Cylindrical helical springs made from round wire and bar — Guide to methods of specifying, tolerances and testing —

Part 2: Extension springs

ICS 21.160

British Standards

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee GME/15, Mechanical springs, upon which the following bodies were represented:

British Impact Treatment Association

Institute of Spring Technology

This British Standard, having been prepared under the direction of the Engineering Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 25 September 2002

The following BSI references relate to the work on this British Standard:

Committee reference GME/15

Draft for comment 02/702407 DC

ISBN 0 580 39720 3

Amendments issued since publication

Amd. No.	Date	Comments

Contents

Foreword

BS 1726-2 was first published in 1951 and revised in 1964 to incorporate much of the essential information from ADE Design Data Sheets, which were no longer available from HM Stationery Office and for which copyright permission to republish was obtained. The standard was revised in 1988 take account of current manufacturing processes.

BS EN 13906-2 was published in 2001 and under the rules of CEN the UK is obliged to withdraw conflicting standards.

This edition of BS 1726-2 includes those provisions of the previous edition not included in the EN standard.

Together with BS EN 13906-2:2001, this edition of BS 1726-2 supersedes BS 1726-2:1988, which is withdrawn.

BS 1726 is published in three parts:

— *Part 1: Compression springs*;

— *Part 2: Extension springs*;

— *Part 3: Torsion springs*.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document consists of a front cover, an inside front cover, pages i and ii, pages 1 to 13 and a back cover.

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1 Scope

This Part of BS 1726 provides guidance on the specification, tolerancing and testing of parallel sided helical compression springs manufactured from round wire and bar.

Two grades of tolerance, 1 and 2, are given for springs.

Fifteen types of end coils are provided for, these being divided into three groups.

This standard applies to springs which have not been subjected to heat treatment other than stress relieving after coiling.

This standard gives two methods of specifying springs and a methods of testing springs.

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 applies.

BS 887, *Specification for precision vernier callipers.*

BS 969, *Specification for limits and tolerances on plain limit gauges.*

BS EN ISO 7500-1, *Tension/compression testing machines — Verification and calibration of the force measuring system.*

BS 1726-1, *Cylindrical helical springs made from round wire and bar — Guide to methods of specifying, tolerances and testing — Part 1: Compression springs.*

BS EN ISO 3650, *Geometrical product specifications (GPS) — Length standards — Gauge blocks.*

BS 5411, *Methods of test for metallic and related coatings.*

BS EN 13906-2, *Cylindrical helical springs made from round wire and bar — Calculation and design — Part 2: Extension springs.*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this Part of BS 1726 the definitions given in BS 1726-1 apply as relevant.

3.2 Symbols

Symbol	Term	Unit
C	spring index	—
D	mean coil diameter	mm
D_i	inside diameter of spring	mm
D_o	outside diameter of spring	mm
D	material diameter	mm
E	material diameter tolerance	mm
f	natural frequency of unloaded spring	Hz
F	spring force	N
F_o	nominal initial tension	N
F_1, F_2, etc.	force at length L_1, L_2, etc.	N
ΔF	change in spring force	N
G	modulus of rigidity	N/mm^2
K	stress correction factor	—
L	spring length	mm
L_B	spring body length	mm
L_H	hook opening gap	mm

Symbol	Term	Unit
L_L	loop length	mm
$L_{max.}$	maximum length to which the spring will be extended in assembly or use	mm
L_o	free length of spring	mm
$L_{o, max.}$	maximum free length of spring	mm
$L_{o, tol.}$	free length tolerance	mm
ΔL	change in spring length	mm
n	number of active coils in spring	—
N	total number of coils in spring	—
R_m	minimum tensile strength	N/mm^2
S	spring rate	N/mm
$S_{tol.}$	spring rate tolerance	N/mm
δ	extension from nominal free length to loaded length	Mm
ρ	density of material	kg/mm^3
τ	shear stress in spring	N/mm^2
τ_0	shear stress in spring with initial tension	N/mm^2
τ_1, τ_2, etc.	shear stress in spring at F_1, F_2, etc.	N/mm^2

4 Specifying springs for general purposes

4.1 Introduction

There are two methods by which a customer may specify a spring. In the first method the customer presents the supplier with a complete design and indicates what manufacturing processes, such as stress relieving, prestressing and shot peening, should be carried out. In this case the information should be supplied on Data Sheet 1 (Figure 1).

When the customer does not have the information to complete Data Sheet 1, the customer should complete Data Sheet 2 (Figure 3). This is an application for spring design in which the customer should specify the requirements from an operational point of view, giving such information as dimensional constraints, force–length parameters, fatigue life, resistance to corrosion, in order that the supplier can produce a spring design to meet these requirements.

