SLOVENSKI STANDARD
kSIST prEN 15611:2008

Železniške naprave - Zavore - Ventili za kontrolo tlaka

Railway applications - Braking - Relay valves

Bahnanwendungen - Bremse - Relaisventile

Ta slovenski standard je istoveten z: **prEN 15611**

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Railway applications - Braking - Relay valves

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

If this draft becomes a European Standard, 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.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document (prEN 15611:2008) 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 Formal Vote.

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 96/48 and EU Directive 2001/16, as modified by EU Directive 2004/50.

For relationship with EU Directive(s), see informative Annexes ZA and ZB, which are integral parts of this document.

1 Scope

This European Standard is applicable to relay valves designed to control the brake cylinder pressure of compressed air brakes fitted to railway vehicles, in association with an air brake distributor valve or other control device, and in response to a change in vehicle load that is either continuously variable or in two stages i.e. empty - loaded.

Relay valves operating with other pressures, in particular the brake pipe pressure, are not included.

This European Standard specifies the requirements for the design, manufacture and testing of relay valves.

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*

prEN 15355, *Railway applications - Braking - Distributor valves and distributor-isolating devices*

prEN 15625, *Railway applications — Braking — Automatic variable load-sensing devices*

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 for general use — Part 1: Contaminants and quality classes*

3 Symbols, abbreviations, terms and definitions

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

3.1 Symbols

p pressure

p_i input pressure

p_o output pressure

t time

3.2 Abbreviations

BCP brake cylinder pressure

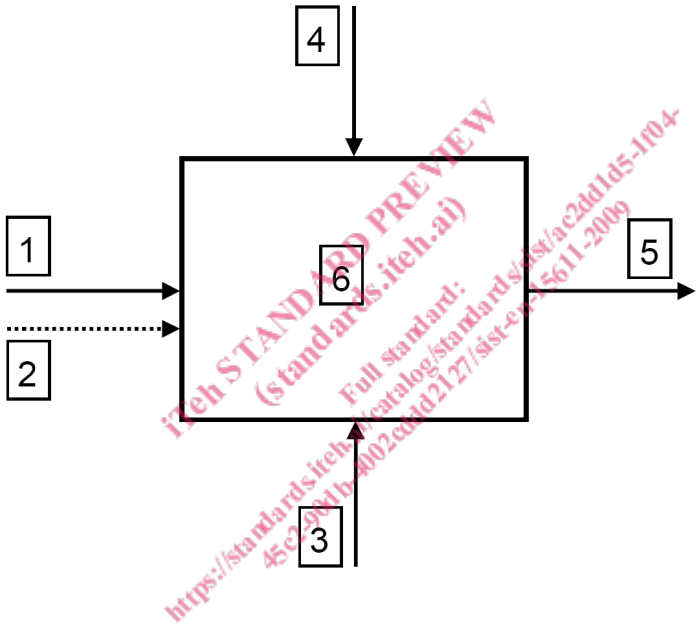
Lcp Control signal - continuous load sensing pressure

Lsp Control signal - empty/load signal pressure

AR Auxiliary reservoir pressure, supply pressure

3.3 Terms and definitions

3.3.1
relay valve
device, the main function of which is to control a pneumatic output pressure as a function of the variation of one or more input pressures (see Figure 1)



Key

1 first input pressure

2 second input pressure

3 control signal - continuous load sensing pressure (Lcp), or control signal - empty/load signal pressure (Lsp), or mechanical input (lever) or electrical input

4 auxiliary reservoir pressure, supply pressure (AR)

5 output pressure

6 relay valve

Figure 1 — Relay valve, pressures and control signals

NOTE The definition of “relay valve” in EN 14478 is specific to a load dependant relay valve. This EN standard considers one or more input pressures in accordance with the diagram in Figure 1.

3.3.2
input pressure
control pressure received by the relay valve

NOTE Pressure generally considered as being the output pressure from a distributor or a brake control unit; sometimes referred to as pilot pressure or dummy brake cylinder pressure

3.3.3
output pressure
pressure output from the relay valve

NOTE Pressure generally considered as being the brake cylinder pressure when the relay valve is used in a variable load braking system. This pressure can also be used as the input pressure to another relay valve. The output pressure can obtain one, two or three fixed levels or it can be changed continuously between a minimum and a maximum or vice versa.

3.3.4
relay valve ratio
ratio of the output pressure to input pressure

3.3.5
control signal
signal received from the continuous load sensing device (Lcp) or empty - loaded changeover device (Lsp) or a mechanical input (lever) or an electrical input that varies the relay valve ratio dependant on vehicle load

NOTE This can also be a speed signal or other parameter, dependant on the relay valve application.

