SLOVENSKI STANDARD
SIST EN 15624:2021

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Nadomešča:
SIST EN 15624:2009+A1:2010

Železniške naprave - Zavore - Avtomatsko menjalo "naloženo-prazno"

Railway applications - Braking - Empty-loaded changeover devices

Bahnanwendungen- Bremse - Leer-Beladen-Umstellvorrichtungen

Applications ferroviaires - Freinage - Dispositifs de changement de régime Vide-Chargé

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45.040	Materiali in deli za železniško tehniko	Materials and components for railway engineering

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Railway applications - Braking - Empty-loaded changeover devices

Applications ferroviaires - Freinage - Dispositifs de changement de régime vide-chargé

Bahnanwendungen - Bremse - Leer-Beladen-Umstellvorrichtungen

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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 15624:2021) 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of an identical text or by endorsement, at the latest by August 2021, and conflicting national standards shall be withdrawn at the latest by August 2021.

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 supersedes EN 15624:2008+A1:2010.

The main changes compared to EN 15624:2008+A1:2010 are:

a) normative references have been updated;

b) terms and definitions have been revised;

c) requirements on design and manufacture have been revised;

d) requirements on materials have been removed;

e) requirements on type tests have been revised;

f) requirements on routine test and inspection have been removed;

g) requirements on type validation have been removed;

h) requirements on in-service assessment have been added;

i) requirements on installation validation and on documentation have been removed;

j) requirements on designation, identification and marking have been revised;

k) Annex ZA has been updated.

This document has been prepared under a standardization request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 2016/797/EU.

For relationship with EU Directive 2016/797/EU, see informative Annex ZA, which is an integral part of this document.

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

1 Scope

This document is applicable to empty-loaded changeover devices. The purpose of such devices is the generation of a load-related signal which causes the brake performance to be adjusted to the current vehicle mass.

The manually operated empty-loaded changeover devices change their output signal according to the position of the handles which together with the associated changeover plates serve as interfaces. The changeover plates read the required information for the operation of the empty-loaded changeover devices, i.e. brake weights for each position and the relevant changeover mass of the vehicle.

Automatic empty-loaded changeover devices sense a certain load threshold of the vehicle to automatically adjust the output signal when the mass of a vehicle reaches a defined value. This threshold is the changeover mass. Below this mass the vehicle's brake system provides a reduced brake force. For the changeover mass or more the high brake force applies.

This document specifies the requirements for the design, testing and quality assurance of empty-loaded changeover devices.

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 14478:2017, *Railway applications — Braking — Generic vocabulary*

EN 15625:2021, *Railway applications — Braking — Automatic variable load sensing devices*

EN 15877-1:2012+A1:2018, *Railway applications — Marking on railway vehicles — Part 1: Freight wagons*

EN 45545-2:2020, *Railway applications — Fire protection on railway vehicles — Part 2: Requirements for fire behavior of materials and components*

EN 60721-3-5:1997, *Classification of environmental conditions — Part 3: Classification of groups of environmental parameters and their severities — Section 5: Ground vehicle installations (IEC 60721-3-5:1997)*

EN 61373:2010, *Railway applications — Rolling stock equipment — Shock and vibration tests (IEC 61373:2010)*

EN ISO 228-1:2003, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation (ISO 228-1:2000)*

ISO 8573-1:2010, *Compressed air — Part 1: Contaminants and purity classes*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14478:2017, EN 15625:2021 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 https://www.iso.org/obp

3.1
empty-loaded changeover device
device connected to the vehicle, which is either manually operated or responds automatically to a change of vehicle load, thereby providing a load-related signal which changes at a certain vehicle mass threshold (changeover mass) when the load is increased or when the load is decreased

3.2
positive load signal pressure device
empty-loaded changeover device that provides a positive output pressure in the loaded state

3.3
zero load signal pressure device
empty-loaded changeover device that exhausts the output pressure to nominally 0 bar in the loaded state

3.4
changeover mass
lowest value of vehicle mass at which it is deemed to be in the loaded state, thereby requiring the adjustment of brake force to achieve the required brake performance

3.5
automatic variable load sensing device
weighing valve
device connected to the vehicle, which responds to the loading of that vehicle to provide a continuous load proportional signal to the brake control device

Note 1 to entry: The load input is normally a share of the wagon's mass because of the devices position in the vehicle suspension system. The result is a pneumatic output signal pressure that can be any value between a minimum at tare mass and a maximum at maximum mass. Most of the existing self-adjusting load-dependant brakes generate the load signal using a weighing valve.

