

## Section 1

### Rules for the Masting and Rigging of Sailing Ships (Traditionell Rigs)

#### A. General

##### 1. Scope

**1.1** These rules are applicable to all seagoing ships with class

✕ 100 A5 sailing ship  
(or training sailing ship).

**1.2** Germanischer Lloyd (GL) applies these rules to the testing of the masting and rigging also of ships without class where it is commissioned to carry out such testing.

**1.3** The construction of the hull is subject to the Society's currently most recent rules for the construction of seagoing ships.

**1.4** For ships which cannot be classified according to Section B. and having a length not exceeding 24 m the "Rules for Classification and Construction, I – Ship Technology, [Part 3 "Pleasure Craft, Chapter 2, Mast and Rigging"](#) apply.

In cases of doubt an agreement is to be sought with GL Head Office.

##### 2. Documents for approval

**2.1** Fully dimensioned drawings of the following parts of the rigging shall be submitted to the Society in triplicate for examination:

- Rigging plan showing sail areas and centres of effort as well as the arrangement and dimensions of the standing rigging;
- Masts, upper masts and crosstrees;
- Yards with their fastenings to masts and upper masts;
- Booms for gaff sails with their fastenings to masts and upper masts;
- Bowsprits;
- Fastenings for standing rigging on hull, masts and upper masts;
- Substructures of masts and bowsprits;
- Running rigging, where this is subjected to forces transmitted by yards, booms, etc.

**2.2** The forces acting at the crosstree and the cap are to be determined and submitted to GL for approval.

**2.3** Calculations of Intact Stability and, if need be, of Damage Stability are likewise to be submitted.

#### B. Definitions

##### 1. Types of rig

**1.1** The term "Rig" is used for the masts and the standing rigging of a sailing ship. In these Rules the running rigging does not come under this term.

**1.2** The rigs of sailing ships are of two basic types:

- Square rig
- Fore-and-aft rig.

**1.3** The masts of square-rigged ships carry yards. (Square- and stay sails.)

**1.4** The masts of fore-and-aft rigged ships carry no yards ("schooner rig", gaff-, top- and stay-sails).

##### 2. Types of ships

Depending on the type of rig used, sailing ships are classed as:

**2.1** Square-rigged ships (each mast carrying square sails). These include:

- the brig (two masts)
- full-rigged ships with three masts or more (e.g. a four-masted ship-rigged vessel).

**2.2** Ships with mixed rig:

These include:

- the schooner brig or brigantine (square-rigged foremast and fore-and-aft rigged mainmast)
- the topsail schooner or barkentine (square-rigged foremast, fore-and-aft rigged main and mizzen-mast)

- the bark (square-rigged fore- and mainmast, fore-and-aft rigged mizzenmast)
- the bark with more than three masts (the after-most mast invariably fore-and-aft rigged)
- the square topsail schooner (masts are both square and fore-and-aft rigged).

### 2.3 Schooners (fore-and-aft rig only).

These include:

- the two-masted schooner
- the fore-and-aft schooner with three or more masts (e.g. a five-masted schooner).

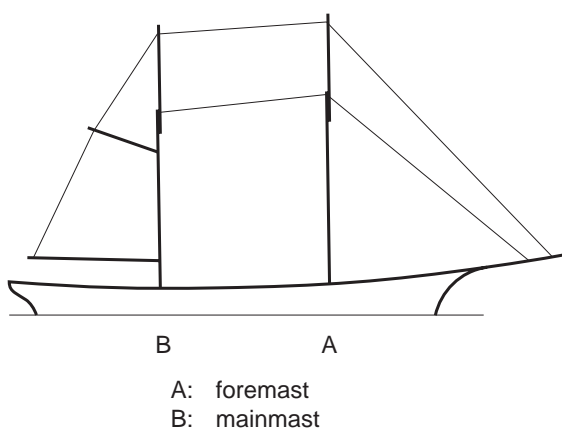
## 3. Nomenclature applied to masts

**3.1** Different names are given to the masts on the various types of vessel. The following terms are used:

### 3.2 Two-masted ships

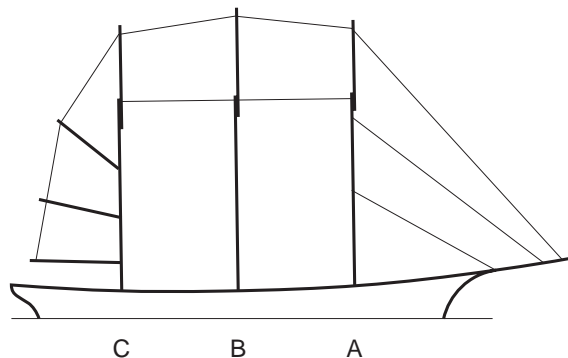
Independent of the kind of rig there is for

- brigs,
- schooner brigs
- schooners



**Fig. 1.1**

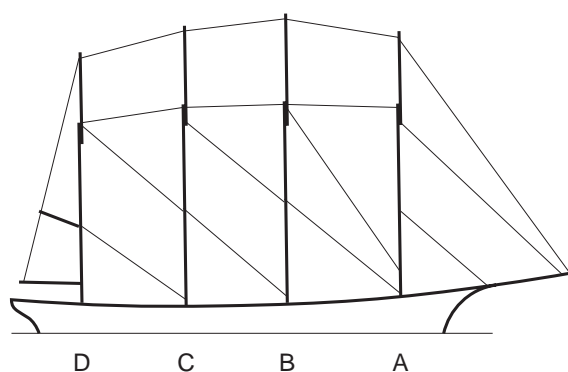
### 3.3 Three-masted ships



Barks, topsail schooners and full-rigged ships:  
 A: foremast  
 B: mainmast  
 C: mizzenmast

**Fig. 1.2**

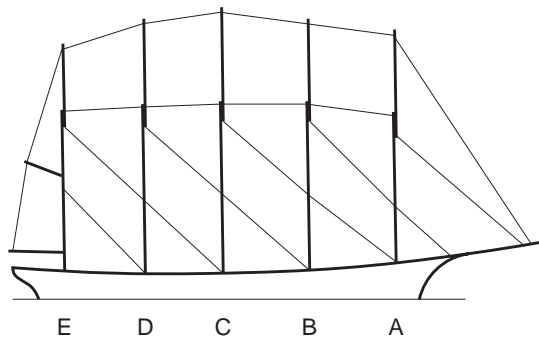
### 3.4 Four-masted ships



Four-masted barks and full-rigged ships:  
 A: foremast  
 B: mainmast  
 C: mizzenmast  
 D: jigger or spanker-mast

**Fig. 1.3**

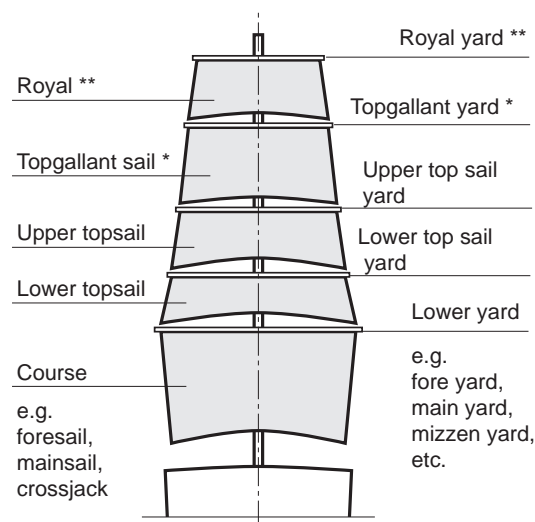
### 3.5 Five-masted ships



Five-masted barks and full-rigged ships:

- A: foremast
- B: mainmast
- C: mizzenmast
- D: jigger-mast
- E: spanker-mast

**Fig. 1.4**



\* On large sailing ships the topgallant sail may be divided into an upper and lower topgallant sail with the corresponding upper and lower topgallant yards.

\*\* On very large sailing ships, the sky yard and/or the sky sail will be arranged above the royal yard.

**Fig. 1.5 Nomenclature of yards and sails**

### 4. Nomenclature applied to yards

**4.1** The nomenclature applied to the yards is shown in Fig. 1.5.

### 5. Nomenclature applied to the standing rigging

**5.1** The nomenclature applied to the shrouds and backstays is shown in Fig. 1.6. The names given to the stays are shown in Fig. 1.7.

**5.2** The names given to the bowsprit stays are shown in Fig. 1.8.

### 6. Nomenclature applied to sails

**6.1** Sails are divided into three types:

- Square sails
- Gaff sails
- Stay sails

**6.2** The nomenclature applied to square sails is shown in Fig. 1.5.

**6.3** The lower gaff sails are named according to the masts on which they are carried (e.g. gaff foresail, gaff mainsail) but that on the mizzen is called a spanker. Corresponding names are also given to the gaff-topsails (e.g. main, fore and mizzen gaff-topsail). Further details are shown in Fig. 1.9.

