

# INTERNATIONAL STANDARD

**ISO**  
**2162-2**

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## **Technical product documentation — Springs —**

### **Part 2:**

Presentation of data for cylindrical helical  
compression springs

*Documentation technique de produits — Ressorts —*

*Partie 2: Présentation des données techniques des ressorts cylindriques  
de compression*



Reference number  
ISO 2162-2:1993(E)

## 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.

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.

International Standard ISO 2162-2 was prepared by Technical Committee ISO/TC 10, *Technical drawings, product definition and related documentation*, Sub-Committee SC 6, *Mechanical engineering documentation*.

ISO 2162 consists of the following parts under the general title *Technical product documentation — Springs*:

- *Part 1: Simplified representation*
- *Part 2: Presentation of data for cylindrical helical compression springs*
- *Part 3: Vocabulary*

Annexes A and B of this part of ISO 2162 are for information only.

# Technical product documentation — Springs —

## Part 2: Presentation of data for cylindrical helical compression springs

### 1 Scope

This part of ISO 2162 establishes a uniform system for the presentation of technical data and for the representation of cylindrical helical compression springs to be used in technical product documentation intended for e.g. tender and/or order drawings.

### 2 Normative references

The following standards contain provisions which through reference in this text, constitute provisions of this part of ISO 2162. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this part of ISO 2162 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 2162-1:1993, *Technical product documentation — Springs — Part 1: Simplified representation*.

ISO 2162-3:1993, *Technical product documentation — Springs — Part 3: Vocabulary*.

### 3 Definitions

For the purposes of this part of ISO 2162, the definitions given in ISO 2162-3 apply.

### 4 Letter symbols

See table 1.

### 5 Presentation of data

#### 5.1 General

The data presented shall comprise

- graphical representation, information on action and on the type of finish to ends; and
- design and manufacturing data.

#### 5.2 Representation, data on the spring action and indication of the type of spring ends

Graphical representation of the spring shall be in accordance with ISO 2162-1.

Data on the spring action shall be indicated preferably by means of a load deflection chart (or graph) showing the predominant requirements necessary for the functioning of the spring together with any additional requirements.

The type of spring ends shall be indicated in accordance with table 2.

#### 5.3 Technical data list

The technical data list presented shall include all information necessary for the manufacture of the springs. Possibilities for the adaptation of a certain spring to given requirements during manufacture shall be specified.

In particular, for springs working on a rod the minimum inside diameter of the coil shall be stated, and for springs working in a cylinder the maximum outside diameter of the coil shall be stated.

To aid economy in manufacture, tolerances on sizes should not be unnecessarily restrictive.

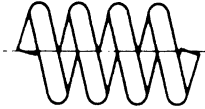
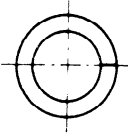
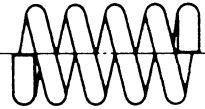
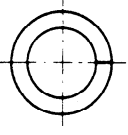
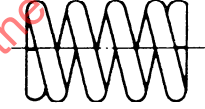
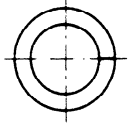
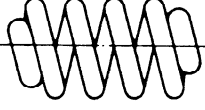
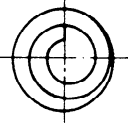
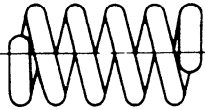
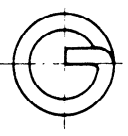
An example of a preprinted data list is given in annex A. This form provides a uniform scheme for the presentation and indication of data on helical compression springs, regardless of the method of data entry. It should be used for enquiries, offers and orders for this type of spring.

