LOOS & CO. INC.
CABLEWARE® DIVISION

ROD RIGGING TENSION GAUGE

The Loos rod rigging tension gauge is designed to provide an accurate measurement of the tension in rod rigging used in sailing, yachts, and other structural applications. It is particularly used for accurate and repeatable tuning of a sailboat's standing rigging.

Model **RT-10**	For rod diam.	.172, .198, .225, .250, .281in.
Model **RT-10M**	For rod diam.	4.4, 5, 5.7, 6.3, 7.1mm.
Model **RT-11**	For rod diam.	.281, .330, .375in.
Model **RT-11M**	For rod diam.	7.1, 8.4, 9.5mm.

Each model covers a tension range of approximately 5% to 25% of the breaking strength of the rod and is designed and tested to provide an accuracy of plus or minus 5% at mid-range.

The gauge may be hooked on the rod and will remain in position while the tension is adjusted.

U.S. Patent No. 5,461,929

How To Measure

1. Hold the gauge with the left hand and place the cable between the two nylon spools as shown in **Figure 1**.

2. With the right hand pull the lanyard and extend the spring until the hook on the nylon slider can be hooked on the rod as shown in **Figure 2**.

3. Release the lanyard. Read the needle position on the scale. Refer to the calibration table to obtain correct tension in the rod. The gauge can be left on the rod for “hands free” adjusting of the rod.

4. To assure accurate readings make sure that the slider moves freely in the frame slot and does not bind. Also, lubricate the slider slot frequently with silicone lubricant.

Fig .1

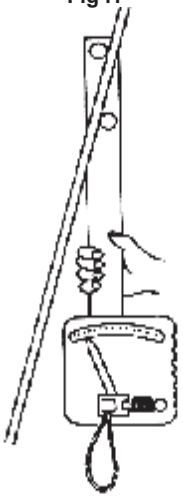
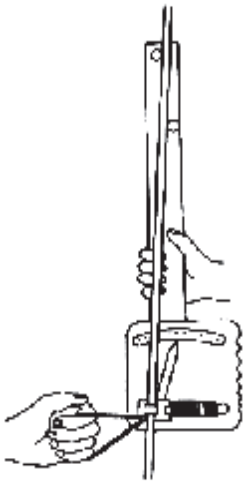


Fig. 2



How Much Tension?

Table 1

Nitronic 50 Rod

	Breaking Strength		Forestay*		Shrouds*	
Diam. In	lbs.	kgs.	lbs.	kgs.	lbs.	kgs.
.172	4700	2140	705	320	470	214
.198	6300	2860	950	430	630	290
.225	8200	3730	1230	560	820	380
.250	10300	4680	1550	700	1030	470
.281	12500	5680	1880	850	1250	570
.330	17500	7960	2630	1190	1750	800

*Suggested initial settings

Table 1 recommends an initial tension setting, but there is no simple solution since the optimum rigging tension will be a function of the boat design, the rig (masthead or fraction, one or more spreaders, etc.), and even the cut of the sails. Many skippers use insufficient tension because of a fear of “breaking something.” It should be noted that on 12 meters, where good tension instrumentation is available, the standing rigging is set as tight as is structurally feasible.

One Design Class Racing Sailboats

It is suggested that you contact your sailmaker for recommended inital settings for the rod rigging on your boat. For larger boats it may be prudent to check with the designer of the boat.

When no specific requirements are provided by the sailmaker, the following general comments will provide a basis for a rational procedure for tuning the rig.

Forestay Tension - Masthead Rig

On the masthead rig it's almost always advantageous to set the forestay tension as high as possible within the limits of structural strength. Generally, it's possible to use 15% of the breaking strength of the cable. Thus, a forestay tension of 1,550 lbs. is a reasonable and conservative place to start with a .250 diameter Nitronic rod. Backstay tension would, of course, have to be adjusted to maintain a straight mast with the desired forestay tension. Since the backstay makes a greater angle to the mast, the backstay tension will be lower than the forestay tension.

Forestay Tension - Fractional Rig

In a fractional rig the forestay does not go all the way to the masthead and forestay tension cannot be directly balanced by tension in the backstay. Therefore, some mast bend is generally accepted and the mainsail is cut to fit the bend. A forestay tension of at least 15% of the rod strength is desirable. However, if this results in excessive mast bend it will be necessary to back off a bit. On some fractional rigs, diamond shrouds are used to reduce mast bend.

One Design Class Racing Sailboats

Upper and Lower Shroud Tension - **Masthead Rig**

There is a simple criterion for shroud tension. The initial rigging tension should be high enough that the leeward shrouds do not go slack when sailing close-hauled in a reasonably brisk breeze. The proper value for your boat can be found by a few trial runs under sail. Once the correct tension is known, the gauge can be used to maintain the value. For many boat designs a shroud tension of 10% to 12% of the breaking strength of the rod is adequate. Thus, for a .250 diameter Nitronicrod, the upper and lower shrouds would be set to 1000 to 1,200 lbs. tension. On some rigs it may be desirable to carry more tension in the uppers than in the lowers.