When the spring supplier has prepared a design from the information on Data Sheet 2 the spring supplier will complete Data Sheet 1 and submit it to the customer for approval.

4.2 Method one (customer design) using Data Sheet 1

4.2.1 *General*

It is not necessary to prepare a detailed scale drawing for a helical compression spring and details should be specified on Data Sheet 1 (Figure 1). Only essential dimensions and properties, for which the spring is to be inspected, need be toleranced, other features being given in the design for information only.

The following points should be noted before completing the form.

a) Specify only those particulars which are of functional importance by marking the appropriate squares in boxes 5, 6 and 8 of data sheet 1.

b) Avoid redundant dimensioning.

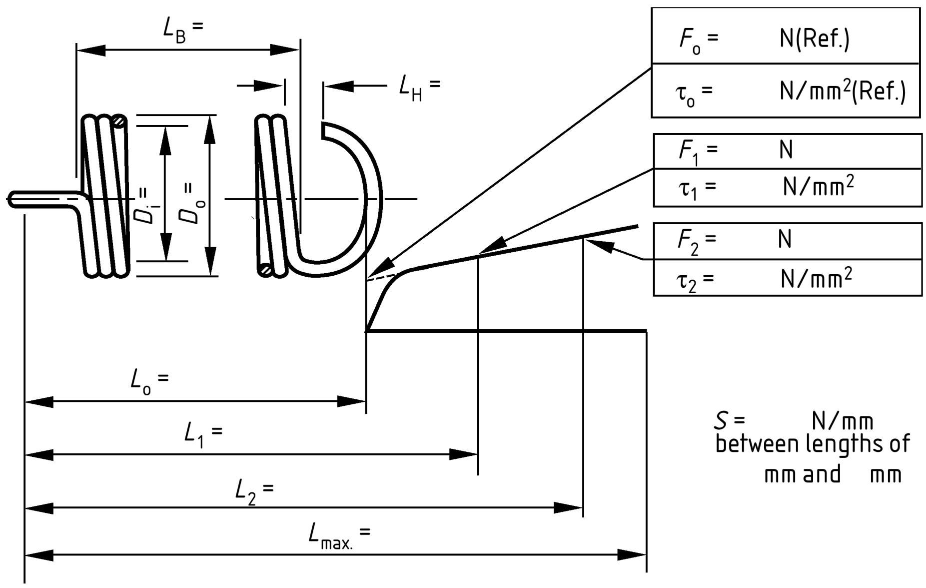
c) Refer to BS EN 13906-2 for the methods of calculation used to determine values for rate, force and stress.

d) If space is insufficient in any box, further details should be attached on a separate sheet and attention drawn to this fact in the relevant box on the form.

4.2.2 *Material*

Complete box 1 (Figure 1) by giving the material type and complete specification code, quoting the relevant British Standard where possible and the material diameter.

SPECIFICATION FOR HELICAL COMPRESSION SPRING **BS 1726-2:2002 DATA SHEET 1**	**Part** **Serial No.** ____________
This form should be completed with reference to BS 1726-2:2002, Clause 4.2	



All dimensions in mm.

NOTE Dimensions market "(Ref.)" are normally for reference only, and therefore do not have to be complied with unless the purchaser has specified in box 9

For nomenclature see Clause **3**

1 **Material** Specification number Diameter = mm	**8 Surface coating**
2 **Direction of coiling** Optional/	**9 Tolerances: mandatory requirement only**
3 **End loop form** Type (see Clause **5**) Relative position Where dimensions of loops are of importance, a drawing on a separate sheet of paper is to be attached.	 Grade 1 Value / Grade 2 Value / Other (specify) D_0 ____________ F_1 ____________ F_2 ____________ S ____________ L_1 ____________ L_2 ____________ — ____________ — ____________ — ____________
4 **Total number of coils** N =	
5 **Stress relieving** No Yes If yes Time min Temperature °C **6 Shot peening** No Yes Fatigue requirement:	**10 Identification**
7 **Performance tests** Relaxation: No Yes Details: Fatigue: No Yes Details:	**11 Special Requirement**
Sheet 1 of ________________________	Serial/design/Part No.

Figure 1 — Data sheet 1

4.2.3 *Direction of coiling*

The direction of coiling is rarely important for the spring function, and unless it is included in box 2 it should be assumed that the supplier is free to coil either hand (see Figure 2). However, for springs with plain end and threaded plug [see Figure 6(d)] the hand of coiling should be stated.

