



BSI Standards Publication

**Cylindrical helical springs made
from round wire and bar –
Guide to methods of specifying
and tolerancing hot coiled
springs, and cold coiled springs
not covered by BS EN 15800,
and general spring testing**
Part 1: Compression springs

Publishing and copyright information

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to ii, pages 1 to 22, an inside back cover and a back cover.

Foreword

Publishing information

This part of BS 1726 is published by BSI and came into effect on 30 November 2010. It was prepared by Technical Committee FME/9, *Fasteners*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

Together with BS EN 15800:2008, this part of BS 1726 supersedes BS 1726-1:2002, which is withdrawn.

Relationship with other publications

BS EN 13906-1 was published in 2002 and under the rules of CEN the UK is obliged to withdraw conflicting standards. The 2002 edition of BS 1726-1 included those provisions of the previous edition not included in the EN standard. The publication of BS EN 15800 has prompted this revision of BS 1726-1 to reflect the reduced scope of this standard.

Information about this document

BS 1726-1 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 1987 to take account of current manufacturing processes.

BS 1726 is published in three parts:

- *Part 1: Compression springs;*
- *Part 2: Extension springs;*
- *Part 3: Torsion springs.*

Use of this document

BSI permits the reproduction of BS 1726-1:2010, Figure 1 and Figure 5. This reproduction is only permitted where it is necessary for the user to record findings on the figures during each application of the standard.

As a guide, this part of BS 1726 takes the form of guidance and recommendations. It should not be quoted as if it were a specification or a code of practice and claims of compliance cannot be made to it.

Presentational conventions

The guidance in this standard is presented in roman (i.e. upright) type. Any recommendations are expressed in sentences in which the principal auxiliary verb is "should".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

1 Scope

This part of BS 1726 provides guidance on methods of specifying and tolerancing hot coiled compression springs, and cold coiled springs that fall outside the size range limits specified in BS EN 15800. In addition, this standard includes in Annex A the general testing methods for parallel sided helical compression springs that are applicable to both hot and cold coiled springs manufactured from circular section material.

Two grades of tolerance, 1 and 2, are given for hot coiled circular section springs, or cold coiled springs that fall outside the size ranges specified in BS EN 15800.

Three types of end coils are provided for, i.e. open end, closed end, and closed and ground end, the last of these being applicable only to springs where the diameter or axial dimension of material is 0.5 mm or greater.

This part of BS 1726 differentiates between springs that have or have not been stress relieved after forming (designated group A), and springs, the material of which has undergone a structural change by heat treatment after forming (designated group B).

This standard gives two methods of specifying springs for general purposes and one method 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 EN 13906-1, *Cylindrical helical springs made from round wire and bar – Calculation and design – Part 1: Compression springs*

BS EN 15800, *Cylindrical helical springs made of round wire – Quality specifications for cold coiled compression springs*

BS EN ISO 26909, *Springs – Vocabulary*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this part of BS 1726, the terms and definitions given in BS EN ISO 26909 and the following apply.

3.1.1 edge dressing

removal of material from the outside edge of the end coils where they protrude beyond the outside diameter of the spring

3.1.2 group A springs

springs with material that has not undergone a structural change by heat treatment after forming

NOTE This may include both springs that have been stress relieved and those that have not.

3.1.3 group B springs

springs, the material of which has undergone a structural change by heat treatment after forming

3.1.4 safe deflection

maximum deflection that can be applied to a spring without exceeding the elastic limit of the material

3.2 Symbols

For the purposes of this part of BS 1726-1, the symbols in Table 1 apply.

Table 1 Symbols

Symbol	Term	Unit
c	spring index	—
D	mean coil diameter	mm
D_o	outside diameter of spring	mm
$D_{H, \min}$	minimum diameter of pocket into which spring has to fit	mm
D_i	inside diameter of spring	mm
$D_{s, \max}$	maximum diameter of spigot over which spring has to fit	mm
d	material diameter	mm
$d_{\max}$	maximum material diameter allowing for material diameter tolerance	mm
F	spring force	N
F_s	theoretical solid force	N
L	spring length	mm
L_o	free length of spring	mm
L_s	theoretical solid length of spring	mm
$L_{s, \max}$	maximum allowable solid length of spring	mm
n	number of active coils in spring	—
N	total number of coils in spring	—
R_i	inside radius to clear on spring seat	mm
R_o	outside radius to clear on spring seat	mm
S	spring rate	N/mm
δ	deflection from nominal free length to loaded length	mm
τ	shear stress in spring	N/mm ²
τ_s	theoretical solid stress in spring	N/mm ²
v	seating coefficient	—

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 5). 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 and 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 should 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; 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 tolerated, other features being given in the design for information only.

