SLOVENSKI STANDARD
SIST EN 13802:2014

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Nadomešča:
SIST EN 13802:2004

Železniške naprave - Vzmetenje - Hidravlični blažilniki

Railway applications - Suspension components - Hydraulic dampers

Bahnanwendungen - Federungselemente - Hydraulische Dämpfer

Applications ferroviaires - Eléments de suspension - Amortisseurs

Ta slovenski standard je istoveten z: EN 13802:2013

ICS:

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

SIST EN 13802:2014 **en,fr,de**

EUROPEAN STANDARD

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Railway applications - Suspension components - Hydraulic dampers

Applications ferroviaires - Eléments de suspension - Amortisseurs hydrauliques

Bahnanwendungen - Federungselemente - Hydraulische Dämpfer

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

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Foreword

This document (EN 13802:2013) 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of an identical text or by endorsement, at the latest by June 2014, and conflicting national standards shall be withdrawn at the latest by June 2014.

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 document supersedes EN 13802:2004.

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

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

— Clause 1 The complete hydraulic dampers, with their end mountings, are now considered in the scope. This new consideration has been taken into account in the whole standard.

— Clause 2 The normative references have been updated.

— 4.2.1.2 A new item concerning the life cycle of the dampers has been added.

— 4.2.2.2 The value of $T_{ao,min}$ to take by default has been decreased.

— 4.2.2.3 The value of $T_{ae,min}$ to take by default has been decreased.

— 4.2.4 and 5.2.4 The requirements concerning the behaviour against the vibrational exposures are now given as recommendations.

— 4.3.3 A criterion about of the surface protection has been defined.

— 4.3.4 A criterion about the noise generated by the damper has been defined.

— 4.3.9 The supply of the value of the mass is now required.

— 4.4.1 A criterion about the orientation of the damper has been defined.

— 4.4.6 and 5.4.6 The definition of the dynamic characteristics of the dampers has been revised.

— 6.3 Requirements about the serial tests have been added.

— Clause 7 The position of the permanent marking of horizontally orientated dampers has been specified.

— B.2 Methods of calculation of the damper length have been defined in this new sub-clause.

— B.3 Preferred interface dimensions of end mountings have been defined in this new sub-clause.

— Annex F Dynamic test velocities have been defined in this new annex.

NOTE The above list of changes includes the significant technical changes from EN 13802:2004 but is not an exhaustive list of all modifications from the previous version.

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, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard applies to hydraulic dampers and their end mountings used on rail vehicles. The dampers covered in this standard include:

- dampers that control the dynamic behaviour of a vehicle:
  - suspensions dampers, (e.g. primary vertical dampers, secondary vertical dampers and secondary lateral dampers);
  - yaw dampers;
  - roll dampers;
  - inter-vehicles dampers.
- dampers that control the dynamic behaviour of mechanical systems:
  - pantograph dampers;
  - motor dampers, etc.

All relevant terminology which is specific to the subject is defined in this European Standard.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 13913, *Railway applications — Rubber suspension components — Elastomer-based mechanical parts*

EN 14363, *Railway applications — Testing for the acceptance of running characteristics of railway vehicles — Testing of running behaviour and stationary tests*

EN ISO 2813, *Paints and varnishes — Determination of specular gloss of non-metallic paint films at 20°, 60° and 85° (ISO 2813)*

EN ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests (ISO 9227)*

3 Terms, definitions and symbols

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

NOTE 1 In this document, the spatial characteristics of the damper are defined with reference to its axes (see Figure 1). Axial characteristics are defined along the X-axis. Extension of the damper is defined as positive and compression as negative. Transverse characteristics are defined in the Y-Z plane. Rotations are defined as positive in a clockwise direction.

NOTE 2 Decimal multiple and sub-multiple of units defined below can be used.

3.1 Terms and definitions

3.1.1
damper
hydraulic damper with end mountings

3.1.2
hydraulic damper
device with a fluid as the damping medium

3.1.3
damper characteristic
relationship (assuming that there is no force as a function of velocity phase shift) between damper force and damper velocity established at a damper displacement of large amplitude and low frequency to discount the dynamic influence of the damper structure and fluid stiffness

3.1.4
damper displacement
displacement or stroke, relative axial displacement of the damper ends

3.1.5
damper fluid
damping medium (usually oil)

3.1.6
damper specification
document used to define the performance requirements and capabilities of a damper (see Annex A)

3.1.7
dynamic damper characteristic
damper characteristic (see 3.1.3), but including the phase shift effect, and thus including influence of damper structure and fluid stiffness

3.1.8
end mounting
components fitted at both ends of the damper for its mounting on the vehicle, usually elastomer based component

Note 1 to entry: Mountings are not specified in detail in this document.