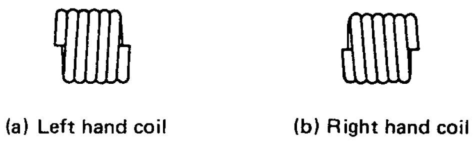


Figure 2 — Hand of coiling

4.2.4 *End loop form*

The name (see Figure 4, Figure 5 or Figure 6) and the relative position of the end loops, if appropriate, should be entered in box 3.

4.2.5 *Total number of coils*

The total number of coils may be given in box 4 for reference but should only be toleranced by agreement with the spring supplier.

NOTE Variation of the total number of coils is the most common method of achieving in-manufacture correction, and for this reason it is not measured unless there is special agreement between the customer and supplier to do so.

4.2.6 *Stress relieving*

Indicate in box 5 whether or not stress relieving is required. If it is, the time and temperature should be given.

NOTE Attention is drawn to the fact that stress relieving can reduce the amount of initial tension in the spring.

4.2.7 *Shot peening*

Shot peening requirements should be indicated in box 6.

NOTE Owing to the form of extension springs shot peening is generally only applied to the end loops. In specialist cases, where fatigue within the coils is a concern, the spring can be extended within its elastic limit and shot peening applied to the whole spring form.

4.2.8 *Performance tests*

The most common tests are for relaxation and fatigue. Details of the tests should be given in the space provided in box 7. For relaxation tests the minimum information required is extended length, temperature and test duration along with the maximum allowable force loss. For fatigue tests the maximum and minimum working positions, temperature and life required should be stated. For both types of test the batch size should also be given.

If more specialized tests are required, such as dynamic relaxation or corrosion tests, then these details should be given in box 11.

4.2.9 *Surface coating*

Surface coatings can be specified in box 8. Where possible the number of the relevant British Standard should be quoted.

NOTE Coatings applied subsequent to the manufacture of a close coiled spring cannot be expected to afford complete coverage.

4.2.10 *Tolerances*

Tolerances on coil diameter, free length, force at length, etc. should be calculated as indicated in Clause **6** and this should be referred to before completing the tolerance box (box 9).

Marking the appropriate tolerance indicates that the tolerances required are those calculated using the expressions/data given in Clause **6**.

If the designer has requirements for tolerances other than those calculated under Clause **6**, these should be given under the heading "Other (specify)" in box 9.

When establishing the spring dimensions and tolerances, it should be borne in mind that no single parameter may be changed without affecting one or more of the remaining parameters. Only those parameters which have to be met should be toleranced and the supplier should be left free to adjust the remainder in order to meet the specification in Data Sheet 1.

For example, where two force–length dimensions, material diameter and a coil diameter are specified as of critical importance, the number of turns and free length should only be specified as reference values. Similarly, where a coil diameter, one force–length dimension, the material diameter and number of turns are of importance, variation in the free length should be allowed.

4.2.11 ***Identification***

If identification of individual springs is required, this should be indicated in box 10, noting that colour marking is the most common method used.

4.2.12 ***Special requirements***

Where the designer has requirements for the spring which cannot be detailed elsewhere on the data sheet, they should be given in box 11.

4.3 Method two (application for spring design) using Data Sheet 2

4.3.1 ***General***

Insert relevant dimensions on the drawing, giving only those which are dictated by the design of the mechanism in which the spring is to operate.

4.3.2 ***Free length***

A maximum free length, $L_{o,\ max.}$, should not be specified unless it is necessary for assembly purposes.

4.3.3 ***Force–length conditions***

The required force–length conditions should be specified, together with either the maximum force or length.

4.3.4 ***Spring rate***

Where the spring rate is deemed more important than specific force–lengths, it should be specified between two lengths. A single force–length may also be specified.

4.3.5 ***End coil formation***

The type of end coil (see Clause **5**) should be specified in box 1.

4.3.6 ***Operation***

Springs should be designed on the assumption that normal operation will involve the spring remaining static at a force–length with occasional, gradual movement to another specified loaded length.

If the spring is expected to withstand dynamic operation, i.e. greater than 10 000 cycles, then the minimum required life, operating levels of length, force or stress, speed of operation, and mode of operation (if an approximation to simple harmonic motion would not be acceptable) should be specified in box 2.

4.3.7 ***Temperature***

The maximum and minimum temperatures to which the spring will be subjected during its working life are to be specified in box 3. Where a spring is subjected to temperatures outside this range, the conditions of temperature, time and force should be specified in box 5.

4.3.8 ***Relaxation***

Where it is important to maintain a force within close limits throughout the life of a spring, the maximum allowable force loss (relaxation) should be given in box 4 along with details of temperature, duration and the extended length of the spring under the stated conditions.

