TRAINING MANUAL FOR

Optimist Measurer

Bob Witham, NZIODA Chief Measurer,
in conjunction with NZIODA

Introduction

Contents

01 INTRODUCTION.....2

02 GENERAL INFORMATION.....3

03 SAILS AND SAIL NUMBERS.....4

- HOW TO MEASURE & REFERENCE PHOTOS

04 SPARS.....9

- MAST – HOW TO MEASURE & REFERENCE PHOTOS
- BOOM – HOW TO MEASURE & REFERENCE PHOTOS
- SPRIT – HOW TO MEASURE & REFERENCE PHOTOS

05 FOILS.....15

- RUDDER – HOW TO MEASURE & REFERENCE PHOTOS
- DAGGERBOARD – HOW TO MEASURE & REFERENCE PHOTOS

The Optimist Dinghy is a one design class with class rules that are updated annually. The class rules should be read in conjunction with the Equipment Rules of Sailing (ERS) in the areas that apply to the Optimist Dinghy. ERS can be downloaded from the Internet.

The measurers have an important role as keeping the class legal means all sailors compete on an equal basis. The hulls are not fully measured at all regattas, but they are weighed at some events. The hull condition required for weighing is explained in the class rules; measurers need to be aware of this procedure.

Measuring needs to be accurate as when measurements are allowed to drift this undermines the one design aspect of the class.

The class will benefit from having measurers covering as much of the country as possible. Currently we need more measurers to cover the areas where there are growing fleets. If you feel it is something you would like to be involved in, please make this known to NZIODA.

Measurers deal with matters relating to safety and at some events they undertake measurement and safety checks on the water.

Measurers and Jury members work closely together when documents are lost, forgotten or items are damaged and replacement items are being submitted at a regatta. The measurers can protest a boat that infringes a class rule relating to measurement and safety.

Bob Witham,
NZIODA Chief Measurer

The photographs in this manual are numbered and labelled to align with the numbers in the sections (Sails, Spars and Foils) in the manual. The check sheets list the measurements that need to be checked and recorded. These sheets can be downloaded from our website: optimist.org.nz/officials-2

02 General information

Measurement, by definition, is quantifying the size of an object.

Measurements will often have a tolerance. For example, the allowable size on a drawing may be 10 mm +/- 0.2mm. The size is acceptable anywhere in the range from 9.8 mm to 10.2 mm. Generally, Optimist items such as sails, foils and spars are stated as whole number measurements and no tolerance on the size is specified. Some measurements have a maximum AND minimum. Measurers need to measure accurately using scales, tapes, rulers, thickness calipers, scales, vernier calipers, and micrometers. The last two items will measure to a high degree of accuracy and must be handled very carefully. When measuring with a ruler or tape I will sometimes record a size to be 10.5 if I believe the area being measured warrants this level of accuracy and I can see it is not exactly 10 or 11.

Sometimes a manufactured item like the mast band is intended to meet a class specified size. Mast band width with a Vernier might measure 9.8 / 9.9. I would record this as 10mm as they clearly intended this to be 10mm, but the manufacturing process is not accurate. However in this case it is the spacing between the bands and the position from the top of the mast that are important. I disregard a small band width error that offers no benefit to a sailor. When two people are measuring, ensure that both people measure on the same edge of the tape.

On the NZIODA website there is a document that shows where serial numbers for sails, spars and foils are often located.

Current class rules must be available throughout the measuring process. Changes to the rules are highlighted in red each year. Equipment labels and the location of these are required on Spars and Foils from 2025.

