SLOVENSKI STANDARD
SIST EN 15663:2017

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Nadomešča:
SIST EN 15663:2009
SIST EN 15663:2009/AC:2010

Železniške naprave - Določitev mase železniškega vozila

Railway applications - Vehicle reference masses

Bahnanwendungen - Definition der Fahrzeugreferenzmassen

Applications ferroviaires - Définition des masses de référence des véhicules

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ICS:

45.060.01	Železniška vozila na splošno	Railway rolling stock in general

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English Version

Railway applications - Vehicle reference masses

Applications ferroviaires - Masses de référence des véhicules

Bahnanwendungen - Fahrzeugreferenzmassen

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COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 15663:2017) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, 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of an identical text or by endorsement, at the latest by January 2018, and conflicting national standards shall be withdrawn at the latest by January 2018.

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.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

This document supersedes EN 15663:2009.

The main changes with respect to the previous edition are listed below:

a) general editorial reordering of clauses and text;

b) new subclause 3.2 for abbreviations;

c) new numbering for vehicle categories in 4.2;

d) new subclause 4.6 for defining additional or alternative mass definitions and payload states in application standards;

e) new requirements for standing areas in gangways between vehicles in Clause 6;

f) new treatment of wheelchair loadings in Clauses 6 and 7;

g) permitted variations in standing passenger loadings redefined;

h) new recommendations for the determination of the centre of gravity in 7.1;

i) new Annex B for application of EN 15663 reference masses in other European Standards;

j) new Annex C for application of EN 15663:2009 reference masses in TSI.

This European Standard aims to support the TSIs and European Standards for the calculation of vehicle masses.

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, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

To define the design, testing and operation of vehicles in general and their main constituent parts, it is necessary to clearly specify the associated states of loading. This European Standard provides such a set of vehicle reference masses and describes how each is derived.

1 Scope

This European Standard defines a set of reference masses for specifying the requirements for the design, testing, acceptance, marking, delivery and operation of rail vehicles.

The reference masses defined in this document are as follows:

— dead mass;

— design mass in working order;

— design mass under normal payload;

— design mass under exceptional payload;

— operational mass in working order;

— operational mass under normal payload.

These reference masses are defined with respect to the whole vehicle, but they can also apply to a specific system or component.

The specification of values for tolerances applicable to reference masses is not in the scope of this standard. Tolerances can be required by an application standard.

Additional loadings due to environmental factors, for example snow and retained or absorbed rainwater, are not in the scope of this European Standard.

2 Normative references

There are no normative references in this document.

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1
mass increment
quantity added to or subtracted from the vehicle mass

Note 1 to entry: Examples are payload, staff, consumables and wear allowances.

3.1.2
payload
mass increment for the load carried by the vehicle (passengers, luggage or cargo)

Note 1 to entry: Typically a load from which revenue is derived.

3.1.3
luggage compartment
closed area, for the carriage of luggage and goods, which is not intended for the transport of passengers

3.1.4
luggage area
low level location or unit in a passenger saloon or vestibule provided to store luggage

Note 1 to entry: Overhead luggage racks are not regarded as luggage areas.

3.1.5
passenger area
area inside the vehicle dedicated for transporting passengers

Note 1 to entry: Catering areas are not regarded as passenger areas.

3.1.6
catering area
area set aside for passengers for the purchase or consumption of catering services (e.g. buffet, bar or bistro)

3.1.7
standing area
unobstructed part of either a passenger area or a catering area which can be used by standing passengers (e.g. vestibules, aisles, stairways)

3.1.8
normal seat
permanent seat in a passenger or catering area

3.1.9
tip up seat
folding seat fixed to a wall or partition for temporary use

3.1.10
wear allowance
quantity of mass that is assumed to be lost in service due to abrasion and mechanical wear

Note 1 to entry: The main sources of wear to be accounted for are from wheels and brake friction materials.

