



Measurement procedure for a Class40

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PREAMBLE

This document is non-exhaustive.

Where there is doubt between the measurement procedure and the Class Rules and Appendix to Class Rules, the Class Rules prevail.

The straps or slings for lifting, the slings and straps used to tilt the boat at 90° will be put in place under the responsibility of the crew of the measured boat.

CHAPTER 1 – PROCEDURE FOR WEIGHING AND 90° TEST

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100 – EQUIPMENT REQUIRED

100.1 – Supplied by the person requesting measurement

- ◆ Three people (two to hold the mooring lines during the 90° test, and one to read the spirit level on the mainsheet traveller track).

Depending on the location where measurement takes place and the method used, a diver may be required to fit the strops around the bulb for the 90° test (La Trinité sur Mer, for example).

- ◆ Equipment required for both weighing and the 90° test

- One crane, of a minimum lifting load of 6000 kg at a horizontal distance greater than 10 m,
- Sufficiently long bow and stern lines to control the boat during lifting and the 90° test (minimum 20 m each)

- ◆ Supplementary equipment required for weighing :

- Lifting strops,
- And/or 1 crossbar or 1 spreader bar,
- And/or slings,
- 1 shackle: minimum capacity of 6000 kg, to attach the top shackle of the load cell to the crane hook.

Lifting method used:

- 1) Lifting with crossbar : 1 crossbar (overall capacity of 6 000 kg minimum) + 2 lifting slings (minimum capacity of 6000 kg and 10 m length minimum) ;
- 2) Lifting with slings : 4 slings (minimum capacity of 6000 kg, minimum 5m length) + 2 lifting slings (minimum capacity of 6000 kg and minimum 10 m length) ;
- 3) Lifting with long slings : 2 lifting slings (minimum capacity of 6000 kg and minimum 15 m length).

- ◆ Additional equipment to the 90° test in cases where the boat is heeled to 90° by lifting the bulb :

- slings:

Lifting slings to be securely attached around the bulb (whether the bulb protrudes beyond the leading edge of the fin or not) + 1 strop long enough to reach above the sheer of the boat (minimum capacity of the strops: 4000 kg. Overall length needed: about 5m);

- ropes:

- ✓ Ropes to secure the slings around the bulb (preventing fore and aft movement of the slings on the bulb);
- ✓ One long rope (approx 10m) attached to the bulb lifting slings so that they can be released from the bulb without lifting the boat out of the water.

- Two boats:

An open boat with engine and no flag mast (rib, inflatable, etc...) of a minimum weight of 500 kg, big enough to carry 4 people and fitted with a strong attachment point situated as low as possible, and which can take a minimum upward load of 500kg.

A second boat to read the spirit level at on the mainsheet traveller track during the 90° test.

- ◆ Additional equipment to the 90° test in cases where the boat is heeled to 90° by pulling on the mast :

- slings:

- ropes and blocks:

- slings:

- ✓ ropes allowing the boat to be heeled by pulling on the mast
- ✓ the blocks required for running the rope used to heel the boat

- One boat:

A dinghy or small RIB to read the level on the mainsheet traveller track during the 90° test.

100.2 – Equipment supplied by the measurer

- ◆ Two load cells

1) 1 x 6T load cell :

with a minimum working load of 6000 kg with a +/- 0.1 % margin of error (+/- 5 kg for 5 000 kg), equipped with a remote digital display or display on the load cell (in this case the measurer will bring a pair of good binoculars and ensure the display is facing the right way when it is hooked to the crane), and a top and bottom shackle (or hook),

2) 1 x 400 kg load cell :

with a minimum working load of 400 kg with a +/- 500 g margin of error, and of minimum height,

- ◆ Equipment for attachment to the top of mast

1) 1 x 6:1 block and tackle:

minimum safe working load of 400 kg, with a cleat;

2) ropes and lifting strops

minimum safe working load of 400 kg, the first to be used to attach the small load cell to the top of the mast tied around the tube, and the second one to be used to attach the block and tackle to the boat used for the 90° test.

101 – MEASUREMENT TRIM OF THE BOAT

Weighing and the 90° test are undertaken with the boat in measurement trim as described in the Class 40 Rules. Any extra or missing items in relation to measurement trim will be weighed and listed on the official measuring report (diesel in tank, fenders etc...)

See Appendix 11 – Weighing conditions

102 – WEATHER CONDITIONS AND BASIN/ DOCK

102.1– Weather conditions required for both weighing and 90° test

Weighing and the 90° test can only be undertaken safely and accurately in calm weather; wind speed shall be less than 5 knots, and chop under 10 cm.

102.2 – Specific conditions for 90° test

♦ Size of the basin/dock

The test shall be undertaken in a basin/ dock big enough to allow for the boat, including when on its side, with no risk of hitting the dockside, pontoon or another boat.

♦ Layout of the basin/ dock

The layout of the basin/ dock needs to be such that the boat can be held in place with bow and stern lines when heeled at 90°.

♦ Orientation of the basin/ dock

The orientation of the basin/ dock shall be such that the wind blows the boat away from the dockside on which the crane is situated, ensuring that the boat cannot be pushed towards the dockside, and that it can be easily held in place.

♦ Availability of the basin/ dock

No craft shall pass close to the boat being measured during the test.

103.1 – Preparation of the boat for weighing

Ensure that the backstay, runners and lazy jacks are tied forwards to the mast. Ensure that the water ballast intake and the port/ starboard transfer valves are all open, thereby ensuring that any remaining water in the ballast system drains out.

103.2 – Weighing

◆ Load cell set-up

The crane is in place on the dockside, the boat is parallel to the dockside ready for weighing, held by one bow and one stern line. The measurer sets up the load cell (6T) on the crane hook using a shackle, and if the load cell doesn't have a remote display, ensures that it faces the right way for the result to be read. The measurer switches on the load cell on and resets it to zero before attaching the lifting strops. The weight of the lifting strops and slings will be measured only after the boat has been put back in the water, so that they are weighed wet.

◆ Set-up of the lifting slings

The lifting slings are installed under the boat by the boat crew, who will take care to avoid the sail drive or propeller shaft, and make sure that the boat sits correctly when lifted in the slings. The crew must also be careful with the standing rigging and spreaders when installing the slings.



Photo 1: Lifting with strops



Photo 2: Lifting with long slings

Result

The weight of the boat in measurement trim can be calculated by subtracting the weight of the strops and slings, and adding or subtracting the missing or extra items (fenders, diesel etc).

104 - 90° TEST

104.1 – Preparation of the boat for the 90° test

The port and starboard runners are tightened (medium tension), the boom is put at sailing height and centered, the bow sprit and the spinnaker pole are attached and ropes in the cockpit are secured.

All items (down below and on deck) that might fall during a 90° incline shall be secured (tape, rope..).

Check that all through hull fittings, tank breathers, ballast vents, openings, hatches, openings for deck gear attachment, etc... that might be under or close to the waterline when the boat is at 90° are closed or made watertight.

As for the engine, the 90° test can cause the cooling water to run towards the cylinders through the exhaust system, causing mechanical damage when the engine is next started. Therefore, before the test, the engine should be run for a few seconds with the water intake closed until no more water comes out of the exhaust.

With some engines, there is a risk that oil runs down from the lower engine to the cylinders with the same potential problems when the engine is next started. In this case, the only solution is to remove the oil from the lower engine before the test: the skipper must check with the engine manufacturer whether this is likely to happen or not.

The spirit level is attached with tape or any other means on the mainsheet traveller track.

If the boat is weighed at a measured weight below the required minimum, it must be brought up to the minimum weight by adding ballast (lead, a water container, etc.) before the 90° test is performed. For the 90° test, this corrective weight must be positioned around the keel box.

104.2 – Inclining to 90°

104.2.a - Case where the boat is heeled by lifting the bulb

◆ Inclining the boat

After weighing (reading of the number on the display), the boat is lowered above the dockside so that the crew can attach the sling and the ropes on the bulb.

◆ Example of Securing the slings and ropes on the bulb:



Photo 4: Bulb protruding at the front with aft line to protect the trailing edge, and forward line to remove sling



Photo 5: Bulb protruding at the front with aft line to remove sling + line in the middle to hold slings in place

◆ Example of Lowering of the boat into the water



Photo 6: Lowering of the boat with tension on bulb



Photo 7: Boat in the water with bulb sling held tight

◆ Inclining the boat to 90°

The crane driver can start lengthening the arm of the crane to move the boat away from the dockside until it is 3 to 5m away from the edge.

At the same time, those handling the mooring lines will ease them as the boat moves.

The measurer can then take to the boat being used for measurement with the extra crew needed.

The measurer will give instructions directly to the crane driver (the best solution), and will need to stand up when the boat is at 90° if (s)he wants to be seen, or via somebody else on the dockside and in sight of the crane driver. It may be useful for the crane operator and the measurer to stay in communication (headset, earpieces) during the operation, as the boat may obstruct their view.

