



**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN 15624:2009

<https://standards.iteh.ai/catalog/standards/sist/5e9b1e7c-90c1-4777-a0cd-131860010814/sist-en-15624-2009>

EUROPEAN STANDARD

EN 15624

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2008

ICS 45.060.01

English Version

## Railway applications - Braking - Empty-loaded changeover devices

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

Bahnanwendungen - Bremse - Leer-beladen-Umstellvorrichtungen

This European Standard was approved by CEN on 13 September 2008.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

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.

CEN members are the national standards bodies of 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 United Kingdom.

[SIST EN 15624:2009](https://standards.iteh.ai/catalog/standards/sist/5e9b1e7c-90c1-4777-a0cd-131860010814/sist-en-15624-2009)

<https://standards.iteh.ai/catalog/standards/sist/5e9b1e7c-90c1-4777-a0cd-131860010814/sist-en-15624-2009>



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

Management Centre: rue de Stassart, 36 B-1050 Brussels

## Contents

	Page
Foreword.....	4
<b>1 Scope .....</b>	<b>5</b>
<b>2 Normative references .....</b>	<b>5</b>
<b>3 Terms, definitions and symbols.....</b>	<b>5</b>
<b>3.1 Terms and definitions .....</b>	<b>5</b>
<b>4 Design and manufacture .....</b>	<b>6</b>
<b>4.1 General.....</b>	<b>6</b>
<b>4.2 Functional requirements .....</b>	<b>7</b>
<b>4.2.1 General.....</b>	<b>7</b>
<b>4.2.2 Automatic empty-loaded changeover device .....</b>	<b>7</b>
<b>4.2.3 Pneumatic device characteristics .....</b>	<b>8</b>
<b>4.2.4 Automatic hydraulic to pneumatic converter .....</b>	<b>9</b>
<b>4.2.5 Automatic elastomeric to pneumatic converter .....</b>	<b>9</b>
<b>4.2.6 Components for operation of the manual empty-loaded changeover device .....</b>	<b>9</b>
<b>4.3 Vibrations and shock .....</b>	<b>10</b>
<b>4.4 Environment .....</b>	<b>10</b>
<b>4.4.1 General.....</b>	<b>10</b>
<b>4.4.2 Temperature .....</b>	<b>10</b>
<b>4.4.3 Other environmental conditions .....</b>	<b>11</b>
<b>4.5 Compressed air quality .....</b>	<b>12</b>
<b>4.6 Service life .....</b>	<b>12</b>
<b>4.7 Fire behaviour .....</b>	<b>13</b>
<b>4.8 External appearance.....</b>	<b>13</b>
<b>4.9 Design requirements regarding pressure stress .....</b>	<b>13</b>
<b>4.10 Leakage.....</b>	<b>13</b>
<b>4.11 Interfaces .....</b>	<b>13</b>
<b>4.11.1 Mechanical.....</b>	<b>13</b>
<b>4.11.2 Pneumatic.....</b>	<b>14</b>
<b>5 Materials .....</b>	<b>14</b>
<b>6 Type tests .....</b>	<b>14</b>
<b>6.1 General.....</b>	<b>14</b>
<b>6.2 Individual automatic empty-loaded changeover device type tests .....</b>	<b>14</b>
<b>6.2.1 Test bench for individual automatic empty-loaded changeover device type tests .....</b>	<b>14</b>
<b>6.2.2 Sampling for type tests .....</b>	<b>15</b>
<b>6.2.3 Test requirements.....</b>	<b>15</b>
<b>6.2.4 Check of physical and geometrical characteristics .....</b>	<b>16</b>
<b>6.2.5 Leakage.....</b>	<b>16</b>
<b>6.2.6 Changeover operation – empty to loaded .....</b>	<b>17</b>
<b>6.2.7 Changeover operation – loaded to empty .....</b>	<b>18</b>
<b>6.2.8 Response time – empty to loaded.....</b>	<b>19</b>
<b>6.2.9 Response time – loaded to empty.....</b>	<b>20</b>
<b>6.2.10 Shock and vibration tests .....</b>	<b>20</b>
<b>6.2.11 Operation at extreme temperatures .....</b>	<b>21</b>
<b>7 Routine test and inspection.....</b>	<b>21</b>
<b>8 Type validation.....</b>	<b>21</b>
<b>9 Manual empty-loaded changeover device installation validation .....</b>	<b>22</b>
<b>9.1 Equivalent handle movement .....</b>	<b>22</b>
<b>9.2 Changeover plate alignment.....</b>	<b>22</b>