[SOURCE: EN 15625:2021, 3.1]

3.6
mechanically operated pneumatic device
device or mechanism which responds to a mechanical input by a change of the output pressure

[SOURCE: EN 15625:2021, 3.2]

3.7
hydraulic to pneumatic converter
device or mechanism which transforms a hydraulic pressure into a pneumatic pressure with a defined transmission ratio

[SOURCE: EN 15625:2021, 3.3]

3.8
elastomeric to pneumatic converter
device or mechanism having both elastomeric and pneumatic components which transforms a pressure in the elastomer into a pneumatic pressure with a defined transmission ratio

[SOURCE: EN 15625:2021, 3.4]

3.9
output signal pressure
load signal pressure
LSP
output pressure delivered by the empty-loaded changeover device, which signals the load state (either empty or loaded) of the vehicle to the brake control device

3.10
supply pressure
input pressure to a pneumatic empty-loaded changeover device

3.11
normal litre
Nl
unit of amount of a gas equal to the amount of 1 l at a pressure of 1,0 bar and at a standard temperature, at 20 °C

Note 1 to entry: Air flow is often stated in normal litres per minute (Nl/min).

4 Design and manufacture

4.1 General

The design and manufacture of the empty-loaded changeover device shall take the requirements of this clause into account for all intended operating conditions.

4.2 Functional requirements

4.2.1 General

4.2.1.1 The empty-loaded changeover device shall supply a signal indicating the variation in vehicle load (empty or loaded) to the braking control system; this shall be mechanical or pneumatic. The method of producing the pneumatic signal shall be a mechanically operated pneumatic device, hydraulic to pneumatic converter device or an elastomeric to pneumatic converter device.

4.2.1.2 The empty-loaded changeover device shall, in all cases, supply an output signal, which is a function of the load.

4.2.1.3 The empty-loaded changeover device shall not alter any of the characteristics of the distributor and/or any associated relay device, when fitted to a vehicle, thereby not altering the characteristics of the brake system, other than to signal the load change and thereby cause the brake cylinder pressure to change from one state to another.

4.2.1.4 The design of the empty-loaded changeover device shall either provide a positive output pressure (positive load signal pressure device) or exhaust the output pressure to nominally 0 bar (zero load signal pressure device) in the loaded state dependant on the applicable design requirements.

4.2.1.5 The air consumption of a pneumatic empty-loaded changeover device shall, during running of the vehicle, be minimal and shall not interfere with the normal braking performance of that vehicle. A test which can be used to confirm this is described in A.4.2.

4.2.2 Automatic empty-loaded changeover device

4.2.2.1 General

4.2.2.1.1 An automatic empty-loaded changeover device shall change from the empty to a loaded state or vice versa, when the vehicle mass exceeds or falls below the changeover mass.

4.2.2.1.2 The automatic empty-loaded changeover device shall comply with the changeover values specified in its technical specification.

Once fitted on the vehicle the changeover shall take place within ± 5 % of the defined changeover mass of the vehicle.

For vehicles that operate only in empty or fully loaded states, this tolerance is in the range of ± 20 %.

NOTE A test which can be used to confirm this is described in A.3.2.1.

4.2.2.1.3 An automatic empty-loaded changeover device may have a damping facility within its mechanism to prevent the effects of transient suspension movement from causing a change of the load signal.

4.2.2.1.4 An automatic empty-loaded changeover device shall be designed to fit to a vehicle in a position to sense the load change of that vehicle, causing a change of state/output signal of the changeover device.

4.2.2.2 Changeover response

Where the empty-loaded changeover device does not include integral damping the response of the output pressure shall be immediate, i.e. the pressure shall fall or increase dependent on the particular design of the device, as soon as the device is moved from one state to another. Where the empty-loaded changeover device has integral damping a delay in the LSP response shall be apparent.

4.2.2.3 Empty to loaded changeover

4.2.2.3.1 Integrally damped device supplied with air from the distributor auxiliary reservoir or main reservoir pipe

Not earlier than 3 s after the operating mechanism was moved to the loaded position and remains there the output pressure shall change to the loaded state for the particular design of the device as defined in 4.2.3. This shall be tested in accordance with 5.2.8.2.

When the operating mechanism is moved to the loaded position and kept there for less than 3 s the output pressure shall not reach a value that causes a changeover to occur.

4.2.2.3.2 Device supplied with air from the distributor output pressure

When the operating mechanism is in the loaded position the output pressure shall remain in or change to the loaded state during braking for the particular design of the device as defined in 4.2.3. This shall be tested in accordance with 5.2.8.

When the brake is released there is no output pressure provided by the empty-loaded changeover device regardless the position of the operating mechanism.