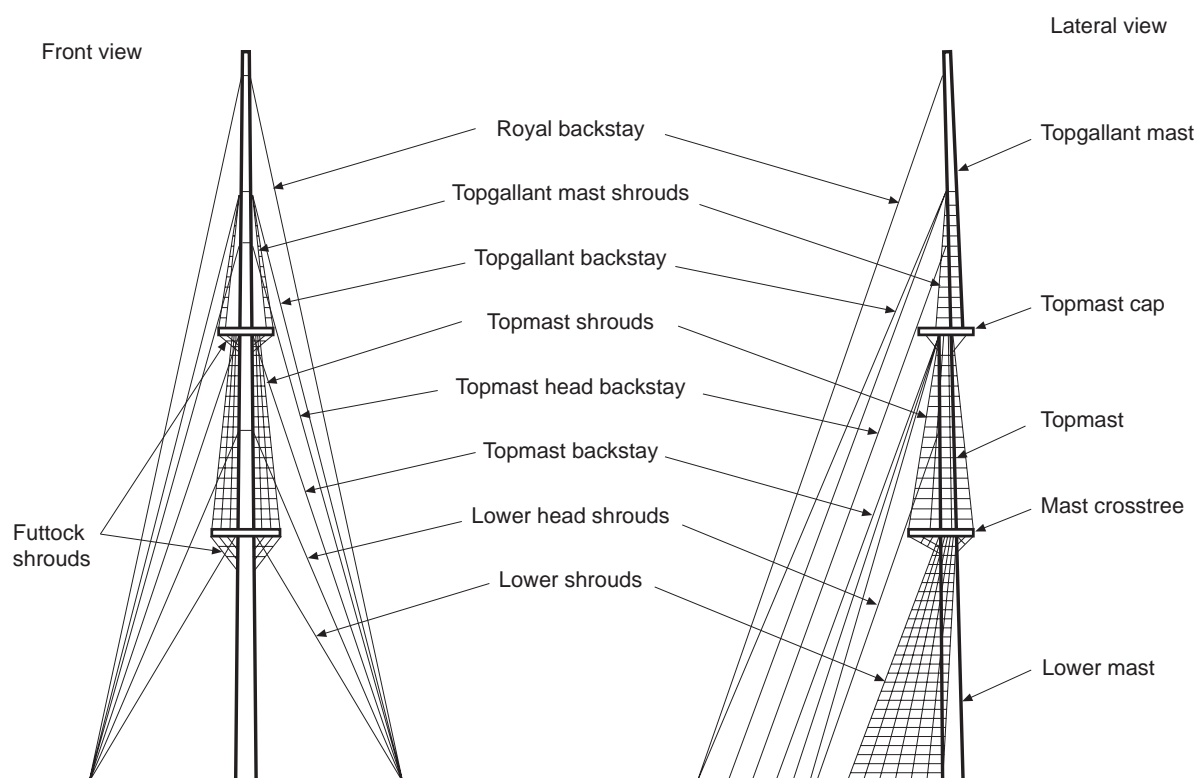
**6.4** The nomenclature applied to stay sails is shown in Fig. 1.10

### C. Dimensioning of Masts, Topmasts, Yards, Booms and Bowsprits

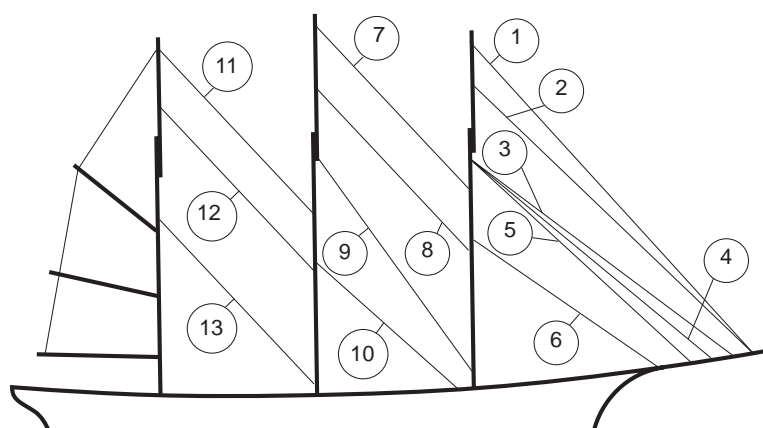
#### 1. General

**1.1** The dimensions of the parts given in the Tables Nos. 1.1 to 1.7 are based on steel with a tensile strength of 400 – 490 N/mm<sup>2</sup>. For further details on the materials please refer to "Rules for Classification and Construction, II – Material and Welding Technology, Part 1 – Metallic Materials".

Where materials of different tensile strength are used, the dimensions given in Tables Nos. 1.1 to 1.7 must be resp. are allowed to be modified accordingly.

