text{ mm} \pm 0,5 \text{ mm}$;
- nominal external diameter: 90 mm;
- nominal thickness: 6,7 mm;
- density: minimum: $1\,350 \text{ kg/m}^3$, maximum: $1\,460 \text{ kg/m}^3$;
- minimum resistance (MRS) 25 MPa.

5.8.2 RCVs fitted with a lifting device

The materials specified in 5.8.1 shall be emptied in bulk by the lifting device into the hopper (initially empty) from a waste container as specified in 5.7.

5.8.3 Hand loading

The materials specified in 5.8.1 shall be emptied in bulk into the hopper (initially empty) from a suitable container located on the rive rail with an overhang not less than 200 mm, by tilting it from the horizontal position to 45° in less than 2 s.

6 Noise measurement

6.1 General

The requirements of EN ISO 11201 relating to measurements of the emission sound pressure levels at the operator's positions shall be fulfilled.

The requirements of EN ISO 3744 relating to the measurements to determine the sound power levels shall be fulfilled.

6.2 Microphone positions

6.2.1 Microphone positions for determining the emission sound pressure levels at the operator's positions

6.2.1.1 Microphone positions inside the cab

The sound pressure level shall be measured in the cab at the driver's ear position (see positions 9 in Figure B.1a to Figure B.1c).

6.2.1.2 Microphone positions outside the RCV

The microphones shall be positioned in accordance with the requirements of Figure B.1a to Figure B.1c for the outside working stations corresponding to the three types of RCVs, at a height of 1,7 m (positions 7 and 8).

6.2.2 Microphone positions for determining the sound power levels

The microphones shall be positioned in accordance with the requirements of Figure B.2.

6.3 Measurement durations

6.3.1 General

The measurement durations to be used for the determination of both the emission sound pressure level at the operator's positions and the sound power levels shall be in accordance with 6.3.1 to 6.3.4.

6.3.2 Chassis operation

At least 15 s.

6.3.3 Compaction system operation

If the compaction system is running automatically, at least three complete cycles of the system shall be included.

If the compaction system is not running automatically but cycle by cycle, measurements shall be carried out during at least three cycles.