3.3.6 Relay valve types

3.3.6.1
single stage relay valve
relay valve type A
relay valve with one fixed relay valve ratio, where the ratio can be less (step-down), equal or greater (step-up) than 1

3.3.6.2
multi stage relay valve
relay valve type B
relay valve with more than one fixed relay valve ratio, where the ratios can be less (step-down), equal or greater (step-up) than 1

3.3.6.2.1
relay valve type B1
multi stage relay valve that can change relay valve ratio during a brake application

NOTE Typically used on vehicles normally operated in empty or fully loaded condition.

3.3.6.2.2
relay valve type B2
multi stage relay valve where a change of relay valve ratio cannot take place during a brake application

NOTE Blocking the relay valve ratio during brake application is typically used to avoid frequent changeovers taking place on vehicles operated near the changeover weight.

3.3.6.2.3
empty/load relay valve
specific type of multi stage relay valve (type B1 or B2) with only two stages, giving an empty (tare) or a loaded output pressure proportional to input pressure dependant on the load signal input

3.3.6.3
variable load relay valve
relay valve type C
relay valve with a continuously changeable relay valve ratio, where a load signal is used to change the ratio

3.3.6.4
multi stage variable load relay valve
relay valve type C1
relay valve with a continuously changeable relay valve ratio, where a load signal is used to change the ratio and with a multi stage feature added

NOTE Typically a load signal is used to change the relay valve ratio and a control signal (automatic or manual) is used to change the stage(s). The typical result is that at the same load and input pressure, in the lower stage (e.g. P-mode, passenger train) results a lower output pressure and in a higher stage (e.g. R-mode, rapid passenger train) this results in a higher output pressure.

3.3.6.5
two (multi) input relay valve
relay valve type D
relay valve (type A, B or C) with two (or more) input pressures, controlling a single output pressure

3.3.6.6
variable load relay valve with kinked characteristic
relay valve type E
variable load relay valve (Type C) with a special, non-linear characteristic, which automatically comes into operation when the vehicle has more than a certain load

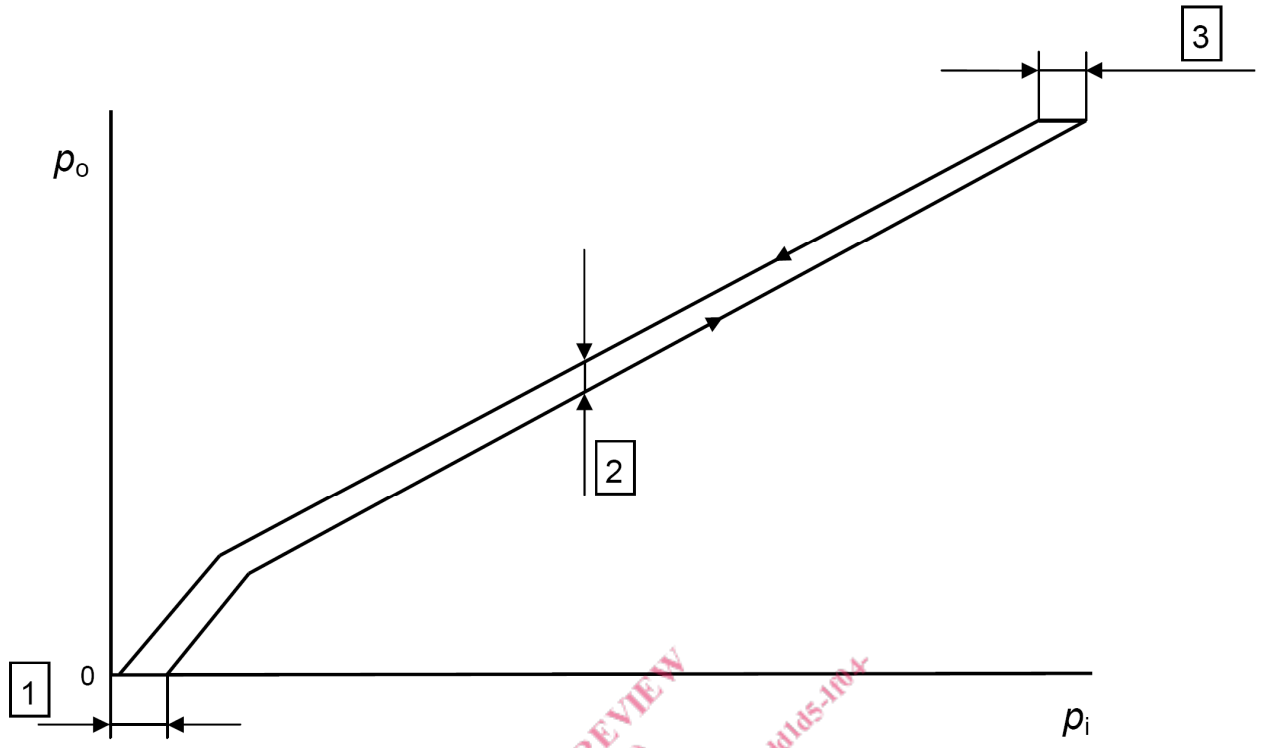
NOTE This function reduces (in comparison with a linear characteristic) the output pressure for low input pressures to a certain level to limit the heat impact to the wheels during continuous braking.

