
International Standard



404

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Steel and steel products — General technical delivery requirements

Acier et produits sidérurgiques — Conditions générales techniques de livraison

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 404 was developed by Technical Committee ISO/TC 17, *Steel*, and was circulated to the member bodies in May 1979.

It has been approved by the member bodies of the following countries :

Austria	Hungary	Norway
Belgium	India	Poland
Canada	Ireland	Portugal
Chile	Italy	Romania
Czechoslovakia	Korea, Dem. P. Rep. of	South Africa, Rep. of
Denmark	Korea, Rep. of	Switzerland
Finland	Libyan Arab Jamahiriya	Turkey
France	Netherlands	United Kingdom
Germany, F.R.	New Zealand	USSR

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Australia
Sweden
USA

This International Standard cancels and replaces ISO Recommendation R 404-1964, of which it constitutes a technical revision.

Steel and steel products — General technical delivery requirements

1 Scope and field of application

This International Standard defines the general technical delivery requirements applicable to crude¹⁾, semi-finished and finished wrought steel products.

Where the product standards provide for different requirements, such requirements are applicable.

In special cases, variations in these requirements may form the subject of an agreement at the time of order.

— inspection and testing conditions and type of document (see clause 5),

— conditions for marking, workmanship, conditioning, packing, loading, dispatch and place of destination,

and all data concerning application of the product which are necessary for the order to be carried out correctly; for instance, subsequent heat treatment, surface coating, hot or cold forming, etc.

3.3 The information given in 3.2 shall be specified :

2 Reference

ISO/R 377, *Selection and preparation of samples and test pieces for wrought steel.*

— either by reference to one or more standards with, if necessary, stipulation of any variations allowed by these standards;

— or, in the absence of a standard, by stipulation of the characteristics and conditions defined beforehand by mutual agreement.

3 Ordering

3.1 The purchaser selects the type of product, specifying its dimensions and characteristics as well as the grade and quality of the steel. In his choice he may be guided by the manufacturer.

3.2 The order shall contain all necessary information such as

- the number of pieces (and/or mass or length),
- the tolerances on the dimensions, shape, mass, number of pieces,
- the shape of the product,
- the nominal dimensions,
- the grade and quality of the steel,
- technical data (if the product standard allows for an alternative or if special agreements are possible),
- heat treatment conditions,
- requirements for treating and finishing of surface,

If, in an order, reference is made to a given standard without specifying its date, this reference is interpreted as being the edition current at the date of signing the order.

4 Manufacturing process

4.1 The manufacturing process shall be left to the discretion of the manufacturer, except by agreement to the contrary at the time of order or as otherwise specified in the product standard.

4.2 In the manufacturing process, the following shall be distinguished :

4.2.1 the steelmaking process, i.e. the melting and refining process (for example : basic Bessemer, open-hearth, electric, oxygen processes, etc.);

4.2.2 the state of deoxidation : rimmed, semi-killed, killed, special killed, etc.;

4.2.3 the product making process, i.e. the sequence of operations following solidification of the metal and preceding delivery of the products.

1) For the purposes of this International Standard, the concept of "crude products" covers not only ingots but also continuously cast products intended for forming at a later stage, such as blooms, billets, slabs and all products of other sections.

4.3 The steelmaking process shall be indicated to the purchaser for information if this has been specified in the order.

5 Inspection, testing and conformity of products

5.1 General principle

The manufacturer is responsible to the purchaser with respect to the compliance of the products with the requirements of the order.

Consequently, the manufacturer arranges appropriate inspection and testing of his production at his works.

5.2 Conformity of the products

5.2.1 At the time of order, the purchaser shall specify if the products are to be delivered with non-specific inspection and testing or with specific inspection and testing.

By special agreement, continuous inspection and testing may be specified (see 5.4).

5.2.2 At the time of order, the purchaser shall also specify which documents shall be required according to 5.3.1.2.1, 5.3.1.2.2, 5.3.2.3.1 and 5.3.2.3.2.

5.3 Inspection and testing of the products and related documents

5.3.1 Non-specific inspection and testing

5.3.1.1 Definition

Non-specific inspection and testing is inspection and testing carried out by the manufacturer in accordance with his own procedures (see 5.1), on products made by the same manufacturing process, but not necessarily on the products actually supplied.

5.3.1.2 Documents

5.3.1.2.1 Statement of compliance with the order

Document in which the manufacturer states that the products supplied are in compliance with the requirements of the order, without mention of any test result.

5.3.1.2.2 Test report

Document in which the manufacturer states that the products supplied are in compliance with the requirements of the order and in which he supplies the results of the routine works in-

spection tests, carried out on products made by the same manufacturing process as the consignment, but not, therefore, necessarily applying to the actual products supplied.