4.2.2.4 Loaded to empty changeover

4.2.2.4.1 Integrally damped device supplied with air from the auxiliary reservoir or main reservoir pipe

Not earlier than 3 s after the operating mechanism was moved to the empty position and remains there the output pressure shall change to the empty state for the particular design of the device as defined in 4.2.3. This shall be tested in accordance with 5.2.9.2.

When the operating mechanism is moved to the empty position and kept there for less than 3 s the output pressure shall not reach a value that causes a changeover to occur.

4.2.2.4.2 Device supplied with air from the distributor output pressure

When the operating mechanism is in the empty position the output pressure shall remain in or change to the empty state during braking for the particular design of the device as defined in 4.2.3. This shall be tested in accordance with 5.2.9.

When the brake is released there is no output pressure provided by the empty-loaded changeover device regardless the position of the operating mechanism.

4.2.3 Pneumatic device characteristics

4.2.3.1 The device shall be designed to accept a supply pressure directly from the vehicle's auxiliary reservoir or from the distributor output/brake cylinder pressure.

4.2.3.2 When the load signal is pneumatically transmitted to the brake control device, the changeover device shall produce a step in LSP at a defined value of input signal representing the changeover mass between the empty and loaded states.

4.2.3.3 Where the supply pressure to the empty-loaded changeover device is supplied from the auxiliary reservoir the following shall apply.

a) For a positive load signal pressure device:

   1) all values of the LSP of ≤ 0,5 bar shall indicate a vehicle load that is less than the changeover mass with the purpose of causing the brake control device to output its lower ratio,

   2) all values of the LSP of ≥ 3,0 bar shall indicate a vehicle load greater than the changeover mass with the purpose of causing the brake control device to output its higher ratio. An LSP lower than 3,0 bar is acceptable to signal a vehicle load greater than the changeover mass, when an automatic variable load sensing device is used as an automatic empty-loaded changeover device.

b) For a zero load signal pressure device:

   1) all values of the LSP of ≥ 3,0 bar shall indicate a vehicle load that is less than the changeover mass with the purpose of causing the brake control device to output its lower ratio,

   2) all values of the LSP of ≤ 0,5 bar shall indicate a vehicle load greater than the changeover mass with the purpose of causing the brake control device to output its higher ratio.

4.2.3.4 Where the supply pressure is supplied from the distributor output/brake cylinder pressure system the following shall apply.

a) For a positive load signal pressure device:

1) the value of the LSP indicating a vehicle mass greater than the changeover mass, shall be equivalent to the distributor output/brake cylinder pressure,

2) the value of the LSP indicating a vehicle mass lower than the changeover mass, shall be 0 bar.

b) For a zero load signal pressure device:

1) the value of the LSP indicating a vehicle mass greater than the changeover mass, shall be 0 bar,

2) the value of the LSP indicating a vehicle mass lower than the changeover mass, shall be equivalent to the distributor output/brake cylinder pressure.

4.2.4 Automatic hydraulic to pneumatic converter

4.2.4.1 The load from the vehicle suspension applied mechanically to the empty-loaded changeover device shall result in a change in state of the device as a consequence of a change in hydraulic pressure within the device. This change of state shall occur at a value to be defined by the technical specification of the component considered and result in a step change in the pneumatic LSP as in 4.2.3.

4.2.4.2 The design shall incorporate a method of ensuring that normal transient movements of the vehicle suspension do not affect the state of the empty-loaded changeover device. This may be for example achieved by incorporating a damping restriction in the hydraulic circuit of the device.

4.2.5 Automatic elastomeric to pneumatic converter

4.2.5.1 The load from the vehicle suspension applied mechanically to the empty-loaded changeover device shall result in a change in state of the device as a consequence of a change in load on the elastomeric element within the device. This change of state shall occur at a value to be defined by the technical specification of the component considered and result in a step change in the pneumatic LSP as in 4.2.3.2.

4.2.5.2 The design shall incorporate a method of ensuring that normal transient movements of the vehicle suspension do not affect the state of the empty-loaded changeover device. This can be for example achieved by a special elastomeric characteristic of the device.

4.2.6 Components for operation of the manual empty-loaded changeover device

4.2.6.1 When a vehicle is fitted with a brake system with one “empty” state and one or several “loaded” states, changeover from one state to another shall be made by means of a cranked lever actuated from both sides of the vehicle. See Figure B.1 for an example.

4.2.6.2 Operation of the manual empty-loaded changeover lever shall either cause a change of the rigging’s lever ratio, or provide a signal which then causes a changeover of brake cylinder output pressure.

4.2.6.3 For the “loaded” brake state corresponding to the maximum vehicle mass the lever shall be inclined towards the top on the right, making an angle of 90 ° ± 10 ° with the “empty” position.