Upper and Lower Shroud Tension - **Fractional Rig**

For most fractional rigs the correct shroud tension is the same as that for a masthead rig, i.e., a tension setting that will keep the leeward shrouds from going slack. However there is one exception. On certain fractional rigs , the upper and lower shrouds lead to chainplates that are aft of the mast. The spreader is swept back. For such a rig most of the forestay tension is balanced by the upper shrouds. A shroud tension of approximately 20 % of the rod strength may be required to achieve the desired forestay tension. Never exceed 25% of the rod breaking strength. (Refer to the breaking strength chart **Table 1**.)

Benefits of Correct Rigging Tension

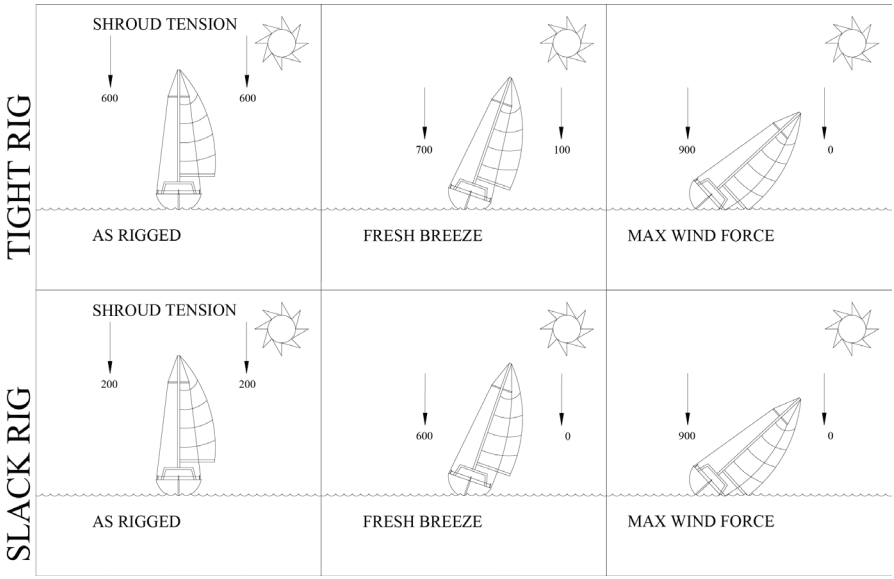
Contrary to popular thought, a slack rig is more punishing on a hull than a properly adjusted, tight rig. Insufficient tension will not reduce the loads transmitted in the hull.
Slack rigging will punish the spar and rigging needlessly by allowing excessive movement, chafe and shock loading. Modern fiberglass hulls should not be damaged by a properly adjusted, tight rig.

Figure B lists the rigging tension under different conditions for a typical boat with a properly tuned rig and with a slack rig. It will be noted that the maximum load is the same. However, for properly tuned rig the leeward shrouds will not go slack under normal sailing conditions.

The lateral stiffness of the mast and the fore and aft stiffness of the spreaders is reduced by a factor of 2 when the leeward shrouds go slack. This important structural characteristic is not generally recognized.

Rigging tension is becoming more important as a result of the trend toward the use of mast bend to control mainsail shape under different wind conditions. Mast bend will also affect the shape and trim of the jib, since mast adjustment generally affects forestay tension. The expert skipper will benefit by maintaining consistent rigging tension while developing the optimum sail shape and sailing tactics.

Fig. B



Safety and Performance

SAFETY - The failure of a fitting or shround or stay could damage your boat, buckle the mast or even cause personal injury. To avoid such failure of rod or fittings from either fatigue or shock loading, it is important to set up your standing rigging with proper tension. Too little tension in the shrouds will premit the leeward shrouds to go slack, only to fetch up with a jolt when the boat rolls or pitches. A less common problem is excessive tension. This can cause permanent stretch to the rods and possibly damage the mast.

PERFORMANCE - The actual set of sails under load is determined by the cut of the sail and the shape of the structure which supports the sail. Rigging tension plays an important part in determining the set of the sails.

When the boat has been tuned for peak performance, measured rod tension shoud be recorded.The stainless steel used to make the standing rigging can stretch a little bit over time under high loading. Thus, marking turnbuckles, ect. cannot guarantee that subsequent adjustments will provide the desired tension. Only by gauging is it possible to repeat the inital turning or improve it.

Limiting the sag of the forstay is perhaps the most important benefit to performance from having the proper rigging tension. Forstay sag permits the jib luff to fall off the leeward, tightening the leech and seriously degrading the performance to winward.

Tension in the upper and lower shrouds will influence the mast bend and set of the mainsail. This is especially important on modern fractional rigs where the mast bend is used to depower the sail in heavy winds.

If the shrouds are not set up with enough tension, the leeward shrouds will go slack when the boat is sailing to winward. This can result in for and aft pumping of the mast in a head sea. This mast movement will change the shape of the mainsail and cause performance loss as well as possible structual damage.

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