**Table 1 — Spring design parameters and letter symbols**

| No. | Parameter                                                                                        | Unit                     | Letter symbol (Formula)                  |
|-----|--------------------------------------------------------------------------------------------------|--------------------------|------------------------------------------|
| 1   | outside (external) diameter of spring                                                            | mm                       | $D_e$                                    |
| 2   | enlargement of outside diameter of spring when loaded                                            | mm                       | $\Delta D_e$                             |
| 3   | inside diameter of spring                                                                        | mm                       | $D_i$                                    |
| 4   | mean diameter of coil                                                                            | mm                       | $D \left( = \frac{D_e + D_i}{2} \right)$ |
| 5   | diameter of wire (or bar)                                                                        | mm                       | $d$                                      |
| 6   | maximum outside diameter of wire (or bar)                                                        | mm                       | $d_{\max}$                               |
| 7   | modulus of elasticity (or Young modulus)                                                         | N/mm <sup>2</sup> or MPa | $E$                                      |
| 8.1 | load cycle frequency                                                                             | Hz or s <sup>-1</sup>    | $f$                                      |
| 8.2 | natural frequency (both ends fixed)                                                              | Hz or s <sup>-1</sup>    | $f_e$                                    |
| 9   | spring load for the spring lengths $L_1, L_2, L_3, \dots, L_n$ (at ambient temperature of 20 °C) | N                        | $F_1, F_2, F_3, \dots, F_n$              |
| 10  | spring load for the minimum test length $L_n$                                                    | N                        | $F_n$                                    |
| 11  | theoretical spring load at solid length $L_c$                                                    | N                        | $F_{cth}$                                |
| 12  | spring load at temperatures other than 20 °C, e.g. spring load $F_2$ at 0 °C                     | N                        | $F_{2/0}$                                |
| 13  | modulus of rigidity                                                                              | N/mm <sup>2</sup> or MPa | $G$                                      |
| 14  | stress correction factor depending on $D/d$                                                      | —                        | $k$                                      |
| 15  | free length                                                                                      | mm                       | $L_0$                                    |
| 16  | spring length for the loads $F_1, F_2, F_3, \dots, F_n$                                          | mm                       | $L_1, L_2, L_3, \dots, L_n$              |

| No. | Parameter                                                                                       | Unit                 | Letter symbol (Formula)                  |
|-----|-------------------------------------------------------------------------------------------------|----------------------|------------------------------------------|
| 17  | minimum acceptable test length for $F_n$                                                        | mm                   | $L_n$                                    |
| 18  | solid length                                                                                    | mm                   | $L_c$                                    |
| 19  | active coils                                                                                    | —                    | $n$                                      |
| 20  | total number of coils                                                                           | —                    | $n_t$                                    |
| 21  | static axial spring rate                                                                        | N/mm                 | $R_s$                                    |
| 22  | static transverse spring rate                                                                   | N/mm                 | $R_{tr}$                                 |
| 23  | lateral deflection force at defined axial force                                                 | N                    | $\varphi C$                              |
| 24  | deflection of spring (stroke) between two loads                                                 | mm                   | $s_h$                                    |
| 25  | torsion stress for $F_1, F_2, F_3, \dots, F_n$                                                  | N/mm <sup>2</sup>    | $\tau_1, \tau_2, \dots, \tau_n$          |
| 26  | torsion stress for $L_c$                                                                        | N/mm <sup>2</sup>    | $\tau_c$                                 |
| 27  | torsion stress range (corrected) for $F_1, F_2, F_3, \dots, F_n$                                | N/mm <sup>2</sup>    | $\tau_{k1}, \tau_{k2}, \dots, \tau_{kn}$ |
| 28  | torsion stress (corrected) for a given stroke $s_h$                                             | N/mm <sup>2</sup>    | $\tau_{kh}$                              |
| 29  | working temperature (minimum/maximum)                                                           | °C                   | $T$                                      |
| 30  | static axial flexibility                                                                        | (N/mm) <sup>-1</sup> | $1/R_s$                                  |
| 31  | static transverse flexibility                                                                   | (N/mm) <sup>-1</sup> | $1/R_t$                                  |
| 32  | working or test duration (during relaxation tests)                                              | $h$                  | $t$                                      |
| 33  | (required) total number of cycles up to rupture                                                 | —                    | $N$                                      |
| 34  | permissible relaxation at defined initial stress (normally $\tau_2$ ), temperature and duration | N/mm <sup>2</sup>    | $\delta F$                               |

