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Leaf springs — Technical specifications

Ressorts à lames — Spécifications techniques

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 227, *Springs*.

Leaf springs — Technical specifications

1 Scope

This International Standard specifies the technical specifications for leaf springs.

This International Standard is applicable to leaf springs for road vehicle (hereinafter simply “springs”). The leaf springs for other vehicle may refer to this International Standard.

2 Normative references

The following referenced 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.

ISO 683-14, *Heat-treatable steels, alloy steels and free-cutting steels — Part 14: Hot-rolled steels for quenched and tempered springs*

ISO 3887, *Steels — Determination of depth of decarburization*

ISO 6506-1, *Metallic materials — Brinell hardness test — Part 1: Test method*

ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method*

ISO 16249, *Springs — Symbols*

ISO 18265, *Metallic materials — Conversion of hardness values*

ISO 26909, *Springs — Vocabulary*

ISO 26910-1, *Springs — Shot peening — Part 1: General procedures*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 26909 and Table 1 apply.

4 Symbols

For the purposes of this document, the symbols and units given in ISO 16249 and Table 1 apply.

Table 1 — Terms, symbols and units

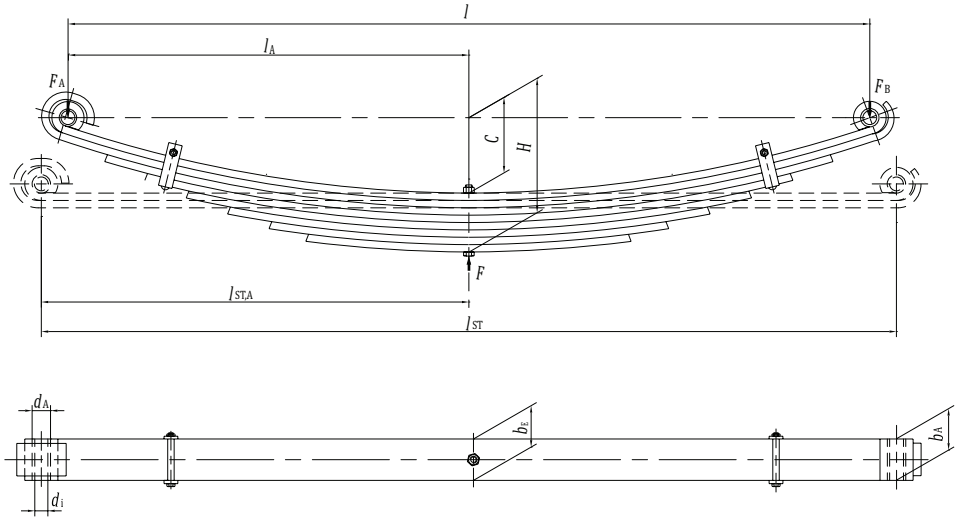
Term	Symbol	Unit	Meaning
Spring end width	b_A	mm	Width of the spring eye or sliding end.
Assembled spring width	b_E	mm	Width of the assembly in the range of U-clamping.
Camber	C	mm	Perpendicular distance from the surface where tensile stress is generated in use, of the uppermost leaf at the centre pin or the centre bolt, to the straight line connecting the centers of both eyes or connecting the load-supporting points of the spring.
Free camber	C_0	mm	Camber when free or at zero load.
Design camber	C_d	mm	Camber under design (nominal) load.

Table 1 *(continued)*

Term	Symbol	Unit	Meaning
Eye inner diameter	d_A	mm	Inner diameter of the spring eye.
Eye bush inner diameter	d_i	mm	Inner diameter of the spring eye bush.
Load	F	N	Total spring force.
Design load	F_d	N	Design (nominal) load of the spring.
Maximum test load	$F_{max.t}$	N	Maximum test force of the spring.
Height	H	mm	The overall height of the spring.
Free height	H_0	mm	Height when free or at zero load.
Design height	H_d	mm	Height under design (nominal) load.
Span	l	mm	Distance between the load-supporting points of the spring.
Free Span	l_0	mm	Span when free or at zero load.
Fixed half span	l_A	mm	Length of the span between the fixed end and the centre.
Straight span	l_{ST}	mm	Length of the span between the load-supporting points of the spring when the first leaf is straight.
Fixed half straight span	$l_{ST,A}$	mm	Length of the span between the fixed end and the centre when the first leaf is straight.
Spring rate	R	N/mm	Force required to deflect the spring by one unit of deflection.
Deflection	s	mm	Change of the vertical position of the centre pin or the centre bolt against the line connecting the centers of both eyes or connecting both load-supporting points of the spring.
Design deflection	s_d	mm	The deflection under the design load.
Maximum test deflection	$s_{max,t}$	mm	The deflection under the maximum test load.
Flank bending	δ	mm	Side bending deformation of the leaf.