07 Sails and sail numbers

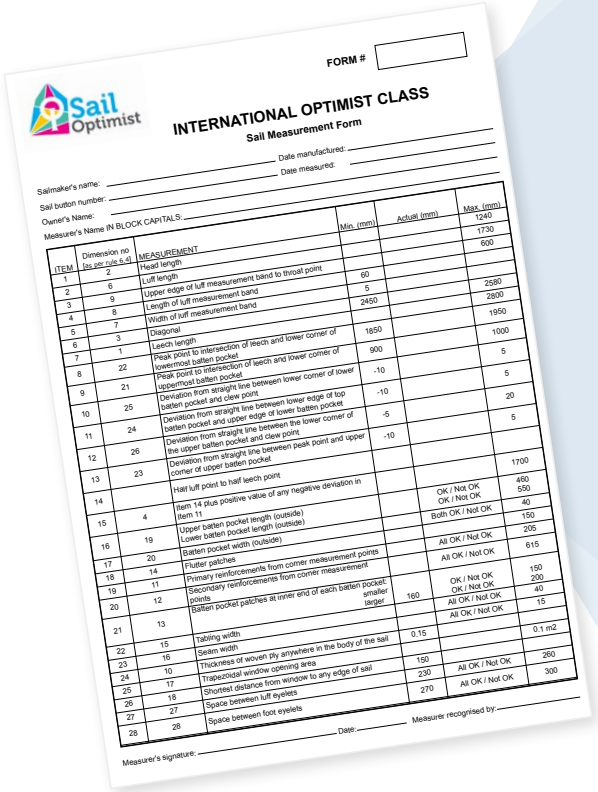
How to measure

I have found that it is best to measure sails at table height (900mm) as measuring on the floor becomes very tiring when you have four or five sails to measure. It is much quicker and easier to have a helper to hold the tape or the string line and help with tensioning the sail. A flat clean surface is required if tables are not available. Sails need to be handled carefully to avoid creasing and marking. Accuracy is important as some of the sail sizes may be close to the maximum or minimum. Equipment Rules of Sailing (ERS) pages 38, 39 & 42 shows the measurement points at the peak, tack, clew and throat which I recommend viewing. ERS also shows the sail edges mentioned in this manual.

Optimist Sail Measurement Form

The sail and sail number measurement form can be downloaded from the International Optimist Dinghy Association (IODA) website.

https://www.optiworld.org/uploaded_files/Document_2045_20180605202313_en.pdf



Sail Optimist

FORM #

INTERNATIONAL OPTIMIST CLASS

Sail Measurement Form

Sailmaker's name: _____ Date manufactured: _____

Sail button number: _____ Date measured: _____

Owner's Name: _____

Measurer's Name IN BLOCK CAPITALS: _____

ITEM	Dimension no (as per rule 5.4)	MEASUREMENT	Min. (mm)	Actual (mm)	Max. (mm)
1	2	Head length			1240
2	6	Luff length			1730
3	9	Upper edge of luff measurement band to throat point	60		600
4	8	Length of luff measurement band	5		
5	7	Width of luff measurement band	2450		2680
6	3	Diagonal			2800
7	1	Leech length	1850		1950
8	22	Peak point to intersection of leech and lower corner of lowermost batten pocket			
9	21	Intersection of leech and lower corner of uppermost batten pocket to peak point	900		1000
10	25	Deviation from straight line between lower corner of lower batten pocket and clew point	-10		5
11	24	Deviation from straight line between lower edge of top batten pocket and upper edge of lower batten pocket	-10		5
12	26	Deviation from straight line between the lower corner of the upper batten pocket and clew point	-5		20
13	23	Deviation from straight line between peak point and upper corner of upper batten pocket	-10		5
14		Half luff point to half leech point			
15	4	Item 14 plus positive value of any negative deviation in Item 11			1700
16	19	Upper batten pocket length (outside)		OK / Not OK	460
17	20	Lower batten Pocket length (outside)		OK / Not OK	550
18	11	Batten pocket width (outside)		Both OK / Not OK	40
19	14	Flutter patches			150
20	12	Primary reinforcements from corner measurement points		All OK / Not OK	205
21	13	Secondary reinforcements from corner measurement points		All OK / Not OK	615
22	15	Batten pocket patches at inner end of each batten pocket: smaller larger	160		150
23	16	Tabling width		OK / Not OK	200
24	10	Seam width	0.15	OK / Not OK	40
25	17	Thickness of woven ply anywhere in the body of the sail		All OK / Not OK	15
26	18	Trapezoidal window opening area	150	All OK / Not OK	
27	27	Shortest distance from window to any edge of sail	230		0.1 m2
28	28	Space between luff eyelets	270	All OK / Not OK	260
		Space between foot eyelets		All OK / Not OK	300

Measurer's signature: _____ Date: _____ Measurer recognised by: _____

The following equipment for measuring sails is required.

