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Stainless steel strip for springs – Technical delivery conditions

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 10151

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ICS 77.140.25

English version

Stainless steel strip for springs - Technical delivery conditions

Bandes pour ressorts en aciers inoxydables - Conditions techniques de livraison

Federband aus nichtrostenden Stählen - Technische Lieferbedingungen

This European Standard was approved by CEN on 14 September 2002.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Foreword

This document (EN 10151:2002) has been prepared by Technical Committee ECISS/TC 23 "Steels for heat treatment, alloy steels and free-cutting steels - Qualities and dimensions", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2003, and conflicting national standards shall be withdrawn at the latest by May 2003.

Annex A is informative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

1.1 This European Standard applies to cold rolled narrow strip of thicknesses up to and including 3 mm in rolled widths less than 600 mm made from the stainless steel grades listed in Table 1. The steels are used in the conditions given in Table 4 for the production of springs and spring parts that are exposed to corrosive effects and sometimes slightly increased temperatures.

1.2 Other steel grades than those listed in Table 1, but covered by prEN 10088-2 can be supplied in the above conditions after agreement between supplier and customer (see also annex A).

1.3 The general technical delivery conditions specified in EN 10021 apply in addition to the specifications of this European Standard, unless otherwise specified in this European Standard.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

CR 10260, *Designation systems for steels - Additional symbols.*

CR 10261, *Iron and steel - Review of available methods of chemical analysis.*

EN 10002-1, *Metallic materials - Tensile testing - Part 1: Method of test at ambient temperature.*

EN 10021, *General technical delivery requirements for steel and iron products.*

EN 10027-1, *Designation systems for steel - Part 1: Steel names, principal symbols.*

EN 10027-2, *Designation systems for steel - Part 2: Numerical system.*

EN 10052, *Vocabulary of heat treatment terms for ferrous products.*

EN 10079, *Definition of steel products.*

prEN 10088-2, *Stainless steels - Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general and construction purposes.*

prEN 10168*, Iron and steel products – Inspection documents – List of information and description.*

EN 10204, *Metallic products - Types of inspection documents.*

EN 10258, *Cold-rolled stainless steel narrow strip and cut lengths - Tolerances on dimensions and shape.*

EN ISO 377, *Steel and steel products - Location and preparation of samples and test pieces for mechanical testing (ISO 377:1997).*

EN ISO 6507-1*, Metallic materials – Vickers hardness test – Part 1: Test method (ISO 6507-1:1997).*

EN ISO 7438, *Metallic materials – Bend test (ISO 7438:1985).*

ISO 14284, *Steel and iron - Sampling and preparation of samples for the determination of chemical composition.*

3 Terms and definitions

For the purposes of this European Standard, the following term and definition in addition to the terms and definitions given in EN 10021, EN 10052, EN 10079, prEN 10088-2, EN ISO 377 and ISO 14284 applies.

3.1
spool
strip spirally wound onto a supporting centre. Strip on a spool can also be welded together end-to-end

4 Classification and designation

4.1 Classification

Steels covered in this European Standard are classified according to their structure into:

— ferritic steels;

— martensitic steels;

— precipitation hardening steels;

— austenitic steels.

4.2 Designation

4.2.1 Steel names

For the steel grades covered by this European Standard, the steel names as given in the relevant tables are allocated in accordance with EN 10027-1 and CR 10260.

4.2.2 Steel numbers

For the steel grades covered by this European Standard, the steel numbers as given in the relevant tables are allocated in accordance with EN 10027-2 and CR 10260.

5 Information to be supplied by the purchaser

5.1 Mandatory information

The following information shall be supplied by the purchaser at the time of enquiry and order:

a) the quantity to be delivered;

b) the designation of the product form (e.g. strip or cut length);

c) the number of the dimensional standard (EN 10258);

d) the dimensions and tolerances on thickness, width and length according to EN 10258 and, if applicable, letters denoting relevant special tolerances (see 7.5);

e) the internal coil diameter according to EN 10258 (see 7.5);

f) the number of this European Standard (EN 10151);

g) steel name or steel number (see 4.2);

h) the delivery condition (see 6.2.2),

i) the type of inspection document in accordance with EN 10204 (see 8.2).

EXAMPLE
5 tons narrow strip according to EN 10258 of nominal thickness 0,80 mm ordered with precision thickness tolerances (P), nominal width of 250 mm with precision tolerances on width (P) in steel X5CrNi18-10 (1.4301) in the cold worked condition +C850, process route 2H, as specified in this European Standard and an inspection certificate 3.1.B according to EN 10204.