3.1.9
friction characteristic type damper
hydraulic damper that has a diagram force as a function of displacement which has a more or less rectangular shape (see Figure 7)

3.1.10
leakage
visible evidence of accumulation of fluid, which has originated from within the damper

3.1.11
priming
operation allowing the removal of temporary imperfection to the damper characteristic caused by entrapment of gas (usually air) in the damper pressure chamber

3.1.12
life time
total time or distance travelled in which a damper remains in service use until its final withdrawal

Note 1 to entry: The life time can consist of several service intervals.

3.1.13
service interval
minimum continuous time or distance travelled in which a damper remains in service use, with only periodic visual inspections and without any dismounting or repairing

3.1.14
symmetrical damper characteristic
damper characteristic (see 3.1.3) having the same compression and extension force as a function of velocity characteristic throughout the operating range (see Figure 8)

3.1.15
asymmetric damper characteristic
damper characteristic (see 3.1.3) not having the same compression and extension force as a function of velocity characteristic throughout the operating range (see Figure 9)

3.2 Symbols

A_c	[J]	Area of the force/displacement diagram that is the dissipated energy in a cycle
c_d	[N.s/m]	Dynamic damping rate, this includes the effect of phase shift
d_c	[m]	Compression margin, the part of damper compression travel never reached by the piston during operation in the given mechanical system NOTE 1 $d_c = L_{u,\min} - L_{\min}$
$d_{c,Fnull}$	[m]	Displacement corresponding to zero force value in compression (measured on the diagram force as a function of displacement and is negative by convention).
d_e	[m]	Extension margin, the part of damper extension travel never reached by the piston during operation in the given mechanical system NOTE 2 $d_e = L_{\max} - L_{u,\max}$
$d_{e,Fnull}$	[m]	Displacement corresponding to zero force value in extension (measured on the diagram force as a function of displacement and is positive by convention)
d_n	[m]	Nominal travel, the travel over which the damper meets the operational requirements established by the damper specification NOTE 3 The nominal travel is indicative of the operating travel of the damper in the given mechanical system.
d_w	[m]	Working stroke NOTE 4 $d_w = L_{u,\max} - L_{u,\min}$

d_0	[m]	Damper displacement amplitude at sinusoidal motion
		NOTE 5 $d(t) = d_0 \times \sin(\omega \times t)$
D_{max}	[m]	Diameter of an envelope cylinder in which the main body of the damper shall be contained (dust guard included) (see Figures 2 and 3)
D_{res}	[m]	Diameter of the additional damper reservoir envelope (see Figure 3)
f	[Hz]	Excitation frequency
		NOTE 6 f = ω / (2 x π) either f = v_0 / (2 x π x d_0)
F	[N]	Damper force, the axial force of the damper
$F_{c,vn}$	[N]	Nominal damper compression force (is negative by convention)
		NOTE 7 Force at nominal velocity.
$F_{c,v0}$	[N]	Damper compression force at maximum velocity of the test (measured at mid stroke on the diagram force as a function of displacement and is negative by convention)
$F_{cmax,vmax}$	[N]	Maximum damper compression force measured on the diagram force as a function of displacement at the maximum damper velocity v_{max} (is negative by convention)
$F_{cmax,v0}$	[N]	Damper maximum compression force with sinusoidal displacement (measured on the diagram force as a function of displacement and is negative by convention)
$F_{e,vn}$	[N]	Nominal damper extension force (is positive by convention)
		NOTE 8 Force at nominal velocity.
$F_{e,v0}$	[N]	Damper extension force at maximum velocity of the test (measured at mid stroke on the diagram force as a function of displacement and is positive by convention)
$F_{emax,vmax}$	[N]	Maximum damper extension force measured on the diagram force as a function of displacement at the maximum damper velocity v_{max} (is positive by convention)
$F_{emax,v0}$	[N]	Damper maximum extension force with sinusoidal displacement (measured on the diagram force as a function of displacement and is positive by convention).
F_0	[N]	Damper force amplitude at sinusoidal motion
H_{res}	[m]	Height of the additional damper reservoir to damper centreline (see Figure 3)
k_d	[N/m]	Dynamic damper stiffness