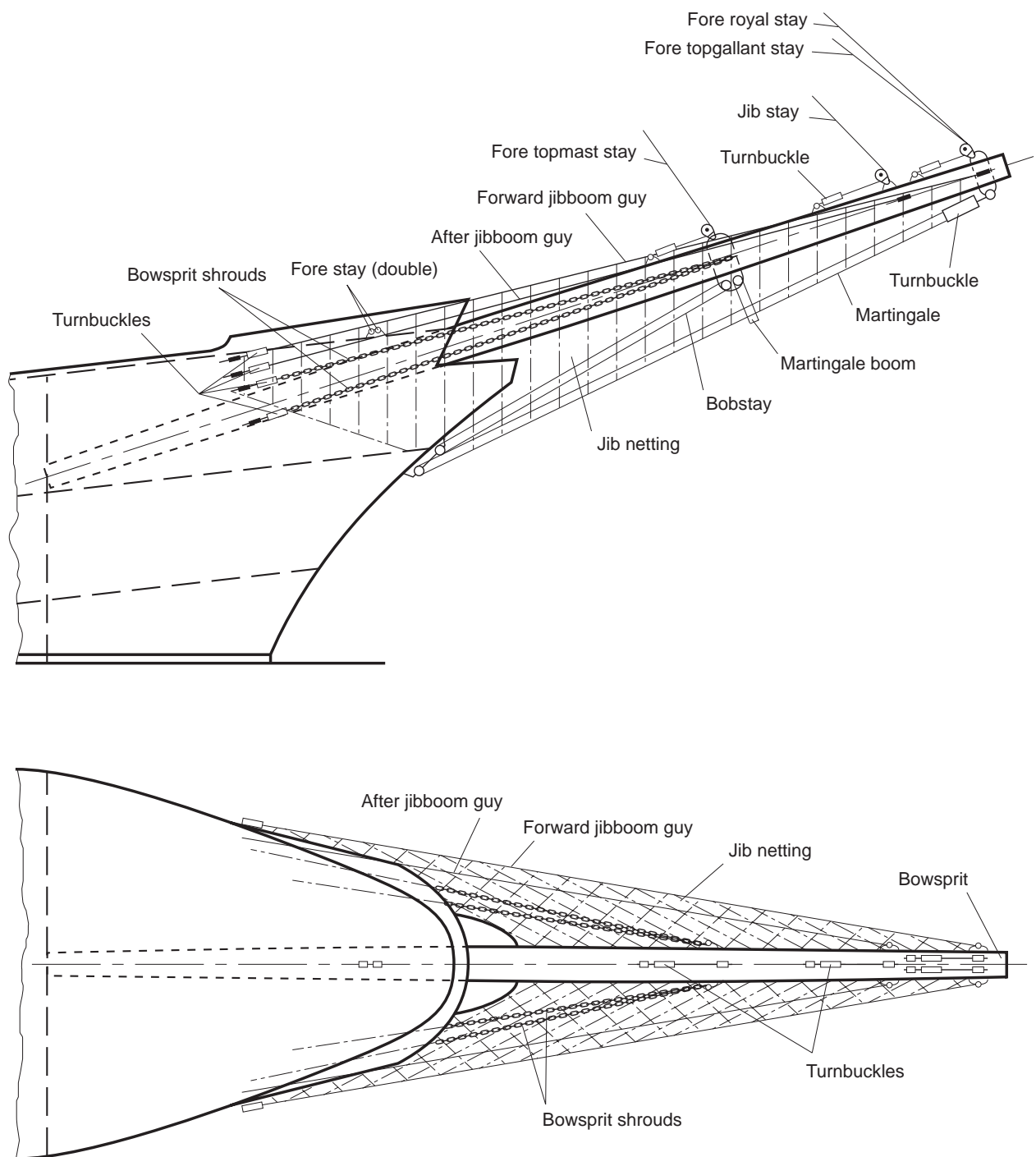


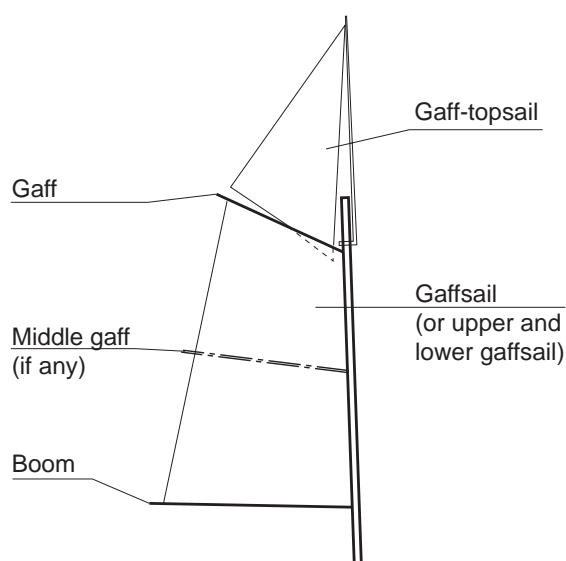
**Fig. 1.6 Shrouds and backstays**



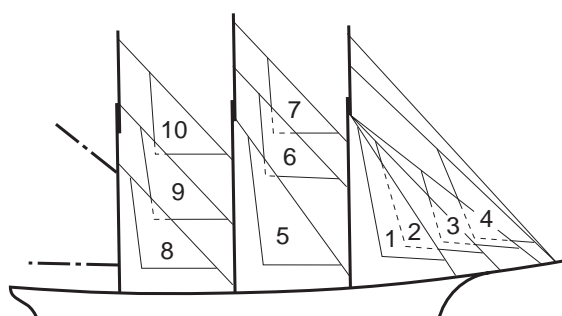
- |   |                      |    |                        |
|---|----------------------|----|------------------------|
| 1 | Fore royal stay      | 8  | Main topgallant stay   |
| 2 | Fore topgallant stay | 9  | Main topmast stay      |
| 3 | Outer jib stay       | 10 | Main stay              |
| 4 | Inner jib stay       | 11 | Mizzen topgallant stay |
| 5 | Fore topmast stay    | 12 | Mizzen topmast stay    |
| 6 | Fore stay            | 13 | Mizzen stay            |
| 7 | Main royal stay      |    |                        |

**Fig. 1.7 Stays (for a bark)**

**Fig. 1.8 Bowsprit stays**



**Fig. 1.9 Nomenclature of Gaff sails**



- 1 Fore top mast stay sail
- 2 Inner jib
- 3 Outer jib
- 4 Flying jib
- 5 Main top mast stay sail
- 6 Main topgallant stay sail
- 7 Main royal stay sail
- 8 Mizzen stay sail
- 9 Mizzen topmast stay sail
- 10 Mizzen topgallant stay sail

**Fig. 1.10 Stay sails**

**1.2** If solid spars are used they get the same diameters as specified in the text or Tables depending on their kind of use. This is based on the characteristic values of comparatively light woods as fire and spruce.

The max. diameter of wooden masts, upper masts, yards, booms or bowsprits may be reduced by 10 % if they are made from pitch pine or oregon pine, and by 5 % if they are made from pine or larch. The other diameters are then to be taken from the respective line in the Tables 1.1 to 1.7.

All spars must be of best condition, sufficiently dried, sound and free from sap, branches and detrimental faults. Timber of twisted growth may not be used.

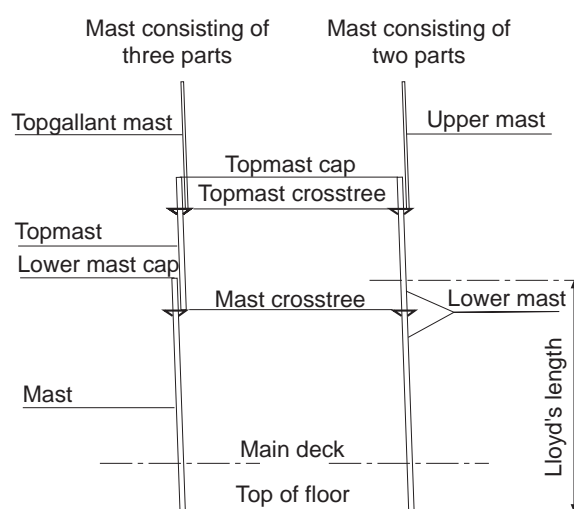
## 2. Masts

### 2.1 Length and dimensions of masts

**2.1.1** If the mast of a sailing ships consists of three parts (mast, topmast and topgallant mast), the length of the mast may be taken as extending from the top of the floor to the lower mast cap (see Fig. 1.11). The dimensions of the mast may be taken from Table 1.1.

**2.1.2** If the mast consists of two parts (lower mast and upper mast), the dimensions of the lower mast – equivalent to what was the mast and the topmast compared to 2.1.1 – must be based on an imaginary length known as the "Lloyd's length". This is the distance measured from the top of the floor to a fictitious mast cap situated, for all masts, about 2 – 3 m above the mast crosstrees.

The dimensions of the parts of the lower mast may be taken from Table 1.1.



**Fig. 1.11 Subdivision of masts**

The top portion of the lower mast above the "Lloyd's length" may be gradually tapered to the diameter of the topmast at the cap as shown in Table 1.2.

The wall thicknesses of the upper part of the lower mast shall also be as indicated in Table 1.2.

**2.1.3** The diameter of the masts in the main deck masthole need not be greater than 28 mm per running metre of length for square-rigged masts, 25 mm for masts with only one upper mast and max. 3 yards, and 21 mm for the masts without yards.

**2.1.4** If the diameter of the mast has been determined in accordance with 2.1.3, then the other dimensions corresponding to this diameter shall be as indicated in Table 1.1.

**2.1.5** All masts which are not passed through to the top of the floor must be dimensioned in a different way, if need be. This may also effect the dimensioning of the standing rigging.

### 2.2 Design requirements

**2.2.1** At those points on the mast at which the hoisted yards are hanging, the diameter and the plate thickness of the mast must be at least as great as the maximum diameter and the maximum plate thickness of the yard concerned.

**2.2.2** The purpose of the crosstrees is to absorb both the vertical and the lower horizontal forces exerted by the upper masts. The crosstrees provides the bottom support for the upper mast.

**2.2.3** The mast cap provides the upper support for the upper mast and absorbs the horizontal forces acting at that point.

**2.2.4** The dimensions of the eye plates needed to fasten the standing rigging to the mast shall be as specified in Table 1.1.

**2.2.5** In way of the main deck masthole the masts are to be reinforced over a length of approx. two times the mast diameter (e.g. by using a section with 1,5 times the plate thickness indicated in Table 1.1).

## 3. Upper masts

### 3.1 Lengths and dimensions of upper masts

**3.1.1** The dimensions of the topmast, when fitted, in accordance with Table 1.2 shall be determined by reference to the actual length.

**3.1.2** For the topgallant masts and upper masts of square-rigged masts a diameter at the heel of 25 mm

per running metre of length is sufficient. For fore-and-aft rigged masts a figure of 21 mm is sufficient.

**3.1.3** If the diameter of the topgallant mast and the upper mast at the heel has been determined according to 3.1.2 all other dimensions shall be those shown in Table 1.2 for this diameter.

### 3.2 Design requirements

**3.2.1** Upper masts are to be reinforced at the cap, the crosstrees and the sheave-holes (e.g. by using a section having 1.5 times the plate thickness specified in Table 1.2).

**3.2.2** At those points on upper masts at which the hoisted yards are hanging, the diameter and the plate thickness of the upper mast must be at least as great as the maximum diameter and the maximum plate thickness of the yard concerned.

## 4. Bowsprit

### 4.1 Use and dimensions of the bowsprit

**4.1.1** The bowsprit is used to secure the lower ends of the various foremast stays (see Fig. 1.8).

**4.1.2** The dimensions of the bowsprit shall be those shown in Table 1.7.

**4.1.3** The dimensions of the bob stay and bowsprit shrouds shall be those shown in Table 1.8.

**4.1.4** The following relationships are also applicable:

- Diameter of the martin gale =  $0,6 \times \text{diameter of the bob stay}$
- Diameter of the martin gale boom =  $1,15 \times \text{diameter of the bob stay}$

### 4.2 Design requirements

**4.2.1** The distance between the housing at the heel of the bowsprit and the housing at the stem must be at least 4 times the diameter of the bowsprit.

**4.2.2** At the bowsprit, strong horses and hand becketts as well as a sufficient number of cross ropes or nets must be fitted. Ships exceeding 700 GRT must be provided with nets underneath their bowsprits, extending up to the forecastle.

**4.2.3** The bowsprit is to be reinforced within the housings (e.g. by using a section having 1,5 times the plate thickness specified in Table 1.7).