4.3.9 ***Atmosphere and special protection details***

Where special cleanliness, resistance to corrosive atmospheres or such qualities as magnetic or electrical resistance are required, these conditions should be specified in box 6 and performance criteria agreed between the customer and supplier.

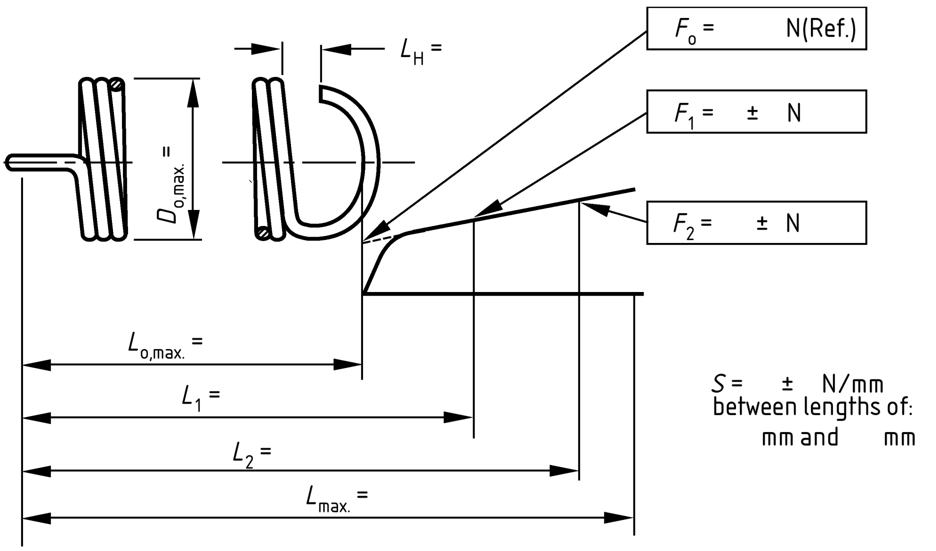
4.3.10 ***Surface coating***

If a specific surface coating is required, such as for identification, protection or decorative purposes, this can be given in box 7.

4.3.11 ***Other requirements***

Any requirements other than those detailed in **4.3.1** to **4.3.10** should be given in box 8.

SPECIFICATION FOR HELICAL COMPRESSION SPRING **BS 1726-2:2002 DATA SHEET 2**	**Part** **Serial No. ________**
This form should be completed with reference to BS 1726-2:2002, Clause 4.3	



All dimensions in mm.

NOTE Dimensions market "(Ref.)" are normally for reference only.

For nomenclature see Clause **3**

1 End loop form Type (see Clause **5**) Relative position Where important, loop details, dimensions and the method of fixing are to be given on a separate sheet of paper and attached to this data sheet	**5 Assembly, or further processing details**
2 Operation (if dynamic) Minimum required life ________________cycles Speed of operation _______________Hz Maximum force–length _______________N·mm Minimum force–length _______________N·mm	**6 Atmosphere, special protection details**
3 Temperature Minimum operating temperature __________________°C Maximum operating temperature __________________°C	**7 Surface coating**
4 Relaxation Permissible relaxation ________________ % length = ________________ mm time = ________________ h temperature = ________________ °C	**8 Other requirement**
Sheet 1 of ________________________________	Serial/design/Part No.

Figure 3 — Data sheet 2

5 Types of end loop

Three groups of end loop are dealt with in this Part of BS 1726 as follows.

a) *Group 1* (see Figure 4) to which the tolerances given in Clause **6** can be applied.

b) *Group 2* (see Figure 5) to which the tolerances given in Clause **6** can be applied with the following restrictions:

