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SVENSK STANDARD SS-EN ISO 642

Handläggande organ	Fastställd	Utgåva	Sida
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Steel – Hardenability test by end quenching (Jominy test) (ISO 642:1999)

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This Standard supersedes the Swedish Standard SIS 117002, ed. 4.

Swedish Standards corresponding to documents referred to in this Standard are listed in ”Catalogue of Swedish Standards”, issued by SIS. The Catalogue lists, with reference number and year of Swedish approval, International and European Standards approved as Swedish Standards as well as other Swedish Standards.

Stål – Härdbarhetsprovning enligt Jominy (ISO 642:1999)

Europastandarden EN ISO 642:1999 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN ISO 642:1999.

Standarden ersätter SIS 117002, utg. 4.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 642

September 1999

ICS 77.040.99

English version

Steel - Hardenability test by end quenching (Jominy test) (ISO 642:1999)

Acier - Essai de trempabilité par trempe en bout (essai Jominy) (ISO 642:1999)

Stähle - Stirnabschreckversuch (Jominy-Versuch) (ISO 642:1999)

This European Standard was approved by CEN on 16 August 1999.

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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 Central Secretariat has the same status as the official versions.

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Foreword

The text of the International Standard ISO 642:1999 has been prepared by Technical Committee ISO/TC 17 "Steel" in collaboration with Technical Committee ECISS/TC 2 "Steel - Physico-chemical and non-destructive testing", the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by March 2000, and conflicting national standards shall be withdrawn at the latest by March 2000.

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, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of the International Standard ISO 642:1999 was approved by CEN as a European Standard without any modification.

NOTE: Normative references to International Standards are listed in annex ZA (normative).

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Steel — Hardenability test by end quenching (Jominy test)

1 Scope

This International Standard specifies a method for determining the hardenability of steel by end quenching (Jominy test) by using a test piece 25 mm in diameter and 100 mm long.

NOTE By agreement and for a defined field of application, the test described in this International Standard may be replaced by the calculation of the Jominy curve in accordance with an accepted mathematical model (see annex C). In case of dispute, the test shall be carried out.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 6507-1, *Metallic materials — Vickers hardness test — Part 1: Test method.*

ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T)*.

ISO 6508-2, *Metallic materials — Rockwell hardness test) — Part 2: Verification and calibration of testing machines (scales A, B, C, D, E, F, G, H, K, N, T)*.

ISO 6508-3, *Metallic materials — Rockwell hardness test — Part 3: Calibration of reference blocks (scales A, B, C, D, E, F, G, H, K, N, T).*

3 Principle

The test consists of:

a) heating a cylindrical test piece to a specified temperature in the austenitic range for a specified period of time;

b) quenching it by spraying water on one of its ends under specified conditions;

c) measuring the hardness at certain given points, on longitudinal flats made on the test piece, in order to determine the hardenability of the steel by variations of this hardness.

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4 Symbols and designations

Symbol	Designation	Value
L	Total length of test piece	(100 ± 0,5) mm
D	Diameter of test piece	$\left(25\ ^{+0,5}_{0}\right)$ mm
t	Time during which test piece is maintained at heating temperature	$\left(30\ ^{+5}_{0}\right)$ min
t_m	Maximum time lag between removal of test piece from furnace and start of quenching	5 s
T	Temperature of cooling water	(20 ± 5) °C
a	Internal diameter of vertical water supply pipe	(12,5 ± 0,5) mm
h	Height of water jet without test piece in position	(65 ± 10) mm
l	Distance from end of water supply pipe to lower end of test piece	(12,5 ± 0,5) mm
e	Depth of flats for measurement of hardness	(0,4 to 0,5) mm
d	Distance, in millimetres, from quenched end to points where hardness is measured	
Jxx-d	Jominy hardenability index at distance d, in Rockwell HRC-mm	
JHVxx-d	Jominy hardenability index at distance d, in Vickers HV 30-mm	

5 Form of test pieces and their preparation

5.1 Sampling

In the absence of specific requirements in the product standard, and unless otherwise agreed on the order and regardless of the thickness (or diameter) of the product, the sampling of test piece from the product can be made:

— either by hot rolling or forging of test piece with 30 mm to 32 mm diameter;

— or by machining of test piece with diameter $\left(25\ ^{+0,5}_{0}\right)$ mm whose axis shall be at least at $\left(20\ ^{+5}_{0}\right)$ mm from the surface product (see Figure 1).

In case of products from continuous casting, a minimum reduction ratio 8:1 is recommended before sampling.

In all the forming processes preceding the machining of the test piece, the deformation of the product from all sides should be as uniform as possible.