L	[m]	Damper length The damper length definition will vary according to attachment details which are defined in the damper specification. If not otherwise specified, the damper length is between the centres of the end mountings (see Figure 4).
L_{del}	[m]	Damper length at delivery NOTE 9 The length of the damper to permit mounting it on a vehicle at rest on straight, horizontal track (except for particular cases, for example pantograph dampers).
L_i	[m]	Length of the damper installed NOTE 10 Length when the damper is mounted on a vehicle at rest on straight, horizontal track.
L_{max}	[m]	Damper length when the damper is fully extended
L_{min}	[m]	Damper length when the damper is fully compressed
L_n	[m]	Nominal damper length $L_n = \frac{(L_{max} + L_{min})}{2}$
$L_{u,max}$	[m]	Maximum utilization length of the damper NOTE 11 The maximum length of the damper during operation.
$L_{u,min}$	[m]	Minimum utilization length of the damper NOTE 12 The minimum length of the damper during operation.
$T_{ae,max}$	[°C]	Maximum ambient temperature (i.e. temperature of the air surrounding the damper) in extreme situations
$T_{ae,min}$	[°C]	Minimum ambient temperature (i.e. temperature of the air surrounding the damper) in extreme situations
$T_{ao,max}$	[°C]	Maximum ambient temperature for normal vehicle operation
$T_{ao,min}$	[°C]	Minimum ambient temperature for normal vehicle operation
T_n	[°C]	Nominal test temperature of the damper (see 4.2.2.1)
$T_{s,max}$	[°C]	Maximum transportation or storage temperature to be experienced by the damper
$T_{s,min}$	[°C]	Minimum transportation or storage temperature to be experienced by the damper
v	[m/s]	Damper velocity, piston velocity that is the relative axial velocity of the damper

v_{max} [m/s] Maximum damper velocity

NOTE 13 Highest velocity to be encountered during operation by the damper for the application specified and considered in the design of the damper. The value of this velocity is part of the performance description of the damper.

v_n [m/s] Nominal damper velocity

NOTE 14 Upper velocity to be encountered during operation by the damper for the application specified. The value of this velocity is part of the performance description of the damper.

v_0 [m/s] Damper velocity amplitude at sinusoidal motion

NOTE 15 $v(t) = d_0 \times \omega \times \cos(\omega \times t) = v_0 \times \cos(\omega \times t)$

Φ [rad] Force as a function of displacement phase shift at sinusoidal motion (see the definition for c_d and k_d)