3.2 Abbreviations

For the purposes of this document, the following two and three letter abbreviations are derived as follows:

The first letter denotes either an increment or a total vehicle mass:

M the total vehicle Mass

P mass increment (Payload, consumables, staff, wear allowance)

The second letter denotes the type of payload or reference mass:

U dead mass i.e. Underlying mass

C Consumables, staff and wear allowance

V in working order (Vide)

N Normal

X eXceptional

The third letter denotes the condition that is required (see 4.1):

D Design condition

O Operational condition

Where the third letter is omitted, the mass or payload applies to all conditions.

The unused letters of the alphabet are available to denote a particular mass or payload condition that is defined by an application standard (see 4.6).

Table 1 — Reference mass abbreviations

Abbreviation	Term
MU	Dead mass
MVD	Design mass in working order
MND	Design mass under normal payload
MXD	Design mass under exceptional payload
MVO	Operational mass in working order
MNO	Operational mass under normal payload

Table 2 — Payload and mass increment abbreviations

Abbreviation	Term
PCD	Design consumables
PND	Normal design payload
PXD	Exceptional payload
PCO	Operational consumables
PNO	Normal operational payload

If the default values for standing areas in passenger and catering areas set out in 7.2 and 7.3 are not used, the abbreviations shall be extended to indicate the values used in kg/m² (e.g. MXD160). Where a separate catering area load is used this shall also be included, preceded by a "/" (e.g. MXD240/160).

4 Derivation of vehicle reference masses

4.1 General

Methods for calculating reference masses including standard values for payloads are given in this document.

To determine a reference mass the following parameters are required:

— applicable vehicle category (see 4.2);

— applicable payload state (see 4.4); and

— condition that is required:

- design condition; or
- operational condition.

The design condition is a theoretical state for analysis and calculation; the operational condition is an assumed average state when in service.

The vehicle specification and application standards specify these parameters.

Tolerances to the reference masses can be given in application standards or in the vehicle specification. Particular applications can require reference masses to be evaluated in a way that gives for example axle and wheel loads and then places tolerances on those individual values (for example EN 15528).

Methods are given in this document together with standard values and assumptions to be used. It is permissible to deviate from the standard values within the ranges given in 7.2 and 7.3. The vehicle specification together with an application standard gives these deviations.

Annex B gives an overview of references made by other European Standards (at the time of publication) to the reference masses defined in this document.

4.2 Vehicle categories

For the purpose of vehicle mass definitions rolling stock is divided into three vehicle categories which are given in Table 3.

Units for regional services can only be considered as category M-I if they are not intended for services where operational conditions are similar to commuter operations.

Locomotives (passenger and freight and power heads) are treated as passenger vehicles without payload. Driving trailers are treated as passenger vehicles.

Infrastructure construction and maintenance machines are treated as freight vehicles with special requirements for payloads, staff and consumables as defined in their application standards.

The vehicle category to be used for determining reference masses shall form part of the vehicle specification.

Table 3 — Vehicle categories

Vehicle category		Passenger density	Examples and explanations
M-I	high speed and long distance units	normal	all passenger units not intended to be used on commuter and suburban services
M-II	passenger vehicles other than high speed and long distance units	high	Commuter and suburban services (for the French network: RER or some TER, for the German Network: S-Bahn or some RB- and RE-Trains), metros, tramways
M-III	freight vehicles	-	wagons and freight motored units

4.3 Dead mass

Dead mass is the mass of the vehicle in the “as built” condition without consumables and without staff (see Clause 5). The dead mass is the underlying mass of a vehicle, a common fixed element that is used to define the other reference masses in this document. It includes interior fittings and furniture, fixed quantities of lubricants and fluids (e.g. oils, greases, insulating fluids, cooling fluids, heating fluids, transmission fluids, battery electrolyte, etc.), catering equipment (e.g. utensils, cutlery and table linen), tools and emergency equipment. All parts subject to wear shall be in a new, unworn condition.

NOTE 1 At the start of a project the dead mass is an estimated value together with an estimated manufacturing tolerance based on the best information available (calculations and weighed components, etc.). The dead mass and the tolerances are refined as the project progresses and more accurate information becomes available.