5 t narrow strip EN 10258-0,80Px250P
Steel EN 10151-X5CrNi18-10+C850+2H
EN 10204-3.1.B

or

5 t narrow strip EN 10258-0,80Px250P
Steel EN 10151-1.4301+C850+2H
EN 10204-3.1.B

5.2 Options

A number of options are specified in this European Standard and listed below. If the purchaser does not indicate his wish to implement one of these options, the supplier shall supply in accordance with the basis specification of this European Standard (see 5.1):

a) any requirement concerning manufacturing process of the steel and of the products (see 6.1);

b) any requirement concerning form of delivery (see 6.2.1.1);

c) any requirement concerning condition of the edges (see 6.2.1.2);

d) any requirement concerning special treatment conditions (see 6.2.2.1 and Table A.4);

e) any requirement concerning special technological properties (see 7.3.1, Table 5 and 7.3.3);

f) any requirement concerning surface finish (see 7.3.2);

g) any requirement concerning bending limit of strip differing from Table 5 (see 7.3.1 and 8.3.3.2.2);

h) any requirement concerning testing of internal soundness (see 7.4);

i) any requirement concerning additional specific testing (see 8.1);

j) any requirement concerning tensile testing for checking the uniformity of tensile strength (see 8.3.1 and Table 6);

k) any requirement concerning determination of product analysis (see 8.3.2.2 and Table 6);

l) any requirement concerning carrying out of bending ability tests (see 8.3.2.3 and Table 6);

m) any requirement concerning tolerances on flatness, edge waviness and edge camber (see 8.3.3.3);

n) any requirement concerning measurement of coil set including the relevant values (see 8.3.3.3).

6 Manufacturing process

6.1 General

Unless otherwise agreed at the time of enquiry and order, the steelmaking process and manufacturing process of the products are left to the discretion of the manufacturer.

6.2 Delivery

6.2.1 Delivery form

6.2.1.1 Strip is usually supplied in coils. Thin strip may be wound on a supporting centre, made of steel, cardboard or other material, in order to avoid the collapse of the centre. Strip may also be supplied as a spool (see 3.1), in order to increase coil weight, whilst minimising coil outside diameter. In the latter case, any welds shall be clearly marked.

Alternatively, strip may be supplied in cut lengths. These may be in a box, or on a pallet, and perhaps strapped together in bundles.

Several coils, or bundles of cut lengths, may be assembled on a carrier.

Unless otherwise agreed at the time of enquiry and order, the choice of delivery form is left to the discretion of the manufacturer.

6.2.1.2 Unless otherwise agreed at the time of enquiry and order, cold-rolled strip for springs is delivered with slit edges. By special agreement, strip can also be supplied with mill edges or with special edges, e.g. machined edges, deburred edges or edges dressed to produce a regular form, usually square or round.

6.2.2 Delivery condition

6.2.2.1 The condition in which the strip is to be delivered shall always be specified by the purchaser.

The delivery conditions possible are those given in Table 3 and Table 4.

In special cases, products may, if this is agreed, also be delivered in the treatment conditions given in Table A.4 which are normally reserved for finished springs.

6.2.2.2 In the condition +C, strip shall be delivered with a bright surface (2H), or a rough, matt surface (see 7.3.2).

Strip of steel types X20Cr13 (1.4021), X30Cr13 (1.4028), X39Cr13 (1.4031) and X7CrNiAl17-7 (1.4568) in the conditions “annealed“ or “solution annealed“ may be delivered, at the manufacturer‘s choice, with a bright annealed (2R), pickled (2D), pickled and skin passed (2B) or matt (2F) surface according to prEN 10088-2.

7 Requirements

7.1 Chemical composition

7.1.1 The chemical composition requirements given in Table 1 apply in respect of the chemical composition according to the cast analysis.

7.1.2 The product analysis may deviate from the limiting values for the cast analysis given in Table 1 by the values listed in Table 2.

7.2 Mechanical properties

7.2.1 For the tensile strength of spring-hard rolled strip, the data in Table 3 and Table 4 apply.

7.2.2 Regardless of the mass of the coil and for spools (see 3.1) of mass 500 kg or less, the maximum difference in tensile strength between the two ends of a coil or spool shall be 100 MPa (see 8.3.1). For spools with masses above 500 kg, the maximum difference in tensile strength shall be agreed at the time of enquiry and order.

