Fractional rig *without a masthead backstay*
with aft swept spreaders

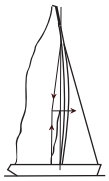
Tuning instructions

These instructions should be read in conjunction with Hints & Advice (H&A), (part. no: 595-540-E).

CAUTION!

– When sailing with the *main reefed so that the head-board is 0.5 - 1 m below the forestay attachment*, the mast can achieve a dangerous negative bend unless action is taken (see Comments 3.2.2).

– When sailing downwind in strong winds (especially with a spinnaker hoisted) cap shroud tension and mast compression will be high (see Comments 3.2.7).



1. Step the mast according to H&A, chapters A, B and C1-C3.

2. Keelstepped masts only:
   Fit the tie rod rigging screws and mast chocking according to H&A, C5-C7.
3. Give the mast the desired fore and aft rake using the forestay.

4. Tension the cap shrouds to about 15% of the breaking load of the wire (see H&A, C4). This pushes the mast forward in the region of the spreaders.
5. Tension the lower shrouds (thereby pulling the spreader region aft) to give the mast the curve (mainsail luff curve) desired.

When sailing at the optimum heeling angle for the boat (20°- 25°) check:

- That the mast is straight in the athwartships direction.
- That the lee-side cap shroud does not become slack. If this is the case, increase the cap shroud tension (max. 25% of the ultimate wire load), and repeat from item 5.

The forestay should not be left highly tensioned when the boat is not being sailed. On smaller yachts the tension can be relieved by lengthening the forestay. Attach the jib halyard to the stemhead attachment, winch in, release the forestay and fit an extra toggle. Reattach the forestay, and release the halyard.

With this rig type it is essential that the leeward shroud must not go slack. Low cap shroud tension causes:

- poor longitudinal stability of the mast.
- poor forestay tension with, among other things, a decrease in pointing ability.

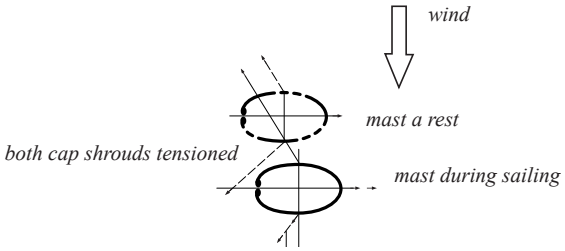
Comments

1. Forestay tension
The forestay tension is mainly controlled by tightness of the angled cap shrouds. If the leeward cap is slack, the forestay tension decreases drastically as the forestay mast attachment moves forward and the forestay sags.

A sheeted, full main has a backstay effect created by mainsheet / leech tension. This influences forestay tension.

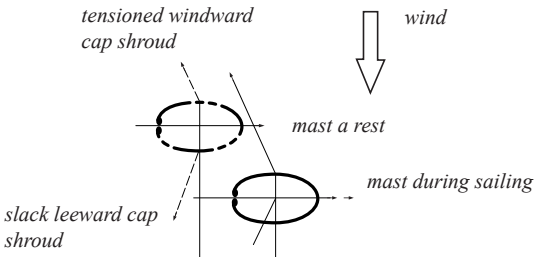
Regarding running backstays see Comments 3.2.9

Fig. 1a. Correctly tuned cap shrouds



both shrouds together restrict forward motion.

Fig. 1b. Incorrectly tuned cap shrouds

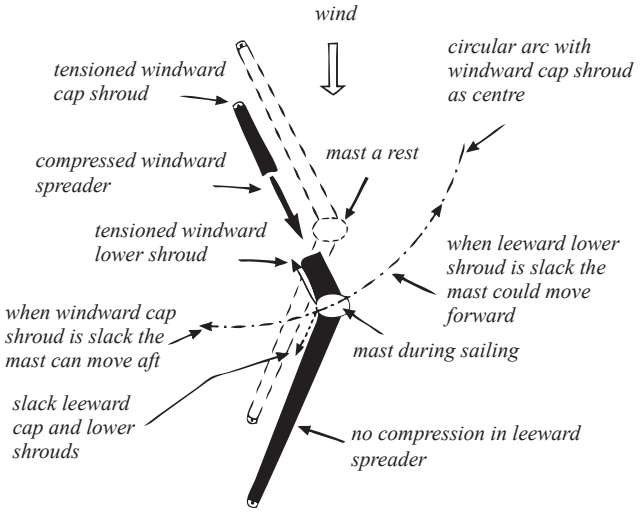


mast moves forward more

2. Longitudinal mast stability achieved by the system of aft swept cap shrouds/spreaders/lower shrouds.

The interaction between the forward force of the spreaders and the aft force of the lower shrouds secures this region of the mast, in the force and aft plane. For correct mast control both cap shrouds must be tight, simultaneously, for correct control. If the cap shrouds need increased static tension, it must not exceed 25% of the ultimate wire load.