ω [rad/s] Angular velocity of excitation

NOTE 16 $\omega = \frac{v_0}{d_0}$

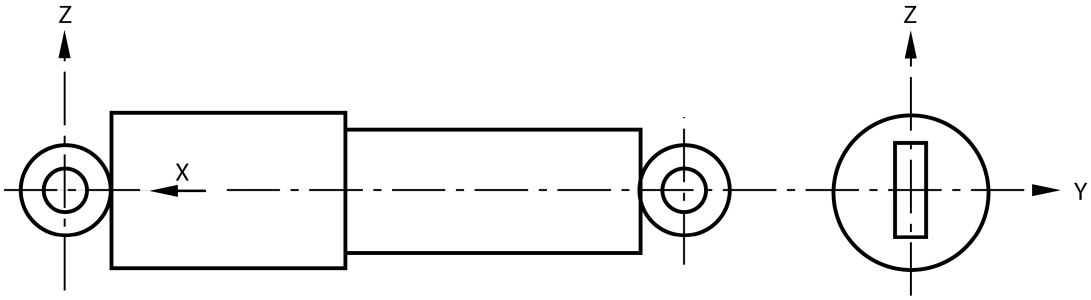

Figure 1 — Spatial definition

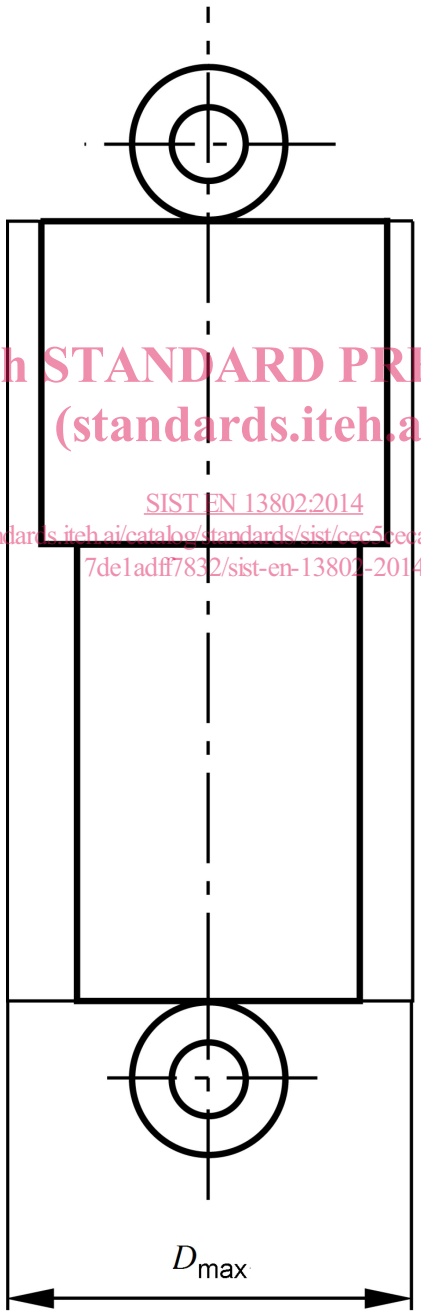

Figure 2 — Diameter D_{max} of the damper space envelope

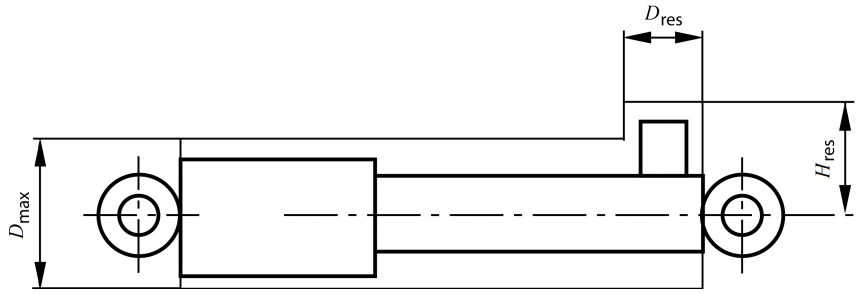

Figure 3 — Cross sectional dimensions of damper (D_{max} , D_{res} , H_{res})

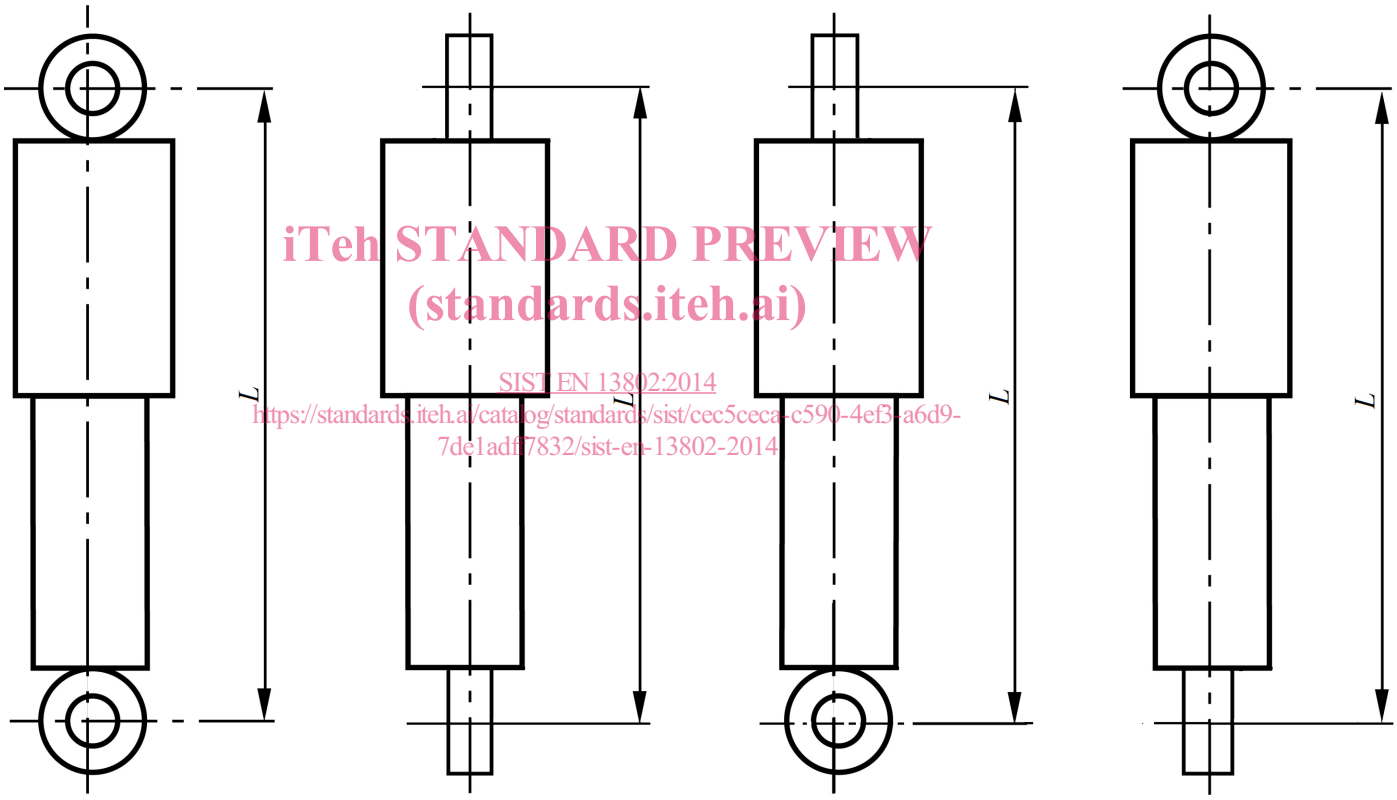

Figure 4 — Definition of damper length L