BRITISH STANDARD

BS EN
10254:1999

Steel closed die forgings — General technical delivery conditions

The European Standard EN 10254:1999 has the status of a British Standard

ICS 77.140.85

National foreword

This British Standard is the English language version of EN 10254:1999.

The UK participation in its preparation was entrusted to Technical Committee ISE/31, Wrought steels, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

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 comprises a front cover, an inside front cover, the EN title page, pages 2 to 15 and a back cover.

The BSI copyright notice displayed in this document indicates when the document was last issued.

This British Standard, having been prepared under the direction of the Engineering Sector Committee, was published under the authority of the Standards Committee and comes into effect on 15 December 1999

ISBN 0 580 35151 3

Amendments issued since publication

Amd. No.	Date	Comments

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 10254

September 1999

ICS 77.140.85

English version

Steel closed die forgings - General technical delivery conditions

Pièces estampées en acier - Conditions techniques générales de livraison

Gesenkschmiedeteile aus Stahl - Allgemeine technische Lieferbedingungen

This European Standard was approved by CEN on 22 August 1999.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 10254:1999 E

Content

Foreword

This European Standard has been prepared by Technical Committee ECISS/TC 28, Steel forgings, the Secretariat of which is held by BSI.

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.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association. This European Standard is considered to be a supporting standard to those application and product standards which in themselves support an essential safety requirement of a New Approach Directive and which make reference to this European Standard.

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.

1 Scope

This European Standard specifies the general delivery conditions for steel closed die forgings.

These forgings are produced by blow or pressure of the heated product at a suitable temperature (hot or warm) in a die, which in the forming process shapes the material to the form of the die. Similar products, such as warm extrusions and upset forgings, are also regarded as part of the process.

This European Standard applies also to closed die forgings when their surface is partially treated subsequently by cold forming or coining, in order to improve the surface quality or to obtain more precise dimensional accuracy.

This standard does not apply to open die forgings, processes in which the tooling does not fully surround the components produced.

2 Normative references

This European Standard incorporates by reference provisions from specific editions of certain other publications. These normative references are cited at the appropriate points in the text and the publications are listed hereafter. Subsequent amendments to, or revisions of, any of these publications apply to this European Standard only when incorporated in it by amendment or revision. In the case of undated references, the most recent edition of publications referred to applies.

EN 10002-1	Metallic materials - Tensile testing - Part 1: Method of test (at ambient temperature)
EN 10002-5	Metallic materials - Tensile testing - Part 5: Method of test at elevated temperatures
EN 10003-1	Metallic materials - Hardness test - Brinell - Part 1: Test method
EN 10045-1	Metallic materials - Charpy impact test - Part 1: Test method
EN 10052	Vocabulary of heat treatment terms of ferrous products
EN 10109-1	Metallic materials - Hardness test - Part 1 Rockwell test (scales A - B - C - D - E - F - G - H - K) and Rockwell superficial test (scales 15 N, 30 N , 45 N, 15 T, 30 T and 45 T)
EN 10204	Metallic products - Type of inspection documents
EN 10243-1	Steel die forgings - Tolerances on dimensions - Part 1: Drop and press forgings
EN 10243-2	Steel die forgings - Tolerances on dimensions - Part 2: Upset forgings made on horizontal forging machines
CR 10261	ECISS Information Circular 11 - Iron and steel - Review of available methods of chemical analysis

EU 103	Micrographic examination of ferritic or austenite grain size of steel
EU 104	Determination of the depth of decarburization of non-alloy and low-alloy structural steels
ISO 3763	Wrought steels - Macrographic methods for assessing the content of non-metallic inclusions
ISO 4967	Steel - Determination of content of non-metallic inclusions - Micrographic method using standard diagram
ISO 4968	Steel - Macrographic examination by sulphur print (Baumann method)
ISO 4969	Steel - Macrographic examination by etching with strong mineral acid

3 Information to be supplied by the purchaser

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

a) full details of closed die forging through an approved drawing (see clause **4**);

b) quantity of closed die forgings to deliver;

c) all details about tooling as foreseen in clause **5**;

d) intended use of closed die forgings;

e) material and heat treatment (see clause **6**).

Information supplied by the purchaser shall meet the characteristics required and shall preferably refer to European Standards.

NOTE: The informative annex A summarizes all the mandatory and optional information.

4 Reference drawing

The approved drawing provided by the purchaser is normally the definitive document for the production and delivery of closed die forgings.