## 5. Yards

### 5.1 Dimensions of yards

**5.1.1** The dimensions of yards shall be those indicated in Table 1.4.

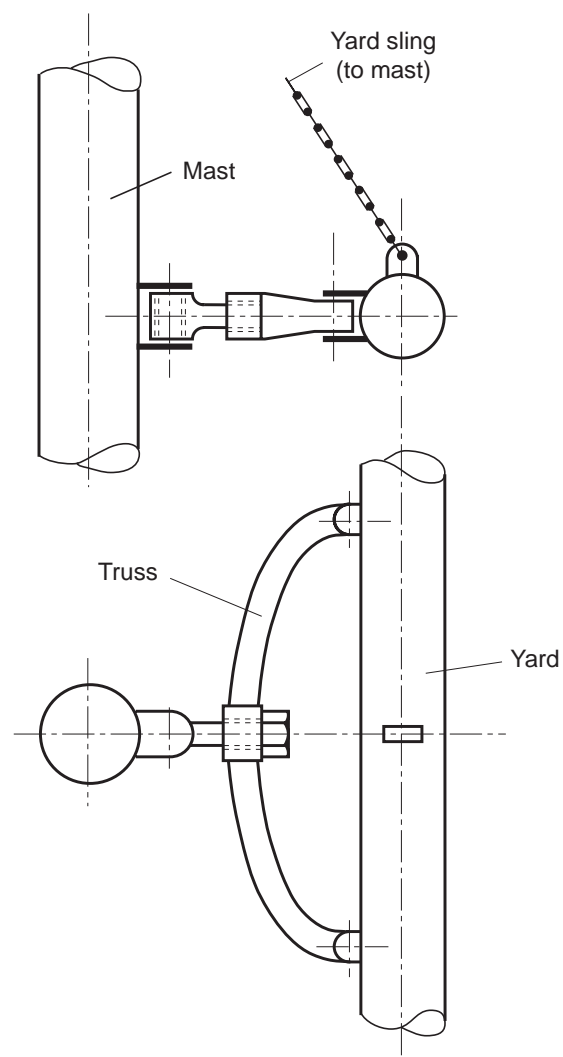
**5.1.2** The diameter in the middle need not exceed 19 mm per running metre for topgallant yards or 18 mm per running metre for royal yards.

**5.1.3** If the diameter in the middle has been determined in accordance with 5.1.2, the other dimensions shall be those shown in Table 1.4 for this diameter.

### 5.2 Arrangement of yards

**5.2.1** Yards may be fixed to the mast or adjustable in height.

**5.2.2** The method of fastening a fixed yard to the mast is shown in Fig. 1.12.



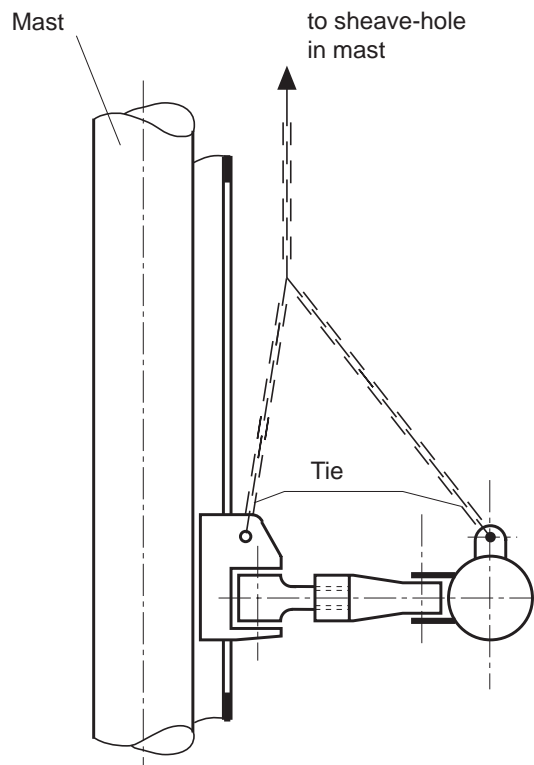
**Fig. 1.12 Fixed yard**



The yard sling is designed to support and transmit to the mast the vertical force (structural weight and wind pressure component) acting on the yard. It transmits this force to the mast and/or the upper mast.

The required load of the yard sling shall be that specified in Table 1.5.

**5.2.3** The arrangement of an adjustable yard is shown in Fig. 1.13.



**Fig. 1.13 Adjustable yard**

The tie is used for hoisting and lowering the yard and also takes the place of the yard sling.

The required load of the tie shall be that specified in Table 1.5.

**5.2.4** The purpose of the truss (see Fig. 1.12) is to take up the horizontal force acting on the yard and to transmit this force into the mast and/or upper mast. It must allow the yard to move as required. The dimensions of the truss shall be those specified in Table 1.6.

### 5.3 Design requirements

**5.3.1** Yards are to be reinforced in the middle to beyond the truss fastenings (e.g. by including a section with 1.5 times the plate thickness shown in Table 1.4).

**5.3.2** Yards are to be provided with strong horses and with a sufficient number of hand becketts or other handles offering the crew safe support. Horses made from wire ropes are to be coated.

## 6. Booms for gaff sails

### 6.1 Dimensions

The dimensions of gaff sail booms shall be those specified in Table 1.3.

## 7. Gaffs for gaff sails

### 7.1 Dimensions

**7.1.1** Depending on their lengths  $L$ , the gaff diameters are calculated in accordance with the following formulae:

diameter at the mast:

$$0,015 \times L$$

diameter at  $1/3 L$  distance from mast:

$$0,021 \times L$$

diameter at outer end:

$$0,006 \times L$$

**7.1.2** If the diameter has been determined in accordance with 7.1.1, the pertinent wall thickness shall be as shown in Table 1.3 for this diameter.

## D. Standing Rigging

### 1. General

**1.1** In the older rules applicable to standing rigging the dimensions were based on wire ropes with a nominal strength of 735 N/mm<sup>2</sup>. For the same minimum breaking strength these wire ropes had a greater metal cross-section than the wire ropes customary today with a nominal strength of 1570 N/mm<sup>2</sup>.

**1.2** In order to preserve the same static conditions in the standing rigging – in its interaction with the masts – the metal cross-section of the ropes specified in the aforementioned older rules has been retained. This explains the wire rope diameters shown in Tables 1.8 and 1.9.

**1.3** The rope construction  $6 \times 7$  FC, according to DIN 3055, is most suitable for the standing rigging.

Since these ropes are hard to get now a days the rope construction  $6 \times 36$  IWRC, according to DIN 3064, may be used as a substitute.

Because the inner wires of these ropes are thinner it is to be assumed that their life expectancy is shorter. To this regard the quality of corrosion protection is decisive.

**1.4** Ropes of the construction type  $6 \times 19$  FC, according to DIN 3060, have a bigger elasticity than those referred to under 1.3. Apart from having to choose a comparatively bigger diameter (see footnote in the Tables 1.8 and 1.9) the adjustability may be increased, if need be, by using links which can be removed later on.

## **2. Dimensions of standing rigging**

**2.1** The dimensions of standing rigging and its fastenings shall be those specified in Tables 1.8 to 1.16.

**2.2** For the square-rigged masts of four and five-masted ships, the diameter of the standing rigging may be reduced according to the statements in Table 1.8.

**2.3** For full-rigged ships and barks, the length of the masts – except for the aftermost mast – may be taken as the average of the individual mast lengths, and the beam at the main deck may be taken as the average of the deck breadths at the individual masts for determination of the dimensions of the standing rigging.

**2.4** Where masts less than 24 m long carry double topgallant yards, a topmast head backstay shall also be fitted to the topmast cap.

**2.5** If the angle made by the bob stay and bowsprit shrouds with the centre line of the bowsprit is less than  $14^\circ$ , then the bob stay and bowsprit shrouds shall be strengthened accordingly (see Fig. 1.8).

**2.6** The dimensions of the turnbuckles are shown in Tables 1.12 to 1.15.

**2.7** The dimensions of the other parts of the fastenings may be determined by reference to the effective Lifting Appliances Regulations. Their loads shall match those of the corresponding turnbuckles.

## **3. Design requirements**

**3.1** Where shrouds are fixed to the mast by shackles, a separate shackle and eye is required for each shroud.

**3.2** Wherever possible, standing rigging shall be fixed directly to the sheer strake.

**3.3** Where sail-carrying stays (e.g. those fastened to the bowsprit) are led around guide sheaves, the diameters of the guide sheaves must be equal to at least 5 times the nominal diameter of the stay concerned.

**3.4** Stays shall be arranged in such a way that the forces are properly transmitted between the masts.

**3.5** The futtock shrouds may also be constructed in the form of round steel bars.

## **E. Miscellaneous**

### **1. Components**

#### **1.1 Interchangeable components**

**1.1.1** Where not specified in the Tables, the dimensions of these components shall be determined in accordance with the loads imposed on them by reference to the effective Lifting Appliances Regulations.

**1.1.2** It is not necessary to test each component under load. The testing of randomly selected samples using the standard test loads according to the Lifting Appliances Regulations is sufficient. The scope of the tests shall be determined by the Surveyor responsible. In any event, not less than 20 % of all components should be tested.

**1.1.3** Para. 1.1.2 does not apply if the ship owner requires more extensive tests.

#### **1.2 Non-interchangeable components**

These components like for instance bearings and eye plates shall be dealt with in accordance with the effective Lifting Appliance Regulations.

#### **1.3 Nominal sizes**

The nominal sizes of components according to the Tables 1.11 to 1.15 are to be chosen dependent on the related wire rope diameter according to Table 1.16.

## **2. Running rigging**

**2.1** Only those parts of the running rigging form part of the classification to which forces are transmitted by the structural components covered by Sections C. and D.

**2.2** For running rigging, both fibre ropes (natural or synthetic fibres) and steel wire ropes may be used.

**2.3** Running rigging shall be designed to the satisfaction of the Surveyor responsible.

### 3. Spare parts

**3.1** On voyages in International Service each sailing ship must carry on board a spar suitable for a uppermast or lower yard and a second spar suitable for a jibboom or topsail yard.

Ships with schooner rig and sailing ships engaged in Restricted International Service need carry only one spare spar on board. If they have an engine of sufficient power, this spare spar is not required.

