
**Vozila za talni transport - Energijska učinkovitost - Preskusne metode - 4. del:
Vozila za talni transport s spremenljivim dosegom**

Energy efficiency of industrial trucks - Test methods - Part 4: Variable-reach rough-terrain trucks

Energieeffizienz von Flurförderzeugen - Testmethoden - Teil 4: Geländegängige Flurförderzeuge mit veränderlicher Reichweite

Efficacité énergétique des chariots de manutention - Méthodes d'essai - Partie 4: Chariots tout-terrain à portée-variable

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

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English Version

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4: Variable-reach rough-terrain trucks**

Efficacité énergétique des chariots de manutention -
Méthodes d'essai - Partie 4 : Chariots tout-terrain à
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This European Standard was approved by CEN on 30 December 2018.

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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-CENELEC Management Centre has the same status as the official versions.

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

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European foreword

This document (EN 16796-4:2019) has been prepared by Technical Committee CEN/TC 150 “Industrial Trucks - Safety”, the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by September 2019, and conflicting national standards shall be withdrawn at the latest by September 2019.

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

EN 16796 consists of the following parts, under the general title *'Energy efficiency of Industrial trucks — Test methods'*:

- *Part 1: General*
- *Part 2: Operator controlled self-propelled trucks, towing tractors and burden-carrier trucks*
- *Part 3: Container handling lift trucks*
- *Part 4: Variable-reach rough-terrain trucks*
- *Part 5: Trucks with elevating operator position and trucks specifically designed to travel with elevated loads*

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1 Scope

This document specifies the method of fuel consumption measurement for rough-terrain variable-reach trucks as defined in ISO 5053-1, hereinafter referred to as trucks. It does not apply to slewing trucks having a movement of more than 5° either side of the longitudinal axis.

This part is intended to be used in conjunction with EN 16796-1. Where the requirements of this part differ from that in part 1, requirements in this part 4 will take precedence.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1459-1, *Rough-terrain trucks - Safety requirements and verification - Part 1: Variable-reach trucks*

EN 16796-1:2016, *Energy efficiency of Industrial trucks - Test methods - Part 1: General*

ISO 5053-1, *Industrial trucks - Terminology and classification - Part 1: Types of industrial trucks*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5053-1, EN 1459-1 and EN 16796-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

eco-mode

system designed to improve fuel consumption and/or efficiency

4 Test conditions

The test conditions are given in Clause 4 of EN 16796-1:2016.

5 Measurement procedure

5.1 General

EN 16796-1 applies together with the following clauses that are describing specific information for the trucks.

Where fuel usage cannot be accurately measured directly from the fuel tank as per EN 16796-1:2016, 5.4, the manufacturer may choose to indirectly measure fuel usage by the introduction of a secondary removable fuel tank to calculate fuel usage by mass after the tests are performed.

Where trucks are fitted with an eco-mode operated by the user and intended to reduce fuel consumption, a comparative test shall be carried out showing with and without eco-mode operation.

5.2 Truck duty phases

5.2.1 General

The four phases described below are the general duties expected of a truck.

Travelling is not permitted whilst lifting/lowering, or tilting operation. Simultaneous operation is not permitted.

All fluids shall be at normal operating temperature. During the tests, the air-conditioning (if fitted) shall be switched off.

5.2.2 Phase 1 – Travelling

The test shall be carried out on level ground (0 ± 2) % at maximum speed of the truck. For the purpose of this travelling test, the fuel tank of the truck shall be full, without any attachment fitted to the truck.

A track shall be used that does not require excessive steering. The truck shall be tested in both directions to compensate for any gradient and wind effects.

5.2.3 Phase 2 – Idle mode

The engine is running at idle speed, the truck is stationary and the transmission is in neutral position. When a truck is fitted with a manual isolator for the hydraulic system the hydraulic system shall not be isolated during the test.

5.2.4 Phase 3 – Pick and carry

The truck shall be laden as follows:

- 70 % of the rated capacity of the truck when this 70 % is less than 1,5 t;
- 70 % of the rated capacity for those trucks with a capacity of more than 6 t;
- 1,5 t for all other cases.

The load is moved between 2 pallet racks A and B (see Figure 1) 30 m apart and placed at 1,5 m high.

The truck start position is as shown in Figure 1. The truck shall start the test laden and the load is lifted and placed on pallet rack A at 1,5 m high.

Reverse away from the pallet rack and the load is lowered, the load is moved towards pallet rack B, the load is lifted at 1,5 m high and placed on pallet rack B, then repeat the manoeuvre from B to A to complete the cycle. The speed is adapted so that 1 cycle equals to $1 \text{ min} \pm 3 \text{ s}$. Whilst travelling, the load shall be at 500 mm ($\pm 100 \text{ mm}$) above the ground.