Table 2 — Types of spring ends

| Form                                                                                                                      | Execution                     | View                                                                                 |                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------|-------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| A                                                                                                                         | open, not ground              |    |    |
| B                                                                                                                         | closed, not ground            |    |    |
| C                                                                                                                         | open, ground                  |    |    |
| D                                                                                                                         | closed, ground                |  |  |
| E                                                                                                                         | closed, pigtail ends          |  |  |
| F                                                                                                                         | closed and bent to the centre |  |  |
| NOTE — The views show a right-hand (RH) spring. However, the same types of ends apply equally for left-hand (LH) springs. |                               |                                                                                      |                                                                                       |

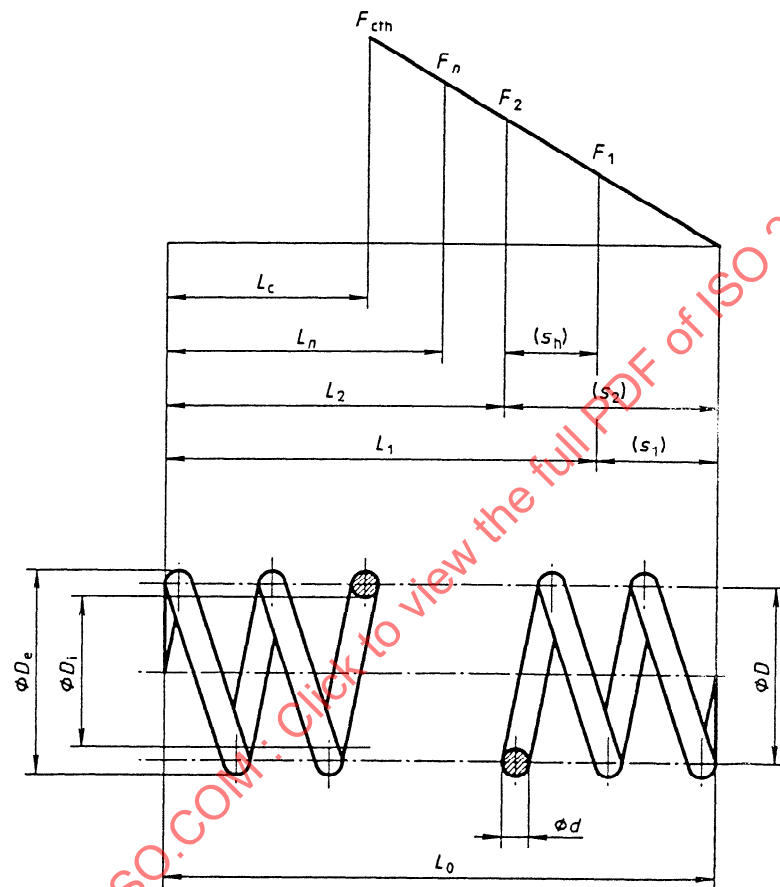
**Annex A**  
(informative)

**Example of the presentation of a preprinted data set for a spring**

NOTE 1 The actual size of data sheets is A4, in accordance with ISO 5457.