The drawing of the closed die forging is:

- either provided by the forging manufacturer after the finished component definition, descriptive note, drawing or computer document, and approved by the purchaser; or

- supplied by the purchaser before the preparation of the tooling dies and approved by the forging manufacturer.

In the latter case the simultaneous delivery of a finished part definition is desirable.

As close as possible co-operation between the purchaser and the forging manufacturer will serve to enable the latter, on the basis of his experience, to meet the functional requirements of the purchaser in the best possible way from a technical and economic point of view.

This co-operation extends not only to the design of the closed die forging, the material and in certain cases also heat treatment, but also to the type and range of proposed testing of the determined qualities of the closed die forging for the assurance of consistent quality. The type and range of the planned tests must at the time of the order be specified and included in the order, or in the closed die forging drawing as the case may be.

Dimensions which have to be monitored by SPC (Statistical Process Control) must be agreed between forging manufacturer and purchaser and indicated on the drawing prior to the order.

The identification of surfaces for subsequent first machining is of decisive importance for the dimensioning and dimension control of the forging, and should therefore be indicated on the component drawing.

Dimensions are of importance in the function and dimensional control of the forging, and tolerances and agreed deviations from European Standard EN 10243 may only be applied to dimensions which are included in the forging drawing.

Dimensions for the greatest length, width, height and thickness of the forged component should always be inserted, as they are needed for the determination of tolerances.

Should the purchaser consider it necessary to apply special tolerances to particular dimensions, this must be stated in the order and be subject of an agreement between the forging manufacturer and the purchaser.

5 Tooling

5.1 General

The basis for the production of the tooling, in particular of the dies, is the approved forging drawing. In view of the experience and expertise of the forging manufacturer it is recommended that he should be entrusted with the design and implementation of tooling.

In special cases where the purchaser wishes to supply the tools, the conditions of this supply (inspection, modification, adaptation to the machines) should be agreed and made part of the order to take into account the suitability of the machine and the tooling (see **5.2** to **5.4**).

5.2 Tools specific to a particular purchaser

In the case of tools specific to a particular purchaser, conditions for obtaining and using them shall be defined in a specific contract. The forging manufacturer may use tools for which the purchaser has paid cost or part cost only for deliveries to this purchaser.

5.3 Tools not specific to a particular purchaser

Tooling for standard or other forgings which are not specific to a particular purchaser such as: standard forged bolts, hooks, forged flanges,..., is manufactured and supplied by the forging manufacturer. The forging manufacturer can make use of this tooling without restriction.

5.4 Modification of the tools

Die and tool modifications at the purchaser's request will involve the purchaser in additional costs for labour, and other charges which may include the die material.

6 Material and heat treatment

6.1 Material

6.1.1 Steel grade

The designation of the steel grade is as far as possible to be taken from the appropriate material standards. In other cases materials with similar specification shall be used.

6.1.2 Purity standard, hardenability

Any special requirements about purity and hardenability of the material, which exceed those included in the appropriate material standards, must be stated at the time of order.

6.1.3 Forging reduction ratio

If a particular forging reduction ratio of the material (component or bar) is required, this forging reduction ratio shall be specified.

6.1.4 Grain flow

If the purchaser requires a particular grain flow in the material in each section of the forging, this must be included in the drawing of the forging as it is of considerable importance in determining the forging method.

6.2 Heat treatment

If post forging heat treatment is required it must be stated by the purchaser and specified on the forged component drawing [1)] and in particular if it is a direct treatment or separate conventional treatment.

If it is agreed to test mechanical properties with test pieces, then the agreed location of these test pieces and their position shall be given either on the drawing or in the testing specification.

If heat treatment is required for the closed die forgings, this shall be quoted using the terminology in EN 10052.

[1)] The relative requirements for heat treatment are also applicable when the nature of the steel requires a fixed cooling rate (e.g. in the case of precipitation hardening steels).

7 General technical conditions of manufacturing

7.1 Responsibility of the forging manufacturer

The forging manufacturer is free to select forging operations, any heat treatment techniques applied, and any supplementary operations required to obtain conforming products in accordance with his own practices.

Any special requirements regarding the forging temperature range shall be indicated.

Nevertheless, for products destined for specific applications, the order should state explicitly the mandatory requirements which affect forging (such as rolling direction, decarburization, etc.) and heat treatment stipulated by agreement between purchaser and the forging manufacturer.

