BRITISH STANDARD MARINE SERIES

BS MA 29: 1982

Specification for

Steel wire rope and strand for yachts

UDC 629.125.12.014.23:677.721

Foreword

This British Standard was first published as BS MA 29 in 1973, when it superseded BS 3972. This revision, having been prepared under the direction of the Shipbuilding and Marine Standards Committee, covers a range of steel wire rope and strand suitable for the majority of normal requirements for yachts.

Unlike the 1973 edition, natural and man-made fibre ropes have been omitted from this standard. Reference should be made to BS 2052 for requirements for natural fibre ropes, and to BS 4928 for requirements for man-made fibre ropes.

For types of construction of steel wire rope, see BS 365.

While it is not intended to restrict the choice of rope, the term "British Standard yacht rope" applies only to rope described in Table 3, Table 4 and Table 5 of this standard.

In line with current international practice, the term "zinc coated" has been adopted in this standard in place of "galvanized". The terms are synonymous.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

This British Standard, having been prepared under the direction of the Shipbuilding and Marine Standards Committee, was published under the authority of the Board of BSI and comes into effect on 29 October 1982

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The following BSI references relate to the work on this standard:
Committee reference SME/8
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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 5 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Amendments issued since publication

Amd. No.	Date of issue	Comments

Contents

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1 Scope

This British Standard specifies requirements for the material, manufacture and testing of the following types, constructions and diameters of steel wire rope and strand.

Type and construction	Nominal diameter range	
Zinc coated steel wire rope	mm	
7 × 7(6/1)	2 to 14	(see Table 3)
7 × 19(12/6/1)	3 to 14	
Stainless steel wire rope		
7 × 7(6/1)	2 to 14	(see Table 4)
7 × 19(12/6/1)	3 to 14	
Stainless steel wire strand		
1 × 19(12/6/1)	2 to 26	(see Table 5)

2 References

This standard makes reference to the following publications.

BS 365, *Galvanized steel wire ropes for ships.*

BS 970, *Wrought steels in the form of blooms, billets, bars and forgings — Part 4 Stainless, heat resisting and valve steels.*

BS 2052, *Specification for ropes made from manila, sisal, hemp, cotton and coir*[1)].

BS 2763, *Specification for round carbon steel wire for wire ropes.*

BS 4928, *Man-made fibre ropes*[1)].

3 Definitions

For the purposes of this British Standard, the definitions given in Appendix B of BS 365:1968 apply.

4 Material

4.1 Zinc coated wire. Zinc coated wire used for the manufacture of rope shall comply with the requirements for class A zinc coated wire specified in BS 2763:1982.

The tensile strength grade of zinc coated wire shall be 1 770 N/mm^2, except that king wires of strands shall be of any tensile strength grade listed in BS 2763:1982 between 1 370 N/mm^2 and 1 770 N/mm^2.

4.2 Stainless steel wire. Stainless steel wire used for the manufacture of rope or strand shall comply in respect of chemical composition with the requirements for grade 316S16 specified in BS 970-4:1970. It shall be free from harmful defects and shall comply with the requirements of BS 2763 in respect of the selection of test pieces and wire diameter.

NOTE The mechanical tests specified in BS 2763 are not applicable to stainless steel wire.

The minimum tensile strength of stainless steel wire (except for core and king wires) shall be as given in Table 1.

Table 1 — Minimum tensile strength and nominal diameter range of stainless steel wire

Nominal diameter of wire		Minimum tensile strength
From	Up to but excluding	
mm	mm	N/mm^2
	0.20	1 860
0.20	0.25	1 860
0.25	0.30	1 810
0.30	0.40	1 760
0.40	0.50	1 720
0.50	0.60	1 670
0.60	0.70	1 570
0.70	1.50	1 470
1.50	2.50	1 420
2.50	3.00	1 370
3.00	3.50	1 270
3.50	5.50	1 180

NOTE The variation in tensile strength of each of the wires in any one layer shall be not greater than 290 N/mm^2.

4.3 Main core of rope. The main core of either zinc coated or stainless steel rope shall be a wire strand of the same construction, material and tensile strength grade as the outer strands.

NOTE The main core of the rope includes a king wire or core.

4.4 Lubricant. Any lubricant used for wire rope shall be selected to reduce friction in the rope, and to provide protection of the steel wires against corrosion. Any lubricant used shall be free from acid or marked alkali content and shall have no injurious effect on the steel wire.

5 Manufacture

5.1 King wire. King wires of strands shall be of such a size as to provide sufficient support to enable the covering wires to be evenly laid.

[1)] Referred to in the foreword only.

5.2 Main core of rope. The main core of the rope shall be of such a size as to provide adequate support to the strands and to enable them to be evenly laid with suitable clearances.

5.3 Directions of lay of rope (see Table 3 and Table 4). The ropes shall be right-hand ordinary lay.

5.4 Post-forming and pre-forming

5.4.1 *Post-forming of 1 × 19 strand.* When the twelve outer wires of the end of the strand are carefully unlaid for a distance of one lay length, all the wires being as equally spaced as possible, the twelve outer wires shall retain their position without any further movement. After unlaying the outer wires, the seven inner wires shall retain their position without unlaying.

