# INTERNATIONAL STANDARD

ISO 3178

Second edition
1988-06-01

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

## Steel wire ropes for general purposes — Terms of acceptance

*Câbles en acier d'usages courants — Conditions de reception*



Reference number
ISO 3178 : 1988 (E)

## 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.

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 3178 was prepared by Technical Committee ISO/TC 105, *Steel wire ropes.*



This second edition cancels and replaces the first edition (ISO 3178 : 1974), of which it constitutes a minor revision. Annex B, works certificate, has been replaced by a certificate of conformance.

Annexes A, B, C and D are for information only.



Printed in Switzerland

# Steel wire ropes for general purposes — Terms of acceptance

## 1 Scope

This International Standard specifies the terms of acceptance for steel wire ropes for general purposes as specified in ISO 2408.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.



ISO 2232 : 1973, *Drawn wire for general purpose non-alloy steel wire ropes — Specifications.*

ISO 2408 : 1985, *Steel wire ropes for general purposes — Characteristics.*

ISO 3108 : 1974, *Steel wire ropes for general purposes — Determination of actual breaking load.*



## 3 General

The number of test pieces to be taken from each batch and the types of test to be carried out should be agreed between the interested parties.

If inspection by sampling is agreeable to the two parties, it may be based on that given in annex A.

If no agreement can be reached, the batch size shall be that number of coils (reels) presented for acceptance.

## 4 Tests on rope

### 4.1 Diameter and tolerances

**4.1.1** The nominal diameter of the rope shall be one of those specified in clause 6 of ISO 2408.

**4.1.2** The actual diameter of the rope shall be within the tolerances specified in ISO 2408.

**4.1.3** The actual diameter shall be measured with a suitable caliper fitted with jaws broad enough to cover not less than two adjacent strands.

The measurements shall be taken on a straight portion of the rope without tension, at two points spaced at least 1 m apart, and at each point the two diameters at right angles shall be measured.

The average of these four measurements shall be within the tolerances specified by reference to the nominal diameter.

**4.1.4** The measurements for ovality (out-of-roundness) shall be taken in accordance with 4.1.3. The maximum variation between any of the four measurements shall not exceed the values given in table 1.

**Table 1 — Permissible ovality**

| Nominal diameter $d$ mm | Permissible ovality on nominal diameter, % | |
|---|---|---|
| | Ropes with strands exclusively of wire | Ropes with fibre strand cores |
| 2 and 3 | 7 | — |
| 4 and 5 | 6 | 8 |
| 6 and 7 | 5 | 7 |
| 8 and over | 4 | 6 |

**4.1.5** In case of dispute, the diameter may be measured under a force of approximately 5 % of the minimum breaking load of the rope.

### 4.2 Breaking force

The actual breaking force of the rope shall be not less than the minimum breaking force specified in ISO 2408 when measured in accordance with the method specified in ISO 3108.

## 5 Tests on wires from the rope

When specified by the purchaser on the enquiry and order, tests of wires from each production length shall be carried out in respect of diameter, tensile strength, torsions, bends and, when necessary, galvanizing.

### 5.1 Material

The material shall comply with ISO 2232 subject to the acceptance levels given in 5.4

### 5.2 Sampling

In order to obtain wire test pieces, a suitable length shall be cut from the rope and the wires unlaid.

In the case of six- and eight-strand ropes, the number of test wires of equal nominal diameter shall be equal to the number of wires of that diameter in one strand. The wires to be tested shall be selected at random from all the main strands of the rope.

In the case of multistrand ropes, the number of test pieces shall be in accordance with table 2.

**Table 2 — Number of test pieces**

| Rope designation | Number of wires for testing | | |
|---|---|---|---|
| | Outer strands | Intermediate strands | Inner strands |
| **17 × 7** | 11 | — | 6 |
| **18 × 7** | 12 | — | 6 |
| **34 × 7** | 17 | 11 | 6 |
| **36 × 7** | 18 | 12 | 6 |

The samples of wire taken for tests shall normally not include filler wires, core wires or wires from a steel main core. (Wires from the steel main cores of eight-strand ropes may be excluded from this provision.)

For the purposes of evaluating the test results, the rope manufacturer shall specify the nominal diameters of the wires, at the purchaser's request.

### 5.3 Test methods

The methods of testing for wire diameter, tensile strength, torsions, reverse bends and galvanizing shall be the same as those described in ISO 2232.

Attention is drawn to ISO 6892 and ISO 7800 on the subject of straightening the wires.

### 5.4 Levels of acceptance

#### 5.4.1 Tensile test

At least 95 %[1)] of the wires tested shall comply with the requirement of the appropriate tensile grade as detailed in ISO 2232, subject to a reduction of not more than 50 N/mm$^2$.

#### 5.4.2 Torsion test

At least 95 %[1)] of the wires tested shall comply with the appropriate requirements of ISO 2232 except that the minimum number of torsions may be 75 % (to the nearest whole number of torsions above) of those specified.

#### 5.4.3 Reverse bend test

At least 95 %[1)] of the wires tested shall comply with the appropriate requirements of ISO 2232, except that the minimum number of reverse bends may be 80 % (to the nearest round number of bends above) of those specified.

#### 5.4.4 Tensile test on knotted wire

For wires having a diameter of less than 0,5 mm, the bending and torsion tests shall be replaced by the tensile test on knotted wire. At least 95 %[1)] of the wires tested shall comply with the appropriate requirements of ISO 2232.

