

PART X -- SAILS

All sails must be available to the Measurer for measuring or checking marked dimensions and declarations made as to the use of these while racing (see also 3.02.3 & 9.01).

SAIL RESTRICTIONS

10.01 Construction.

10.01.1 The term "sail" shall be taken to include the headboard, tabling, bolt and foot rope or tapes. It shall not include cringles which are wholly outside the sail.

10.01.2 Openings in the sail, in addition to the normal cringles and reefing eyelets, are permitted provided that the sail is flat in the vicinity of the openings.

10.02 Sail Inventory

10.02.1 A yacht while racing shall not carry on board more sails of each type than the numbers below:

Large jibs	5
Small jibs	4
Light staysails	1
Spinnakers	5
Mainsails	1
Storm Trysails	1
Storm Jibs	1
Heavy -Weather Jibs	1
Mizzens	1
Mizzen Staysails	3

- Large jibs are those having an LPG greater than 1.1*J.
- Small jibs are those having an LPG less than or equal to 1.1*J. Sails in this category, except inner forestaysails, must be set on stays permanently attached to the mast and tacked on the centerline of the yacht. Inner forestaysails must also be tacked on the centerline of the yacht, but need not be set on a stay.
- Where the largest jib for which a yacht is rated is a Small Jib, the total number of jibs allowed shall be the Small Jib maximum plus two.
- Light staysails are those having an LPG less than or equal to 1.1*J which shall only be set flying.
- The specifications of storm and heavy weather sails are those of the Offshore Special Regulations Governing Offshore Racing, section 4.26.4.

10.02.2 For long distance races the race organizer may modify these limitations to permit carrying additional sails of the kinds and numbers appropriate to the character of the race.

10.03 Trimming of Sails.

All sails must be set and trimmed in a manner consistent with the way they are measured. A sail shall not be constructed in such a manner that any portion may be completely detached.

10.04 Double Luffed Sails.

Double luffed sails (those with thick or wrap-around luffs, not spinnakers) are not permitted.

10.05 Restrictions on Setting and Sheeting of Jibs

- a) When a jib is set under a spinnaker or inside another jib, it shall not be tacked in such a position that, if the sail were trimmed flat along a parallel to the center line of the yacht, its clew would fall abaft the LP line (see b below).
- b) The LP line is defined as a line abaft and parallel to the foremost headstay and separated from it by the dimension of LP printed on the Rating Certificate. The foremost headstay is defined as the line joining the upper measurement point of IG and the forward measurement point of J.
- c) If a jib is set under or abaft another headsail, it shall not be so tacked that, if trimmed along a parallel to the center line of the yacht, more than 50 per cent of its area would fall abaft the foreside of the mast.
- d) No tack pennant greater than 0.762m (2.5 ft) may be used on a jib (except the storm jib) when set flying.
- e) No jib shall be so tacked that the forward end of any batten is aft of the center line of the mast.
- f) Jibs may be sheeted to any part of the deck or rail, but to no fixed point higher than $0.05 \cdot B$ above the deck or coachroof, or to the main boom, within the measurement limits (see 9.10.2) or to the spinnaker pole when the pole is set on the opposite side from the main boom but may not be sheeted to any other spar or outrigger.
- g) No jib may be set in conjunction with any other headsail so as by any means to simulate a double clewed or double luffed jib. (For example, except when changing sails, no two jibs may be carried simultaneously in a luff groove device and sheeted on the same side of the yacht.)

10.06 Restrictions on Setting and Sheeting of Spinnakers

- a) The outboard end of the spinnaker pole shall be used only on the windward side of the yacht (i.e. that opposite to the main boom). A spinnaker pole shall only be used with its inboard end attached to the mast (foremast if there is more than one mast).
- b) A bona fide jib (see 10.16) for which the yacht has been measured may be set and sheeted as a spinnaker where either of the following conditions apply:
 1. In heavy weather when no other sail is set in the foretriangle and the apparent wind is abaft the beam, or
 2. When all spinnakers aboard have been damaged beyond repair during the race.A jib so set may have either its tack or clew to the spinnaker pole.
- c) Spinnakers shall be sheeted from only one point on the sail.
- d) A spinnaker may be sheeted to any part of the rail or deck or to the main boom, within the measurement limits (see 9.10.2), but to no other spar or outrigger.