3.3.7
sensitivity
change of input pressure causing a variation of output pressure, when the change of input pressure is in the same direction, with no overshoot or reversal

3.3.8
initial sensitivity
change of input pressure, starting at 0 bar which causes the output pressure to start increasing (see Figure 2)

3.3.9
sensitivity at reversal
change of input pressure causing a variation of output pressure, when the change of input pressure is changing its direction from increasing to decreasing (see Figure 2)

3.3.10
hysteresis
difference in output pressure with the same input pressure, where the input pressure is first rising to a value and then, having been taken past that value, subsequently falls to the same value (see Figure 2)



Key

1 initial sensitivity

2 hysteresis

3 sensitivity at reversal

NOTE The figure is simplified for illustrative purposes, e.g. the real pressure development is not shown.

Figure 2 — Hysteresis and sensitivity

3.3.11
initial braking position
first braking step corresponding to a reduction of the brake pipe pressure of 0,4 bar to 0,5 bar, which results in an input pressure to the relay valve of (0,7 ± 0,1) bar

3.3.12
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 Airflow is often stated in normal litres per minute (Nl/min).

4 Design and manufacture

4.1 General

4.1.1 A relay valve shall enable a distributor valve to be used without any vehicle specific modification to the distributor, related to the brake cylinder volume. This includes the independence of the brake application and release times, the inshot feature and the output pressure development for any output (brake cylinder and piping) volume.

4.1.2 The use of a relay valve shall not alter any of the characteristics of the distributor and/or a brake control unit that are not specified in this standard.

4.1.3 The use of a relay valve shall enable the vehicle to maintain a nominally constant brake application or release time.

4.1.4 The use of a relay valve shall enable the brake cylinder pressure to be maintained between prescribed limits (e.g. interoperable or national). These limits may be defined by different brake modes or speed-dependent requirements or where there is a requirement to maintain a nominal constant brake mass percentage irrespective of load.

4.1.5 Table 1 below provides a description of relay valve types described in this standard with the relevant clause references.

Table 1 — Relay valve types and corresponding clauses

Type Symbol	Description	Comment	Definitions Clause Reference	Functional Requirement Clauses	Testing Clauses
A	One fixed relay valve ratio		3.3.6.1 Single stage relay valve	4.2.1 4.2.2.1 4.2.3 4.2.7 4.2.8 4.2.9 4.2.10 4.2.11 4.3 4.4 4.5 4.6 4.7 4.8 4.9 4.10 5	6.2.4.2 6.2.4.3 6.2.4.11 6.2.4.12 6.2.4.14 6.2.4.15 6.2.4.16 6.2.4.17
B – Basis of either B1 or B2 Types below	Two or more fixed relay valve ratios	Empty/loaded or low/high	3.3.6.2 Multi stage relay valve	4.2.1 4.2.2.1 4.2.2.2 4.2.3 4.2.7 4.2.8 4.2.9 4.2.10 4.2.11 4.3 4.4 4.5 4.6 4.7 4.8 4.9 4.10 5	6.2.4.2 6.2.4.3 6.2.4.4 6.2.4.11 6.2.4.12 6.2.4.14 6.2.4.15 6.2.4.16 6.2.4.17
B1		Change of relay valve ratios required/allowed during brake application	3.3.6.2.1	As for Type B plus 4.2.4	As for type B plus 6.2.4.5
B2		Change of relay valve ratio not allowed during brake application	3.3.6.2.2	As for Type B plus 4.2.5	As for Type B plus 6.2.4.6
C	Continuously changing relay valve ratio		3.3.6.3 Variable load relay valve	4.2.1 4.2.2.1 4.2.3 4.2.5 4.2.7 4.2.8 4.2.9 4.2.10 4.2.11 4.3 4.4 4.5 4.6 4.7 4.8 4.9 4.10 5	6.2.4.2 6.2.4.3 6.2.4.6 6.2.4.7 6.2.4.8 6.2.4.12 6.2.4.14 6.2.4.15 6.2.4.16 6.2.4.17
C1		Continuously changing relay valve ratio, with a multi stage feature added	3.3.6.4 Multi stage variable load relay valve	As for Type C plus 4.2.2.3	As for Type C plus 6.2.4.10
D	Two or more input pressures with „select high“ feature	overlay function to type A – C	3.3.6.5 Two (multi) input relay valve	As for Type A, B or C plus 4.2.2.4	As for Type A, B or C plus 6.2.4.13
E	Kinked characteristic	additional overlay function to type C	3.3.6.6 Variable load relay valve with kinked characteristic	As for Type C plus 4.2.6	As for Type C plus 6.2.4.9