10	Documentation .....	22
11	Designation .....	22
12	Identification and marking .....	23
12.1	Identification plate .....	23
12.2	Changeover plate for the manual empty-loaded changeover device .....	23
<b>Annex A</b>	<b>(informative) Assessment of an empty-loaded changeover device when fitted to a vehicle .....</b>	<b>25</b>
A.1	Vehicle assessment – Testing set up .....	25
A.2	Design acceptance testing set up .....	25
A.3	Single vehicle static testing .....	25
A.3.1	Vehicle requirements .....	25
A.3.2	Test procedures .....	25
A.4	Running tests .....	26
A.4.1	General .....	26
A.4.2	Pneumatic empty-loaded changeover device – Air consumption .....	26
A.4.3	Pneumatic empty-loaded changeover device – Output signal variation .....	27
<b>Annex B</b>	<b>(informative) Examples of manual empty-loaded changeover device handles and changeover plates .....</b>	<b>28</b>
<b>Annex C</b>	<b>(informative) Test bench diagram .....</b>	<b>30</b>
<b>Annex ZA</b>	<b>(informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2001/16/EC, as amended by EU Directive 2004/50/EC .....</b>	<b>31</b>
	<b>Bibliography .....</b>	<b>32</b>

## iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 15624:2009](https://standards.iteh.ai/catalog/standards/sist/5e9b1e7c-90c1-4777-a0cd-131860010814/sist-en-15624-2009)

<https://standards.iteh.ai/catalog/standards/sist/5e9b1e7c-90c1-4777-a0cd-131860010814/sist-en-15624-2009>

**EN 15624:2008 (E)****Foreword**

This document (EN 15624:2008) 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 April 2009, and conflicting national standards shall be withdrawn at the latest by April 2009.

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

This European Standard has been prepared under a mandate given to CEN/CENELEC/ETSI by the European Commission and the European Free Trade Association to support Essential Requirements of EU Directive 2001/16, as modified by EU Directive 2004/50.

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

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 United Kingdom.

**ITEH STANDARD PREVIEW**  
**(standards.iteh.ai)**  
SIST EN 15624:2009  
<https://standards.iteh.ai/catalog/standards/sist/5e9b1e7c-90c1-4777-a0cd-131860010814/sist-en-15624-2009>

## 1 Scope

This European Standard 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 European Standard also covers manually operated empty-loaded changeover devices and the associated changeover plates.

This European Standard specifies the requirements for the design, dimensions, manufacture and testing of empty-loaded changeover devices.

## 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 14478:2005, *Railway applications — Braking — Generic vocabulary*

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

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 61373:1999, *Railway applications — Rolling stock equipment — Shock and vibration tests (IEC 61373:1999)*

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

ISO 8573-1:2001, *Compressed air — Part 1: Contaminants and purity classes*

## 3 Terms, definitions and symbols

### 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14478:2005 and the following apply.

#### 3.1.1

##### **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

#### 3.1.1.1

##### **positive load signal pressure device**

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

#### 3.1.1.2

##### **zero load signal pressure device**

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

**EN 15624:2008 (E)****3.1.2****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

**3.1.3****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

**3.1.4****mechanically operated pneumatic device**

device or mechanism having both mechanical and pneumatic elements

**3.1.5****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

**3.1.6****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

**3.1.7****output signal pressure****load signal pressure*****L<sub>sp</sub>***

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

[SIST EN 15624:2009](https://standards.iteh.ai/catalog/standards/sist/5e9b1e7c-90c1-4777-a0cd-131860010814/sist-en-15624-2009)

**3.1.8****supply pressure**

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

<https://standards.iteh.ai/catalog/standards/sist/5e9b1e7c-90c1-4777-a0cd-131860010814/sist-en-15624-2009>

NOTE Typically supplied from the vehicle distributor auxiliary reservoir, alternatively from the vehicle distributor output pressure or from the brake cylinder pressure.