The dead mass shall be verified on the basis of the average mass of the first 5 weighed vehicles or units of each design (or the full fleet if it is less than 5), taking into account the range of tolerances defined in the vehicle specification or application standards.

NOTE 2 Typically weighing takes place in an intermediate condition between the dead mass and the design mass in working order. The weighed mass is then corrected to give the dead mass.

NOTE 3 It can be necessary to re-evaluate the dead mass and the tolerances if the verification shows that the vehicles or units cannot be produced inside the intended tolerance range for the design mass in working order (MVD).

The dead mass shall be re-evaluated when design changes or refurbishments produce deviations that are outside the tolerance range.

4.4 Payload states

The payload states are described in Table 4.

The mass of the vehicle in working order is the reference condition which represents the vehicle available for service. This is the summation of the dead mass and the mass of staff, consumables and any allowance for wear, but without a payload, i.e. a load from which revenue is derived.

Values for the payloads for the different vehicle categories are given in Clause 7.

Table 4 — Payload states

Payload state	Design condition	Operational condition
Consumables, staff and wear allowance (mass increment from dead mass to mass in working order)	**Design consumables (PCD)** represents the condition available for service, including staff and maximum consumables, but without payload.	**Operational consumables (PCO)** represents the condition available for service, including staff and an average amount of consumables and minus the wear allowance, but without payload.
Normal payload	**Normal design payload (PND)** represents the highest payload seen on a regular basis and it is determined by the type of rolling stock and / or the level of comfort associated with the type of service being provided.	**Normal operational payload (PNO)** represents the typical payload for average operational conditions and it is determined by the type of rolling stock and / or the level of comfort associated with the type of service being provided. This state can be used for example to determine track access conditions, scheduling, energy consumption, vehicle marking and life cycle cost calculation.
Exceptional payload	**Exceptional payload (PXD)** is the maximum possible payload that can be carried and will be experienced only under exceptional conditions (e.g. exceptional number of passengers). It represents the design limit for operation of the vehicle.	**Not applicable**

4.5 Reference masses

The reference masses are derived from the dead mass and the appropriate payload states for both design and operational conditions.

Table 5 summarizes the relationships between the condition that is required and the payload states for the classification of the reference masses. References to the tables for staff and consumables of Clause 5 and the payload of Clause 7 are included.

Table 5 — Reference masses

Reference mass	Design condition	Operational condition
Dead mass	**Dead mass (MU)** Vehicle in the "as built" condition without consumable and without staff (see 4.3)	
Mass in working order	**Design mass in working order (MVD)** Dead mass (MU) plus design consumables (PCD) (see Table 6) MVD = MU + PCD	**Operational mass in working order (MVO)** Dead mass (MU) plus operational consumables (PCO) (see Table 6) MVO = MU + PCO
Mass under normal payload	**Design mass under normal payload (MND)** Design mass in working order (MVD) plus normal design payload (PND) (see Tables 7, 8 and 9) MND = MVD + PND	**Operational mass under normal payload (MNO)** Operational mass in working order (MVO) plus normal operational payload (PNO) (see Tables 7, 8 and 9) MNO = MVO + PNO
Mass under exceptional payload	**Design mass under exceptional payload (MXD)** Design mass in working order (MVD) plus exceptional payload (PXD) (see Tables 7, 8 and 9) MXD = MVD + PXD	**Not applicable**

4.6 Additional or alternative mass definitions and payload states

Non-standard reference masses, specified as additional or alternative mass definitions or payload states, if technically necessary, shall be defined and justified in the technical specification or in the application standard.

In such cases the mass and payload definitions set out in 4.4 and 4.5 should be used as a basis wherever possible. This can be achieved for example by applying factors or by including a specific mass or payload increment. In such cases, a suitable notation should be defined following the principles of the system set out in 3.2. For this notation, the unused letters of the alphabet are available.

EXAMPLE "Maximum braking load" as defined and used in braking standards is an example of an additional reference mass specified by an application standard.

In specifying non-standard values or assumptions for determining reference masses, consideration should be given to: