International Standard 6305/4

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Railway components — Technical delivery requirements — Part 4 : Untreated steel nuts and bolts and high-strength nuts and bolts for fish-plates and fastenings

Éléments constitutifs de la voie ferrée — Spécifications techniques de livraison — Partie 4 : Vis et écrous en acier non traité et vis et écrous à haute résistance pour éclisses et attaches

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Foreword

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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. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 6305/4 was prepared by Technical Committee ISO/TC 17, *Steel*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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Railway components — Technical delivery requirements — Part 4 : Untreated steel nuts and bolts and high-strength nuts and bolts for fish-plates and fastenings

1 Scope and field of application

This part of ISO 6305 defines the specifications regarding product quality and acceptance conditions for nuts and bolts made of untreated steel and high-strength nuts and bolts for fish-plates and fastenings.

2 References

ISO 898/1, *Mechanical properties of fasteners — Part 1 : Bolts, screws and studs.*

ISO 898/2, *Mechanical properties of fasteners — Part 2 : Nuts with specified proof load values.*

ISO 965/1, *ISO general purpose metric screw threads — Tolerances — Part 1 : Principles and basic data.*

ISO 2859, *Sampling procedures and tables for inspection by attributes.* [1)]

ISO 4759/1, *Tolerances for fasteners — Part 1 : Bolts, screws and nuts with thread diameters between* 1,6 *(inclusive) and* 150 mm *(inclusive) and product grades A, B and C.*

3 Manufacturing conditions

3.1 Steelmaking process

The steelmaking process is the prerogative of the manufacturer. However, at the request of the purchaser, the manufacturer shall indicate in his offer the nature and main characteristics of the steelmaking process; he may not amend these without advising the purchaser's agent of this.

The bolts and nuts are of the property classes indicated in the table, defined by the values of the mechanical properties specified in ISO 898/1 and ISO 898/2.

Table

	Property classes				
Bolts	4.6	5.6	6.8	8.8	10.9
Nuts	4/5	5	6	8	10

3.2 Manufacture

The bolts shall be made from one single piece without welding. The heads of the bolts shall be produced by hot or cold upsetting and the nuts shall be hot or cold shaped. In the case of heat-treated bolts and nuts, the treatment is left to the discretion of the manufacturer. However, if requested by the purchaser, the manufacturer shall indicate the heat treatment conditions; he may not amend them without informing the purchaser's agent of this.

The manufacturing drawing provided by the purchaser shall state the type of thread required for the bolt and the nut.

Throughout the manufacturing process, the steel manufacturer and processor shall apply the best available practices so that the bolts comply with the requirements of this specification. In addition to the blooms from ingots, those obtained from continuous casting may also be used.

1) At present at the stage of draft. (Revision of ISO 2859-1974.)

3.3 Dimensions and thread form of the nuts and bolts

3.3.1 The dimensions of nuts and bolts shall conform to existing International Standards.

3.3.2 The type of thread shall conform to the appropriate International Standards.

3.4 Drawings and gauges

One set of the final drawings shall be sent to the manufacturer by the purchaser at the same time as notification of approval of the contract.

If the order so requires, the manufacturer shall provide prior to production two sets of maximum and minimum gauges for the tolerances on the prescribed dimensions.

Only these gauges are valid for inspection.

One set of gauges shall be made available to the purchaser for inspection purposes.

The making of the gauges shall be the responsibility of the nut and bolt manufacturer.

3.5 Marking

The markings and numbers on the purchaser's drawings shall stand out in relief or be embossed and be clear enough to be legible at all times.

The marking is carried out in conformity with the specifications of the order or its annexed documents.

3.6 Quality

The nuts and bolts shall be made in accordance with the drawings supplied by the purchaser; they shall be free from faults which may have an adverse effect on their application or behaviour in operation.

Any operation aimed at covering up a fault is strictly forbidden and may involve rejection of the goods supplied.

In the case of heat treated nuts and bolts, if the mechanical properties are not attained, subsequent heat treatment may be applied and the purchaser shall be informed of the conditions of this treatment.

3.7 Tolerances

3.7.1 Tolerances excluding thread tolerances

The tolerances for the nuts and bolts shall comply with ISO 4759/1.

The purchaser shall indicate the tolerance class required at the time of ordering.