- e) Struts, spools or similar devices used solely for the purpose of keeping the spinnaker guy away from the windward main or foremast shrouds are permitted but are not to be used for any other purpose.
- f) Where the spinnaker configuration is classified as Centerline Asymmetric (i.e., no pole allowed on board – see 9.05.1b), the spinnaker shall be tacked on the centerline of the yacht and sheeted on the same side as the boom

10.07 Restrictions on Setting and Sheeting of Mainsails

- a) Mainsails shall be either fully secured at the foot or fully loose footed and shall remain so while racing. A mainsail secured at the foot shall be provided with a bolt rope, track or tunnel slides, or similar boom attachment that prevents the foot from lifting away from the boom. A loose-footed mainsail shall be sheeted only from a single clew.
- b) Spare mainsails are not permitted to be carried on board.
- c) Storm trysails, as distinguished from loose-footed mainsails, must be materially smaller than a normal close-reefed mainsail and of a strength consistent with their purpose viz. use in extremely severe weather (see ORC Special Regulations 4.24(b)). Aromatic polyamides and other high modulus fibers shall not be used in the storm trysail.
- d) Headboard carriages are permitted only if the sail is set and trimmed in a manner consistent with the way HB was measured (see 10.30).

10.08 Restrictions on Setting and Sheeting of Mizzen Staysails on Yawl or Ketch

- a) Mizzen staysails may be sheeted to the rail or hull, and to the mizzen boom within the measurement limits (whether or not the mizzen is set) but they may not be sheeted to any other spar or outrigger.
- b) Mizzen staysails must be three-cornered (head, tack and clew). The tack or tack pennant must be secured abaft the point of intersection of the afterside of the mainmast with the main deck and also must be secured directly to and no higher than the rail cap, deck or cabin top (includes dog house top).
- c) Not more than one mizzen staysail may be set at the same time.
- d) No mizzen staysail may be carried on a yawl or ketch whose mizzen is set on a permanent backstay in lieu of a mizzen mast.

SAIL MEASUREMENTS

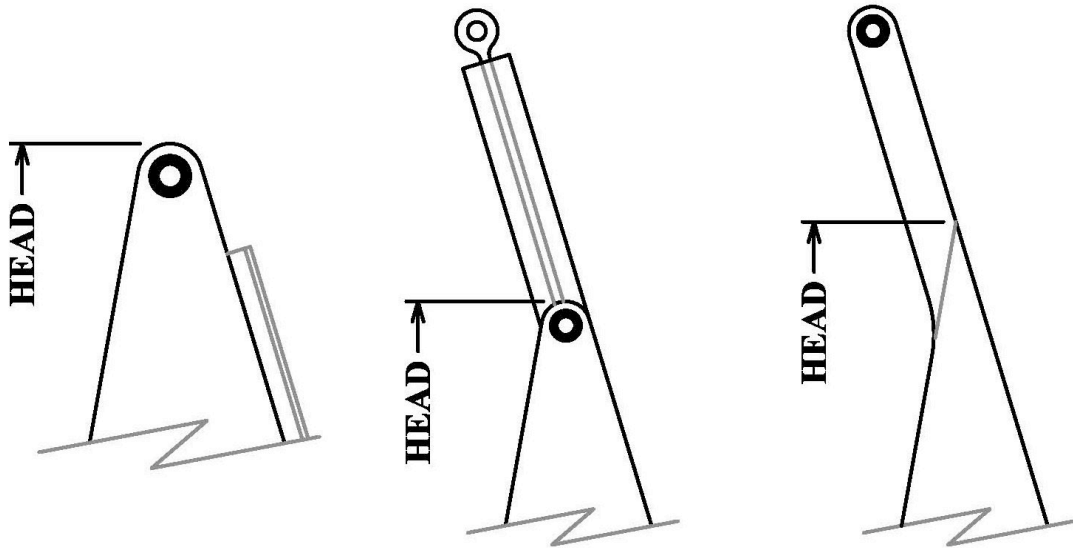
10.09 Tension and Wrinkles in Sails

When measuring sails it is required that sufficient tension be applied between measurement points as to remove all wrinkles across the line of measurement and must include the fabric length between measurement points.

10.10 Measurement Points at Corners of Sails

Measurement points at the corner of a sail shall be the intersection of the adjacent sides projected except in the case of the head of a jib which shall be determined in accordance with the diagrams below. For jibs other than storm jibs, the head measurement point is the highest point of the sail. In the case of a storm jib the head measurement point is the lower of the highest point of the sail or the intersection of the adjacent sides projected. All other measurement points shall be at the extreme outside of rope, wire or fabric of the sail's edge.

Measurement points at the heads of Jibs.



10.11 Definition of Headsails.

The word headsail is defined as a sail set in the foretriangle. It can be either a spinnaker or a jib.

MEASUREMENT OF JIBS

10.12 Longest Perpendicular of Jibs (LPG).

10.12.1 Jibs shall be measured on the perpendicular from the luff (outside edge of the sail and/or luff rope) to clew (intersection of the lines of the foot and leech). A wrap-around jib shall be measured on the perpendicular from the line of junction of the wrap-around parts to the clew.

10.12.2 LPG shown on the rating certificate shall be the value for the largest area jib carried on the yacht.

10.13 Jib Girths and Jib Roach (JR).

- 10.13.1** From any specified point on the leech of a jib, the mid-girth is defined as the distance from that point to the nearest point on the luff of the jib.
- 10.13.2** JMGL, JMGM, JMGU shall be the mid-girths, as defined in 813.1 above, from respectively 25%, 50%, and 75% of the leech length from the clew.
- 10.13.3** JLE shall be the straight line distance from the jib head to jib clew.
- 10.13.4** JLU, JLE, LPG, JMGL, JMGM, and JMGU shall be measured for each jib and recorded on that jib's sail certificate.
- 10.13.5** Jib Roach (**JR**) is defined as the maximum excess of the three girths JMGL, JMGM, JMGU over the base girths of respectively 75%, 50%, 25% of LPG. 75% of JR shall be multiplied by JLE for the purpose of calculating the roach area.
- 10.13.6** For no mid girths shall the girth excess, as defined in 10.32, exceed 12% of its respective base girth.
- 10.13.7** The JR and JLE for the largest area jib shall be shown on the certificate.

10.14 Forestay Perpendicular (FSP).

FSP shall be the larger of either:

1. Twice the maximum dimension, measured at right angles to the longitudinal axis, of a luff groove device;
- or
2. The largest dimension of the doubled portion of a wrap-around jib measured at right angles to the luff line when opened out.

10.15 Longest Luff of Jibs (JL).

The length of the luff shall normally be the distance between the lowest part of the sail on the luff rope at the tack and the highest point of the sail on the luff rope at the head. JL shall be recorded as the largest such dimension found on the jibs carried on the yacht.

MEASUREMENT LIMITATIONS ON JIBS

10.16 All jibs are subject to the following limitations:

- 10.16.1** The distance, measured on the surface of the sail, between the midpoint of the foot and the midpoint of the luff shall not exceed 0.55 of the length of the leech.
- 10.16.2** Except in non-overlapping self-tacking jibs no clew boards may be used in jibs.
- 10.16.3** No headboards may be used in jibs.

- 10.16.4** Except that battens are not permitted in jibs of LPG greater than $1.1*J$, battens may be used in jibs only if the number of battens is limited to four, which must be arranged with approximately equal spacing between head and clew (see also 10.05 (e)).
- 10.16.5** A yacht may use a luff groove device provided that such luff groove device is of constant section throughout its length and is either essentially circular in section or is free to rotate without restraint. Any permitted device on the forestay other than hanks shall be measured for FSP (see 10.14).
- 10.16.6** Jibs may be sheeted from only one point on the sail except in the process of reefing the sail. (Thus quadrilateral or similar sails or sails in which the sailcloth does not extend to the cringle at each corner are excluded.)
- 10.16.7** Aromatic polyamides, carbon fibers and other high modulus fibers shall not be used in the storm jib.

DEFINITION OF SPINNAKERS

10.17 Symmetric Spinnakers.

To be classified as a symmetric spinnaker a sail must meet the following criteria:

- 10.17.1** The luff and leech (see 10.21) must be of equal length.
- 10.17.2** The sail must be symmetric, in shape, material and cut, about a line joining the head to the center of the foot.

