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ISO/DIS 18137-1

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Leaf springs —

Part 1:
Technical requirements and test methods

Ressorts à lames —

Partie 1: Exigences techniques et méthodes d'essai

ICS: 21.160

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 18137-1 was prepared by Technical Committee ISO/TC 227, *Springs*.

Leaf springs — Part 1: Technical requirements and test methods

1 Scope

This International standard specifies the technical requirements and test methods 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 symbols

3.1 Terms

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

3.2 Symbols and units

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	F_d	mm	Camber under design (nominal) load
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 divided by one unit of deflection of the spring
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

4 Spring types

The most common spring types are shown in the following.

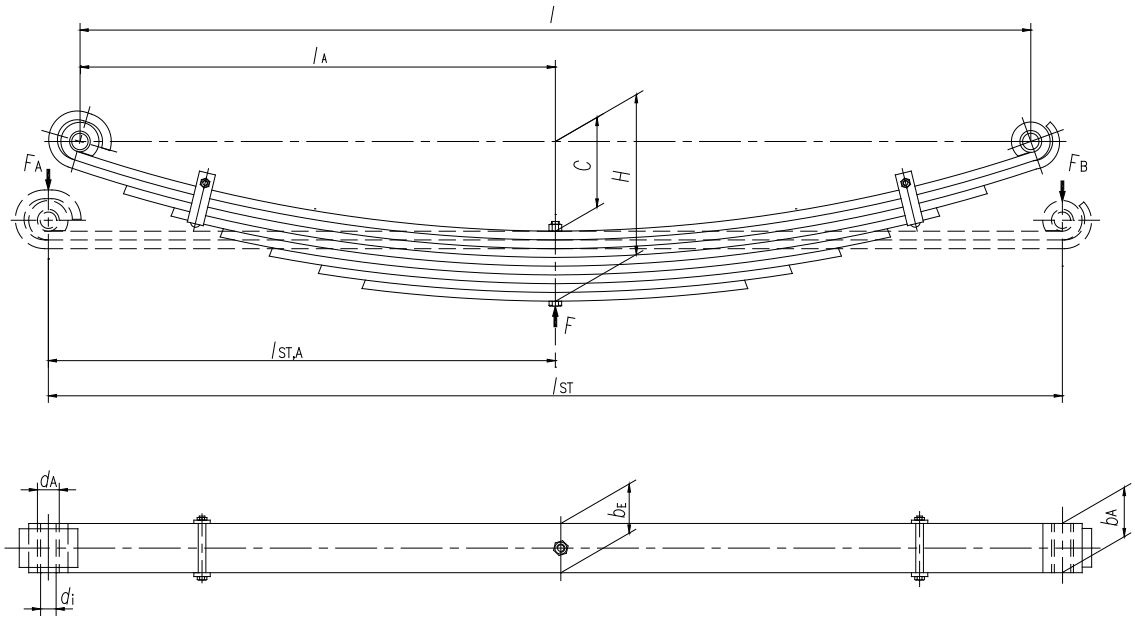
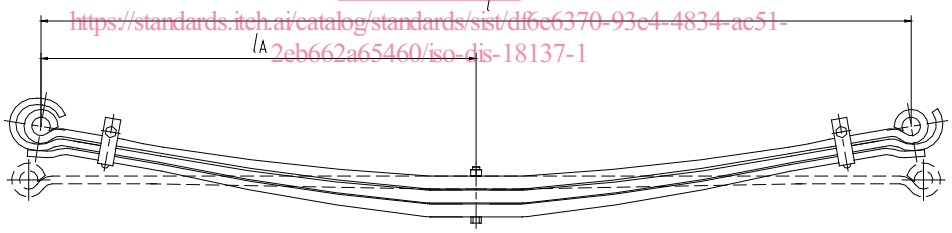
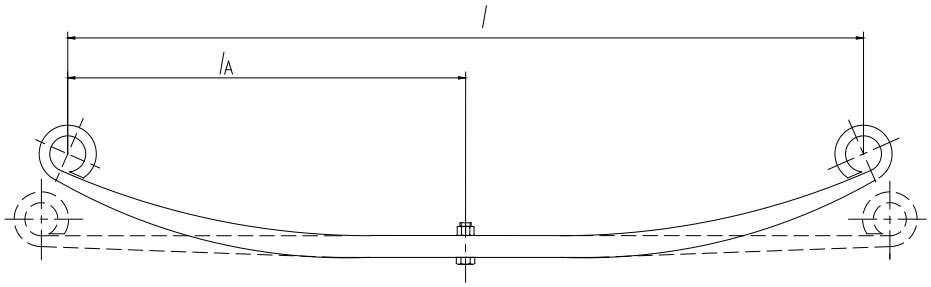


Figure 1 — Multi-leaf spring with eyes



(a)