3.7.2 Thread tolerances

If the purchaser requests that the thread be checked as a replacement for the screwing test (see 4.1.3.1), he shall indicate the tolerance class in accordance with ISO 965/1 and ISO 4759/1 at the time of ordering.

4 Acceptance conditions

The tests and acceptance inspection shall be carried out on finished pieces.

4.1 Mechanical tests

4.1.1 Nature of the tests

For the bolts, the tests are determined in accordance with programme B specified in ISO 898/1. For nuts, the proof load tests and the hardness tests specified in ISO 898/2 shall be carried out.

4.1.2 Batching method

The following batching method shall be applied for the tests on the nuts and bolts :

— one series of tests per batch of 500 to 20 000 items for the fish-bolts;

— one series of tests per batch of 2 000 to 100 000 items for the coupling bolts.

4.1.3 Test procedure

For the bolts, the tests shall be carried out in accordance with the specifications of clause 8 of ISO 898/1.

For the nuts, the proof load test and the hardness test shall be carried out in accordance with the specifications of subclauses 8.1 and 8.2 of ISO 898/2. The screwing test shall be carried out as described in 4.1.3.1.

4.1.3.1 Screwing test

The nut shall be screwed on by hand with no appreciable play over two thirds of its height at least. It shall then be screwed right down with a torque wrench, without the torque exceeding 35 N·m for bolts of diameter less than or equal to 20 mm and 45 N·m for bolts of diameter greater than 20 mm.

At the request of the purchaser, this test may be replaced by checking the thread tolerance class, the characteristics of which shall be indicated in the order (see 3.7.2).

4.1.4 Interpretation of the tests

The tests shall be carried out on samples taken from batches of nuts and bolts manufactured in accordance with this International Standard.

The statistical sampling plan to be used shall be the subject of an agreement between the purchaser and the manufacturer.

The agreement shall mention the risks, the accepted quality level and the batch and sample size.

If there is no such agreement, the sampling shall be carried out in accordance with the Wald sampling plan or, when possible, in accordance with the corresponding table of ISO 2859 which leads to the same risks to the manufacturer and the user of this diagram. The two inspection plans have practically the same operating characteristics but the sequential plan is much more economical.

The risks defining the scheme translated by the diagrams (annexes C and D) are as follows :

a) for batches of 500 to 2 000 items :

1) 10 % probability of rejecting a batch containing a 20 % proportion of defectives,

2) 10 % probability of accepting a batch containing a 30 % proportion of defectives;

b) for batches of 2 001 and to 100 000 items :

1) 10 % probability of rejecting a batch containing a 10 % proportion of defectives,

2) 10 % probability of accepting a batch containing a 20 % proportion of defectives.

The test is complete when the representative point of the test development has passed into the acceptance zone or the rejection zone in the diagram.

4.2 Checking of dimensions

4.2.1 Nature of the checks

Systematic checking of the dimensions involves the following dimensions :

— diameter of the shank in the non-threaded section;

— length of the shank;

— dimension across the flats of the bolt head;

— dimension across the flats of the nut;

— height of the bolt head and thickness of the nut;

— threads (on request and replacing the screwing test, see 4.1.3.1).

The other dimensions in the drawings enclosed with the invitation to tender may be the subject of inspection on the part of the purchaser at any time, but they are not subjected to the systematic check as defined in 4.2.3.

4.2.2 Batching method

The items selected shall be arranged in batches having the same characteristics. The samples taken shall be such that they are representative of the batches submitted. The batch size cannot be less than 500 items nor greater than 20 000 items for fish-bolts; it cannot be less than 2 000 items nor greater than 100 000 items for coupling bolts.

The purchaser has the right to split up the lots or group them together for the checks.

The items selected shall be marked by the purchaser and these marks shall be kept intact until the acceptance tests have been completed.

4.2.3 Interpretation of the checks

If at least one checked dimension of any nut and bolt is outside the tolerance limits or the finish of the nut and bolt does not satisfy the requirements of 3.5, that nut and bolt is regarded as a "bad" sample.

The dimensional checks shall be carried out on samples taken from batches of nuts and bolts.

The statistical sampling plan to be applied shall be the subject of an agreement between the purchaser and the manufacturer. The agreement shall mention the risks, the accepted quality level and the batch and sample size.

If there is no such agreement, the statistical sampling plan shall be in accordance with the Wald diagram or with the corresponding table in ISO 2859 which leads to the same risks for the manufacturer and the user of this diagram. The two inspection plans have practically the same operating characteristics but the sequential plan is much more economical.

The risks defining the scheme transmitted by the diagram (annexes A and B) are as follows :

— 5 % probability of rejecting a batch containing a 5 % proportion of defectives;

— 5 % probability of accepting a batch containing a 15 % proportion of defectives.

The inspection is complete when the representative point of the test development has passed into the acceptance zone or the rejection zone in the diagram.

In the case of rejection, the manufacturer has the right of picking out the items of the rejected batch and resubmitting the batch for the acceptance test.

During this second test, the check shall be carried out in accordance with the sequential sampling plan, annex B, providing the purchaser with a lower risk.

The purchaser may waive the dimensional check under the conditions specified in 4.2.4.

4.2.4 Alternative to dimensional checks on samples taken from batches — Control chart

When the manufacturer applies a permanent control chart system approved by the purchaser, the latter may space out inspections on samples taken from the batches as he wishes. The

results recorded in the control charts are then regarded as constituting the inspection check.

The agreement of the purchaser on the system of control charts covers the following main points :

— the stages of manufacture at which the inspection is carried out;

— the sampling size and frequency;

— the inspection limits;

— where appropriate, the number of items outside the limits allowed during a given period.

The control charts shall be kept available for the purchaser who may check at any time that the system is being applied correctly by whatever method the purchaser chooses.

The control charts shall contain all the data permitting clear identification of the manufactured goods. They shall be kept by the manufacturer until at least 31 December of the year following the one indicated on the items.

5 Data to be supplied by the purchaser

The attention of users of this part of ISO 6305 is drawn to the fact that the invitation to tender is normally accompanied by a definition of the conditions for use, in addition to documents useful in drawing up the contract, especially those regarding the application of the requirements of this specification.

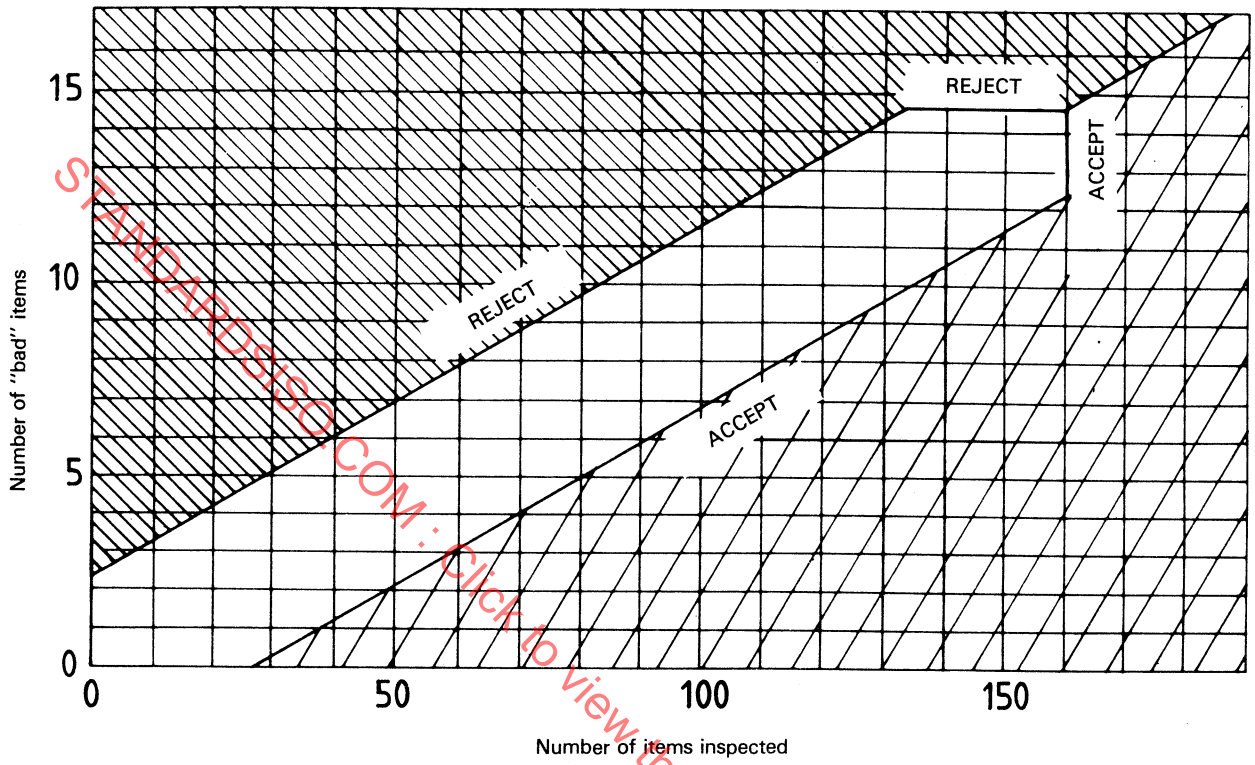
6 Packaging

The order shall specify the nature of the packaging required for the goods supplied.

