SLOVENSKI STANDARD
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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

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 256.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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European foreword

This document (prEN 15624:2019) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 15624:2008+A1:2010.

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 2008/57/EC.

For relationship with EU Directive 2008/57/EC, see informative Annex ZA, which is an integral part of this document.

1 Scope

This document is applicable to empty-loaded changeover devices designed to automatically sense when the load of a railway vehicle reaches a defined value (changeover mass), which represents the point at which the vehicle is classed as “loaded” and thereby requires the brake force to be adjusted accordingly to achieve the required brake performance. This document also covers manually operated empty-loaded changeover devices and the associated changeover plates.

This document specifies the requirements for the design, dimensions, manufacture and testing 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, *Railway applications — Braking — Generic vocabulary*

EN 50125-1, *Railway applications — Environmental conditions for equipment — Part 1: Rolling stock and on-board equipment*

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

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

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

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 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
empty loaded changeover device
device connected to the vehicle, which is either manually operated or responds automatically to a change of vehicle loading, thereby changing the state of the brake system at a defined value of vehicle mass (changeover mass) either when the load is increased or when the load is decreased by providing a signal to the brake control device

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 condition, thereby requiring the adjustment of brake force to achieve the required brake performance

3.5
automatic variable load sensing device
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

3.6
mechanically operated pneumatic device
device or mechanism having both mechanical and pneumatic elements

3.7
hydraulic to pneumatic converter
device or mechanism which transforms the hydraulic pressure generated by the mass of the vehicle into a pneumatic pressure with a defined relationship

3.8
elastomeric to pneumatic converter
device or mechanism having both elastomeric and pneumatic components, which transforms the pressure in the elastomer generated by the mass of the vehicle into a pneumatic pressure with a defined relationship

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 mechanism

3.10
supply pressure
input pressure of the air supply in a pneumatic empty-loaded changeover device

Note 1 to entry: Typically supplied from the vehicle distributor auxiliary reservoir, alternatively from the vehicle distributor output pressure or from the brake cylinder pressure.

3.11
normal litre
Nl
unit of mass for gases equal to the mass of 1 l at a pressure of 1,013 2 bar (1 atmosphere) and at a standard temperature, often 0 °C or 20 °C

Note 1 to entry: Airflow 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 (*Lsp*), 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 between the two states.

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.3.2.

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 loaded state or vice versa, when the vehicle mass exceeds or falls below the changeover mass by a deliberate load change.

4.2.2.1.2 When an automatic empty-loaded changeover device is fitted to a vehicle the changeover shall take place within ± 5 % of the defined vehicle changeover mass. 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 of the changeover device. This may be within the vehicle suspension system or linked to it, in order to sense the load change.

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 output pressure (*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 d distributor auxiliary reservoir or main reservoir

When the operating mechanism is moved to the loaded position and kept there for longer than 3 s the output pressure shall change to the loaded condition pressure for the particular design of the device as defined in 4.2.3. This shall be tested in accordance with 6.2.8.2.

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. This is tested in accordance with 6.2.8.4.

4.2.2.3.2 Device supplied with air from the distributor output pressure

When the operating mechanism is moved to the loaded position the output pressure shall change to the loaded condition for the particular design of the device as defined in 4.2.3. This shall be tested in accordance with 6.2.8.

4.2.2.4 Loaded to empty changeover

4.2.2.4.1 Integrally damped device supplied with air from the distributor auxiliary reservoir/main reservoir

When the empty-loaded changeover device is in the loaded state and the operating mechanism is moved to the empty position and kept there for longer than 3 s the output pressure shall change to the empty condition pressure for the particular design of the device as defined in 4.2.3. This shall be tested in accordance with 6.2.9.2.

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. This shall be tested in accordance with 6.2.9.4.

4.2.2.4.2 Device supplied with air from the distributor output pressure

When the operating mechanism is moved to the empty position the output pressure shall change to the empty condition for the particular design of the device as defined in 4.2.3. This shall be tested in accordance with 6.2.9.

4.2.3 Pneumatic device characteristics

4.2.3.1 The device shall be designed to accept a pneumatic input pressure supplied direct from the vehicle distributor auxiliary reservoir or from the distributor output/brake cylinder pressure system.

4.2.3.2 When the load is pneumatically transmitted to the brake control mechanism, the changeover device shall produce a step-in output signal pressure (*Lsp*) at a defined value of changeover mass between the empty and loaded conditions.

4.2.3.3 Where the input 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 output pressure (*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 output pressure (*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. A lower output signal pressure (*Lsp*) 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 output pressure (*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 output pressure (*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 input 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 output signal pressure (*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 output signal pressure (*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 output signal pressure (*Lsp*) indicating a vehicle mass greater than the changeover mass, shall be 0 bar,

2) the value of the output signal pressure (*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 defined value of vehicle mass (changeover mass) and result in a step change in the pneumatic output signal pressure 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 porting of the device.