**3.1.9****normal litre****NI**

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 Airflow is often stated in normal litres per minute (NI/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 ( $L_{sp}$ ), 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  $\pm 5\%$  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 dependant 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 ( $L_{sp}$ ) 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

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.

**EN 15624:2008 (E)**

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**

[SIST EN 15624:2009](https://standards.iteh.ai/catalog/standards/sist/5e9b1e7c-90c1-4777-a0cd-131860010814/sist-en-15624-2009)

**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 ( $L_{sp}$ ) 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 ( $L_{sp}$ ) of  $\leq 0,5$  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 ( $L_{sp}$ ) of  $\geq 3,0$  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 ( $L_{sp}$ ) 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 ( $L_{sp}$ ) of  $\geq 3,0$  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 ( $L_{sp}$ ) of  $\leq 0,5$  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 ( $L_{sp}$ ) 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 ( $L_{sp}$ ) 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 ( $L_{sp}$ ) indicating a vehicle mass greater than the changeover mass, shall be 0 bar;
- 2) the value of the output signal pressure ( $L_{sp}$ ) 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.

#### **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 defined value of vehicle mass (changeover mass) and result in a step change in the pneumatic output signal pressure as in 4.2.3.

**4.2.5.2** 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 change over device. This may be for example achieved by 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 one "empty" brake system and one or several "loaded" brake systems, changeover from one system to another shall be made by means of a cranked lever moving perpendicular to the axles. See Figure B.1 for an example.

**EN 15624:2008 (E)**

**4.2.6.2** Operation of the manual empty-loaded changeover lever shall either act directly on a mechanical linkage causing a change of lever ratio, or effect a changeover of a mechanical linkage via a pneumatic device fitted to the mechanical lever arrangement.

**4.2.6.3** For the "loaded" brake system corresponding to the changeover mass, the lever shall be inclined towards the top on the right, making an angle of at least 90° with the "empty" position.

**4.2.6.4** For the "empty" brake system, the changeover lever shall be inclined towards the top on the left and occupy its extreme position on the left.

**4.2.6.5** The lever position corresponding to more than one "loaded" position shall be between those stated in 4.2.6.3 and 4.2.6.4 and increasing in power as from the left.

**4.2.6.6** When the vehicle is fitted with one empty-loaded changeover device only, it shall have a simple cranked lever only. See Figure B.1 a) for an example of the cranked lever form.

**4.2.6.7** When the vehicle is fitted with two or more separate empty-loaded changeover devices, the levers shall be cranked and have a double handle. See Figure B.1 b) for an example of the cranked levers.

**4.3 Vibrations and shock**

The design of the empty-loaded changeover device and its installation on the vehicle shall ensure that outside influences, e.g. impacts and jolts, in no way affects the correct function of the device. The empty-loaded changeover device shall be able to operate without restriction under vibration and shock conditions as specified by EN 61373:1999, Category 1, class A or B or Category 2, dependant on the installation location for which it is designed. This requirement shall be tested in accordance with 6.2.10.

**4.4 Environment****4.4.1 General**

The design shall take into account that the empty-loaded changeover device shall be able to be put into service and operate normally in the conditions and climatic zones for which it is designed and in which it is likely to run, as specified in this European Standard.

NOTE 1 The environmental conditions are expressed in classes for temperature etc. thereby giving the vehicle designer the choice of an empty-loaded changeover device suitable for operation on a vehicle all over Europe, or have a restricted use.

NOTE 2 The environment range limits specified are those that have a low probability of being exceeded. All specified values are maximum or limit values. These values can be reached, but do not occur permanently. Depending on the situation there can be different frequencies of occurrence related to a certain period of time.

The empty-loaded changeover device shall be tested in accordance with the requirements given in Clause 6 including where required environmental/climatic testing.

**4.4.2 Temperature**

The empty-loaded changeover devices covered by this European Standard shall be able to operate:

- at  $-25\text{ °C} \leq \text{environmental temperature} \leq 70\text{ °C}$  without any deviation from the technical requirements specified in this European Standard;
- at  $-40\text{ °C} \leq \text{environmental temperature} < -25\text{ °C}$  without deviation from the main technical requirements specified in this European Standard but without affecting the function of the empty-loaded changeover device.

Deviations from the technical requirement when testing at extremes are defined in 6.2.11.