10.18 Asymmetric Spinnakers.

To be classified as an asymmetric spinnaker a sail must meet the following criteria:

- 10.18.1** The luff shall be at least 5 percent longer than the leech (see 10.21).
- 10.18.2** The mid girth (see 10.23) shall not be less than 75 percent of the foot length (see 10.22).

MEASUREMENT OF SPINNAKERS

10.19 Spinnaker Headboard (HBS).

HBS shall be the maximum width of a spinnaker headboard, which shall not exceed $0.05*J$.

10.20 Spinnaker Maximum Width (SMW).

SMW for a symmetric spinnaker shall be the spinnaker maximum width, whether at the foot or across the body of the sail between points on the luff and leech equidistant from the head.

10.21 Spinnaker Luff and Leech (SL & ASL).

10.21.1 Symmetric Spinnaker Luff and Leech (SL).

SL shall be the greatest length of a symmetric spinnaker luff and leech measured along the edges of the sail from head to foot.

10.21.2 Asymmetric Spinnaker Luff (ASL).

- a) SLU shall be the length of the longer edge (luff) of an asymmetric spinnaker measured along the edge of the sail from head to tack.
- b) SLE shall be the length of the shorter edge (leech) of an asymmetric spinnaker measured along the edge of the sail from head to clew.
- c) ASL shall be calculated from the following formula:

$$ASL = 0.5 * SLU + 0.5 * SLE$$

For symmetric spinnakers, where stiffening is used to widen the angles at the tack and clew beyond an included angle of 110 degrees the greatest length of any such stiffening along the foot, measured from the clew, shall be added to the luff length to determine SL.

10.22 Spinnaker Foot Length (SF & ASF).

Spinnaker foot length shall be the distance from tack to clew measured in the shortest path on the surface of the sail. For a symmetric spinnaker, the distance shall be recorded as SF. For an asymmetric spinnaker, the distance shall be recorded as ASF.

10.23 Asymmetric Spinnaker Mid Girth Length (AMG).

AMG shall be the distance between the midpoints of luff and leech measured in the shortest path on the surface of the sail.

10.24 Measurements for Spinnaker Area

For calculation of sail area the dimensions of HBS, SMW, AMG, SF, ASF, SL and ASL shall be from the spinnaker with the largest area (see) carried on the yacht, but also see 10.45 for rated minimum SMW, AMG, SF, ASF, SL and ASL.

MEASUREMENT LIMITATIONS ON SPINNAKERS

10.25 All spinnakers are subject to the following limitations:

10.25.1 A sail shall not be measured as a spinnaker unless the mid girth is 75 per cent or more of the foot length.

10.25.2 Battens shall not be used in spinnakers.

10.26.3 Adjustable leech lines are not permitted in symmetric spinnakers.

MEASUREMENT OF MAINSAILS

- 10.26 Mainsail Head** - The head shall be taken as the highest point of the sail projected perpendicular to the luff or its extension.
- 10.27 Mainsail Clew** - The clew shall be taken as the aftermost part of the sail projected to the foot of its extension.
- 10.28 Mainsail Cross Widths** - The cross measurements shall be the distance from the leech measurement points, as defined below, to the nearest point on the fore edge of the sail including their bolt rope. The points on the leech from which the cross measurements are taken shall be determined bridging any hollows in the leech with straight lines.
- 10.29 Mainsail Mid Point of Leech** - The mid-point of the leech shall be determined by folding the head to the clew and the quarter and three-quarter leech points by folding the clew and the head to the mid-point leech. The seven-eighth leech point is determined in a similar fashion.