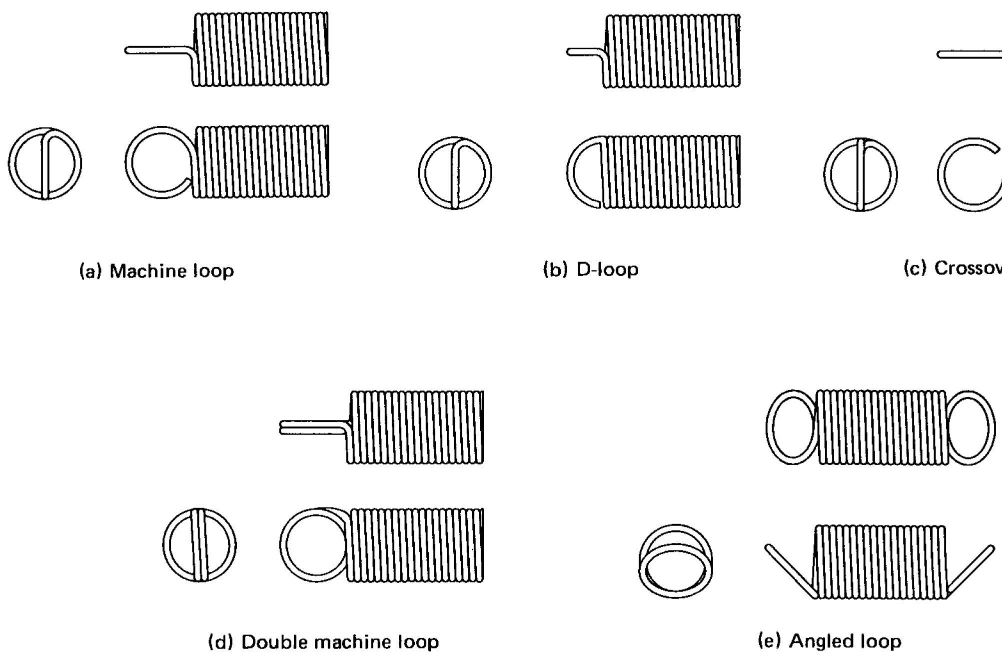
1) the length of the loops, L_L, is restricted to a maximum of 1.75 times the outside diameter of the spring, D_o;

2) only grade 2 load and length tolerances are applicable;

3) the minimum number of coils is 6.

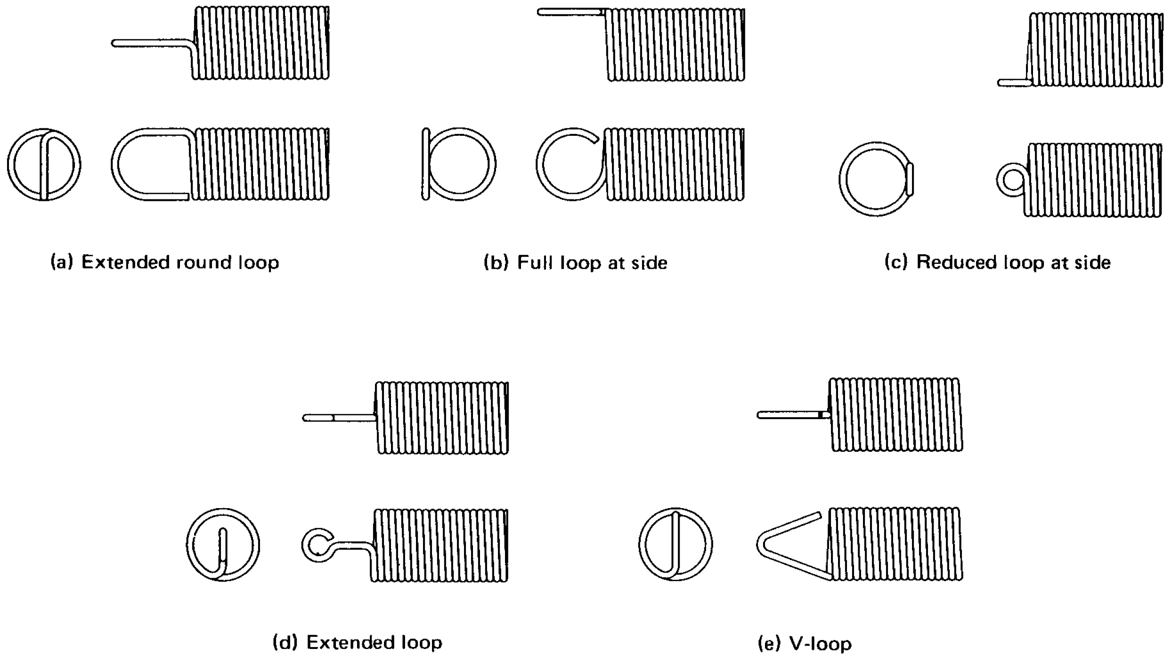
c) *Group 3* (see Figure 6) for which the tolerances are to be agreed between the customer and the supplier.

NOTE The nomenclature associated with the various end loop configurations is not intended to define the method of manufacture.