In the case of a separately cast reference test piece, the original cross section before deformation must be at least three times that corresponding to the required diameter of 30 mm to 32 mm.

By special agreement, the test piece can be obtained by a suitable casting process and tested in the as-cast condition.

The flats of the test piece shall have their axes at approximately the same distance from the product surface (see Figure 1). For this purpose, the test piece shall be marked so that its position in the round bar can be clearly recognized.

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5.2 Dimensions

5.2.1 The test piece shall consist of a round bar machined to a diameter of 25 mm and a length of 100 mm.

5.2.2 The end of the test piece which will not be quenched shall be 30 mm to 32 mm or 25 mm in diameter, depending upon the form of that end. Two examples, test pieces with a flange or an undercut (to permit rapid centring and fitting in position for the quenching operation by means of an appropriate support) are shown in Figure 2.

5.2.3 The test piece shall, if necessary, be marked (on the end opposite to the end to be quenched) to enable its position to be identified in relation to the original product.

5.3 Heat treatment

Unless otherwise agreed, the test piece shall be normalized before machining and quenching. The normalizing process shall be carried out at the average temperature within the range specified in the material standard. If the material standard does not specify a temperature for normalizing, the normalizing temperature shall be subject to special agreement or duly selected by the testing department. The holding time at normalizing temperature shall be $\left(30\ ^{+5}_{0}\right)$ min.

The heat treatment shall be carried out in each case in such a way that the finish-machined test piece shows absolutely no traces of decarburization.

5.4 Machining

The cylindrical surface of the test piece shall be machined by fine turning; the surface of the test piece end to be quenched shall have a reasonably fine finish, preferably obtained by fine grinding, and should be free from burrs (see Figure 2).

6 Apparatus

The apparatus consists of a device for quenching the test piece.

6.1 The quenching device consists essentially of a means of suddenly inducing the water jet to impinge on the end of the test piece to be quenched. This can be realized e.g., by a quick action tap and a system to adjust the flow rate of the water or a disc allowing the water jet to be released and cut off rapidly (see Figure 3). In the case of a quick action tap the length of the water supply pipe behind the tap shall be at least 50 mm in order to ensure non-turbulent water flow.

6.2 The relative positions of the end of the water supply pipe and the test piece support shall be such that the distance between the end of the water supply pipe and the test piece end to be quenched is (12,5 ± 0,5) mm (see Figure 3).

6.3 The test piece support shall allow precise centring of the test piece above the end of the water supply pipe and the holding of it in position during spraying. It shall be dry while the test piece is being placed in position; the test piece shall be protected from water splashes while it is being placed in position as well as before and during the actual end quenching operation.

6.4 The height of the water jet above the end of the water supply pipe without the test piece in position shall be (65 ± 10) mm (see Figure 4).

The water temperature in the pipe shall be (20 ± 5) °C.

In the case of comparative tests, tests shall be carried out with the same water temperature.