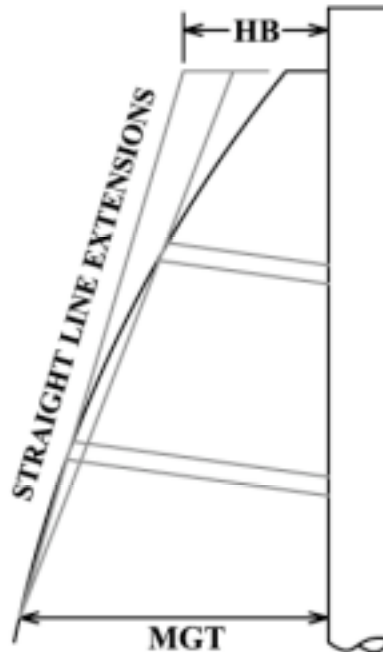


10.30 Mainsail Headboard (HB).

Where the center line of the top batten pocket is not situated above the MGT leech measurement point, HB shall be the maximum fore and aft dimension from the luff of the mainsail, projected if necessary, to the extreme aft edge of the leech measured across the widest part of the headboard. If the widest point of the headboard is in doubt, the highest of the widest points shall be used. If no headboard is fitted, then HB shall be the dimension taken perpendicular to the luff of the mainsail, or its fair projection, to the extreme aft edge of the leech, or its fair projection, across the bearing surface of the head cringle or stop. Any stiffening used to extend the leech beyond a reasonable roach shall be added to HB. HB has as a limit the greater of $0.04 \cdot E$ or 0.152m (0.5 ft).

10.31 Top Batten Upper Limit – Determination of HB

Where the center line of a batten pocket is situated above the MGT leech measurement point, HB shall be measured as diagrammed below and recorded to the nearest cm (metric) or nearest tenth of a foot (imperial) as for sails. A straight line extension of a line from the leech measurement point of MGT through the outer tip of the batten above MGT giving the greatest value for HB shall determine the aft measurement point for HB.



10.32 Mainsail Girths (MGT, MGU, MGM, & MGL).

10.32.1 MGT, MGU, MGM and MGL shall be the length of the girths of the mainsail taken at points 7/8, 3/4, 1/2 and 1/4 of the leech from the clew respectively, measured in accordance with 10.28. The values recorded for MGT, MGU, MGM and MGL shall be the largest to be found on any mainsail used on the yacht.

10.32.2 Standard Mainsail Girths.

- a) The standard for MGT is $0.22 * E$
- b) The standard for MGU is $0.38 * E$
- c) The standard for MGM is $0.65 * E$
- d) The standard for MGL is $0.89 * E$

In ORR a mainsails is rated on both its actual area and the vertical distribution of that area. These standard girths are nominal values only. Where any girth exceeds its limit, a rating assessment shall be applied.

10.32.3 The rules for mainsail girths and limits apply to mizzens by appropriate substitution.

10.33 Mainsail weight (MSW).

MSW shall be the dry weight of the mainsail not including battens (see also 2.06.1). The value of MSW for any calculation shall be the smallest found on any mainsail used for racing.

10.34 Batten Adjustment

No device other than a normal leech line shall be employed to adjust the curvature of any batten.

MEASUREMENT OF MIZZEN SAILS

Where noted, rules under the Mainsail section apply also to mizzens by substitution of the corresponding mizzen values.

10.35 Mizzen Headboard (HBY).

HBY shall be the maximum fore and aft dimension from the luff, projected if necessary, to the extreme aft edge of the leech measured across the widest part of the headboard. If the widest point of the headboard is in doubt, the highest of the widest points shall be used. By substitution, the HB limit applies to HBY.

10.36 Mizzen Top Batten upper limit.

The center line of the top batten pockets shall not be situated above the MGTY leech measurement point.

10.37 Mizzen Girths (MGTY, MGUY, MGYM & MGLY).

Mizzen girth measurements are as for mainsail girths (reference 10.32).

10.38 Mizzen Batten Adjustment.

No device other than a normal leech line shall be employed to adjust the curvature of any mizzen batten.

MIZZEN STAYSAIL

10.39 Mizzen Staysail Foot (YSF).

Mizzen staysails shall be three-cornered. YSF is the distance measured along the edge of the foot of the mizzen staysail from tack to clew. For measurement purposes, the foot shall be taken as the shortest side. YSF shall be the largest such dimension found on the staysails carried on the yacht.

10.40 Mizzen Staysail Depth (YSD).

YSD is the shortest distance that can be measured across the mizzen staysail from head to foot. For measurement purposes the head shall be taken as the junction of the two longest sides. YSD shall be the largest such dimension found on the staysails carried on the yacht.

10.41 Mizzen Staysail Mid Girth (YSMG).

YSMG is the distance measured on the surface of the sail between the mid points of the two longest sides. YSMG shall be the largest such dimension found on the staysails carried on the yacht.

