
**Steels for the reinforcement
and prestressing of concrete —
Certification scheme for steel bars
and wires**

*Aciers pour l'armature et la précontrainte du béton — Système
particulier de certification des barres et fils d'acier*

STANDARDSISO.COM : Click to view the full PDF of ISO 10144:2018



STANDARDSISO.COM : Click to view the full PDF of ISO 10144:2018



COPYRIGHT PROTECTED DOCUMENT

© ISO 2018

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

	Page
Foreword	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Initial product and process evaluation	2
4.1 General	2
4.2 Purpose	2
4.3 Organization	2
4.4 Procedure	2
4.4.1 General	2
4.4.2 Assessment of the production conditions	2
4.4.3 Sampling and testing of specimens	3
4.4.4 Certification decision and attestation	3
4.4.5 Verification of the long-term quality level	3
5 Internal inspection by the manufacturer	4
5.1 Purpose	4
5.2 Procedure	4
5.2.1 Conformance testing	4
5.2.2 Determination of the long-term quality level	5
6 Surveillance	6
6.1 Organization	6
6.2 Purpose	6
6.3 Procedure	6
6.4 Evaluation	6
7 Conformity documents	7
Bibliography	8

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by ISO/TC 17, *Steel*, Subcommittee SC 16, *Steels for the reinforcement and prestressing of concrete*.

This second edition cancels and replaces the first edition (ISO 10144:1991), which has been technically revised.

The following changes have been made:

- the references to ISO/IEC standards have been updated;
- the scheme stages have been aligned with modern certification criteria;
- the sampling criteria have been clarified.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Steels for the reinforcement and prestressing of concrete — Certification scheme for steel bars and wires

1 Scope

This document specifies rules for a certification scheme for continuous production of steel bars, rods and wires for the reinforcement of concrete structures in order to verify conformity with requirements specified in product standards, such as ISO 6935-1 and ISO 6935-2.

It includes requirements for the production process and management system assessment activities.

A product certification scheme for continuous production consists of the following stages:

- initial evaluation;
- review of evidence of conformity;
- certification decision and attestation;
- surveillance activities.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 17065, *Conformity assessment — Requirements for bodies certifying products, processes and services*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1 certification scheme

certification system as related to specified products, processes or services to which the same particular standards and rules, and the same procedure, apply

3.2 certification body

body that conducts certification of conformity

3.3 characteristic value

value having a prescribed probability of not being attained in a hypothetical unlimited test series

[SOURCE: ISO 16020:2005, 2.4.10, modified — the note has been deleted.]

3.4 inspection

examination of a product design, product, process or installation and determination of its conformity with specific requirements or, on the basis of professional judgement, with general requirements

Note 1 to entry: Inspection of a process may include inspection of persons, facilities, technology and methodology.

[SOURCE: ISO/IEC 17000:2004, 4.3]

4 Initial product and process evaluation

4.1 General

A signed certification agreement should be concluded before commencing the certification process, covering the product range requiring certification.

4.2 Purpose

The purpose of product evaluation is to ensure that the manufacturer has the capability and resources to produce reinforcing steels in accordance with the requirements specified in the product standards.

4.3 Organization

The certification body provides assessment and impartial third-party attestation that the specified requirements have been achieved. Product certification shall be conducted by certification bodies meeting the requirements of ISO/IEC 17065.

4.4 Procedure

4.4.1 General

Evaluation consists of the following stages:

- assessment of conditions for production ([4.4.2](#));
- sampling and testing of specimens ([4.4.3](#));
- calculation and verification of the long-term quality level ([4.4.5](#)).

If satisfactory results are not achieved in one stage, all the stages shall be repeated. Evaluation applies separately for each steel grade and each production method. If a steel grade is produced by various production processes, evaluation shall be conducted to its full extent for each of these processes.

4.4.2 Assessment of the production conditions

Assessment of the production conditions shall include the following:

- the competence of the personnel and satisfactory organization of the production processes;
- the adequacy of the equipment for production including effective process control;
- the independence of the department responsible for quality assurance from the production department;
- the suitability of the test equipment for internal testing;
- the ability of the manufacturer's quality system to ensure the quality of the products. A quality system such as ISO 9001 or similar is considered satisfactory if it meets the requirements of the applicable product standard.