5.4.2 *Pre-forming of wire rope.* When three alternate strands are unlaid for two rope lays, and then laid back, there shall be no tendency for the unlaid strands to "run" and they shall assume their original position in the rope when laid back except for a small increase in actual rope diameter at the end, which shall not exceed the nominal diameter by more than 7.5 %.

5.5 Lubrication. Rope or strand shall be supplied free of surface lubricant.

5.6 Joints. When jointed wires are formed into a rope or strand, the joints shall be made so that the rope or strand complies with the requirements of **5.7**. Wires over 0.4 mm diameter shall be jointed by welding or brazing. Wires 0.4 mm diameter and smaller shall be jointed by brazing, welding or tucking.

The outer layer of wires in 1 × 19 strand given in Table 5 shall be free from joints.

5.7 Freedom from defects. The completed rope or strand shall be evenly laid and free from loose wires, distorted strands or other irregularities and shall remain in this condition when properly unwound from the reel or coil.

5.8 Diameter

5.8.1 *Nominal diameter.* The size of rope or strand, designated as "nominal diameter" in millimetres, shall be one of those given in Table 3, Table 4 and Table 5.

5.8.2 *Actual diameter.* The actual diameter shall be measured with a suitable caliper fitted with jaws broad enough to cover not less than two adjacent strands (see Figure 1). The measurements shall be taken at two points spaced at least 1 metre apart, and at each point two diameters at right angles shall be measured. The average of these four measurements shall be within the limits given in Table 2 for the appropriate nominal diameter. The maximum variation between any of the four measurements shall not exceed 4 % of the nominal rope or strand diameter. The actual diameter of rope or strand shall normally be measured on a straight portion without tension, except that in case of dispute the diameter shall be measured under a force of approximately 5 % of the minimum breaking load.

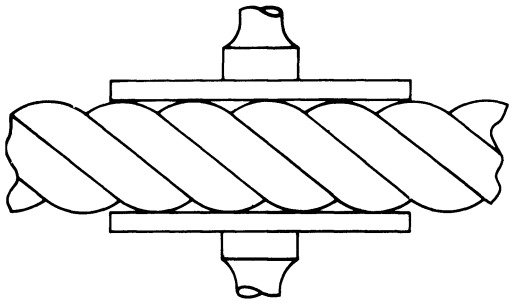

Figure 1 — Method of measuring wire rope diameter

Table 2 — Permitted limits on diameter

Zinc coated and stainless steel wire rope		
Nominal diameter	**Limits**	
	Plus	**Minus**
mm	%	%
2 to 3	7	1
4 to 5	6	1
6 to 7	5	1
8 or larger	4	1
1 × 19 stainless steel wire strand		
Nominal diameter	**Limits**	
	Plus	**Minus**
mm	%	%
2 to 4	4	1
5 to 7	3	1
8 or larger	2	1

5.9 Mass. The mass of rope and strand is not specified in this standard. However, approximate masses of rope or strand are given in Table 3, Table 4 and Table 5 for the appropriate nominal diameters. These are calculated values.

5.10 Length. Rope or strand with plain ends or fitted at one end shall be within + 2.5 %, – 0 of the nominal length.

For rope and strand fitted at both ends, the purchaser shall specify the datum points for length measurements. The tolerance on the nominal length when measured under a minimum force to ensure straightness shall be + 1 %, – 0, unless otherwise agreed between the purchaser and the manufacturer.

5.11 Breaking load. When measured in accordance with **6.2**, the actual breaking load shall be not less than the appropriate minimum breaking load given in Table 3, Table 4 and Table 5.

NOTE The term "breaking load" has been used in conformity with the traditional usage in the industry and current usage in standards published by the International Organization for Standardization (ISO), although the term "breaking force" is unambiguous and is to be preferred.
The method of test described in **6.2** imposes a tensile force, measured in kilonewtons (kN). Some sections of the industry may still refer to breaking loads in units of mass, such as kilograms (kg) or tonnes (t); a mass of 1 kg will exert a force of approximately 1 daN (decanewton) or 0.01 kN in a rope.

6 Inspection, testing and acceptance

6.1 Facilities for inspection. When specified by the purchaser, the manufacturer shall accord the purchaser or his representative all reasonable facilities to satisfy himself that the rope or strand and its components are in accordance with this standard.

6.2 Destructive tensile tests

6.2.1 *General*. The manufacturer shall test to destruction a sample of each ropemaking (production length) selected in accordance with **6.2.2** and shall record the actual breaking load of the sample.

If, in addition to the manufacturer's test, the purchaser specifies that a sample of the rope or strand be tested to destruction, the test shall be carried out as described in **6.2.3**.

During destructive tests, the test piece shall be gripped in such a way that each of the wires takes a share of the load.