RATED ELEMENTS OF THE AERODYNAMICS MODEL

Sail and rig dimensions are used by the Velocity Prediction Program to create an aerodynamic model of the sail plan and rig from which it calculates lift and drag factors to determine the heeling and propulsive force of the sails in different wind velocities and points of sailing.

10.42 Sail Plan Rated Areas.

For the purpose of the aerodynamic model, areas are calculated as follows.

10.42.1 Foretriangle: The area of the foretriangle is determined as $IM \cdot J / 2$.

10.42.2 Jib: The area is determined as $(IM^2 + J^2)^{0.5} \cdot (LP) / 2$.

10.42.3 Spinnakers:

- a) Symmetric Spinnaker: For the purpose of the aerodynamic model, the area of a symmetric spinnaker is determined as $SL \cdot (0.5 \cdot SF + 2 \cdot SMW) / 3$.
- b) Asymmetric Spinnaker: For the purpose of the aerodynamic model, the area of an asymmetric spinnaker is determined as $ASL \cdot (0.5 \cdot ASF + 2 \cdot AMG) / 3$.

10.42.4 Main and Mizzen: Mainsail area is determined by trapezoidal integration of P, E, MGT, MGU, MGM, MGL and HB:

$$\text{Area} = (P/4 \cdot (E + MGL)/2) + (P/4 \cdot (MGL + MGM)/2) + (P/4 \cdot (MGM + MGU)/2) + (P/8 \cdot (MGU + MGT)/2) + (P/8 \cdot (MGT + HB)/2)$$

Where the value for any girth has not been recorded, the corresponding girth limit is substituted. The mizzen area is calculated by the method given above for the mainsail, substituting the corresponding mizzen values.

10.42.5 Mizzen Staysail: The area of a mizzen staysail is determined as:

$$\text{Area} = YSD \cdot (2 \cdot YSMG + YSF) / 4.$$

10.43 Foretriangle Height (IM).

$$IM = (IG + IG \cdot (GO - MW) / (J - GO + MW))$$

10.44 Longest Perpendicular of Jibs, Rated (LP).

LP shall be taken as the greatest of $LPG + FSP$ or J .

10.45 Rated Limits.

For the purpose of calculating the aerodynamic model, the following limits apply.

10.45.1 IM: IM shall not be taken as less than $0.65*(P + BAS)$.

10.45.2 J: J shall not be taken as less than $IM/4$.

10.45.3 LP: LP shall not be taken as less than J.

10.45.4 SMW: SMW shall not be taken as less than the greater of $1.5*J$, or $SMW + .5*(1.5*SPL - SMW)$.

10.45.5 AMG: AMG shall not be taken as less than the greater of $1.5*J$, or $AMG + .5*(1.5*SPL - AMG)$. (SPL is replaced with TPS in this formula for boats rated as centerline asymmetric.)

10.45.6 SF: SF shall not be taken as less than the greater of $1.5*J$, or $SF + .5*(1.5*SPL - SF)$.

10.45.7 ASF: ASF shall not be taken as less than the greater of $1.5*J$, or $ASF + .5*(1.5*SPL - ASF)$. (SPL is replaced with TPS in this formula for boats rated as centerline asymmetric.)

10.45.8 SL & ASL: SL & ASL shall not be taken as less than the spinnaker Luff Limit (LL).

$$LL = 0.95*(ISP^2 + J^2)^{0.5}$$

10.46 Aerodynamic Drag of Masts.

The aerodynamic drag of the masts shall be taken into account by the Velocity Prediction Program and will be determined from the Effective Height of Mainmast (EHM), the Effective Diameter of Mainmast (EDM), the Effective Height of Mizzenmast (EHMY) and the Effective Diameter of Mizzenmast (EDMY).

10.47 Aerodynamic Drag of Rigging and Spreaders.

The aerodynamic drag of the rigging is calculated by deriving an effective diameter from the rigging default weight (see 725.6), divided by the specific gravity of steel and four times IM. This value is then multiplied by IM to obtain an effective rigging windage area which is corrected to take into account the effect of spreaders. Where the mast does not have bona fide spreaders, the drag for spreaders is omitted and that for rigging reduced.

10.48 Effective Height of Mainmast (EHM).

EHM is the greater of $P + BAS$ or IM