The inspection report shall include an evaluation of the activities from melting and/or rolling to dispatch of product.

4.4.3 Sampling and testing of specimens

4.4.3.1 General

The test samples shall be taken from the production of the plant concerned. The test shall cover the entire range of product diameters for which certification is applied.

4.4.3.2 Extent of sampling and testing

Three different diameters, representing the smallest, largest and an intermediate diameter of the intended scope of approval, shall be tested for each grade and manufacturing process. The test specimens for each selected diameter shall come from at least 30 different bundles/coils, with one sample selected from each bundle/coil. The samples shall be distributed equally between the chosen casts and shall be taken to determine each mechanical and geometrical property specified in the product standard. The chemical composition shall be determined on one specimen from at least three different casts for each selected diameter. The test samples shall be taken at random from the material presented for testing by a representative from the inspection body. Care should be taken to ensure that the test specimens taken are representative of the material.

4.4.3.3 Properties to be tested

All properties specified in the product standard shall be tested and compared with its requirements.

4.4.3.4 Evaluation of the test results

The results (individual values, average values, standard deviations) of the tests shall be collated in a test report. Based on the values determined for the standard deviations (related to each cast), it shall be judged whether simplified values, α , for internal inspection (see [5.2.1.2](#)) may be used. It is recommended that a long-term statistical evaluation be conducted on the results available, to aid in offering guidance to the applicant company, but this should not form part of the overall assessment for approval.

4.4.4 Certification decision and attestation

Once the inspection of the production conditions has been satisfactorily concluded, and the test results have been evaluated positively by the certification body, a works identification and an approval to produce for a specific period are granted to the manufacturer. During this period the long-term quality level shall be verified. The certification body will undertake surveillance audits as detailed in [Clause 6](#).

4.4.5 Verification of the long-term quality level

4.4.5.1 Extent of testing

To verify the long-term quality level, the manufacturer shall perform a sufficient number of tests for a sufficiently long period (between six months and one year), in order to properly evaluate the long-term quality level. If necessary, due to an insufficient number of test results or a failure to satisfy the requirements of the long-term quality level, the manufacturer shall double the extent of testing specified in [5.2.1.1](#) for the internal inspection. During this period surveillance shall be conducted more intensively than specified in [6.3](#).

4.4.5.2 Evaluation

At the end of the period specified in [4.4.5.1](#), all results of internal and external inspection shall be evaluated separately and compared with each other. The long-term quality level determined by appropriate statistical methods shall correspond to the requirements of [5.2.2.3](#), if a characteristic value

is specified in the product standard. If the long-term quality level of the product standard is not fulfilled, the manufacturer shall take appropriate corrective action, in association with the certification body.

5 Internal inspection by the manufacturer

5.1 Purpose

Internal inspection of production by the manufacturer is intended to ensure that the level of quality remains satisfactory with time and that, in the case of test results which do not conform to the requirements of the product standard, necessary measures can be taken to improve production process control.

5.2 Procedure

Internal inspection by the manufacturer consists of

- testing of all partial quantities of production (see [5.2.1](#)), and
- determination of the long-term quality level (see [5.2.2](#)).

5.2.1 Conformance testing

5.2.1.1 Extent of testing

The test unit shall be the cast or partial quantity of the cast. For each of the characteristics specified in the product standard, except chemical composition, one test specimen shall be taken per 40 t for all nominal diameters, with at least three tests per cast and nominal diameter.

The chemical composition (cast analysis) shall also be determined for all casts. The contents of the elements specified in the product standard shall be determined in this analysis.

5.2.1.2 Evaluation of the test results

When characteristic values are specified, the requirements shown by [Formula \(1\)](#) for the individual values (x_i) and [Formula \(2\)](#) for the mean value (m) of the test unit shall be met.

$$x_i > 0,95 f_k \quad (1)$$

where f_k is the required characteristic value according to the product standard.

$$m \geq f_k + ks \quad (2)$$

where

k is the acceptability index according to [5.2.2.3](#);

s is the standard deviation of the test results.

Proven values of ks for each product and production process route shall be used.