Annex A

Progressive sampling plan — Wald method

(Forms part of the Standard.)



Item being tested

Type :

Date :

Check on dimensions and finish

Comments :

Supplier :

Administration :

Service :

Note on the use of the Wald diagram

When a test is carried out, individual items are selected at random from the batch being checked. Each is checked and the result is recorded on the diagram before continuing.

A sample shall be deemed to conform if the test or check referred to in the diagram is satisfactory. It shall be deemed not to conform if the contrary is the case.

The results are represented by a point moving over the diagram. The starting position of the point is at zero. For each test, the point is moved by one unit parallel to the x-axis. For each non-conforming test, it is also moved by one unit parallel to the y-axis. The test is stopped as soon as the recording point has reached one of the areas marked "accept" or "reject".

Different kinds of test, forming a series, may be plotted on the same diagram.

The diagrams relating to each series of tests shall be appended to the acceptance report. They shall show each consecutive position of the recording point.

The purchaser may permit sampling to be carried out using groups of adjacent items instead of randomly selected individual items. In this case

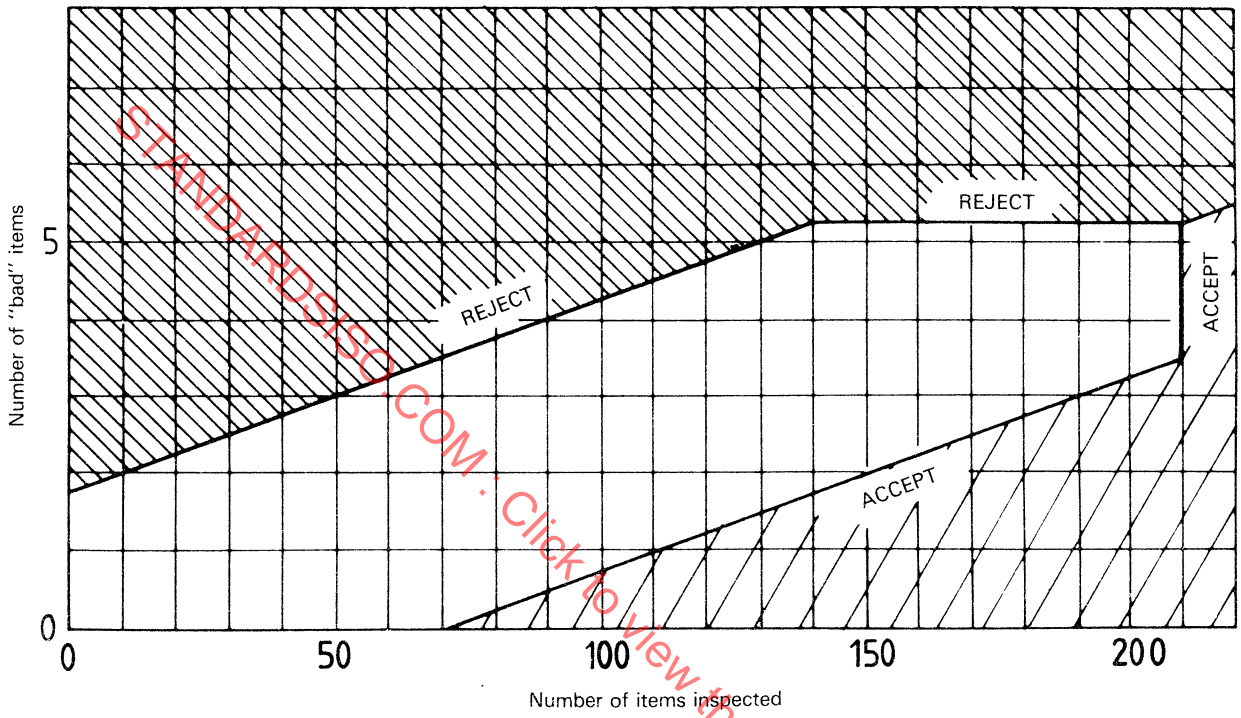
1) the number of items in a group shall be constant throughout the test and be predetermined with a maximum number of 10;

2) the position of the recording point shall be plotted on the diagram after all the items in the group have been checked; the recording point is replotted after each group, parallel to the x-axis, by as many units as there are items in the group, and parallel to the y-axis by a number of units equal to the number of non-conforming items found in the group.