7.2 Surface conditions

7.2.1 Surface finish

Closed die forgings, unless agreed otherwise, are delivered in the as forged condition.

Grinding of the surface is admissible as long as the use of the closed die forging is not impaired. The correction of defects by welding is only permissible with the agreement of the purchaser.

7.2.2 Decarburization

In cases where decarburization is a critical issue the permitted decarburization depth shall be defined by the purchaser prior to the order. In this case, the decarburization depth shall be determined according to EU 104.

7.3 Pre-production samples

7.3.1 Initial samples

In certain circumstances, initial samples are required before volume production begins. In this situation there should be an agreement between forging manufacturer and purchaser on a quantity of closed die forgings which should be delivered to the purchaser under volume production conditions, tested and provided for inspection and in certain cases for machining.

7.3.2 Other samples

Other suitable means for approval before volume production are computer generated geometry data or die impressions. The type and quantity of samples have to be agreed between forging manufacturer and purchaser as a part of the order.

7.3.3 Production release

Volume production will be released by the purchaser when the sample forgings have been approved by both manufacturer and purchaser and verified by a test report.

In any case, the binding document for the volume production of closed die forgings is the approved forging drawing.

7.4 Product marking

Closed die forgings shall carry the identification symbol of the forging manufacturer only if it is agreed between forging manufacturer and purchaser.

Additional marking should be agreed between forging manufacturer and purchaser. The marking area and the marking must be specified on the drawing. The size and the form of the marking are determined by the size of the forging and technical possibilities but the height of the lettering normally shall not be less than 4 mm.

Lettering on the die is subject to particularly rapid abrasion and areas subject to greatest die wear should be avoided. For this reason lettering should be kept as short and simple as possible.

7.5 Delivery quantity deviations

Acceptable deviations from the delivery quantity shall be in the limits of the following Table 1.

Table 1: Acceptable deviations from the delivery quantity

Number of forgings	Tolerances	
	Over run	Under run
20 - 29	4	2
30 - 39	5	2
40 - 49	6	3
50 - 59	7	3
60 - 79	7	4
80 - 99	8	4
	% of the forgings	
	Over run	Under run
100 - 199	8	4
200 - 399	7	3,5
400 - 799	6	3
800 - 1 599	5	2,5
1 600 - 2 999	4	2
3 000 - 5 999	3	1,5
6 000 - 11 999	2	1
12 000 - 24 999	1,5	1
≥ 25 000	1	1

8 Inspection and test procedures

8.1 General principle

The nature and scope of testing procedures for quality assurance depend on the demands which are going to be placed on the forging in further machining and in its future application. Essential points, if testing takes place, are:

- control at the point of entry of the material to be forged;

- testing of the sample forgings;
- testing during production;
- testing of the finished forgings.

The object of the inspection is to ensure the conformity of the products with the specifications of the order and the drawing.

8.2 Routine inspection

Standard tests take place when there is no indication of additional inspection and testing on the drawing or in the order. These include dimensional inspection and visual inspection.

8.3 Additional inspection and testing

Additional tests must be agreed and included on the forging drawing or in the order or order confirmation. The test procedure should be clearly defined with reference to the applicable standards. It should include the type, location, quantity of the test pieces and the limits of acceptance.

The following additional tests may be chosen:

- tensile test at ambient temperature (reference EN 10002-1) or at elevated temperature (EN 10002-5);
- Charpy impact test (EN 10045-1);
- Rockwell hardness (EN 10109-1);
- Brinell hardness (EN 10003-1);
- depth of decarburization (EU 104);
- grain size (EU 103);
- indication of cleanliness (ISO 3763 or ISO 4967);
- macrographic examination (ISO 3763 or ISO 4968 or ISO 4969);
- chemical composition (CR 10261 states the references of all the European Standards for the determination of the chemical analysis);
- non-destructive testing: magnetic particles, penetrant testing, ultrasonic testing, eddy current.

9 Inspection and testing documents

9.1 General

Normally inspection results are not reported to the purchaser. In cases where written documentation is required by the purchaser, the order must specify the type of required document in accordance with EN 10204.

9.2 Submission

If the delivery is to be inspected by the purchaser or a nominated representative this stipulation must be stated and become part of the order.

All details concerning:

- inspection authority;
- date of submission;
- batch size to be submitted;
- condition of sample part;
- tests to be carried out;
- location of tests;
- validity of tests;
- retests;
- conditions of approval;

must be included, and become part of the order.