(b)

Figure 2 — Parabolic spring with eyes

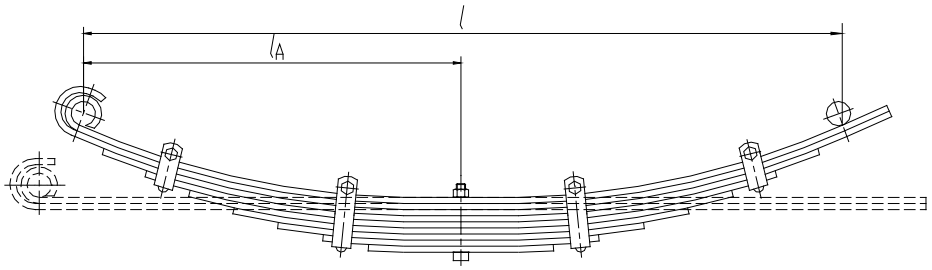


Figure 3 — Multi-leaf spring with one eye and one sliding end

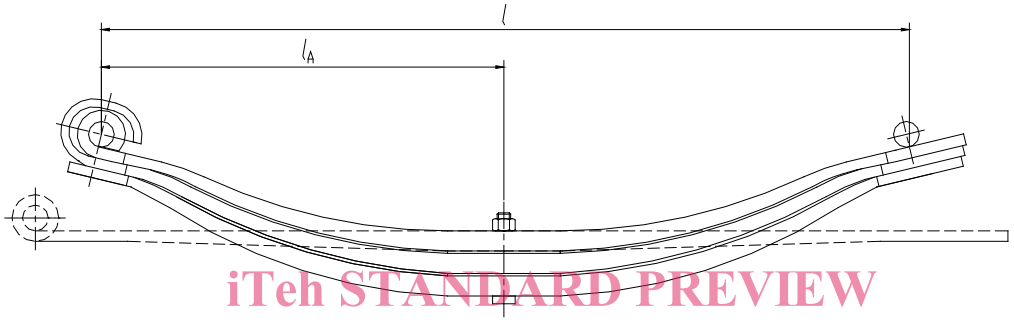


Figure 4 — Parabolic spring with one eye and one sliding end

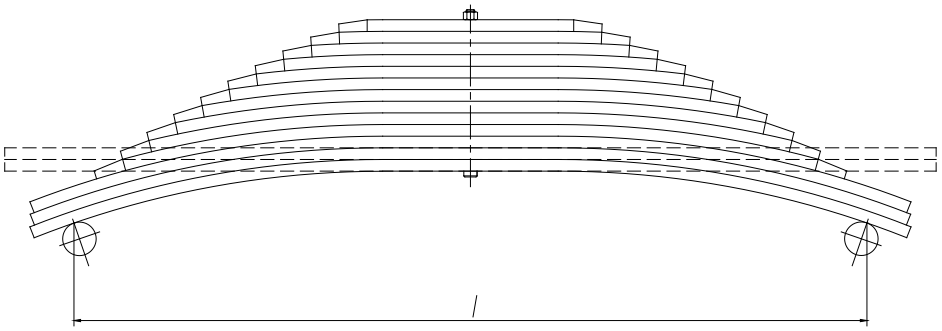


Figure 5 — Multi-leaf spring with sliding ends

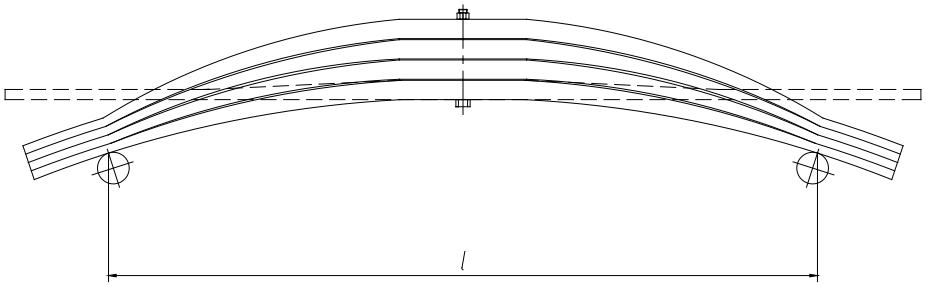


Figure 6 — Parabolic spring with sliding ends

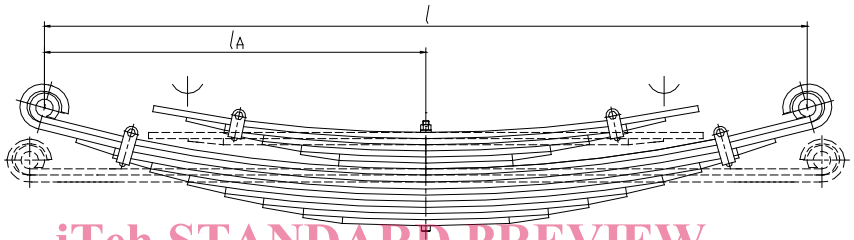


Figure 7 — Two-stage progressive multi-leaf spring with helper spring

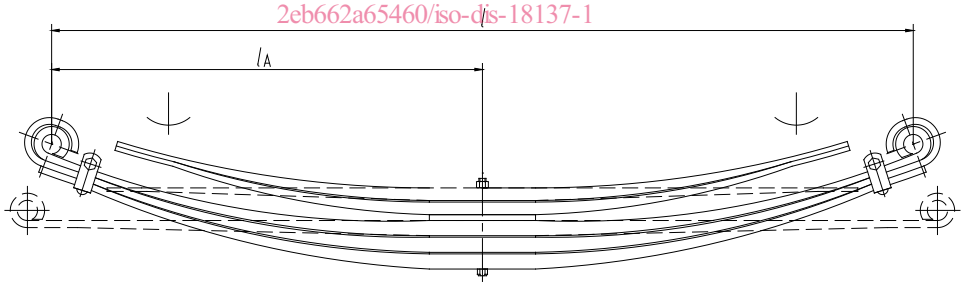


Figure 8 — Two-stage progressive parabolic spring with helper spring

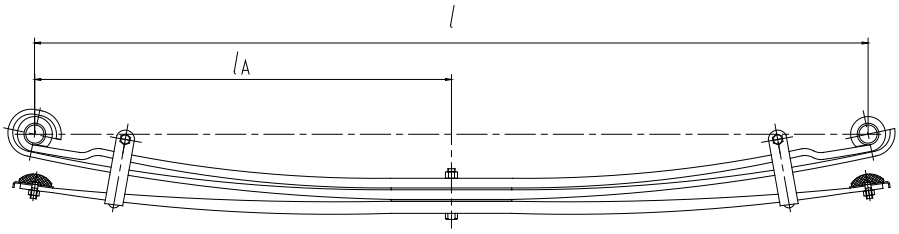


Figure 9 — Two-stage rate parabolic spring with auxiliary spring

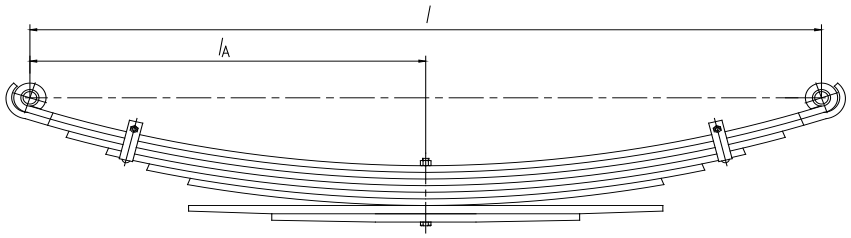


Figure 10 — Progressive (rate) spring

5 Technical requirements

5.1 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.

5.2 Tolerances of spring dimensions and shapes

5.2.1 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} r 1200	± 3,0	± 3.5	$l_{ST,A}$ r 600	± 1,5	± 2,0
1200 < l_{ST} r 1600	± 3,0	± 5.0	600 < $l_{ST,A}$ r 800	± 1,5	± 2,5
1600 < l_{ST} r 2000	± 3,0	± 6,0	800 < $l_{ST,A}$ r 1000	± 1,5	± 3,0