◆ Example of Attaching the load cell to the masthead

The measurer boat goes to the masthead, keeping downwind of the mast.

The measurer positions the boat in such a way that the block and tackle are directly beneath the mainsail hoist band, and keeping the engine of the measurer boat clear of the masthead wind instruments and VHF antenna.

Then, the measurer attaches the load cell to the mast with a rope going around the mast several times at the hoist band, resets the load cell to zero, and attaches the block and tackle to the fixed point on his/her boat, keeping it as short and tight as possible.

The measurer then asks the crane driver to release the tension on the bulb sling, and to stop just when it goes slack (no longer supporting the bulb), but in such a way that the sling weight is not on the bulb either.

A third member of the crew then gets into the dinghy provided for this purpose and goes to the mainsheet traveller track to check, using the spirit level, its vertical alignment; they can then tell the measurer how much to ease the tackle until the boat is perfectly at 90°.



Photo 8: Load cell in place

◆ Measurements :

The measurer can then read the load cell display, while ensuring no movement onboard which could affect the horizontal position of the mast or cause the load cell to oscillate.

104.2.b - cases where the boat is heeled to 90° by pulling on the mast

◆ Optimization of the 90° test:

The results of the weighing and the 90° test may lead the boat's managers to optimize the values. One method is to use lead shot placed inside the keel fin.

The position of the center of gravity must not vary at very large heel angles, in particular to ensure that

the righting moment at 90° or the limit of positive stability remains unchanged.

To guarantee this invariability, the lead shot must be secured in position inside the keel fin before performing the 90° test. The method used to secure it may vary and must be approved by the Class.

The addition of lead shot must be carried out in the presence of a class measurer or a person authorized by the class.

104.3 – MEASUREMENT AT 0°

◆ Freeboard

See Class Rules 205

◆ Height of the mast base

A long straight bar is placed transversally at the centerline of the mast and horizontally (forward or aft of the mast, whichever is the easiest), the height of the lower side of this bar above the water surface is measured on port and starboard, and the height of the mast above the water can then be calculated.



Photos 9 and 10: Examples of the placement of the bar for measuring mast base height

◆ Draft

A bar specifically set up for this is passed twice under the boat, from transom to bow and vice versa. It must remain perpendicular with horizontal pull on the buoys as minimal as possible.

Caution: if the bar gets stuck, the boat has failed the test, and the boat does not comply with the draft rule.

CHAPTER 2 - BALLAST MEASUREMENT PROCEDURE

The measurer will use any and all means with the help of the owner to ensure measurement of the maximum ballast volume and not just the available volume.

If there is a problem with applying a method to measure the total ballast volume, the measurer can assess by calculation the remaining volume of air which cannot be purged by filling when the boat is static at the measurement session. The sum of these 2 values (volume found + volume calculated) determines the total ballast volume.

CHAPTER 3 -SAILS

The rules governing sails are detailed in paragraphs 103 and 212 of the Class Rules.

Each boat shall present a certificate of sail conformity:

- ✓ When first measured;
- ✓ Each time a new sail is made for the boat.

In order to be issued with a certificate, the owner shall provide the sailmaker with a sticker on which the Class secretary has written a unique number. This sticker must be sewn onto the tack or clew by the sailmaker (on the clew of furling sails).

At the start of each race, the measurers/ scrutineers or the Class secretariat shall ask for the declaration of sails on board.

With this document, the combined sail area of 115m², the limit of 2 exotic sails, the heavy-weather jib, and the identification of the sails can be checked at a later stage.

Only sails with a completed certificate which has been sent to the Class secretariat will be allowed on board for racing.

CHAPTER 4 – MEASUREMENT REMINDER

In order for the measurement session of your Class40 to be carried out in the best possible conditions, we suggest you do the following:

Read the following documents carefully:

- Class Rules
- Appendix to Class Rules
- Class40 measurement procedure (non-exhaustive document)

You must provide the Class measurer with:

- the certificates of mast and sail conformity;
- a drawing of the buoyancy foam distribution, signed by the designer, the builder and the skipper.
- certificate of inspection of build drawings from a World Sailing approved body

Furthermore, it can be useful to check the ballast capacity, the bowsprit or spinnaker pole maximum length, hull and deck markings...

Services and travel expenses of the Class-accredited measurer are paid by the owner of the boat.