Annex B

Progressive sampling plan for inspection of resubmitted batches

(Forms part of the Standard.)



Item being tested

Type :

Date :

Check on dimensions and finish

Comments :

Supplier :

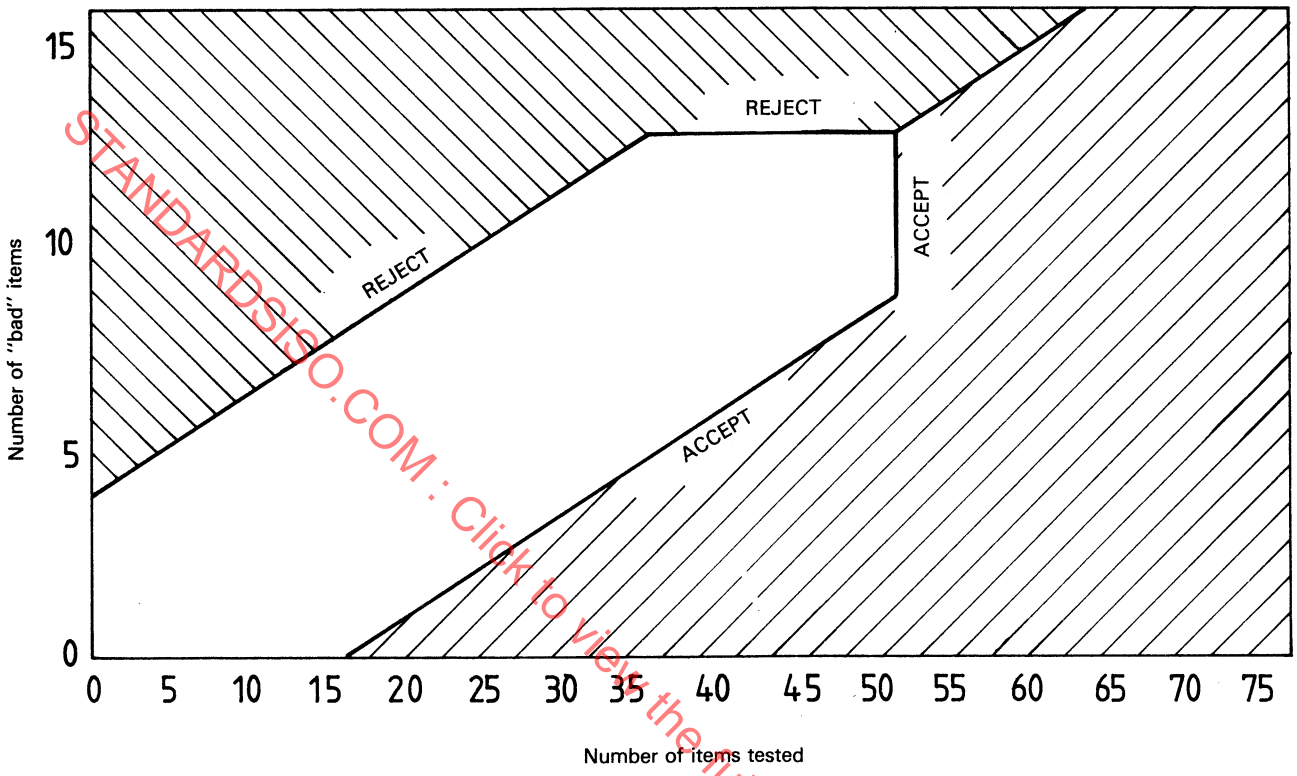
Administration :

Service :

Annex C

Wald diagram for lots of 500 to 2 000 items

(Forms part of the Standard.)



Inspection of steel railways bolts

Type :

Date :

Quality control

Tensile test

Proof load test

Hardness test

Screwing test

Wedge loading test

Supplier :

Administration :

Service :

Comments :