If simplified values can be used (see [4.4.3.4](#)), ks is replaced by the following values, α , for ribbed and plain bars:

For tensile strength: $\alpha = 15 \text{ MPa}$

For yield strength: $\alpha = 10 \text{ MPa}$

For elongation after rupture: $\alpha = 1,5 \%$

The mean value requirement in [Formula \(2\)](#) does not apply if all individual values lie above the required characteristic value.

All casts shall comply with the requirements for the chemical composition, including the carbon equivalent. All other requirements shall be met for each individual test specimen.

When test results are unsatisfactory according to this subclause, the manufacturer shall immediately take suitable corrective actions. Casts which do not conform to the requirements shall be set aside.

5.2.2 Determination of the long-term quality level

5.2.2.1 General

The long-term quality level shall be evaluated separately for each steel grade, each nominal diameter and each production process route and product form.

5.2.2.2 Extent of testing

The results of tests on all test units of the continuous production in accordance with [5.1](#) shall be collated and statistically evaluated and submitted to the certification body after at least 200 results have been presented, and at least every six months, in order to determine the long-term quality level.

5.2.2.3 Evaluation where characteristic values are specified

The average value (m) shall satisfy the requirement shown by [Formula \(3\)](#):

$$m \geq f_k + k \times s_n \quad (3)$$

where s_n is the standard deviation of the n results according to [5.2.2.2](#).

The values for the acceptability index (k) are listed in [Table 1](#); for a failure rate of 5 % ($p = 0,95$) at a probability of 90 % ($1 - \alpha = 0,90$).

Table 1 — Acceptability index (k) as a function of the number (n) of the test results

n	k	n	k
5	3,40	30	2,08
6	3,09	40	2,01
7	2,89	50	1,97
8	2,75	60	1,93
9	2,65	70	1,90
10	2,57	80	1,89
11	2,50	90	1,87
12	2,45	100	1,86
13	2,40	150	1,82
14	2,36	200	1,79
15	2,33	250	1,78
16	2,30	300	1,77
17	2,27	400	1,75

Table 1 (continued)

<i>n</i>	<i>k</i>	<i>n</i>	<i>k</i>
18	2,25	500	1,74
19	2,23	1 000	1,71
20	2,21	∞	1,64

6 Surveillance

6.1 Organization

The certification body shall perform surveillance activities. See ISO/IEC 17020.

6.2 Purpose

Surveillance has two purposes:

- surveillance of the conditions of production for compliance with the conditions established in the initial evaluation stage;
- supervision of the proper procedures of internal inspection.

6.3 Procedure

6.3.1 Surveillance and supervision of the manufacturer shall be conducted at maximum intervals of six months by the certification body.

All properties subjected to internal inspection shall be tested. The test specimens shall be taken from the manufacturer's or purchaser's stock. The test results shall be statistically evaluated and compared with the results from internal inspection. The number of tests in external inspection shall be sufficient to allow an assured assessment.

The results of external and internal inspection shall also be assessed for systematic errors in sampling, test procedures and evaluation. To this end, parallel tests on test specimens from at least 10 different bundles or coils with the same nominal diameter and from the same cast shall be performed in each case by the manufacturer and the body undertaking external inspection, and the results of these tests shall be compared.

6.3.2 The long-term quality level shall be determined at least twice a year and this shall be compared with the results achieved in internal inspection.

6.4 Evaluation

The results of external inspection shall be recorded in an evaluation report, which shall be sent to the certification body and the manufacturer. If the results show that the production does not conform to the requirements, appropriate measures shall be taken, depending on the type and significance of the deficiencies noted, for example:

- warning the manufacturer;
- intensification of surveillance (increase the frequency of testing);
- requesting that the production conditions should be changed;
- withdrawal of product approval.

7 Conformity documents

7.1 Reinforcing steels that have been produced in compliance with the requirements of a relevant product standard and subjected to quality assurance as described in [Clauses 4, 5 and 6](#) shall be supplied with documents that contain the following information:

- a) name of the manufacturer's facility;
- b) symbol or number of the manufacturer's facility;
- c) body carrying out external supervision;
- d) nominal diameter;
- e) designation according to the product standard;
- f) quantity supplied;
- g) date of manufacture;
- h) recipient;
- i) a statement of conformity.

7.2 When reinforcing steels are supplied via a trader or fabricator, they shall confirm on the delivery document that the reinforcement only originates from a manufacturing works that conduct quality supervision according to the requirements of this document.