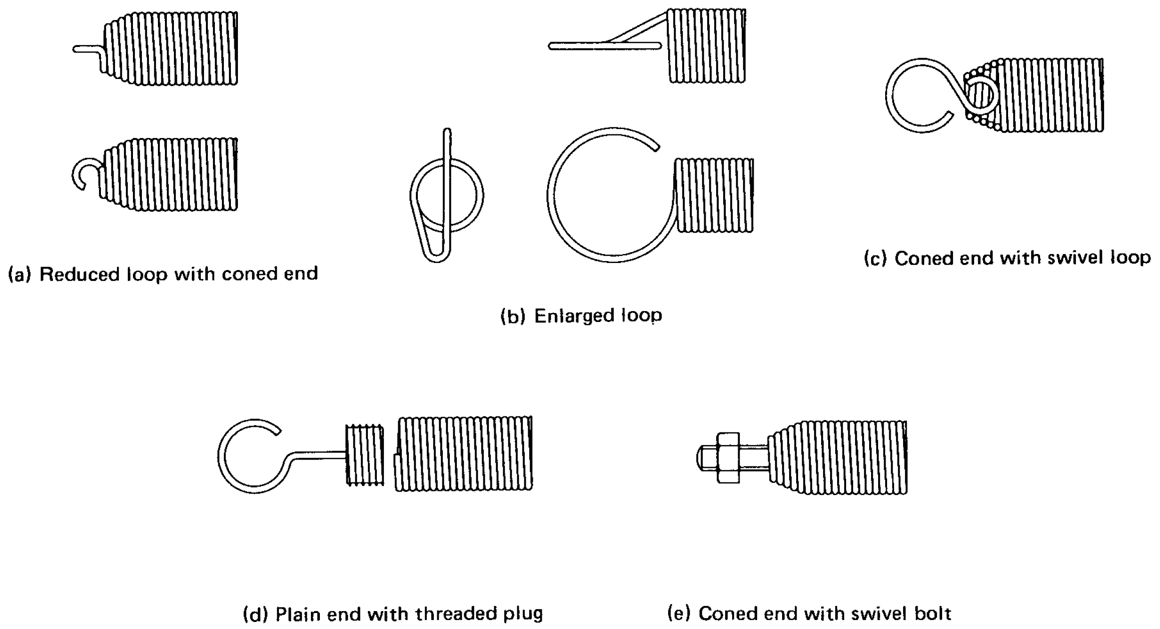
NOTE The loading is axial

Figure 4 — Group 1 end loops



(a) Extended round loop
(b) Full loop at side
(c) Reduced loop at side
(d) Extended loop
(e) V-loop

Figure 5 — Group 2 end loops



(a) Reduced loop with coned end
(b) Enlarged loop
(c) Coned end with swivel loop
(d) Plain end with threaded plug
(e) Coned end with swivel bolt

Figure 6 — Group 3 end loops

6 Tolerances

NOTE 1 Tolerances are based on experience gained within the spring industry, but no process control capability is implied. Where process control capability is required this will need to be agreed between the customer and the supplier.

NOTE 2 The tolerances calculated are the maximum deviations from the specified dimension.

6.1 General

The tolerances given in this clause are those recommended for economic production in two grades, 1 and 2, and only apply to springs with an index in the range 3.5 to 16 inclusive and a total number of coils, N, of not less than 3.5.

In the case of group 2 end loops the tolerances apply only to springs with a total number of turns of not less than 6.

NOTE The choice of tolerance grades will be governed by operational requirements. Grade 1 covers tolerances where close agreement with nominal specification is required, while grade 2 allows wider tolerances. Generally, where several features are toleranced, a combination of grades 1 and 2 is used. Where designers find it necessary to specify tolerances tighter than grade 1, they should consult their supplier as to the practicability or economy of the design in question. The use of wider tolerances should result in more economical production.

6.2 Dimensional tolerances

6.2.1 ***Material diameter***

Tolerances relating to the material being used apply prior to the spring being coiled.

6.2.2 ***Coil outside diameter***

6.2.2.1 The expressions in **6.2.2.2** and **6.2.2.3** give the tolerance (in mm) to be applied to the outside diameter of the parallel body of the spring.

6.2.2.2 The grade 1 tolerance is either:

a) $\pm\frac{1\,000 + (c + 20)(D + 8)}{10\,000}$; or

b) ±1.5 % of the mean diameter,

whichever is the greater.

6.2.2.3 The grade 2 tolerance is 1.5 times the grade 1 tolerance.

6.2.3 ***Free length***

6.2.3.1 A free length tolerance, $L_{o,\ tol.}$, should not be applied to springs subject to two force–length constraints or to one force–length constraint and a rate constraint. In other cases, if a free length tolerance is required, the expressions in **6.2.3.2**, **6.2.3.3** and **6.2.3.4** apply.

6.2.3.2 The grade 1 tolerance (in mm) for closed coiled springs is given by the expression:

$\pm 0.02\ L_o + (N + 1)e$

A minimum tolerance of ±2.5 % of the nominal free length applies.