5 Spring types

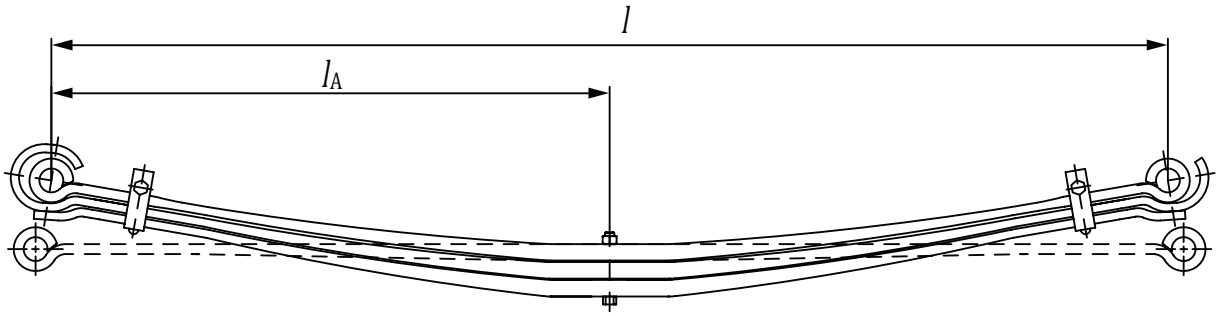
The most common spring types are shown in the following.



Key

b_A	spring end width	F	total spring load
b_E	assembled spring width	F_A, F_B	loads at eye A or eye B
C	camber	l	span
d_A	eye inner diameter	l_A	fixed half span
d_i	eye bush inner diameter	l_{ST}	straight span
H	height	$l_{ST,A}$	fixed half straight span

