INTERNATIONAL STANDARD

ISO
4345

Second edition
1988-06-15

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

Steel wire ropes — Fibre main cores — Specification

Câbles en acier — Âmes centrales en textile — Spécifications

Reference number
ISO 4345 : 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 4345 was prepared by Technical Committee ISO/TC 105, *Steel wire ropes.*

This second edition cancels and replaces the first edition (ISO 4345 : 1977), of which it constitutes a technical revision.

Annexes A, B, C, D and E form an integral part of this International Standard.

Printed in Switzerland

INTERNATIONAL STANDARD **ISO 4345 : 1988 (E)**

Steel wire ropes — Fibre main cores — Specifications

1 Scope

This International Standard specifies the construction and characteristics of fibre main cores for steel wire ropes using two types of fibre :

a) natural;

b) man-made.

This International Standard is not applicable to ropes for mine hoisting purposes.

NOTE — Fibre cores may be adversely affected by high ambient temperatures; when selecting fibre cores, the limitation of specific fibres in this respect should be recognized.

2 Natural fibre cores

Natural fibre cores shall be made from new hard fibres of the following types :

- sisal (*Agave sisalana*);
- abaca; Manila hemp (*Musa textilis*).

3 Man-made fibre cores

Man-made fibre cores shall be made entirely from new fibres of the following types :

- fibre-forming polyolefines (i.e. monofilament, film or fibrillated film of polyethylene, polypropylene, etc.);
- any suitable alternative materials agreed between core purchaser and core supplier.

4 Construction

Main cores complying with this International Standard shall be laid up from at least three strands. Each coil shall be continuous throughout its length without core splices.

5 Core designation

The core shall be designated by its nominal diameter and nominal runnage (mass per unit length); these shall be agreed between the core manufacturer and the wire rope manufacturer. The core manufacturer shall state whether the runnage is based on the lubricated or unlubricated core.

6 Tolerances

The tolerances on the ordered length, l, shall be as follows :

$l \leqslant 400$ m : $^{+5}_{\ 0}$ %

$l > 400$ m : $^{+20}_{\ \ 0}$ m for each 1 000 m or part thereof

The tolerances on nominal diameter and nominal runnage, expressed as percentages, shall be as given in table 1.

Table 1

Tolerances expressed as a percentage

Type of fibre	Tolerances on nominal diameter, D	Tolerances on nominal runnage
Natural fibre	all sizes : $^{+5}_{\ 0}$	$^{+5}_{\ 0}$
Man-made fibre	4 mm $\leqslant D <$ 7 mm : $^{+4}_{\ 0}$	$^{+4}_{\ 0}$
	$D \geqslant$ 7 mm : $^{+3}_{\ 0}$	$^{+3}_{\ 0}$

7 Core lubricants

Lubricants used for cores shall be acid-free and shall not contain moisture.

The lubricant content of pre-lubricated cores shall be agreed between the core purchaser and the core manufacturer; it shall be measured in accordance with the method specified in annex C.

8 Water soluble acids1)

The acidity of the core shall be not more than 2 ml of a 0,1 mol/l acid solution per 100 g of core when tested in accordance with the method specified in annex D.

---

1) Acidity and salt are normally associated only with natural fibre cores and may not be applicable to man-made fibre cores.

9 Salt[1]

The salt content (expressed as a percentage of sodium chloride) shall be not more than 0,3 % when tested in accordance with the method specified in annex E.

10 Packaging and marking

The cores shall be supplied unspliced in continuous length in coils or reels. Each package shall

a) be suitably protected against damage and adverse climatic conditions in transit;

b) bear a label giving the name of the core supplier, the nominal diameter, the nominal runnage, the length and type of fibre.

All ends shall be whipped and tied to prevent unravelling.

---

[1] Acidity and salt are normally associated only with natural fibre cores and may not be applicable to man-made fibre cores.

Annex A
(normative)

Determination of core diameter

Prior to removal of sample from the reel, coil or pad, the outer exposed side of the core shall be marked with chalk or other suitable substance over a distance of about 5 m.

With reference to this mark, the samples shall be selected and the measurements shall be carried out in such a way that no torsion is introduced and the lay is not disturbed.

Place the sample for measurement, at least 3 m long, under a reference tension, F, in newtons, calculated from the formula

$$F = \frac{D^2}{0,8}$$

where D is the nominal core diameter in millimetres.

Measure the core under tension using a sliding calliper having jaws wide enough to cover two strands of the core. Carry out the measurements at the two ends and the centre of the 3 m test length, measuring two mutually perpendicular diameters at each of these points.

Calculate the mean of these six measurements and record the result, in millimetres, rounded to the nearest 0,1 mm, as the core diameter.

The maximum difference between the highest and lowest of the six measurements shall not exceed 5 % of the nominal diameter.

This test shall only be used for cores before they have been put into a wire rope; it shall not be used for cores taken from wire ropes.

Annex B
(normative)

Determination of core runnage (mass per unit length)

Place the samples for measurement, at least 4 m long, under a reference tension calculated in accordance with the formula given in annex A.

Mark the sample accurately with two marks at least 3 m apart, while under this reference tension, and cut at these marks when the tension is released.

Determine the mass of the cut length of rope to the nearest 0,1 g and express it in grams per metre.

The tester shall state whether the runnage refers to a lubricated or an unlubricated core.

This test shall only be used for cores before they have been put into a wire rope; it shall not be used for cores taken from wire ropes.