6.2.2 *Selection and preparation of test piece*. The test piece shall be representative of the rope as a whole. Prior to selection, the ends of the test piece shall be secured to prevent turn being put into or taken out of the test piece. The rope from which the test piece is taken shall be secured in the same way. When cutting the test piece from the rope, neither the test piece nor the rope shall be damaged.

6.2.3 *Procedure for additional tests*. Use a testing machine of suitable capacity and certified accuracy. Select and prepare test lengths (distance between grips) as described in **6.2.2** and having the following dimensions.

Nominal diameter of rope	Minimum test length
6 mm or less	300 mm
Over 6 mm, up to and including 16 mm	600 mm

Apply not more than 80 % of the minimum breaking load quickly. Apply the remaining load slowly at a rate of approximately 10 N/s. Record the breaking load, reached when no further increase of the load is possible.

6.2.4 *Independent test of rope and strand after manufacture*. If the purchaser is not satisfied with the tests, the manufacturer shall be at liberty to have the ropes tested in accordance with this standard by an independent testing authority agreed upon between the purchaser and the manufacturer. If the results of such tests are satisfactory, the ropes or strands shall be deemed to comply with the requirements of this standard.

7 Certificate of test, marking and packaging

7.1 Certificate of test and examination. If specified by the purchaser, a certificate of test and examination in the statutory form shall be supplied with each consignment of rope or strand.

7.2 Marking. A tag securely attached to each coil or reel shall be marked with the following information:

a) the number of this British Standard, i.e. BS MA 29[2)];

b) the order number of the purchaser;

c) any other marking specified by the purchaser.

7.3 Packaging. Unless otherwise specified by the purchaser, rope or strand shall be supplied in coils or on reels at the discretion of the manufacturer.

Rope shall be packaged so as to be protected in transit against damage by moisture, dust and dirt.

[2)] Marking BS MA 29 on or in relation to a product is a claim by the manufacturer that the product has been manufactured to the requirements of the standard. The accuracy of such a claim is therefore solely the manufacturer's responsibility. Enquiries as to the availability of third party certification to support such claims should be addressed to the Director, Quality Assurance Division, BSI, Maylands Avenue, Hemel Hempstead, Herts HP2 4SQ for certification marks administered by BSI or to the appropriate authority for other certification marks.

Table 3 — Zinc coated steel wire rope

Nominal diameter[a]	Standing rigging		Running rigging	
	7 × 7(6/1) construction		7 × 19(12/6/1) construction	
	Approximate mass per 100 m[b]	Minimum breaking load	Approximate mass per 100 m[b]	Minimum breaking load
mm	kg	kN	kg	kN
2	1.51	2.74	—	—
2.5	2.36	4.27	—	—
3	3.40	6.15	3.34	5.77
4	6.05	10.9	5.94	10.2
5	9.46	17.1	9.29	16.0
6	13.6	24.6	13.4	23.0
7	18.5	33.4	18.2	31.4
8	24.2	43.7	23.8	41.0
10	37.8	68.4	37.2	64.0
12	54.5	98.1	53.5	92.2
14	74.1	134.0	72.8	126.0

[a] To convert diameter in millimetres to approximate circumference in inches, divide by 8.
[b] These are calculated values, and are given for guidance only.

Table 4 — Stainless steel wire rope

Nominal diameter[a]	Standing rigging		Running rigging	
	7 × 7(6/1) construction		7 × 19(12/6/1) construction	
	Approximate mass per 100 m[b]	Minimum breaking load	Approximate mass per 100 m[b]	Minimum breaking load
mm	kg	kN	kg	kN
2	1.51	2.37	—	—
2.5	2.36	3.71	—	—
3	3.40	5.34	3.34	5.00
4	6.05	9.49	5.94	8.89
5	9.46	14.8	9.29	13.9
6	13.6	21.4	13.4	20.0
7	18.5	29.1	18.2	27.3
8	24.2	38.0	23.8	35.6
10	37.8	59.3	37.2	55.6
12	54.5	85.4	53.5	80.0
14	74.1	117.0	72.8	109.0

[a] To convert diameter in millimetres to approximate circumference in inches, divide by 8.
[b] These are calculated values, and are given for guidance only.

Table 5 — Stainless steel wire strand

Nominal diameter[a]	Standing rigging	
	1 × 19(12/6/1) construction	
	Approximate mass per 100 m[b]	Minimum breaking load
mm	kg	kN
2	1.95	3.14
2.5	3.05	4.90
3	4.39	7.06
4	7.81	12.6
5	12.2	19.6
6	17.6	28.2
7	23.9	34.8
8	31.2	45.5
9	39.5	57.6
10	48.8	71.1
11	59.1	86.0
12	70.3	102.0
14	95.7	139.0
16	125.0	182.0
19	176.0	212.0
22	236.0	285.0
26	330.0	398.0

[a] To convert diameter in millimetres to approximate circumference in inches, divide by 8.
[b] These are calculated values, and are given for guidance only.

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