Figure 1 — Multi-leaf spring with eyes

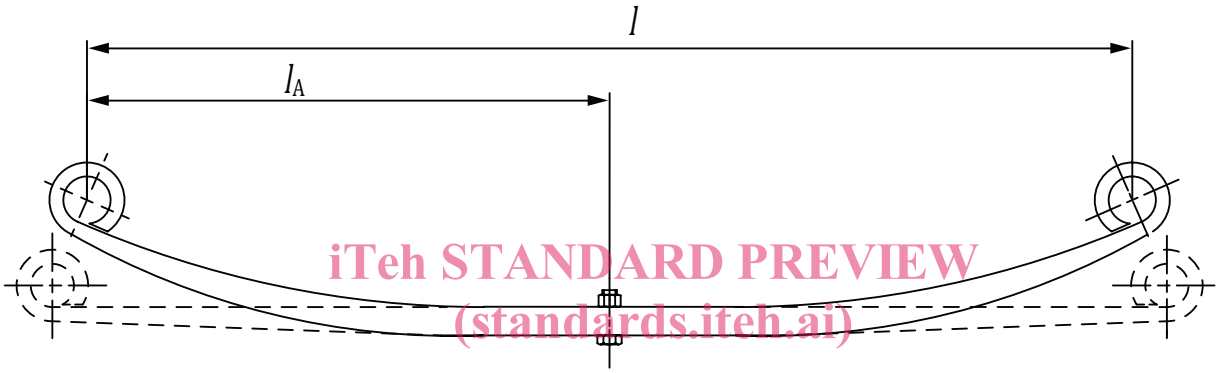


a) Multi-leaf parabolic spring with eyes

Key

l span

l_A fixed half span



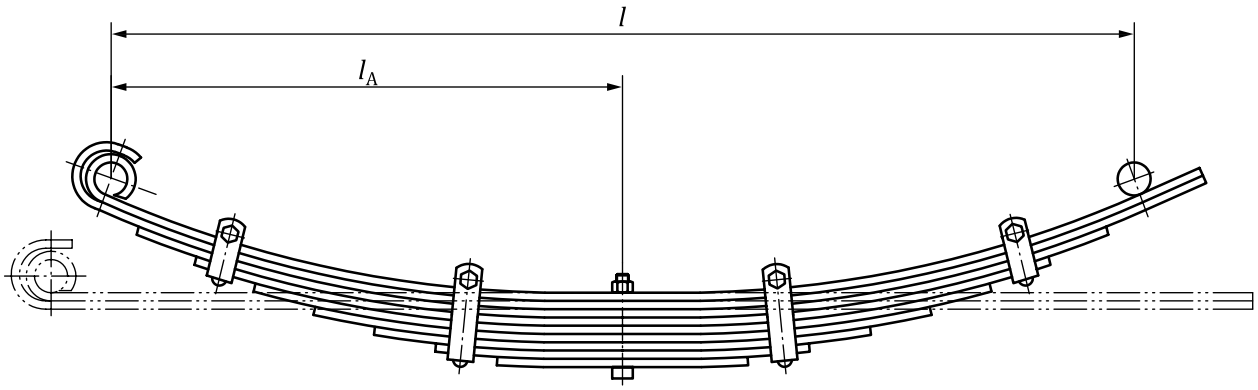
b) Single leaf parabolic spring with eyes