Annex C
(normative)

Determination of water content and core lubricant content

C.1 Preparation of samples

From the centre of a length of wire rope core having a mass of at least 100 g, cut two specimens representing the complete cross-sectional area; the length of the pieces shall be chosen in such a way that the mass m_1 of the specimen to be used for determining the extractable content is between 20 and 30 g and the mass m_2 of the specimen to be used for determining the water content is about 50 g.

C.2 Determination of water content

For this determination, use the sample of mass m_2.

Distil the water contained in the sample after the addition of xylene or an appropriate benzole fraction, and condense it in a graduated receiver. From the mass of water m_4 obtained from the specimen of mass m_2, calculate the mass of water m_5 present in the specimen of mass m_1, using the formula

$$m_5 = \frac{m_1}{m_2} \times m_4$$

Express the result in grams to the nearest 0,001 g.

C.3 Determination of extractable content (moisture-free)

Unravel the first sample, of mass m_1, weigh it to the nearest 0,1 g and put it into a new extraction sleeve, of known mass and not containing any substances soluble in methylene chloride and not dried. Ensure that the sample does not project over the edge of the sleeve.

Dry an extraction flask of nominal capacity 250 ml for at least 2 h in a drying cabinet at 105 °C. Cool the flask in a desiccator for 2 h and determine its mass to the nearest 0,001 g.

Pour 150 ml of methylene chloride[1] into the flask and extract the contents of the sleeve in a Twisselmann or Soxhlet apparatus until the extraction medium flows off in a colourless form, or, if colourless impregnating agents are present, until a specimen taken from the extract evaporates without residue.

After extraction, evaporate the solvent, leaving a small quantity. Evaporate this residual quantity of the extraction agent in a drying cabinet at 105 °C until constant mass is obtained. The drying process can be accelerated by placing the flask in an inclined position. Cool the flask for 2 h in a desiccator and weigh again to 0,001 g. Calculate, by difference, the mass m_3 of the extracted portion (moisture-free).

Calculate the extractable content, M, expressed as a percentage by mass, of the dry fibre material remaining after extraction, using the formula

$$M = \frac{m_3}{m_1 - (m_3 + m_5)} \times 100$$

where

m_1 is the mass, in grams, of the specimen used for determining the extractable content;

m_3 is the mass, in grams, of the matter extracted from the specimen;

m_5 is the mass, in grams, of the water in the specimen, as determined in accordance with clause C.2.

Express the result to the nearest 0,1 % (m/m).

This method shall only be used for cores before they have been put into wire ropes; it shall not be used for cores taken from wire ropes.

---

[1] Attention is drawn to the toxicity of methylene chloride; it is recommended that for routine determinations, 60/80° petroleum ether be substituted.

Annex D
(normative)

Determination of water-soluble acids

Take a sample of core, approximately 20 to 30 g in mass, from the core to be tested, and weigh to the nearest 0,1 g. Unravel the specimen and transfer it to a Soxhlet apparatus.

Boil for 30 min with 100 ml of distilled water.

Filter through a filter paper, and wash the residue successively three times with hot distilled water. After washing, the total quantity of the water extract should not exceed 175 ml.

Add a few drops of phenolphthalein to the extract and titrate with a 0,1 mol/l standard volumetric sodium hydroxide or potassium hydroxide solution to a permanent red colour.

Calculate the water-soluble acid content, Z, in millilitres per gram, as follows :

$$Z = \frac{10 \times V}{m_0}$$

where

m_0 is the mass, in grams, of the sample;

V is the volume of 0,1 mol/l sodium hydroxide or potassium hydroxide solution, in millilitres.

Express the result to the nearest 0,1 ml/100 g.

Annex E
(normative)

Determination of salt content

E.1 Sampling

At east one bale in every 20 or part thereof of raw fibre shall be sampled, but in no case shall fewer than three bales be sampled; three samples of fibre shall be taken from different sections of each selected bale.

The selected sample shall be laid with the fibres parallel alternately head-to-tail, and a central cross-section, 230 mm long, shall be taken. This central section shall be mixed by rolling to form a bundle with parallel fibres.

A sample of fibre shall then be selected at random from various parts of the bundle and cut into two lengths of approximately 115 mm. The samples so obtained shall be stored in a wide-mouthed, glass-stoppered bottle until testing.

E.2 Procedure

Place 10 g of the fibre, sampled as above, in a platinum or silica basin, moisten it with 40 ml of 50 g/l sodium carbonate solution, then evaporate to dryness and ignite at a temperature not exceeding dull redness (or just high enough to give a product sufficiently charred to yield a colourless filtrate on extraction with water).

Extract the residue with hot water, filter and wash. Return the residue to the platinum or silica basin and incinerate completely.

Dissolve the ash in 20 % (V/V) nitric acid, filter, wash the residue, and add this solution and washings to the aqueous extract.

Add to the combined extract, rendered acid with dilute nitric acid, a known volume of a 0,1 mol/l standard volumetric silver nitrate solution in slight excess, stir well, filter and wash the silver chloride precipitate. Add to the combined filtrates and washings 5 ml of a saturated solution of ammonium iron(III) sulfate, and titrate the excess silver nitrate with a 0,1 mol/l standard volumetric potassium thiocyanate solution until a permanent light-brown colour develops.

E.3 Expression of results

Calculate the percentage by mass of sodium chloride from the amount of silver nitrate converted into silver chloride, on the basis that 1 ml of a 0,1 mol/l silver nitrate solution is equivalent to 0,005 85 g of sodium chloride.

Express the result to the nearest 0,1 % (m/m) of sodium chloride.

UDC 677.721 : 677.1/.4

Descriptors : metal products, wire rope, cores, strands, textile fibres, specifications, tests, designation, marking, packing.

Price based on 5 pages