l_{ST} > 2000	± 4,0	± 6,5	$l_{ST,A}$ > 1000	± 2,0	± 3,5

5.2.2 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.

Table 3 — Tolerances of the assembly spring width

Dimensions in millimetres

Assembly spring width, b_E	Tolerances
b_E r 75	+ 2,5 - 0,8
75 < b_E r 100	+ 3,0 - 0,8
100 < b_E r 125	+ 3,5 - 0,8
b_E > 125	+ 4,0 - 0,8

5.2.3 Spring end width

The tolerances of the spring eye width should be in accordance with Table 4.

Table 4 — Tolerances of the spring eye width

Dimensions in millimetres

Spring eye width, b_A	Tolerances
Machined	$^{0}_{-0,5}$
Unmachined	± 1,5

The tolerances of the spring sliding end width should be agreed between the purchaser and the supplier.

5.2.4 Eye inner diameter and bush inner diameter

The tolerances of the inner diameter of the unmachined eye should be in accordance with Table 5. The tolerances of the machined eye inner diameter should be agreed between the purchaser and the supplier.

Table 5 — Tolerances of the eye inner diameter

Dimensions in millimetres

Eye inner diameter, d_E	Tolerances
d_E r 25	± 0,5
25 < d_E r 40	± 0,6
d_E > 40	± 0,7

The tolerances of the bush inner diameter should be agreed between the purchaser and the supplier.