7.3 Technological properties and surface condition

7.3.1 The strip shall have adequate bending ability. Unless otherwise agreed, the guidance data given in Table 5 apply. Cracks visible with the naked eye are not permitted.

7.3.2 The surface of the strip shall be one of those mentioned in 6.2.2 and defined in prEN 10088-2. Oil films from cold-rolling are permitted. Pits, grooves, scars and scratches are only permitted to the extent that they do not impair the performance of the spring. See also A.6.3.

7.3.3 If, for strip which is intended for high-duty springs, the requirements according to 7.3.1 and 7.3.2 are not sufficient, particular agreements shall be made at the time of enquiry and order.

7.4 Internal soundness

The products shall be free from internal defects that could impair their application to a significant extent. Tests appropriate for an assessment of the internal characteristics may be agreed upon at the time of enquiry and order.

7.5 Dimensions and tolerances on dimensions

The tolerances on thickness, width and length shall be specified in accordance with EN 10258.

The internal coil diameter shall be agreed in accordance with EN 10258.

8 Inspection and testing

8.1 General

The manufacturer shall carry out appropriate process control, inspection and testing to assure himself that the delivery complies with the requirements of the order.

This includes the following:

— a suitable frequency of verification of the dimensions of the products;

— an adequate intensity of visual examination of the surface quality of the products;

— an appropriate frequency and type of test to ensure that the correct grade of steel is used.

The nature and frequency of these verifications, examinations and tests are determined by the manufacturer, in the light of the degree of consistency that has been determined by the evidence of the quality system. In view of this, verifications by specific tests for these requirements are not necessary unless otherwise agreed.

8.2 Types and contents of inspection documents

8.2.1 At the time of enquiry and order, the issue of one of the inspection documents in accordance with EN 10204 shall be agreed for each delivery.

8.2.2 If the issuing of an inspection certificate 3.1.A, 3.1.B or 3.1.C according to EN 10204 or of an inspection report 3.2 according to EN 10204 has been agreed, specific inspections according to 8.3 are to be carried out and the following information shall be given in the inspection document with the code numbers and details required by prEN 10168:

a) the information groups A, B and Z of prEN 10168;

b) the results of the cast analysis in accordance with the code numbers C71 to C92 in prEN 10168;

c) the results of the mandatory tests marked in the second column of Table 6 by an 'm';

d) the result of any optional test or inspections agreed at the time of enquiry and order.

8.3 Specific inspection and testing

8.3.1 Extent of testing

The data in Table 6 apply for the composition of test units and for the number of tests per test unit, subject to the following exception for tensile strength:

If proof of uniformity of tensile strength (in accordance with 7.2.2) is agreed upon at the time of enquiry and order, a test piece shall be taken from both ends of each coil or spool (see 3.1). If, from one coil of hot-rolled or cold rolled material, several coils or spools of cold-rolled strip are produced and if these are numbered in sequence, it is only necessary to take a test piece from the beginning of each consecutively produced coil or spool.

8.3.2 Selection and preparation of samples and test pieces

8.3.2.1 General

The general conditions given in ISO 14284 and EN ISO 377 for the selection and preparation of samples and test pieces shall apply.

8.3.2.2 Product analysis

For product analysis, the selection and preparation of samples shall be carried out in conformity with the requirements of ISO 14284.

8.3.2.3 Tensile and bending tests

The test pieces for the tensile test and the bending test shall be taken in accordance with Figure 2 and prepared in accordance with EN 10002-1 and 8.3.3.2.2 respectively.

8.3.3 Methods of test

8.3.3.1 Chemical analysis

In cases of dispute, the reference method used for chemical analysis shall be in accordance with one of the European Standards listed in CR 10261.

8.3.3.2 Tensile and bending tests

8.3.3.2.1 The tensile test shall be carried out in accordance with EN 10002-1.

8.3.3.2.2 By analogy with the process of spring manufacture, to check the bending ability, a test strip, if possible 20 mm in width, is bent through 90° under a press around a mandrel with a radius matched to the thickness of the test piece (see Table 5). Bending is carried out perpendicularly to the longitudinal axis of the test piece, i.e. transverse to the direction of rolling in the case of longitudinal test pieces and parallel to the direction of rolling in the case of transverse test pieces.

In addition, the general specifications in EN ISO 7438 apply.