6.2.3.3 The grade 1 tolerance (in mm) for open coiled springs is given by the expression:

$$\pm\frac{(L_o + 10)(c + 25)}{1\,200} + 0.05D$$

A minimum tolerance of ±3.5 % of the nominal free length applies.

6.2.3.4 The grade 2 tolerance (in mm) is 1.5 × the applicable grade 1 tolerance.

A minimum tolerance of ±5 % of the nominal free length applies.

6.2.4 ***Relative loop position***

The following expressions give the tolerance (in degrees) on the relative loop position.

a) The grade 1 tolerance is given by the expression:

$\log_e^{-1}(0.441 \log_e N + 2.57)$

Results of calculations using this expression are given in Table 1, but in cases of dispute the expression should be used.

b) The grade 2 tolerance is 1.5 × the grade 1 tolerance.

6.2.5 ***End loop squareness and symmetry***

End loop squareness and symmetry should not be toleranced unless they affect the functioning of the spring, in which case they should be subject to agreement between the customer and supplier.

Table 1 — Grade 1 relative loop position tolerances

Number of coils N	Tolerance ± degrees	Number of coils N	Tolerance ± degrees
3.5	22	80	90
6	29	100	100
10	36	120	108
20	49	140	116
30	59	160	123
40	67	200	135
60	79	—	—

6.3 Property tolerances

NOTE In specifying any property tolerance only the nominal free length is to be used as a reference point and not the actual free length.

6.3.1 ***Force at length***

NOTE It is possible, although not normal practice, to specify spring length under a given force. In this case the tolerances are to be agreed between the customer and the supplier.

The tolerances (in N) given by the following expression should be applied only in the range 20 % to 80 % of the safe deflection.

$$\pm L_{o,tol} \times S + \frac{(0.04 R_m d^3)}{D} + S_{tol}\delta$$

where $S_{tol.}$ is the percentage spring rate tolerance × the spring rate.

For grade 1 force tolerance, $S_{tol.}$ and $L_{o,\ tol.}$ are the corresponding grade 1 tolerances for spring rate and free length respectively (see **6.2.3** and **6.3.2** respectively).

For grade 2 force tolerance, $S_{tol.}$ and $L_{o,\ tol.}$ are the corresponding grade 2 tolerances for spring rate and free length respectively (see **6.2.3** and **6.3.2** respectively).

6.3.2 ***Rate***

6.3.2.1 The rate tolerances given in this clause apply only to the range 20 % to 80 % of the safe deflection from the nominal free length of the spring, and to springs with more than 3.5 total coils and less than 5 total coils.

The two lengths between which the rate is to be determined and toleranced have to be given.

a) The grade 1 tolerance is

$$\pm \frac{0.224N(N+205)}{N-2.9}\%$$

b) The grade 2 tolerance is 1.5 times the grade 1 tolerance.

Results of calculations using the preceding expressions are given in Table 2 for total coils between 3.5 and 5, but in cases of dispute the expressions should be used.

Table 2 — Tolerances on spring rate

Number of coils N	Tolerance		Number of coils N	Tolerance	
	Grade 1 ± %	Grade 2 ± %		Grade 1 ± %	Grade 2 ± %
3.5	7.8	11.7	4.3	4.7	7.1
3.6	7.0	10.5	4.4	4.5	6.8
3.7	6.4	9.6	4.5	4.4	6.6
3.8	6.0	9.0	4.6	4.3	6.5
3.9	5.6	8.4	4.7	4.2	6.3
4.0	5.3	8.0	4.8	4.1	6.2
4.1	5.1	7.7	4.9	4.1	6.2
4.2	4.8	7.2	5.0	4.0	6.0

6.3.2.2 For springs with 5 or more coils the tolerance on spring rate is ±4 % for grade 1 and ±6 % for grade 2.

7 Methods of verification

7.1 General

The methods of testing a spring parameter are numerous and any may be used. However, it is suggested that the methods given in **7.2.1** to **7.4.3** should be used in cases of arbitration or disagreement.

Nominal dimensions and those marked for reference only need not be checked.

NOTE It is appreciated that for very small quantities the production of suitable gauges may not be economical and in these cases alternative methods should be agreed between the customer and the supplier.

7.2 Dimensional verification

7.2.1 *General*

Carry out all dimensional tests with the spring in its free state.

Extend springs to their maximum working length, $L_{max.}$, and release before testing.

7.2.2 *Material diameter*

Use a micrometer with the appropriate anvil to measure the material diameter, d, to obtain an indication of its size.

NOTE The dimension obtained can be only an indication since the diameter of the material will change due to slight distortion during coiling, and tolerances cannot therefore apply.