6.5 The test piece shall be protected from draughts throughout the heating and quenching.

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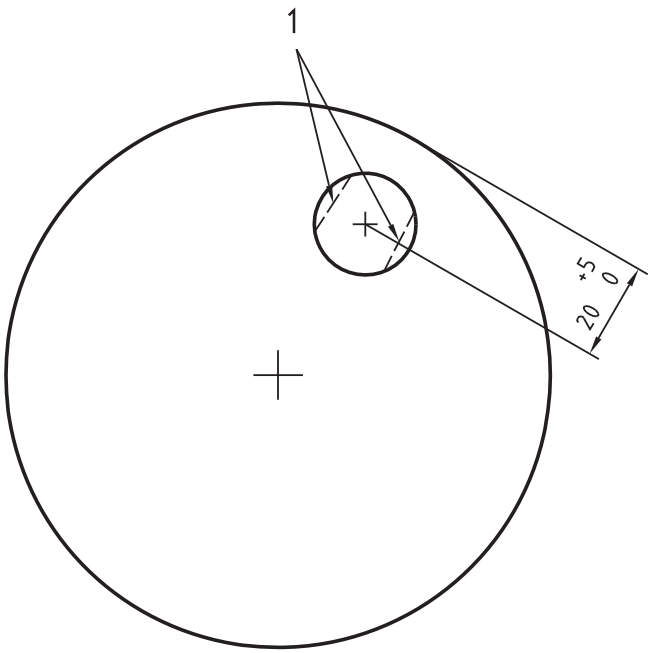
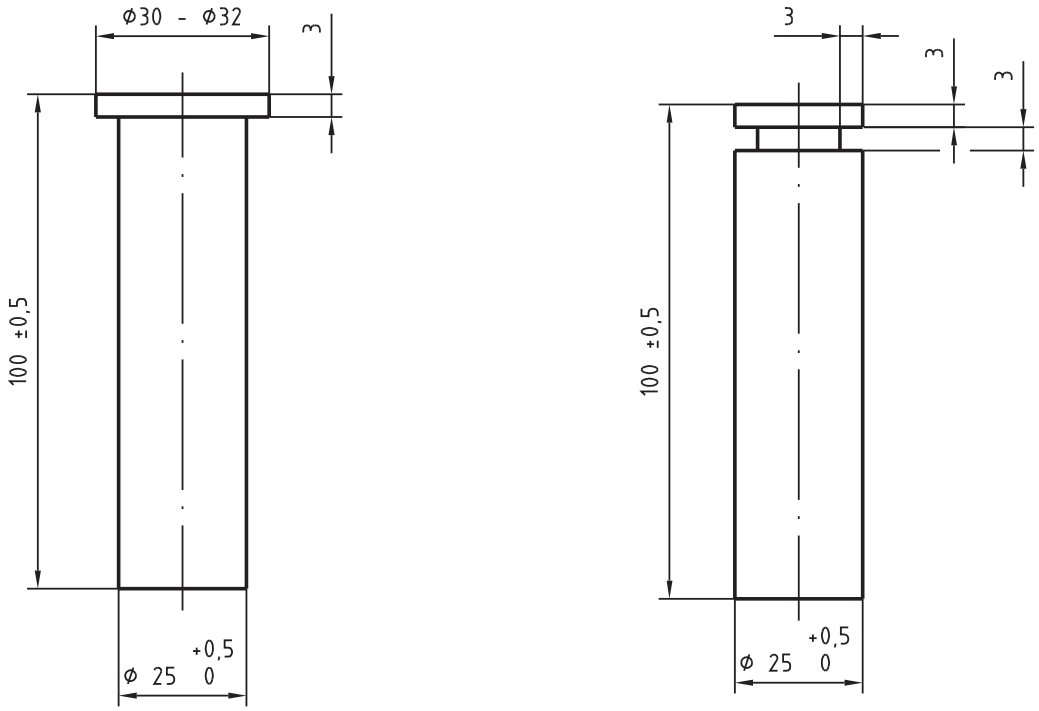
Dimensions in millimetres



Key
1 Test flats.

Figure 1 — Sampling by machining of the test piece

Dimensions in millimetres



a) test piece with flange **b) test piece with undercut**

Figure 2 — Dimensions of test piece

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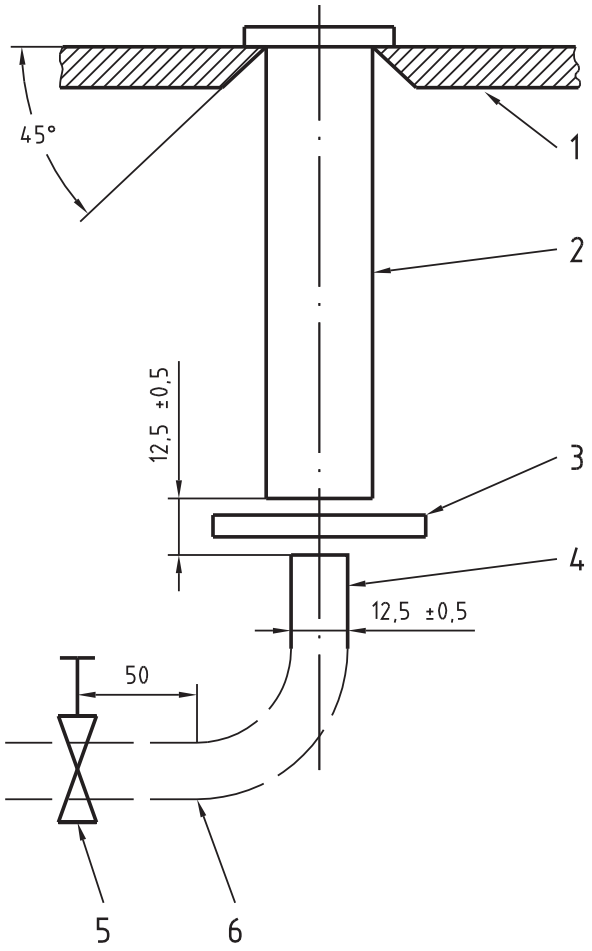
Dimensions in millimetres



Key

1 Device for fixing and centring the test piece.
2 Test piece in position.
3 Disc.
4 End of water supply pipe.
5 Quick-action tap.
6 Water supply pipe.

Figure 3 — Diagram of quenching device