5.3.2 Specific inspection and testing of the products

5.3.2.1 Definition

Specific inspection and testing means the inspection and testing procedure carried out on the products to be supplied, in order to verify whether these products comply with the requirements of the order.

5.3.2.2 Place of inspection and testing

The selection of samples, the preparation of test pieces and the tests themselves shall be carried out, unless agreed to the contrary, in the works of the manufacturer.

Where the works of the manufacturer does not have the necessary means, the inspections shall be carried out at another place agreed between the parties, preferably in the country of the manufacturer.

5.3.2.3 Documents

5.3.2.3.1 Inspection certificate

The inspection certificate contains the results of all the tests specified, carried out on samples taken from the products themselves supplied under the specified batching conditions.

By agreement when ordering, the inspection and testing procedures may be carried out, at the discretion of the purchaser,

a) by the qualified department of the manufacturer's works;¹⁾

b) in the presence of the purchaser or a body designated by him.

The inspection certificate is signed in case a) by the representative of the qualified department, and in case b) by the purchaser or the representative of the designated body.

In certain special cases, by agreement when ordering, the inspection and testing procedures may also be carried out by a body independent of the purchaser and the manufacturer, the tests being carried out outside the production works. In that case, the inspection certificate shall be signed by the representative of that body.

5.3.2.3.2 Inspection report

Where the inspection certificate specified in case b) of 5.3.2.3.1 shall, by agreement, be signed by the manufacturer and purchaser or his representative, it is known as the inspection report.

1) A "qualified department" means an inspection and testing department different from the production department. In certain cases, this department may be subject to approval by the purchaser.

5.4 Continuous inspection of product characteristics

For specific products, following an agreement between the parties, specific product inspections (in accordance with 5.3.2) may be replaced by extracts from the continuous product inspection carried out by the qualified department of the manufacturer's works, approved by the purchaser. The characteristics to be verified and the values of these, the frequency of the inspection and, if necessary, the documents of compliance shall be agreed, as shall the right of the purchaser or his representative to verify such continuous inspection by appropriate means.

5.5 Method of batching, acceptance units, samples and identification of casts

5.5.1 Method of batching

The method of batching is determined by the product standard or the order. The method of batching may, for example, be as follows :

- by cast : the products are of the same product form. They come from the same cast and have been submitted, where appropriate, to the same heat treatment conditions in the manufacturer's works;
- by batch : the products may come from different casts and/or product making processes, identified or otherwise;
- by rolling unit : for instance, sheets coming from the same coil;
- by piece : for certain products where made necessary by technical requirements.

5.5.2 Acceptance unit

The acceptance unit is laid down by the product standard or the order.

The acceptance unit is the number of pieces or the tonnage of products to be accepted or rejected together, on the basis of the inspection to be carried out on these products.

5.5.3 Samples

Each acceptance unit gives rise to the selection of a certain number of samples. This number may vary for the same product according to the type of test (chemical analysis, mechanical tests at a specified temperature, long-duration tests, technological tests, etc.).

In the case of pieces ordered at finished size, the manufacturer may, with a view to taking of samples in accordance with the technical possibilities and subject to agreement at the time of order, submit for acceptance :

- either additional pieces,
- or pieces with prolongations,

- or smaller additional pieces of sufficient size for samples to be taken.

5.5.4 Identification of casts

Where reference to the cast is necessary for the inspection and testing operations, the manufacturer shall be able to relate the products in question to the casts from which they come.

5.6 Submission for inspection and testing

Submission for inspection and testing of part or all of the consignment in accordance with 5.3.2 is notified to the purchaser or his inspection representative by the manufacturer or his authorized representative.

In order to avoid interference with the normal operation of the works, the manufacturer and the purchaser or his inspection representative fix, by common agreement, the date or dates of the inspection.

A submission note referring to the order, or to the available part of the order, is delivered to the inspection representative not later than the beginning of the acceptance procedure.

5.7 Rights and duties of the inspection representative

The inspection representative shall have free access, at any appropriate moment, to the places where the products to be accepted are manufactured and stored. He may indicate the elements of the acceptance unit or the products from which the samples are to be taken in conformity with the specifications. He shall have the possibility of following the operations of selection of samples, preparation (machining and treatment) of test pieces and of witnessing the tests. However, the inspection representative, when moving around the works, shall observe all the safety rules in force in the works and be accompanied, where possible, by a representative of the works.

The acceptance procedures shall be carried out in accordance with the requirements of the normal run of production.

Sufficient time shall be allowed for them to be carried out effectively.

6 Mechanical and technological tests

6.1 Carrying out of tests

The tests shall be carried out, and the test results shall be utilized and interpreted, in accordance with the corresponding International Standards.

The accuracy of the testing machines shall be in accordance with the requirements of the corresponding International Standards.