5.2.5 Phase 4 – Bucket mode

The truck shall be fitted with a bucket which allows to carry 35 % to 50 % of the rated capacity of the truck, taking into account the density of the material used for the test.

Loading material shall have minimal porosity and a density between $1\,450 \text{ kg/m}^3$ and $1\,900 \text{ kg/m}^3$. The material shall have a minimum of dust.

Dust will form as the material is used and can change how the material loads and how full the buckets can be loaded. It is important to keep dust to a minimum. Practice prior to the test should be done on another pile of material to avoid dust creation. Prior to a new test being started, it is recommended that new material be acquired for testing purposes.

The test cycle can use the same material pile. The receiving vehicle or equivalent shall be placed in close proximity and perpendicular to the material pile.

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The truck start position shall be in front of the pile D, with the bucket on the ground. Once the bucket is fully loaded, the truck shall reverse and shall move towards the receiving vehicle (or equivalent) E which shall be at least 3 m high (this may be a high sided skip or bunker to simulate a high sided lorry). The operator shall not begin raising the load to dump into the receiving vehicle (or equivalent), until the truck has stopped.

The truck shall empty the bucket into the receiving vehicle (or equivalent), then re-position the bucket to the travel position.

The truck shall move towards the loading point D (see Figure 2).

End of cycle.

Whilst travelling with the load the bucket shall remain 500 mm (± 100 mm) from the ground.

The operator shall not begin raising the load to dump into the receiving vehicle until the truck has stopped.

The truck start position shall be in front of the test pile.

The test shall be timed for each complete cycle to take 1 min (60 cycles per hour).

See Figure 2. Receiving vehicles (or equivalent) should be large enough to contain all material placed during the test.

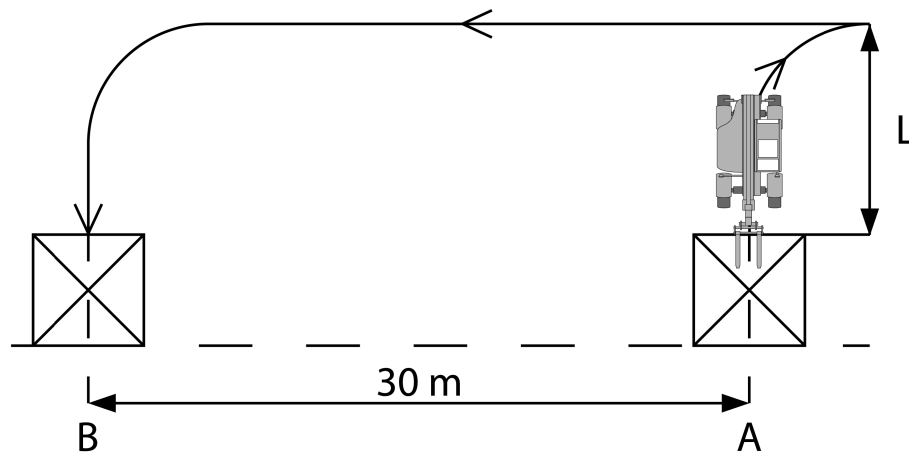
Fuel consumption shall not be measured during the time period between the full receiving vehicle leaving until the empty receiver is in position and it is permissible to switch off the engine.

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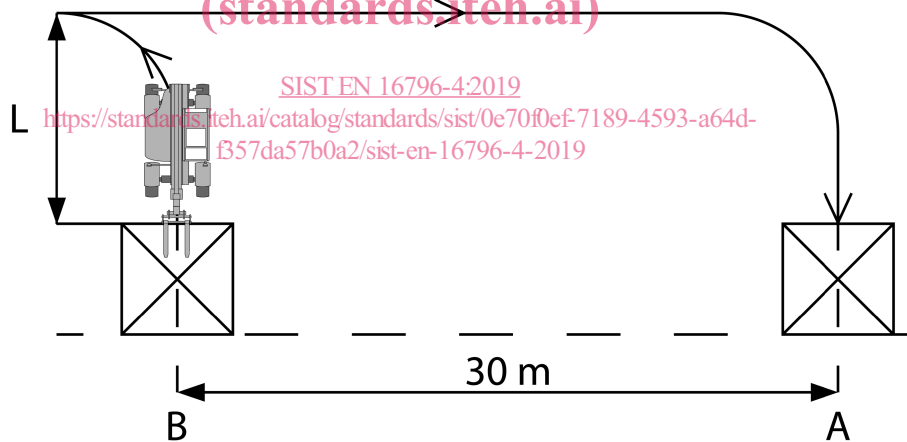
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5.3 Test layout



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Key

A pallet rack

B pallet rack

L max distance between the path of the truck and the front of the pallet racks, as a minimum twice the length of the truck

Figure 1 — Test path for phase 3 – Pick and carry