- Class 2 (II) tape measure, 5 metre length. (show the class 2 symbol on the tape)
- 300 mm alloy ruler
- Straight edge 1 metre
- Fine string line
- Micrometer
- Pencil, pen, fine black permanent marker
- A clip board
- Vernier caliper useful but not essential

1. Top section of the Sail Measurement form

The sail serial number is very important; this should be the first thing recorded on the form. The serial number will be at the tack on the starboard side of the sail. It may be a plastic button or a label sewn on with the number printed on it. The date the sail has been manufactured will be at the peak on new sails but may not be visible if you are re-measuring a used sail. The sail thickness might also be visible in this area and should still be measured. I recommend that the country (NZL) and sail number are recorded at the top of the form. (Photo 1)

2. How to determine the measurement points at the Peak, Throat, Tack and Clew

It is important to know the point you are measuring to and from. The measurement points at the peak, tack, throat and clew are all intersecting extensions of the head, luff, foot and leech lengths. The sprit attachment tape at the peak is not included in the measurement.

The points might need to be lightly marked on the sail with a pencil. ERS, Equipment Rules of Sailing 2024 Subsection B – Additions for other sails on pages 38 and 39 show these measurement points and the sail edges.

Explain and show how to determine the measurement points. Draw a diagram and / or hand out copies from ERS.

3. How to measure the Luff, Head, Leech, Half Height Width and Diagonal Lengths.

The accurate way to measure the outer edges and the internal measurements of the sail is to flake the luff, leech, head, diagonal and the half height width to ensure the true length is being measured. This also applies when the leech deviation is being measured with the string line and the straight edge. Flaking is putting a loose fold in the sail parallel to the length being measured.

Demonstrate this on the luff as the luff round can be quite noticeable. On the leech the flake / fold will be at the inner end of the battens.

4. Tension is very important

The sail material is stable and excessive pressure should NOT be used. The tension should be to ensure the area being measured does not have folds or wrinkles that are at right angles to the line of measurement. The quickest way is to have another person assisting to hold the sail and the tape at one end of the edge being measured and the measurer at the other end applying the tension as well as holding, reading and recording the measurement. It is sometimes best to start the measurement at the 100mm point on the tape to avoid inaccuracies that might arise from clip movement at the end of the tape. This becomes important when the measurement is very close to the maximum allowable size.

Demonstrate.

5. Leech Deviations

Leech deviations from a straight line can be either convex or concave. These have a bearing on the half width of the sail. If the leech is concave between the two battens this is allowed for on the sail measurement form by adding the negative deviation between the battens to the measurement taken between the half luff and half leech point. A straight edge is used to measure the leech deviation between the battens; between the top batten and the peak point and the bottom batten to the clew point. The string line is used to measure between the top batten and the clew point. The ruler is used to measure the deviations (positive or negative) from the sail edge to the string line. The shape of the leech is important as it is directly related to the half width of the sail which is often close to maximum.

Explain and demonstrate this.

6. Luff and Leech Half Points

The luff half point, (Photo 7), is found by carefully taking the tack point to the throat point. One person holds the two points firmly while the other tensions the sail with a pencil in the fold to mark the half- length point with a short pencil line. The leech half point, (Photo 8), is determined by taking the peak point to the clew. The battens remain in the sail at all times during sail measurement. The same technique with the pencil is used to tension and mark the half leech point.

7. Half Height Width

The half-height width, (Photo 5), is the measurement between the two marks made in point 6 above. If the sail leech is convex or straight between the battens the cross measurement is as measured. If the leech happened to be concave between the battens that will have been recorded in the deviation.The negative value of the leech at the half width point is added to the half width measurement.