6.2 Taking and preparation of samples and test pieces for mechanical tests

See ISO/R 377.

6.3 Interpretation of results

6.3.1 Where, in a standard, the mechanical characteristics are specified by thickness categories, the thickness to be considered is the nominal thickness of the product at the required location for taking samples for mechanical tests.

6.3.2 In the absence of any specification in the order or the product standard, the mechanical characteristics relate to the delivery condition of the products.

6.3.3 For certain tests (impact tests, for instance), the interpretation of the results is based on a sequential method as follows :

6.3.3.1 A series of tests (usually three tests) is carried out on test pieces taken from a single sample and the results obtained shall meet the criteria specified by the product standard (arithmetic mean and, if necessary, individual values).

6.3.3.2 In the case of unsatisfactory results, too low a mean or an individual value below the minimum specified value, a second series of tests may be carried out, again on test pieces from the same sample.

The mean of the two series of tests shall comply with the specified mean value. With regard to the individual values of the second series of tests, the requirements of the product standard shall apply. If these conditions are not satisfied, the product is rejected and re-tests are carried out on the remainder of the acceptance unit (see 6.5.2).

6.4 Invalidation of tests

A test is invalidated if the results are unsatisfactory owing to

- a) faulty production of the test piece not attributable to defects in the steel itself;
- b) faulty mounting of the test piece;
- c) faulty working of the test machine;
- d) incorrect heat treatment of the sample where the guaranteed mechanical characteristics relate to a heat treatment condition different from that of the delivery conditions.

In each of these cases, the test shall be repeated.

6.5 Re-tests

Where one or more tests give unsatisfactory results, re-tests may be carried out in accordance with the following

requirements for each unsatisfactory test, except by agreement to the contrary when ordering.

6.5.1 The unsatisfactory result comes from an individual test (for example tensile test or bend test).

6.5.1.1 The acceptance unit is the individual product.

The manufacturer may, at his discretion, retain the product as an acceptance unit, or not.

If the product is retained, two new tests of the same type as the one giving an unsatisfactory result are carried out.

Both new tests shall give satisfactory results. If not, the product is rejected.

6.5.1.2 The acceptance unit is a cast or a batch.

The manufacturer may, at his discretion, retain or not retain in the acceptance unit the product from which the unsatisfactory test piece comes, except by agreement to the contrary.

6.5.1.2.1 If the product is withdrawn from the acceptance unit, the inspection representative once more designates, within the same acceptance unit, two other products of his choice.

Two more tests of the same type are then carried out on test pieces from these two products, under the same conditions as for the first tests; both new tests shall give satisfactory results.

6.5.1.2.2 If the product is retained in the acceptance unit, the procedure is as indicated in 6.5.1.2.1, but one of the new test pieces shall be taken from the product retained in the acceptance unit; both new tests shall give satisfactory results.

6.5.1.2.3 If the result of a test should deviate significantly from the specified requirements for the steel type to be supplied, so that mixed material is suspected, sub-clauses 6.5.1.2.1 and 6.5.1.2.2 no longer apply.

In this case, a special inspection and testing procedure may be agreed between the interested parties.

6.5.2 The unsatisfactory result arises from a sequential method as defined in 6.3.3 (for example, impact test).

As indicated in 6.3.3.2, the product which has not given satisfactory results is rejected.

The procedure is as indicated in 6.5.1.2.1, two new series of tests being carried out on two different products from the remainder of the acceptance unit, both of which shall give satisfactory results.

In that case, sub-clause 6.3.3.2 no longer applies, and a second series of tests may not be carried out.

6.6 Sorting or re-treatment

The manufacturer reserves the right to carry out sorting or re-treatment (for example heat treatment or mechanical treatment) of the products, except by agreement to the contrary when ordering, either before or after the re-tests and to submit these products as a new acceptance unit in accordance with the provisions of 5.5 and 5.6 without prejudice to the purchaser.

The manufacturer shall state to the inspection representative the method of sorting used or the treatment applied.

7 Chemical analysis

Where the order contains requirements relating to chemical composition, the results of the analysis regarding the specified elements are given, in accordance with agreement at the time of order, in one of the documents defined in 5.3.1.2.2, 5.3.2.3.1, 5.3.2.3.2.

7.1 Selection of samples for chemical analysis

Selection of samples is carried out in accordance with the requirements of ISO/R 377.

7.2 Cast analysis

The cast analysis shall apply, except where otherwise indicated in the product standard or by special agreement.

7.3 Product analysis

7.3.1 Where product analysis is required by the product standard or the order, the sample for product analysis shall be taken from the location specified in the product standard or by special agreement.

The product standards state for each element

- either the permissible deviations between the required cast analysis and the product analysis,
- or, directly, the permissible content limits for the product.