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A.1 Front side, or page 1



Spring ends: Form C

Title block  
(see ISO 7200)

## A.2 Overleaf, or page 2

|           |                         |             |                         |                   |                                |
|-----------|-------------------------|-------------|-------------------------|-------------------|--------------------------------|
| $d$       | ..... mm                | $F_1$       | ..... $\pm$ ..... N     | $s_h$             | ..... mm                       |
| $D$       | ..... mm                | $L_1$       | ..... mm                | $\tau_{kh}$       | ..... N/mm <sup>2</sup>        |
| $D_e$     | ..... $\pm$ ..... mm    | $\tau_1$    | ..... N/mm <sup>2</sup> | $k$               | ..... —                        |
| $D_i$     | ..... $\pm$ ..... mm    | $\tau_{k1}$ | ..... N/mm <sup>2</sup> | $N$               | $\geq$ ..... —                 |
| $L_0$     | ..... $\pm$ ..... mm    | $F_2$       | ..... $\pm$ ..... N     | $\delta F$        | $\leq$ ..... N/mm <sup>2</sup> |
| $n$       | ..... —                 | $L_2$       | ..... mm                | $f_e$             | ..... Hz                       |
| $n_t$     | ..... —                 | $\tau_2$    | ..... N/mm <sup>2</sup> | $R_s$             | ..... N/mm                     |
| $L_c$     | ..... mm                | $\tau_{k2}$ | ..... N/mm <sup>2</sup> | $t$               | ..... h                        |
| $F_{cth}$ | ..... N                 | $F_n$       | ..... N                 | $T$ <sup>1)</sup> | ..... / ..... °C               |
| $\tau_c$  | ..... N/mm <sup>2</sup> | $L_n$       | ..... mm                |                   |                                |
|           |                         | $\tau_n$    | ..... N/mm <sup>2</sup> |                   |                                |
|           |                         | $\tau_{kn}$ | ..... N/mm <sup>2</sup> |                   |                                |

|                                                                                                                                                            |                                                                                                                                                                                                                                                |                                                                                                                        |                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| Direction of helix                                                                                                                                         | LH <input type="radio"/> <sup>2)</sup><br>RH <input type="radio"/>                                                                                                                                                                             | Adaptation of the spring                                                                                               |                                      |
|                                                                                                                                                            |                                                                                                                                                                                                                                                | Given requirements                                                                                                     | Permissible deviations <sup>3)</sup> |
| Load cycle frequency, $f$                                                                                                                                  | static <input type="radio"/><br>dynamic (time limited) <input type="radio"/><br>dynamic (time unlimited) <input type="radio"/>                                                                                                                 | <input type="radio"/> One load $F_1$ ,<br>corresponding length $L_1$<br>and spring rate $R_s$                          | $L_0, d, n_t$                        |
| Material                                                                                                                                                   | $G$ : ..... N/mm <sup>2</sup><br>$E$ : ..... N/mm <sup>2</sup>                                                                                                                                                                                 | <input type="radio"/> Two loads $F_1/F_2$<br>and corresponding lengths<br>$L_1/L_2$                                    | $L_0, d, n_t$                        |
| Surface condition                                                                                                                                          | drawn <input type="radio"/><br>rolled <input type="radio"/><br>machined <input type="radio"/><br>shot-peening <input type="radio"/><br>free of burr <input type="radio"/><br>— inside <input type="radio"/><br>— outside <input type="radio"/> | <input type="radio"/> Length of the unpret<br>spring and spring<br>rate $R_s$                                          | $d, n_t$                             |
| Protective surface coating                                                                                                                                 |                                                                                                                                                                                                                                                | <input type="radio"/> One load $F_1$ and the<br>load of the preset<br>spring                                           | $L_0$                                |
| Degree of presetting, or<br>presetting load                                                                                                                |                                                                                                                                                                                                                                                | <input type="radio"/> One load $F_1$ , the length of the<br>preset spring and the length of<br>the unpret spring $L_0$ | $n_t, d$<br>or<br>$n_t, D_e, D_i$    |
| Further details, e.g. on surface conditions or tolerances                                                                                                  |                                                                                                                                                                                                                                                |                                                                                                                        |                                      |
| 1) Minimum/maximum.<br>2) <input type="radio"/> Mark where applicable.<br>3) The listed parameters may be altered in order to meet the given requirements. |                                                                                                                                                                                                                                                |                                                                                                                        |                                      |