7.2.3 *Outside diameter*

Use a GO–NOT GO system of sleeve or gap gauges to measure the outside diameter, D_o, to determine whether the spring will function within a specified diameter.

Where the diameter of the spring body is important the minimum gauge length should be 1.5 times the material diameter.

NOTE 1 The mean diameter, D, cannot be measured.

NOTE 2 The inside diameter cannot be directly measured. In general this diameter should be controlled by the tolerance on the outside diameter except where a threaded insert is used [see Figure 6(d)], where a GO–NOT GO system of plug gauges may be used.

7.2.4 *Free length*

Use a precision vernier calliper in accordance with BS 887 to measure the free length, L_o, of springs if the free length is toleranced.

Place the vernier calliper over the end loops and subtract two nominal material diameters from the reading obtained.

Where the mass of the spring may affect the accuracy of measurement, lay the spring in a horizontal position and use GO–NOT GO gap gauges.

NOTE The body length cannot be measured.

7.2.5 ***Number of coils***

Determine the total number of coils, N, by counting the number of complete coils from one loop to the other and measure any remaining fraction with a protractor. For this purpose, the start and finish of the coils is determined by a plane through the end loops.

NOTE The number of active coils, n, cannot be measured.

7.2.6 ***Hook opening gap***

Measure the hook opening gap, L_H, using a GO–NOT GO plug gauge in accordance with BS 969.

7.2.7 ***Loop orientation***

Measure the relative orientation of end loops using a suitable jig and protractor.

NOTE It should be borne in mind that the relative orientation of end loops can vary depending upon the amount of initial tension present in the spring.

7.2.8 ***Thickness***

Measure the thickness of coating in accordance with BS 5411.

7.3 Property tests

7.3.1 ***General***

Extend springs to their maximum working length and release before testing.

7.3.2 ***Spring length***

Measure the spring force using a testing machine calibrated to class 1 of BS EN ISO 7500-1, or better. Measure spring length using a system calibrated to an accuracy of ±0.02 mm over the whole measuring range by means of gauge blocks which meet the requirements of grade 2 of BS EN ISO 3650 or better.

NOTE If force measurements are only to be made at several discrete lengths, each position can be exactly established by using gauge blocks which comply with grade 2 of BS EN ISO 3650 or better.

7.3.3 ***Rate***

Determine the spring rate in the range of 20 % to 80 % of the safe deflection by carrying out force measurements (F_1 and F_2) at two agreed lengths (L_1 and L_2) and calculate the spring rate using the expression

$$S = \frac{F_2 - F_1}{L_2 - L_1}$$

All coils are to be working when the measurements are taken.

7.3.4 ***Initial tension***

Obtain an approximation of the initial tension, which cannot be measured directly, by calculation from two force–lengths and the free length.

NOTE 1 Some properties of the material (e.g. tensile strength and ductility) cannot be determined after the wire has been coiled.

NOTE 2 Hysteresis in extension springs covered by this Part of BS 1726 is extremely small. If a determination is required for special applications the method of test and tolerances applied are to be the subject of agreement between the customer and supplier. However, it should be borne in mind that in view of the small magnitude of this effect very accurate testing equipment is necessary to undertake such measurements.

NOTE 3 Linearity of extension springs is rarely specified. For springs covered by this Part of BS 1726 non-linearity of the force–deflection curve is not normally significant. If, however, it is necessary to determine this property then the test method and tolerances applied are to be the subject of agreement between the customer and supplier.

7.4 Performance testing

7.4.1 Owing to the nature of these tests and the time involved in carrying them out test only a small sample of springs, as agreed between the customer and supplier. Discard thereafter testing.

7.4.2 Relaxation

Determine the relaxation characteristics of a spring by clamping the spring to the length corresponding to the required force and exposing the spring to a period at a specified temperature. The relaxation characteristic is determined by measuring the specified force at length or length at force and comparing with a value measured before exposure.

NOTE 1 The method of determining the relaxation characteristics of a spring is to be agreed between the customer and supplier.

NOTE 2 The period of the test and the temperature at which it is carried out will vary according to the intended use of the spring and these will also need to be agreed between the customer and supplier.

7.4.3 ***Corrosion***

To obtain an indication of the effects of corrosion on the characteristics of a spring, carry out static or dynamic tests in conditions that simulate working conditions.

NOTE The condition of the test environment and criteria for acceptance will need to be agreed between the customer and supplier.

7.4.4 ***Spring life***

Determine the spring life by carrying out tests which simulate factors that will contribute to its degradation, e.g. environment, fatigue, stress.

NOTE These tests will need to be agreed between the customer and the supplier.

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BSI
389 Chiswick High Road
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W4 4AL