7.3.2 Re-analyses

Where one or more analyses give unsatisfactory results, re-analyses may be carried out according to the following procedures, for each unsatisfactory analysis, except by agreement to the contrary at the time of order.

7.3.2.1 The acceptance unit is the individual product.

The manufacturer may, at his discretion, retain the product as the acceptance unit, or not.

If the product is retained, two new analyses, of the same type as the one which has given an unsatisfactory result, are carried out. Both new analyses shall give satisfactory results. If not, the product is rejected.

7.3.2.2 The acceptance unit is a cast or a batch.

The manufacturer may, at his discretion, retain or not retain in the acceptance unit the product or products from which the unsatisfactory test pieces were taken, except by agreement to the contrary.

7.3.2.2.1 If the product is withdrawn from the acceptance unit, the inspection representative once more designates, in the same acceptance unit, two other products of his choice.

Two new analyses of the same type are then carried out on samples from the two products, under the same conditions as for the first analyses; both new analyses shall give satisfactory results.

7.3.2.2.2 If the product is retained in the acceptance unit, the procedure is as indicated in 7.3.2.2.1, but one of the new samples shall be taken from the product retained in the acceptance unit; both new analyses shall give satisfactory results.

7.3.2.2.3 If the result of an analysis deviates significantly from the specified composition so that mixed material is suspected, sub-clauses 7.3.2.2.1 and 7.3.2.2.2 no longer apply.

In this case, a special inspection and testing procedure may be agreed between the interested parties.

7.4 Arbitration analysis

Arbitration analyses, if any, shall be carried out in a laboratory chosen by common agreement, in accordance with methods specified in the corresponding International Standards.

8 Surface and internal imperfections

8.1 Surface imperfections

8.1.1 Surface imperfections not prejudicial to the proper use of the product cannot be grounds for rejection.

The order contains, if necessary, particular specifications relating to surface appearance which supplement the general or product standards depending on the intended use.

Rejection at the manufacturer's works on the grounds of surface imperfections is limited to the actual products displaying such imperfections.

8.1.2 The use of special techniques, either during acceptance or after delivery, to detect surface imperfections, as well as the procedures for interpreting the results, shall be agreed at the time of order.

8.2 Repairs

Surface imperfections may be removed, provided that the remaining thickness remains within the lower dimensional tolerance limit specified in either the product standard or the order, and provided that this operation is not prejudicial to the use of the product.

The purchaser or the accepting agent may permit local repairs by welding. This agreement may apply either to the whole or only to a part of the consignment.

8.3 Internal imperfections

8.3.1 Internal imperfections not prejudicial to proper use of the product cannot be grounds for rejection.

Rejection, at the manufacturer's works, on the grounds of internal imperfections, is limited to the actual products displaying such imperfections.

8.3.2 The use of special techniques at the time of acceptance (radiography, ultrasonics, magnetic detection, etc.) to detect internal imperfections as well as the number of products to be tested per acceptance unit and the procedures for interpreting the results shall be agreed at the time of order.

9 Tolerances on dimensions, shape and mass

9.1 Tolerances on dimensions and shape

The product may be rejected if the dimensional or shape tolerances are exceeded. Such rejection is limited to those products where the tolerances are exceeded.

9.2 Tolerances on theoretical mass

Generally, the product standard or a specific standard concerning dimensional tolerances lays down tolerances

- on the theoretical mass calculated for each product and/or
- on the theoretical mass of an entire acceptance unit or consignment.

9.3 Tolerances on the number of pieces supplied or the tonnage supplied

Deviations, specified as an absolute value or as a relative value, between the number of pieces supplied or the tonnage supplied and the number of pieces or the tonnage ordered, respectively, may also be specified in the order.

10 Rounding of results obtained by inspection and testing

10.1 Mechanical and chemical properties

The results of mechanical and chemical tests shall be rounded off, using either the rules specified in the testing standards or, where the value obtained contains a larger number of significant figures than the guaranteed value, the generally accepted rules for rounding.

10.2 Dimensional characteristics

The results of determination of dimensions (length, width, thickness, diameter, etc.) and shape (squaring, cambering, straightness, flatness, kinking, ovality, etc.) are not rounded off. These shall comply with the specifications in the standard, taking account of the permissible deviations also given in the standard.

11 Identification and marking

The identification and marking, if any, of the products supplied are carried out in conformity with the specific provisions made in the order, and, where appropriate, the specifications in the product standards.

Where product marking is required, but not detailed in the order, a type of marking compatible with the type of product is left to the discretion of the manufacturer.

12 Complaints after delivery

In the event of a complaint, the manufacturer shall have an opportunity to check the merit of the claim within a reasonable time. The contested items shall remain available for this purpose.

In particular, if imperfections appear after subsequent use by the purchaser, it is necessary to submit the product to a check.