**3.2** It is recommended that, in addition to the above, enough further spare spars be carried to allow one spar for each mast.

**3.3** It is further recommended that each vessel carries along a sufficient reserve for the running rigging.

**3.4** For sailing vessels the following spare sails are required.

Five-masted full rigged ships	Five-masted barks and four-masted full rigged ships	Four-masted barks, full-rigged ships and barks
<div>3 lower sails</div> <div>3 lower topsails</div> <div>3 upper topsails</div> <div>1 fore topmast stay sail</div> <div>1 jib</div> <div>1 mizzen stays sail</div> <div>or</div> <div>1 storm mizzen</div>	<div>2 lower sails</div> <div>3 lower topsails</div> <div>2 upper topsails</div> <div>1 fore topmast stay sail</div> <div>1 jib</div> <div>1 mizzen stay sail</div> <div>or</div> <div>1 storm mizzen</div>	<div>1 foresail</div> <div>1 lower topsail</div> <div>1 upper topsail</div> <div>1 fore topmast stay sail</div> <div>1 jib</div> <div>1 mizzen stay sail</div> <div>or</div> <div>1 storm mizzen</div>

Barkentines, schooner brigs, three-masted schooners with yards	Square topsail shooners and fore and aft schooners	Smaller vessels without yards
<div>1 foresail</div> <div>1 topsail</div> <div>1 fore topmast stay sail</div> <div>1 jib</div> <div>1 main stay sail</div> <div>1 mainsail</div>	<div>1 fore stay sail</div> <div>1 jumbo <sup>2</sup></div> <div>1 boom foresail <sup>1</sup></div>	<div>1 jumbo <sup>2</sup></div> <div>1 mainsail <sup>1</sup></div>
<div><sup>1</sup> Jib-like head sail.</div> <div><sup>2</sup> For sailing vessels equipped with sufficiently powerful engines navigating in the North Sea and the Baltic, the boom foresail and the mainsail are not required.</div>		

**Table 1.1      Steel masts for sailing ships**

Length *	At heel of mast		At main deck mast-hole		At lower edge of crosstrees		At masthead	
	Diameter	Thickness	Diameter	Thickness	Diameter	Thickness	Diameter	Thickness
m	mm	mm	mm	mm	mm	mm	mm	mm
14	300	5,5	390	7,0	310	5,5	260	5,0
15	320	6,0	420	7,5	330	6,0	280	5,5
16	340	6,5	440	7,5	350	6,5	300	6,0
17	360	6,5	470	8,0	380	6,5	310	6,5
18	380	7,0	500	8,0	400	7,0	330	7,0
19	400	7,5	530	8,5	420	7,5	350	7,0
20	420	8,0	560	9,0	440	8,0	360	7,5
21	440	8,5	580	9,5	470	8,5	380	8,0
22	460	9,0	610	10,5	490	9,0	400	8,0
23	490	9,5	640	11,0	510	9,5	420	8,5
24	510	10,0	670	11,5	530	10,0	430	9,0
25	530	11,0	700	12,5	560	11,0	450	11,0
26	550	12,0	720	13,0	580	12,0	470	12,0
27	570	13,0	750	14,0	600	13,0	490	12,5
28	590	13,0	780	14,5	620	13,0	500	13,0
29	610	14,0	810	15,0	650	14,0	520	13,5
30	630	14,5	830	16,0	670	14,0	540	14,0
31	650	14,5	850	16,5	690	14,5	560	14,0
32	670	15,0	880	16,5	720	14,5	580	14,5
33	690	15,5	900	17,5	740	15,0	600	14,5
34	710	15,5	920	18,0	760	15,5	610	15,0

1. The diameter of the masts in the main deck mast-hole need not be greater than 28 mm per running metre of the length for square-rigged masts, 25 mm for masts with only one upper mast and 2 – 3 yards, and 21 mm for masts without yards (see C.2.1.3).

2. For the diameters of masts made from solid spars see C.1.2.

\* The length referred to is the "Lloyd's length", see C.2.1.

**Table 1.2     Uppermasts for sailing ships**

Topmasts													
Length *	At heel		At masthead		At topmast cap		Length *	At heel		At masthead		At topmast cap	
	Dia- meter	Thick- ness	Dia- meter	Thick- ness	Dia- meter	Thick- ness		Dia- meter	Thick- ness	Dia- meter	Thick- ness	Dia- meter	Thick- ness
m	mm	mm	mm	mm	mm	mm	m	mm	mm	mm	mm	mm	mm
9,5	290	6,0	250	6,0	220	4,0	15,5	460	8,5	410	7,5	340	7,0
10,0	300	6,0	260	6,0	230	4,0	16,0	470	8,5	430	7,5	350	7,0
10,5	320	6,0	280	6,0	240	4,5	16,5	490	8,5	440	8,0	360	7,5
11,0	330	6,5	290	6,0	250	5,0	17,0	500	9,0	460	8,0	370	7,5
11,5	350	6,5	300	6,0	260	5,0	17,5	520	9,0	470	8,0	380	7,5
12,0	360	7,0	320	6,5	270	5,5	18,0	530	9,0	480	8,5	390	8,0
12,5	370	7,0	330	6,5	280	5,5	18,5	550	9,0	500	8,5	400	8,0
13,0	390	7,5	350	6,5	290	6,0	19,0	560	9,5	510	8,5	410	8,0
13,5	400	7,5	360	7,0	300	6,5	19,5	570	9,5	520	9,0	420	8,5
14,0	420	7,5	370	7,0	310	6,5	20,0	590	9,5	540	9,0	430	8,5
14,5	430	8,0	390	7,0	320	6,5	20,5	600	10,0	550	9,0	440	8,5
15,0	450	8,0	400	7,5	330	7,0	21,0	620	10,0	570	9,5	450	9,0

1. For topgallant masts and uppermasts see C.3.1.2 and 3.1.3.

2. At those points at which hoisted yards are hanging, the diameter and the plate thickness of masts and uppermasts must be at least as great as the maximum diameter and the maximum plate thickness of the yard concerned. Uppermasts are to be strengthened at the cap, crosstrees and sheave-holes as well as yards which are to be reinforced in the middle to a point beyond the truss bands, e.g. by including a section having 1,5 times the plate thickness (see C.2.2.1, C.3.2 and C.5.3.1).

3. For the diameters of uppermasts made from solid spars see C.1.2.

\* Regarding the length see C.2.1

### Table 1.3 Booms for gaffsails

Length of boom	At the mast		At 1/3 of length from mast		At 1/3 of length from outer end		At outer end	
	Diameter	Thickness	Diameter	Thickness	Diameter	Thickness	Diameter	Thickness
m	mm	mm	mm	mm	mm	mm	mm	mm
7	130	4,0	150	4,0	155	4,0	135	4,0
8	135	4,0	160	4,0	170	4,0	145	4,0
9	140	4,0	170	4,5	190	4,5	155	4,0
10	150	4,0	185	4,5	210	4,5	165	4,0
11	160	4,0	200	5,0	230	5,0	180	4,5
12	175	4,5	220	5,0	250	5,5	195	4,5
13	190	4,5	240	5,5	270	5,5	210	5,0
14	205	5,0	260	5,5	290	6,0	225	5,0
15	220	5,0	280	6,0	310	6,5	240	5,5
16	235	5,5	300	6,0	330	6,5	260	5,5
17	250	5,5	315	6,5	350	7,0	275	6,0
18	265	6,0	335	6,5	370	7,0	290	6,0
19	280	6,0	350	7,0	390	7,5	310	6,5
20	295	6,5	370	7,0	410	7,5	320	6,5

For the diameters of booms made from solid spars see C.1.2.

**Table 1.4      Dimensions of yards**

Length	In the middle		1st quarter distance		2nd quarter distance		3rd quarter distance		At yardarms	
	Diameter	Thick-ness	Diameter	Thick-ness	Diameter	Thick-ness	Diameter	Thick-ness	Diameter	Thick-ness
m	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
10	200	4,5	195	4,5	180	4,5	150	4,5	100	3,0
11	220	4,5	215	4,5	200	4,5	165	4,5	110	3,0
12	240	4,5	235	4,5	215	4,5	180	4,5	120	3,0
13	260	5,0	255	5,0	235	4,5	195	4,5	130	3,0
14	280	5,5	275	5,0	250	5,0	210	4,5	140	3,0
15	300	5,5	295	5,5	270	5,0	225	5,0	150	3,0
16	320	6,0	310	6,0	290	5,5	240	5,0	160	3,5
17	340	6,0	330	6,0	305	6,0	255	5,0	170	3,5
18	360	6,5	350	6,5	325	6,0	270	5,0	180	3,5
19	380	7,0	370	6,5	340	6,5	285	5,5	190	4,0
20	400	7,0	390	7,0	360	6,5	300	5,5	200	4,0
21	420	7,5	410	7,0	380	7,0	315	5,5	210	4,5
22	440	8,0	430	7,5	395	7,0	330	5,5	220	4,5
23	460	8,0	450	7,5	415	7,5	345	6,5	230	5,0
24	480	8,5	470	8,0	430	7,5	360	6,5	240	5,0
25	500	9,0	490	8,5	450	8,0	375	7,0	250	5,5
26	520	9,5	510	8,5	470	8,0	390	7,0	260	5,5
27	540	9,5	530	9,0	490	8,5	405	7,5	270	6,0
28	560	10,0	545	9,0	505	8,5	420	7,5	280	6,5
29	580	10,5	565	9,5	525	9,0	435	8,0	290	6,5
30	600	11,5	585	10,0	540	9,0	450	8,0	300	7,0

1. The diameter in the middle need not exceed 19 mm for topgallant yards and 18 mm for royal yards per running metre of length.