In completing the Data Sheet, users should:

- a) specify only those particulars which are of functional importance by marking the appropriate squares in boxes 1, 3, 5, 6, 7, 8, 9, 10 and 12 of Data Sheet 1;
- b) avoid redundant dimensioning;
- c) comply with BS EN 13906-1 for the method of calculation used to determine values for rate, force, stress and maximum solid length;
- d) attach further details on a separate sheet and draw attention to this fact in the relevant box on the form if space is insufficient in any box.

4.2.2 Material

Box 1 (Figure 1) should be completed by giving the material type and complete specification code, quoting the relevant British Standard where possible, the section shape and its dimensions and the heat treatment details, e.g. austemper, harden and temper, including the hardness required, if relevant.

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 is assumed that the supplier is free to coil either hand.

Figure 2 shows the generally accepted convention for defining hand of coiling. A simple practical method of determining the hand of a spring is as follows.

Hold the spring at eye level and look through it along its major axis. Rotate the spring about this axis until the visible cut end is at the bottom. If the cut end now points to the left, it is a left-hand coiled spring.

Figure 1 Data Sheet 1

SPECIFICATION FOR HELICAL COMPRESSION SPRING BS 1726-1:2010 DATA SHEET 1		Part Serial No. _____
This form should be completed with reference to BS 1726-1:2010, 4.2.		
For nomenclature, see BS 1726-1:2010, Clause 3.		7 Heat stabilization No Yes Relaxation requirements: 8 Shot peening No Yes Fatigue requirements: 9 Performance tests Relaxation: No Yes Details: Fatigue: No Yes Details:
1 Material Specification number _____ Diameter = _____ mm Heat treatment _____		10 Chamfering of spring ends No Yes Radius to clear: Internally Externally
2 Direction of coiling Right Left No preference		11 Surface coating
3 End coil shape Open Closed Closed and ground Other		12 Tolerance: mandatory requirements only Grade 1 Grade 2 Other value value (specify) D_0 D_1 F_1 F_2 S L_0 L_s _____ _____ _____
4 Total number of coils $N =$ _____		13 Identification 14 Special requirements
5 Thermal treatment a) Stress relieving (group A) No Yes If yes Time _____ min Temperature _____ °C b) Heat treatment and hardness (group B)		
6 Prestressing No Yes Compression to: Solid length L_s Minimum compressed length _____ mm Shall not cause permanent set		
Sheet 1 of _____		Serial/Design/Part No. _____

4.2.4 End coil form

Box 3 should be completed by indicating the type of end coil required, these being:

- a) open ends, where the helix is uniform throughout [see Figure 3a)];
- b) closed ends, where the helix in the end coil is equal to the material diameter or thickness [see Figure 3b)];
- c) closed and ground ends [see Figure 3c)].

NOTE 1 It is possible that the end coils might not be completely closed and that a gap might occur between the end coil tip and its adjacent coil.

NOTE 2 It is permissible for group B springs to have their ends formed by tapering the ends of the material before coiling (see Figure 4). Edge dressing is frequently necessary in this method of manufacture.

If any other end form is required, it should be illustrated, dimensioned and toleranced in a separate drawing and submitted to the manufacturer for agreement.

4.2.5 Total number of coils

The total number of coils may be given in box 4 for reference, but should not be toleranced.

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 a measured parameter unless there is special agreement between the customer and the supplier to do so.

Figure 2 Hand of coiling

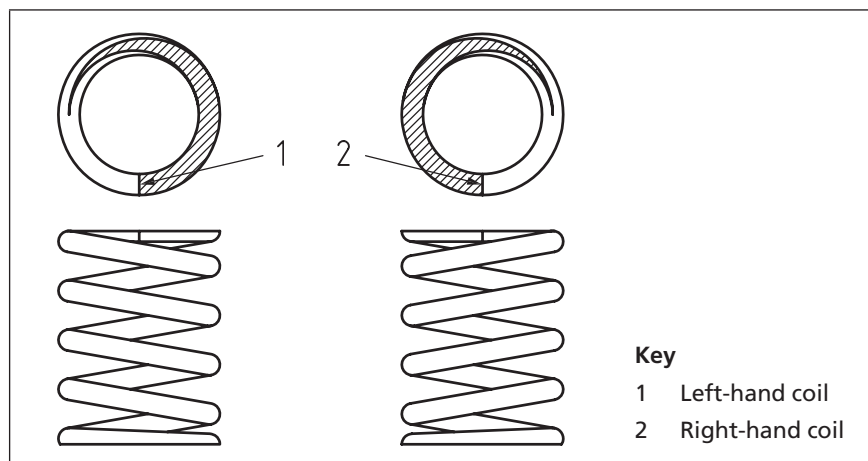


Figure 3 End coil form