Key

l span

l_A fixed half span

Figure 2 — Parabolic spring with eyes

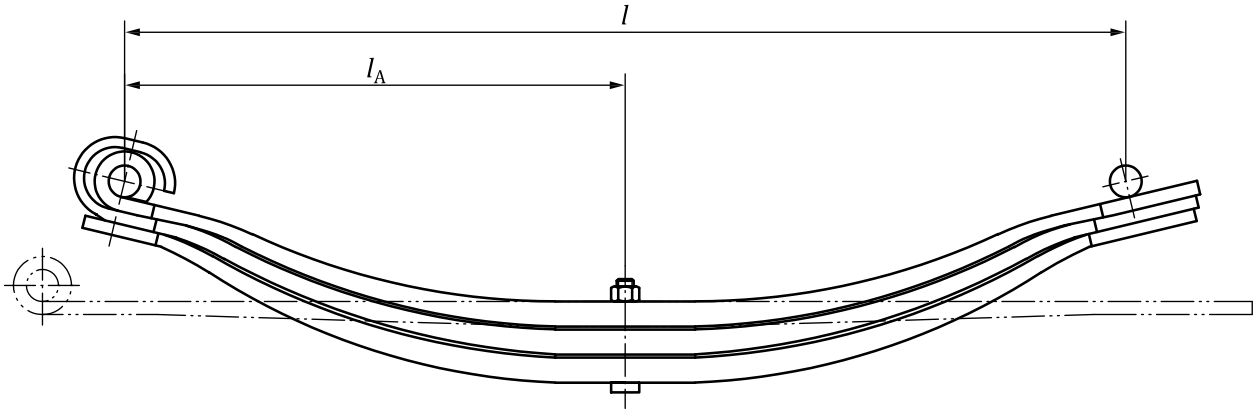


Key

l span

l_A fixed half span

Figure 3 — Multi-leaf spring with one eye and one sliding end

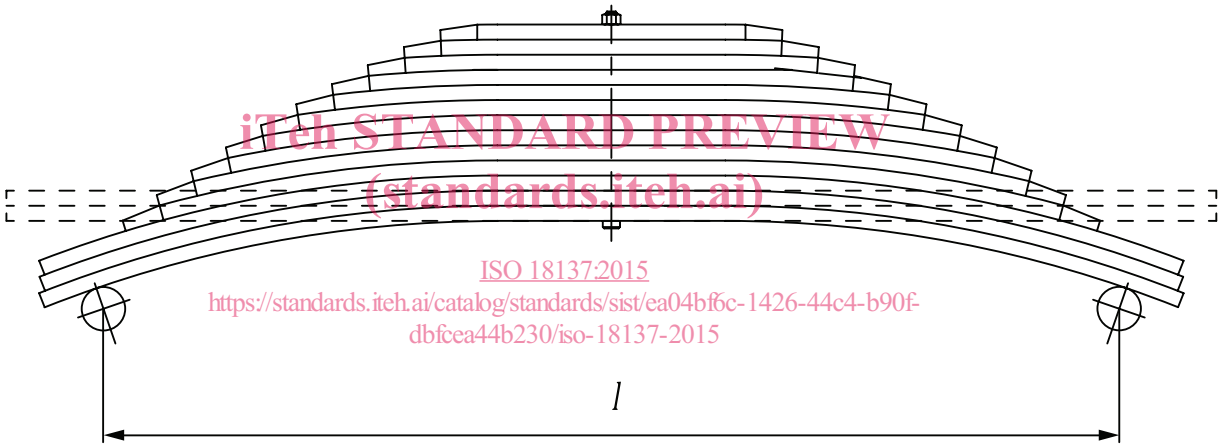


Key

l span

l_A fixed half span

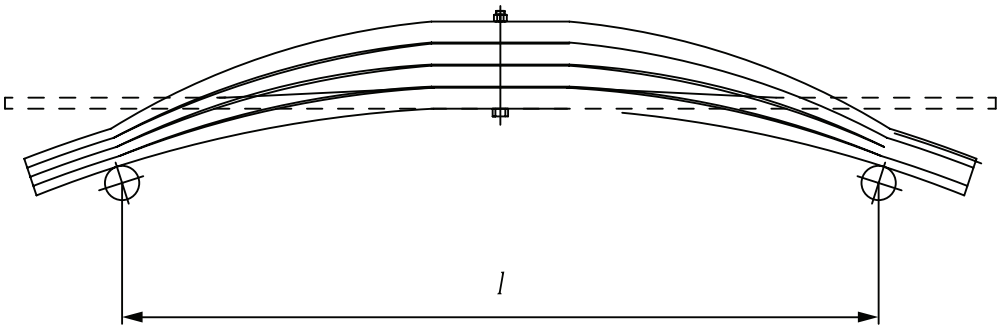
Figure 4 — Parabolic spring with one eye and one sliding end



Key

l span

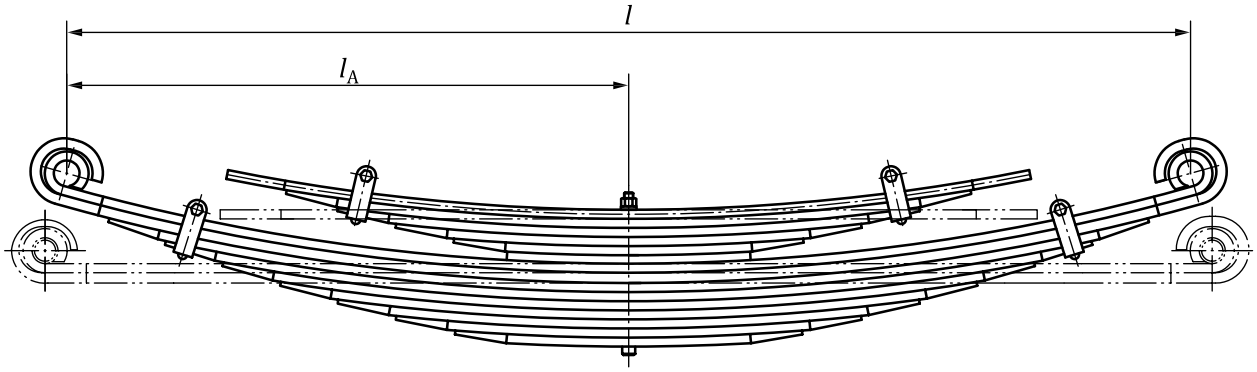
Figure 5 — Multi-leaf spring with sliding ends