2. For the diameters of yards made from solid spars see C.1.2.

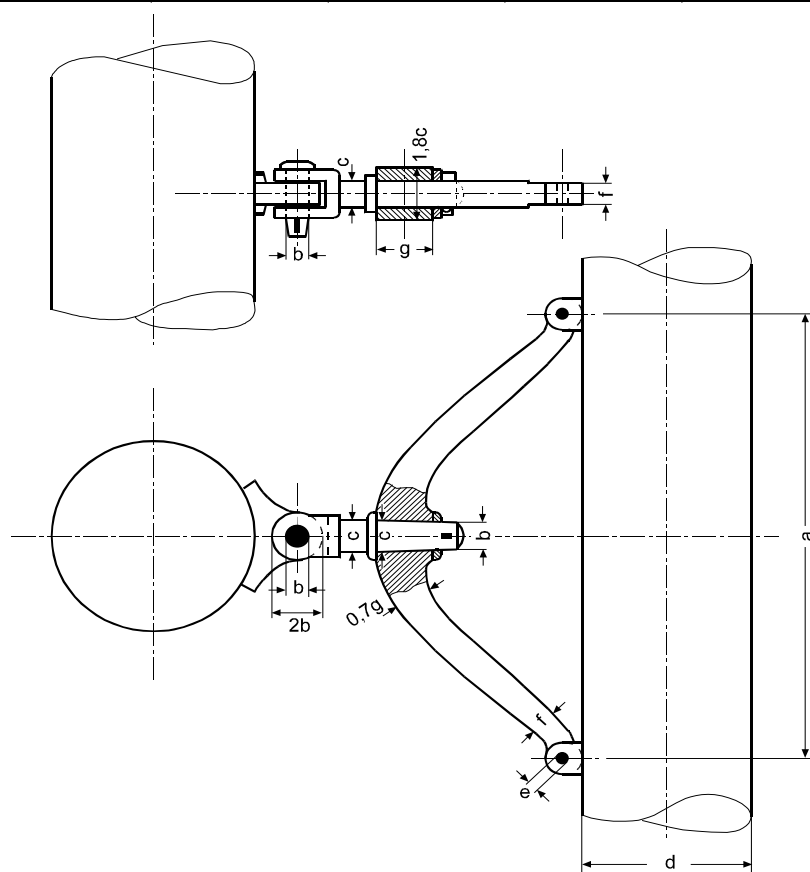
**Table 1.5 Required loads of yard slings and ties**

Length	Required load of yard sling	Required load of tie	Length	Required load of yard sling	Required load of tie
m	kN	kN	m	kN	kN
10	13,6	11,2	21	51,0	41,8
11	16,0	13,1	22	55,7	45,6
12	18,5	15,2	23	60,5	49,6
13	20,8	17,1	24	65,8	53,9
14	23,7	19,4	25	71,5	58,6
15	27,3	22,4	26	77,6	63,6
16	30,7	25,2	27	83,3	68,3
17	34,3	28,1	28	89,1	73,6
18	37,9	31,0	29	96,9	79,5
19	42,0	34,4	30	108,2	84,6
20	46,3	38,0			
The dimensions of these parts and of the sheave-holes shall be those specified in the effective Lifting Appliances Regulations.					



Table 1.6 Main dimensions of trusses

Diameter of yard d *	a	b Ø	c Ø	e Ø	f	g
mm	mm	mm	mm	mm	mm	mm
200	750	40	56	20	40	95
250	850	45	60	24	45	105
300	1000	54	68	29	52	120
350	1100	58	72	32	56	130
400	1240	64	80	39	61	145
450	1330	68	86	43	65	155
500	1460	75	94	48	71	170
550	1550	80	100	52	74	180
600	1680	89	110	56	80	195



\* The intermediate values are to be interpolated linearly.

### Table 1.7      Bowsprits

Length beyond bed	At heel		In bed		At ½ distance between bed and end of bowsprit		At end of bowsprit	
	Diameter	Thickness	Diameter	Thickness	Diameter	Thickness	Diameter	Thickness
m	mm	mm	mm	mm	mm	mm	mm	mm
8	280	9,0	350	8,0	310	8,0	150	6,0
9	330	9,0	410	10,0	370	10,0	170	7,0
10	380	10,0	470	11,0	420	10,0	190	7,0
11	440	11,0	530	11,0	480	10,0	210	8,0
12	490	11,0	590	11,0	530	11,0	230	9,0
13	530	12,0	650	12,5	570	12,0	260	10,0
14	570	12,5	700	12,5	620	12,0	280	10,0
15	610	13,0	750	14,0	660	14,0	300	10,0
16	660	14,0	800	14,0	700	14,0	320	10,0
17	700	15,0	850	15,0	750	14,0	340	12,0
18	740	15,0	900	15,0	800	15,0	360	12,0

1. For the bowsprit stays and shrouds see C.4.

2. For the diameters of bowsprits made from solid spars see C.1.2.

For the foremasts of schooner brigs and barkentines, the full-rigged masts of three, four and five-masted barks and for all the masts of brigs and three, four and five-masted fullrigged-ships														
	Length of mast from main deck to top edge of topmast crosstrees [m]													
	≥ 18 < 19		≥ 19 < 20		≥ 20 < 21		≥ 21 < 22		≥ 22 < 23		≥ 23 < 24		≥ 24 < 25	
Beam of vessel at main deck by mast	< 7,2 m	≥ 7,2 m	< 7,8 m	≥ 7,8 m	< 8,4 m	≥ 8,4 m	< 9,0 m	≥ 9,0 m	< 9,6 m	≥ 9,6 m	< 10,2 m	≥ 10,2 m	< 10,8 m	≥ 10,8 m
Required rope diameters of wire ropes for the standing rigging of masts with yards [mm]														
lower stays lower shrouds lower head shrouds topmast stays <sup>1</sup> topmast backstays topmast head backstays	20	18	21	20	22	21	24	22	26	24	26	26	28	26
topgallant stays topgallant backstays	15	14	16	15	17	16	19	18	20	19	21	20	22	21
royal stays royal backstays	12	11	13	12	14	13	15	14	16	15	17	16	18	17
Number of														
lower stays lower shrouds lower head shrouds topmast stays topmast backstays topm. head backstays <sup>2</sup> topgallant stays topgallant backstays Royal stays and backstays	2 4 — 2 2 — 1 1 1	2 5 — 2 2 — 1 1 1	2 5 — 2 2 — 1 1 1	2 5 — 2 2 — 1 1 1	2 5 — 2 2 — 1 1 1	2 5 — 2 2 — 1 1 1	2 5 — 2 2 — 1 1 1	2 5 — 2 2 — 1 1 1	2 5 — 2 2 — 1 1 1	2 5 — 2 2 — 1 1 1	2 5 — 2 2 — 1 1 1	2 5 — 2 2 — 1 1 1	2 5 — 2 2 — 1 1 1	2 5 — 2 2 — 1 1 1
Minimum Diameter [mm]														
Bobstay <sup>3</sup>	rod	50	55	60	64	68	72	76						
	bolt	40	43	46	50	53	56	59						
	chain	28	30	32	34	36	38	40						
Bowsprit <sup>3</sup> shrouds	chain	17	18	19	20	21	22	22						
	number	1	1	1	1	1	1	2						
<p>– The prescribed diameters are valid for rope construction types 6 × 7 FC and 6 × 36 IWRC according to Table 1.10. If wire ropes of the construction type 6 × 19 FC shall be used instead, the Table values are to be increased by 1 mm up to a rope dia of 21 mm and by 2 mm for a rope dia of 22 mm and more.</p> <p>– A nominal strength higher than 1570 N/mm<sup>2</sup> may not be employed.</p> <p>– For square rigged masts of four- and five-masted ships the rope dia may be decreased by 1 mm up to a Table value of 23 mm Ø and by 2 mm for a Table value of 24 mm Ø and more.</p> <p>– For barks and full rigged ships, the lengths of the masts-except for the aftermost mast- and the beams of the main deck may be taken as an average in order to allow for a standing rigging of the same diameter.</p> <p>– The rope diameters as shown in or derived from this Table include non standardized sizes. If these sizes cannot be obtained the next bigger standard size is to be chosen. This applies analogously to rods, bolts and chains.</p>														
<p><sup>1</sup> The diameter of topmast shrouds must be at least 70 % of the diameter of the topmast stays.</p> <p><sup>2</sup> Where masts less than 24 m long carry double topgallant yards, a topmast head backstay shall also be fitted to the topmast cap.</p> <p><sup>3</sup> If the angle made by the bobstay and bowsprit shrouds with the centre line of the bowsprit is less than 14°, then the bobstay and bowsprit shrouds shall be strengthened accordingly.</p>														