10 Non-conformity

10.1 Complaints

Misforged items may only lead to a complaint when they adversely affect the further treatment or application of the part.

The purchaser must give evidence of the justification for the complaint to the forging manufacturer preferably by presenting the forgings for which the complaint is made.

10.2 Remedial action

Any remedial action to be carried out on the defective part must be agreed between the forging manufacturer and the purchaser.

Annex A (informative)

Information to be supplied by the purchaser at enquiry and order stage

Independently of purely commercial information, the forging manufacturer needs from the purchaser some information to supply a closed die forging corresponding to the purchaser's wishes. Table A.1 summarizes this information:

Separate columns are given in the table for:

- mandatory information:
  - standard: it shall be supplied whatever is the closed die forging;
  - specific: it shall be supplied in particular cases, depending on the type of closed die forging.

  Without this mandatory information the forging manufacturer is unable to execute the order.
- optional information which can be supplied for better understanding of the needs of the purchaser and for better manufacture of the workpieces at less cost.

Table A.1: Information to be supplied by the purchaser at enquiry and order

N°	Information on	Section of relevant standard	Mandatory information		Optional information
			Standard	Specific	
1	Identification of the workpieces	**4**	- designation; - forging number; - drawing number and index		- previous order
2	Quantity to be supplied	**3** **7.3** **7.5**	- anticipated total quantity	- number of prototypes; - pre-production quantity; - whether or not these two quantities are included in the total quantity; - frequency of batch deliveries	- whether repeat orders are anticipated or not
3	Tooling	**5**		- to be made; - existing: - on stock or supplied by the purchaser; - references; - to be checked or modified	
4	Use			- safety critical component	Other conditions: - abrasion, corrosion; - resistance to leaks, friction; - temperature etc. (if possible, specify values); - direction of application of stresses
5	Materials	**6**	- grade and quality; - appropriate material. Standard or specification	- possible variants (grade or specifications); - is the purchaser to supply the material? . if so, specify the tests to be carried out by the forging manufacturer; - steel working and production conditions	

to be continued

Table A.1 (continued)

N°	Information on	Section of relevant standard	Mandatory information		Optional information
			Standard	Specific	
6	Production	**6** **7.2**		- production requirements (decarburization, forging temperature, heat treatment)	
7	Mechanical and physical properties of workpiece	**8.3**	- limit values for Brinell hardness; - test standards	- essential hardness test locations; - strength, impact test; - magnetic permeability, resistivity; - soundness	- direction of stresses or loads; - subsequent surface treatment (case hardening, etc.)
8	Dimensional tolerances	**4**	- general: class E or F of standard prEN 10243-1 or -2	- specific tolerances on site-conforming dimensions; - indication of workpiece holding points, reference faces, machining start points	
9	Metallurgical delivery condition	**6.2**		- type of heat treatment; - characteristics to be achieved; - does the purchaser require advice of the heat treatment parameters?	If delivery is to be made from the forge without heat treatment, specify if heat treatment, and if so what type, will subsequently be carried out
10	Finish	**7.2.1**		As forged, or: - shot blasted; - pickled: type and specification; - protection: type and specification; - machining: partial or complete; number and revision index of drawing	
11	Marking	**7.4**		- marking to be applied; - position on the workpieces; - marking principles	

to be continued

Table A.1 (concluded)

N°	Information on	Section of relevant standard	Mandatory information		Optional information
			Standard	Specific	
12	Inspection and testing	**8** **9**	- with or without inspection; - documents required; - inspection required; - batch content; - number of test series; - location of test pieces in the forgings; - results to be achieved	- name and address of the inspecting organization; - inspection terms of the prototypes and pre-production forgings: . type of checks to be made;7 . areas for special attention; - conditions for performances of special tests (e.g. type of fluid and pressure for pressure tests); - test location, if they cannot be carried out at the supplier's works	
13	Treatment of non-conformities	**10**	- system of remedial action	- special conditions for reworking	
14	Delivery conditions	**9.2**	- batching for delivery; - packaging; - method of delivery; - address of consignee		

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: 020 8996 9000. Fax: 020 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: 020 8996 9001. Fax: 020 8996 7001.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: 020 8996 7111. Fax: 020 8996 7048.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: 020 8996 7002. Fax: 020 8996 7001.

Copyright

BSI
389 Chiswick High Road
London
W4 4AL