Key

l span

Figure 6 — Parabolic spring with sliding ends

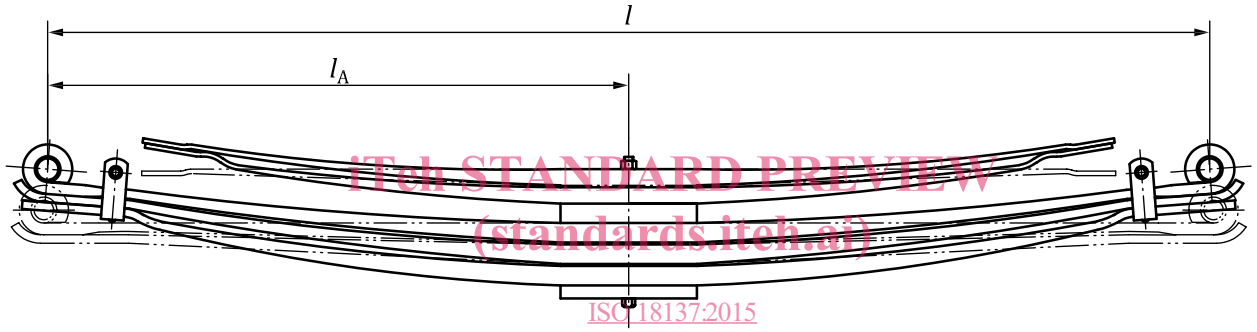


Key

l span

l_A fixed half span

Figure 7 — Two-stage progressive multi-leaf spring with helper spring

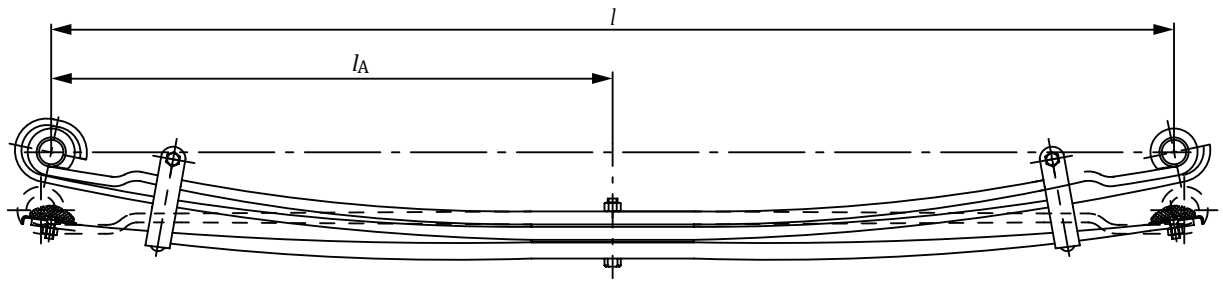


Key

l span

l_A fixed half span

Figure 8 — Two-stage progressive parabolic spring with helper spring

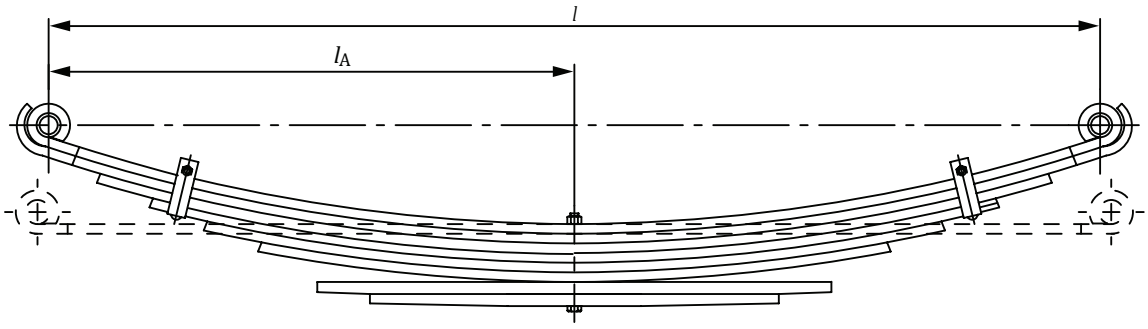


Key

l span

l_A fixed half span

Figure 9 — Two-stage rate parabolic spring with auxiliary spring



Key

l span

l_A fixed half span

Figure 10 — Progressive (rate) spring

6 Technical requirements

6.1 Materials

Unless otherwise agreed by the purchaser and the supplier, the springs should be made from the hot rolled spring flat bar conforming to ISO 683-14.

6.2 Tolerances of spring dimensions and shapes

6.2.1 Span

The tolerances of the straight span and the fixed half straight span should be in accordance with Table 2.

Table 2 — Tolerances of span

Dimensions in millimetres

Straight span, l_{ST}			**Fixed half straight span**, $l_{ST,A}$		
Range	**Tolerances**		**Range**	**Tolerances**	
	Type 1	Type 2		Type 1	Type 2
$l_{ST} \leq 1\,200$	±3,0	±3,5	$l_{ST,A} \leq 600$	±1,5	±2,0
$1\,200 < l_{ST} \leq 1\,600$	±3,0	±5,0	$600 < l_{ST,A} \leq 800$	±1,5	±2,5
$1\,600 < l_{ST} \leq 2\,000$	±3,0	±6,0	$800 < l_{ST,A} \leq 1\,000$	±1,5	±3,0
$l_{ST} > 2\,000$	±4,0	±6,5	$l_{ST,A} > 1\,000$	±2,0	±3,5

The type of the spring should be agreed between the purchaser and the supplier.

6.2.2 Assembled spring width

The tolerances of the assembly spring width should be in accordance with Table 3, the tolerances of the width of the machined part should be agreed between the purchaser and the supplier. (For test methods, see A.2.)