For the foremasts of schooner brigs and barkentines, the full-rigged masts of three, four and five-masted barks and for all the masts of brigs and three, four and five-masted fullrigged-ships								
	Length of mast from main deck to top edge of topmast crosstrees [m]							
	≥ 25 < 26		≥ 26 < 27		≥ 27 < 28		≥ 28 < 29	
Beam of vessel at main deck by mast	< 11,4 m	≥ 11,4 m	< 11,9 m	≥ 11,9 m	< 12,3 m	≥ 12,3 m	< 12,7 m	≥ 12,7 m
Required tope diameters of wire ropes for the standing rigging of masts with yards [mm]								
lower stays lower shrouds lower head shrouds topmast stays <sup>1</sup> topmast head backstays	30	28	32	30	32	32	34	32
topgallant stays topgallant backstays	24	22	26	24	26	26	28	26
royal stays royal backstays	19	18	20	19	21	20	22	21
Number of								
lower stays lower shrouds lower head shrouds topmast stays topmast backstays topm. head backstays <sup>2</sup> topgallant stays topgallant backstays royal stays and backstays	2 6 1 2 2 1 1 2 1	2 6 1 2 3 1 1 2 1	2 6 1 2 3 1 1 2 1	2 6 1 2 3 1 1 2 1	2 6 1 2 3 1 1 2 1	2 6 1 2 3 1 1 2 1	2 6 1 2 3 1 1 2 1	2 6 1 2 3 1 1 2 1
Minimum Diameter [mm]								
Bobstay <sup>3</sup>	rod	80	84	88	92			
	bolt	62	65	68	71			
	chain	42	44	46	48			
Bowsprit <sup>3</sup> shrouds	chain	23	24	25	26			
	number	2	2	2	2			
<p>– The prescribed diameters are valid for rope construction types 6 × 7 FC and 6 × 36 IWRC according to Table 1.10. If wire ropes of the construction type 6 × 19 FC shall be used instead, the Table values are to be increased by 1 mm up to a rope dia of 21 mm and by 2 mm for a rope dia of 22 mm and more.</p> <p>– A nominal strength higher than 1570 N/mm<sup>2</sup> may not be employed.</p> <p>– For square rigged masts of four- and five-masted ships the rope dia may be decreased by 1 mm up to a Table value of 23 mm Ø and by 2 mm for a Table value of 24 mm Ø and more.</p> <p>– For barks and full rigged ships, the lengths of the masts-except for the aftermost mast- and the beams of the main deck may be taken as an average in order to allow for a standing rigging of the same diameter.</p> <p>– The rope diameters as shown in or derived from this Table include non standardized sizes. If these sizes cannot be obtained the next bigger standard size is to be chosen. This applies analogously to rods, bolts and chains.</p>								
<p><sup>1</sup> The diameter of topmast shrouds must be at least 70 % of the diameter of the topmast stays.</p> <p><sup>2</sup> Where masts less than 24 m long carry double topgallant yards, a topmast head backstay shall also be fitted to the topmast cap.</p> <p><sup>3</sup> If the angle made by the bobstay and bowsprit shrouds with the centre line of the bowsprit is less than 14°, then the bobstay and bowsprit shrouds shall be strengthened accordingly.</p>								

**Table 1.8**      **Standing rigging for square rigged masts**      *(Continued)*

1 The diameter of topmast shrouds must be at least 70 % of the diameter of the topmast stays.  
2 Where masts less than 24 m long carry double topgallant yards, a topmast head backstay shall also be fitted to the topmast cap.  
3 If the angle made by the bobstay and bowsprit shrouds with the centre line of the bowsprit is less than 14°, then the bobstay and bowsprit shrouds shall be strengthened accordingly.

### Table 1.9 Standing rigging for fore- and -aft rigged masts (Part 1)

For the aftermost mast of three, four and five-masted barks, for the mainmast of barkentines, for the foremast and mainmast of three and four-masted topsail schooners and for the foremast of schooners and three-masted schooners												
	Length of mast from main deck to top edge of crosstrees [m]											
	≥ 11 < 12	≥ 12 < 13	≥ 13 < 14	≥ 14 < 15	≥ 15 < 16	≥ 16 < 17	≥ 17 < 18	≥ 18 < 19	≥ 19 < 20	≥ 20 < 21	≥ 21 < 22	≥ 22 < 23
Required rope diameters of wire ropes, for the standing rigging of masts without yards [mm]												
lower stays and lower shrouds	18	19	20	21	22	24	26	26	28	28	30	30
topmast stays and topmast backstays	16	17	18	19	20	21	22	24	26	26	28	28
topgallant stays and topgallant backstays	12	13	14	15	15	16	17	18	19	20	21	22
Number												
lower stays	2	2	2	2	2	2	2	2	2	2	2	2
lower shrouds	4	4	4	4	4	4	4	5	5	5	5	5
topmast stays	1	1	1	1	1	1	1	1	1	1	2	2
topmast backstays	1	1	1	1	1	2	2	2	2	2	3	3
topgallant stays	1	1	1	1	1	1	1	1	1	1	1	1
topgallant backstays	1	1	1	1	1	1	1	1	1	2	2	2
<p>– The prescribed diameters are valid for rope construction types 6 × 7 FC and 6 × 36 IWRC according to Table 1.10. If wire ropes of the construction type 6 × 19 FC shall be used instead, the Table values are to be increased by 1 mm up to a rope dia of 21 mm and by 2 mm for a rope dia of 22 mm and more.</p> <p>– A nominal strength higher than 1570 N/mm<sup>2</sup> may not be employed.</p> <p>– The rope diameters as shown in or derived from this Table include non standardized sizes. If these sizes cannot be obtained the next bigger standard size is to be chosen.</p> <p>– The diameter of the topmast shrouds must be at least 70 % of the dia of the topmast stays.</p>												

### Table 1.9 Standing rigging for fore- and -aft rigged masts (Part 2)

<p><b>For the mainmast of schooners and three-masted schooners, for the mizzenmast of four-masted topsail schooners, the mizzenmast of barkentines, three-masted schooners and topsail schooners, the jigger mast of four-masted topsail schooners, and for the masts of fore-and-aft schooners, luggers, tjalks and cutters</b></p>												
	<p align="center"><b>Length of mast from main deck to top edge of crosstrees [m]</b></p>											
	<p align="center">≥ 10 &lt; 11</p>	<p align="center">≥ 11 &lt; 12</p>	<p align="center">≥ 12 &lt; 13</p>	<p align="center">≥ 13 &lt; 14</p>	<p align="center">≥ 14 &lt; 15</p>	<p align="center">≥ 15 &lt; 16</p>	<p align="center">≥ 16 &lt; 17</p>	<p align="center">≥ 17 &lt; 18</p>	<p align="center">≥ 18 &lt; 19</p>	<p align="center">≥ 19 &lt; 20</p>	<p align="center">≥ 20 &lt; 21</p>	<p align="center">≥ 21 &lt; 22</p>
<p align="center"><b>Required rope diameters of wire ropes for the standing rigging of masts without yards [mm]</b></p>												
<b>forestay</b>	18	19	20	21	22	24	26	26	28	28	30	30
<b>lower shrouds</b>	14	15	16	17	18	19	20	21	22	24	24	26
<b>topmast stay and topmast backstays</b>	11	12	13	14	15	16	17	18	19	20	21	22
<b>topgallant stay and topgallant backstays</b>	10	10	10	10	11	12	13	14	14	15	16	17
<p align="center"><b>Number</b></p>												
<b>topmast and topgallant stays</b>	1	1	1	1	1	1	1	1	1	1	1	1
<b>lower shrouds</b>	3	3	3	3	3	3	4	4	4	4	4	4
<b>topmast backstays</b>	1	1	1	1	1	1	1	1	2	2	2	2
<b>topgallant backstays</b>	1	1	1	1	1	1	1	1	1	1	1	1
<ul style="list-style-type: none"> <li>– The prescribed diameters are valid for rope construction types 6 × 7 FC and 6 × 36 IWRC according to Table 1.10. If wire ropes of the construction type 6 × 19 FC shall be used instead, the Table values are to be increased by 1 mm up to a rope dia of 21 mm and by 2 mm for a rope dia of 22 mm and more.</li> <li>– A nominal strength higher than 1570 N/mm<sup>2</sup> may not be employed.</li> <li>– The rope diameters as shown in or derived from this Table include non standardized sizes. If these sizes cannot be obtained the next bigger standard size is to be chosen.</li> <li>– The diameter of the topmast shrouds must be at least 70 % of the dia of the topmast stays.</li> </ul>												