(Illustration overleaf).



Some rigs are equipped with diamond shrouds (from the forestay attachment via the spreader tip to the mast heel). These diamonds are rigged to maintain compression in the leeward spreader. Consequently none of the diamonds must go slack.

3. General comments on mast stability

3.1 Factors contributing to mast stability

1. Correct tuning
2. The mainsail, if it is not too full, helps restrain the middle of the mast from collapsing forward.
3. If the middle of the mast moves aft, the head moves forward. Leech tension in a full (unreefed) mainsail will hold the masthead aft, and stabilise the middle region. (A positive bend can also be created by movable masthead backstay, which can be parked along the lateral rigging when not required).
4. A temporary inner forestay (possibly a low-stretch spinnaker lift) can maintain positive bend. The fitting of forward lower shrouds also helps maintain positive bend.
5. A structurally stift hull allows rigging to maintain pretension.

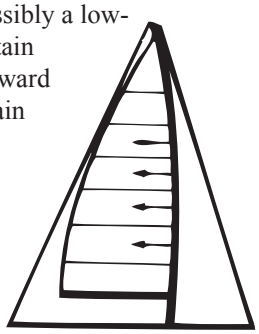


Fig. 3.1.2 An unreefed mainsail decreases the risk for mast buckling forward

3.2 Factors decreasing mast stabillity

1. Improper tuning (this could be caused by the use of runners see comments 3.2.9).
2. *A reefed mainsail (with the head more than 05-1.0 m below the forestay attachment)*. The mast can achive an undesirable negative (aft) bend. Forward spreader thrust from tensioned cap shrouds reduces the risks (see Comments 2).

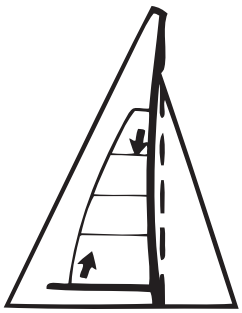


Fig. 3.2.2 A reefed main decreases stability

3. Excessive mast bend (see H&A p.3, item B1b).”Max. permisseble depth of curvature: 2% of the height of the foretriangle”.
4. Large gyration forces on the mast caused by its own mass when pitching in a seaway. The mast is subjected to acceleration/deceleration forces especially in the longitudinal direction.
5. Main boom thrust caused by a tight kicker or severe rolling during reaching or running conditions, which causes the boom to hit the water.
   This eftect can be decreased, on a reach, by releasing the kicker. However, kicker release when running should be avoided as it will aggravate rolling.
6. Spinnaker pole thrust:
   - when close reaching (spinnaker pole close to the forestay).
   - when running the pole end may hit the water during severe rolling.
7. Excessive static mast compression. This can be decreased by sailing whith less heel and/or less crew weight on the windward gunwhale.
   When sailing downwind in strong winds (especially with a spinnaker hoisted), cap shroud tension and mast compression will be high. This is due to the short fore and aft distance between the mast and its shroud chain-plates. The use of runners will decrease these loads.
8. High dynamic forces caused by pitching and rolling. These can be decreased by better steering through the waves.
9. Running backstays. If runners are used to increase forestay tension, the mast will be moved aft. This reduces cap shroud tension, allows the rig to bend and changes the lateral tuning. If the lower end of the runners are attached to the deck at some distance from the for and aft centreline of the hull (i.e on the toe rail) the top of the mast will be pulled to windward. The windward cap shroud will be slackened and lateral tuning can be affected.
   See Comments 3.2.7, second paragraph on the use of runners.
10. Flexible hull/chainplate construction. If hull and chain-plate distort under rigging loads the tuning will change.

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