#### 5.4.5 Galvanizing test

At least 95 %[1)] of the wires tested shall comply with the requirements of ISO 2232 in respect of the tests for mass of coating.

#### 5.4.6 Retests

Retests shall be carried out only when the original test resulted in failure and shall be agreed between the interested parties.



## 6 Certificates

The types of certificate given in 6.1 to 6.3 may be used.



### 6.1 Certificate of conformance

This will acknowledge, if required, the conditions specified in the purchase order. (An example of a certificate of conformance is given in annex B.)

### 6.2 Full works certificate

This shall give the results of the tests requested by the purchaser in his order. It shall be supplied on request. (An example of a full works certificate is given in annex C.)

### 6.3 Certificate of acceptance

This shall be used when tests are carried out in the presence of the purchaser or his representative after manufacture, or in a laboratory designated by the purchaser. (An example of a certificate of acceptance is given in annex C.)

## 7 Facilities for inspection

**7.1** When so specified by the purchaser, the manufacturer shall give the purchaser or his representative all reasonable facilities to carry out the tests in order to ensure that the rope and its components are in accordance with this International Standard.

1) To the nearest whole number below.

**7.2** Unless otherwise agreed, all tests and inspection shall be made at the manufacturer's works before dispatch.

**7.3** Test lengths required for acceptance testing shall be ordered as additional lengths.

## 8 Packaging

Unless specified by the purchaser, ropes shall be supplied in coils or on reels at the discretion of the manufacturer.

The rope shall be protected in transit against moisture, dust and dirt.

# Annex A
(informative)

# Inspection by sampling for wire ropes

## A.1 Sampling

The number of samples, $n$, in relation to the batch size, $N$, shall be determined from table A.1. If the number of samples selected in this way is less than the number of production lengths, then the sample size shall be the number of production lengths.

For each characteristic appearing in clauses 4 and 5, $n$ tests shall be carried out.

## A.2 Conformity

The batch conforms if all the tests give a satisfactory result.

If one or more of the samples fail, a retest on the same coils (reels) shall be made. The batch conforms if the retest gives a satisfactory result.

If the result is unsatisfactory, the coils (reels) from which the result has been taken shall be rejected and, if the batch size is greater than three, additional tests on samples from other coils (reels) of the batch shall be made in accordance with the third column of table A.1. The batch conforms if all additional tests are satisfactory.

If one or more of the additional tests give an unsatisfactory result, all coils (reels) of the batch shall be tested and all coils (reels) failing shall be rejected.

**Table A.1 — Number of samples**

| Batch size $N$ | Number of samples $n$ | Number of samples for the additional tests |
|---|---|---|
| 1 | 1 | — |
| 2 | 2 | — |
| 3 | 3 | — |
| 4 | 3 | 1 |
| 5 | 3 | 2 |
| 6 to 15 | 3 | 3 |
| 16 to 25 | 4 | 4 |
| 26 to 40 | 5 | 5 |
| 41 to 65 | 7 | 7 |
| 66 to 110 | 10 | 10 |
| 111 to 180 | 15 | 15 |
| 181 to 300 | 20 | 20 |

# Annex B
(informative)

## Example of a certificate of conformance for wire ropes

## Certificate of conformance

**Test certificate No.:** .....

**Customer's order No.:** .....

**Reel No.:** .....

**Purchaser**
Name: .....
Address: .....

**Rope supplier**
Name: .....
Address: .....

**Rope maker**
Name: .....
Address: .....



**Characteristics**
Nominal length: ..... m
Nominal rope diameter: ..... mm

Construction
No. of strands: .....
Class: .....
No. of outer wires: .....

Lay
Type: .....
Direction: .....

Tensile grade: ..... $N/mm^2$
Wire finish: .....
Type of core: .....
Preformed: Yes/No[1)]
Lubricated: Yes/No[1)]
Minimum breaking force: ..... kN
Was actual breaking force test carried out: Yes/No[1)]
Approximate unit mass: ..... kg
Standard(s): ..... (if applicable)

**Additional information:** .....

I certify on behalf of the company named above that the above particulars are correct.

Signature: Position held:

1) Delete whichever is not applicable.

# Annex C
(informative)

## Example of a full works certificate of acceptance for wire ropes

## Full works certificate or certificate of acceptance

Manufacturer: .....

Purchaser: .....

Order number: .....

Nominal diameter: ..... mm

Actual diameter of rope: ..... mm

Length: ..... m

Construction: .....

Lay

Type: .....

Direction: .....



Tensile grade of wire: ..... $N/mm^2$

Surface finish of the wires: .....

Actual breaking force: ..... kN

Coil/reel No.: .....

| Number of wires | Nominal wire diameter[1] mm | Measured diameter of wire mm | Breaking force[2] kN | Tensile strength $N/mm^2$ | Number of bends[3] | Number of torsions[4] |
|---|---|---|---|---|---|---|
| | | | | | | |

1) Specified by the manufacturer.
2) Tensile test according to ISO 6892.
3) Reverse bend test according to ISO 7801.
4) Torsion test according to ISO 7800.

It is certified that this rope conforms to ISO 3178.

Place, date ..... Signature (stamp) .....

# Annex D
(informative)

## Bibliography

ISO 6892 : 1984, *Metallic materials — Tensile testing.*

ISO 7800 : 1984, *Metallic materials — Wire — Simple torsion test.*

ISO 7801 : 1984, *Metallic materials — Wire — Reverse bend test.*