Table 1.10 Standing rigging

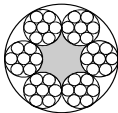
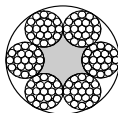
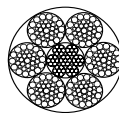
Wire ropes, galvanized *					
Nominal strength			1570 N/mm <sup>2</sup>	1570 N/mm <sup>2</sup>	1570 N/mm <sup>2</sup>
Nominal diameter of rope	Circumference		to DIN 3055  Round strand wire rope 6 x 7 Constr. 6 (6 + 1) FC	to DIN 3060  Round strand wire rope 6 x 19 standard Constr. 6 (12 + 6 + 1) FC	to DIN 3064  Round strand wire rope 6 x 36 Warrington-Seale Constr. 6 (1+7+(7+7)+14) IWRC
			Nominal breaking strength		
mm	mm	inches	kN <sup>1</sup>	kN <sup>1</sup>	kN
8	25	1	33,4	30,9	—
10	32	1 1/4	52,2	48,2	—
12	38	1 1/2	75,1	69,5	80,6
14	44	1 3/4	102	94,6	109
16	51	2	134	124	143
18	57	2 1/4	169	156	181
20	64	2 1/2	209	193	221
22	70	2 3/4	252	234	271
24	76	3	300	278	322
26	83	3 1/4	353	326	378
28	89	3 1/2	409	378	438
32	102	4	534	494	571
36	114	4 1/2	676	625	724
40	127	5	835	722	894
44	140	5 1/2	—	934	1080
48	152	6	—	1110	1290
52	165	6 1/2	—	1300	1510
56	176	7	—	1510	1750
Filling factor $f_1$			0,470 <sup>1</sup>	0,455 <sup>1</sup>	0,580
Spinning factor $k_1$			0,900	0,860	0,782
<sup>1</sup> The values shown in the Table are applicable to ropes with fibre core. Where ropes of the same constructions but with a steel wire core are used the nominal breaking strength is increased by approximately 8 %, the filling factor by 16 %.					
* See also statements under D.					

Table 1.11 Eyes and double-lugs for tensile loads acc. to ISO 6043

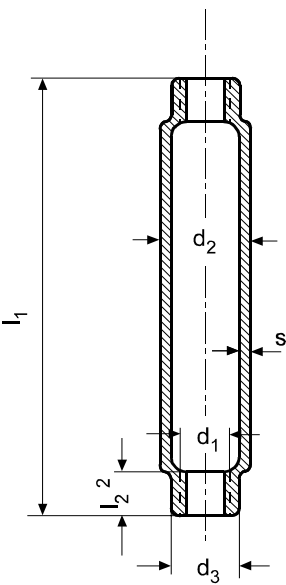
Nominal size <sup>1</sup>	Permitted load	b <sub>1</sub>	b <sub>2</sub>	b <sub>3</sub>	d <sub>2</sub>	d <sub>3</sub>	r <sub>1</sub>	r <sub>2</sub>	t	Bolt		s <sub>1</sub>	Fillet weld a
										d <sub>1</sub>	thread		
	KN	mm	mm	mm	mm	mm	mm	mm	mm	mm		mm	mm
1	10	16	19	8	18	17	17,5	5	23	16	M 12	–	–
1,6	16	20	23	11	22	21	22,5	5	28	20	M 16	6	4
2	20	22	26	12	24	23	25	6	31	22	M 20	6	4
2,5	25	25	29	13	26	25	27,5	6	34	24	M 20	8	5
3	32	28	32	14	30	28	30	6	36	27	M 22	8	5
4	40	30	35	15	33	31	32,5	6	39	30	M 24	8	5
5	50	35	39	18	39	37	37,5	8	46	36	M 27	10	6
6	63	40	45	20	42	40	42,5	8	51	39	M 30	10	6
8	80	45	49	23	48	46	47,5	8	56	45	M 36	12	7
10	100	50	58	26	52	50	55	8	63	48	M 39	14	7
12	125	55	64	28	56	54	60	10	70	52	M 42	14	8

Weldable material with a tensile strength of at least 360 N/mm<sup>2</sup>. Min. bolt strength = 410 N/mm<sup>2</sup>

<sup>1</sup> Nominal size depending on the related wire rope diameter acc. to Table 1.16.

Table 1.12 Tubular bodies acc. to DIN 82004

Turnbuckles for the standing rigging					
Nominal size <sup>1</sup>	Permitted load	$d_2 \times s$ <sup>3</sup>	$d_3$	$l_1$	Thread $d_1$
	kN	mm	mm	mm	
1	10	31,8 × 4,5	25	220	M 18
1,6	16	38 × 5,6	30	240	M 22
2	20	42,4 × 5,6	33	260	M 24
2,5	25	44,5 × 6,3	37	280	M 27
3	32	51 × 6,3	41	300	M 30
4	40	57 × 8	46	320	M 33
5	50	63,5 × 8	50	340	M 36
6	63	70 × 8,8	57	380	M 42
8	80	76,1 × 10	63	420	M 45
10	100	88,9 × 10	72	460	M 52
12	125	88,9 × 11	78	500	M 56



Material with a tensile strength of at least 360 N/mm<sup>2</sup>.

<sup>1</sup> Nominal size depending on the related wire rope diameter acc. to Table 1.16.

<sup>2</sup>  $l_2 = d_1$

<sup>3</sup> Tubes acc. to DIN 2448.

Table 1.13 Oval Eye screws acc. to DIN 82006

Turnbuckles for the standing rigging								
Nominal size <sup>1</sup>	Permitted load	a	b	Thread d <sub>1</sub>	d <sub>2</sub>	g	l <sub>1</sub>	l <sub>2</sub>
	kN	mm	mm		mm	mm	mm	mm
1	10	48	21	M 18	12	14	110	180
1,6	16	58	26	M 22	16	18	120	205
2	20			M 24			130	215
2,5	25	72	32	M 27	21	23	140	245
3	32			M 30			150	255
4	40	94	40	M 33	26	28	160	290
5	50			M 36			170	305
6	63	108	45	M 42	29	32	190	340
8	80	115	49	M 45	32	35	210	370
10	100	125	54	M 52	36	39	230	405
12	125	144	60	M 56	41	44	250	450

Form C Right handed thread  
Form D Left handed thread

Material with a tensile strength of at least 360 N/mm<sup>2</sup>

<sup>1</sup> Nominal size depending on the related wire rope diameter acc. to Table 1.16.

Table 1.14 Double lug screws acc. to DIN 82008

Turnbuckles for the standing rigging										
Nominal size <sup>1</sup>	Permitted load	b <sub>1</sub>	b <sub>2</sub>	b <sub>3</sub>	Thread d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	l <sub>1</sub>	l <sub>2</sub>	r <sub>1</sub>
1	10	10	19	8	M 18	16	17	110	152	17,5
1,6	16	13	23	11	M 22	20	21	120	170	22,5
2	20	14	26	12	M 24	22	23	130	185	25
2,5	25	15	29	13	M 27	24	25	140	200	27,5
3	32	17	32	14	M 30	27	28	150	215	30
4	40	18	35	15	M 33	30	31	160	230	32,5
5	50	22	39	18	M 36	36	37	170	255	37,5
6	63	24	45	20	M 42	39	40	190	280	42,5
8	80	28	49	23	M 45	45	46	210	310	47,5
10	100	31	58	26	M 52	48	50	230	340	55
12	125	34	64	28	M 56	52	54	250	370	60

Form C Right handed thread  
Form D Left handed thread

Double lug bolt acc. to DIN 82020

Material with a tensile strength of at least 360 N/mm<sup>2</sup>, Min. bolt strength = 410 N/mm<sup>2</sup>.

<sup>1</sup> Nominal size depending on the related wire rope diameter acc. to Table 1.16.

Table 1.15 Eye screws acc. to DIN 82010

Turnbuckles for the standing rigging							
Nominal size <sup>1</sup>	Permitted load	b <sub>1</sub>	Thread d <sub>1</sub>	d <sub>2</sub>	d <sub>3</sub>	l <sub>1</sub>	l <sub>2</sub>
	kN	mm		mm	mm	mm	mm
1	10	16	M 18	18	35	110	140
1,6	16	20	M 22	23	45	120	155
2	20	22	M 24	25	50	130	168
2,5	25	25	M 27	27	55	140	182
3	32	28	M 30	30	60	150	195
4	40	30	M 33	33	65	160	208
5	50	35	M 36	39	75	170	225
6	63	40	M 42	42	85	190	250
8	80	45	M 45	48	95	210	275
10	100	50	M 52	52	110	230	305
12	125	55	M 56	56	120	250	335

Form C Right handed thread  
Form D Left handed thread

Material with a tensile strength of at least 360 N/mm<sup>2</sup>

<sup>1</sup> Nominal size depending on the related wire rope diameter acc. to Table 1.16.

Table 1.16 Nominal sizes of components

Rope standard DIN	Rope core	Wire rope diameter [mm]										
		10	11 – 14	15 + 16	17 + 18	19 + 21	22 + 24	26 + 28	30 – 34	36 – 40	42 – 46	48 – 54
3055	FC	10	11 – 14	15 + 16	17 + 18	19 + 21	22 + 24	26 + 28	30 – 34	36 – 40	42 – 46	48 – 54
3064	IWRC											
3060	FC	11	12 – 15	16 + 17	18 + 19	20 + 22	24 + 26	28 + 30	32 – 36	38 – 42	44 – 48	50 – 56
Nominal size		1	1,6	2	2,5	3	4	5	6	8	10	12