Explain and show this on the sail measurement form, line 15.

8. The Diagonal

The diagonal is the length from the throat point to the clew point. Flake the sail when measuring this. (Photo 6)

9. Luff Band and Position

(Photo 4)

This is very important. The band must have a stitch or two at the luff so that the band, which is self- adhesive material, cannot move from the position the sailmaker has chosen. This band must be a contrasting colour to that of the sail and clearly visible on the water from a distance of 6 to 8 metres. The length and width of the band is measured as well as the position of the band on the luff. The sail band must fit between the mast bands when the sail is set up on the mast. The top edge of the sail band MUST NOT overlap the lower edge of the top mast band and the bottom edge of the sail band MUST NOT overlap the top edge of the bottom mast band. The Luff Band position relative to the mast bands is one of the checks on the water when pre-selected boats are checked at the end of a race.

10. Sail Battens

Battens are stitched into the batten pockets and are not removed for measuring. The measurements of the batten pockets are outside measurements. Length and width are the two measurements required.

11. Primary and Secondary Reinforcements

The primary reinforcement is any number of layers of sail cloth as long as the sail can still flex in the areas reinforced. The sizes are stated on the sail measurement form. Secondary reinforcement is restricted to two additional layers of material being the same thickness as the body of the sail. CR 6.3.3.8 refers to the secondary reinforcement stitching spacing. Demonstrate how to identify primary and secondary reinforcements. These reinforcements are located at the Peak, Throat, Tack and Clew.

12. Eyelet Spacing

The eyelets are positioned on the foot and the luff. Measure from the edge of the hole to the next hole edge on the same side of the hole as the hole you started from. Measuring to the eyelet centres is not ideal as it is not accurate. At the clew, tack and throat it is a little more difficult as the diameters of the eyelet holes are different to the diameters of the luff and foot eyelets. Using a ruler, you can get it reasonably accurate. The minimum to maximum eyelet spacing on the foot and the luff is 30mm.

Demonstrate.

13. Sail Thickness

This is measured with a micrometer. If the sail is made from a cloth that has a square pattern in it, you need to measure into the middle of the square as the square boundaries can be slightly thicker. Do not over tighten the micrometer. It should just be able to slide on the section being measured. Too much pressure may affect the accuracy of the reading. These precision instruments are highly accurate and must be handled carefully.

Demonstrate.

14. Tabling and Seam Widths

These are both measured with a ruler. The seams are those joining the sail panels within the sail. In some sails these also join sail sections at the clew, head, tack and throat. Tabling is the edge of the sail where the eyelets are positioned along the foot and luff and also the sail edges at the head and leech.

15. Trapezoidal Window

The trapezoidal window position and size is controlled. If the window is a rectangle the area will be the length multiplied by the width in metres. Windows come in various shapes that meet the definition of the trapezoidal requirement being a four-sided shape that has two parallel sides. It is often necessary to break this down into easily calculated shapes. (e.g. rectangles, triangles) The window area does not include the edges where the window is glued and stitched to the sail. The position of the window is also controlled by measurement on the sail measurement form.

16. Flutter Patches and Batten Pocket Patches

The flutter patch is secondary reinforcement on the leech at the end of the batten pocket. If used, they are positioned on the leech and the size is restricted to a max of 150 mm long. The batten pocket patches at the inner end of the battens can be either small (max150 mm) or large (160 min to 200 max). The patches are usually circular but I have seen hexagons which need to meet the size requirement when measured across the longest measurement. See class rule 6.4.

17. Sail Numbers

Numbers must be Arabic, digital is NOT accepted. Digital with rounded corners is still NOT acceptable. On the back of the sail measurement form the positions for the sail numbers are tabled. They need to be accurately placed within the tolerances stated. The numbers on the starboard side of the sail are highest. Sail Plan 4/5 on the Optimist Website and the internet is a guide only. The plan shows the numbers on the starboard side of the sail as highest which is correct BUT the numbers are normally now close to the leech; not as is shown on plan 4/5. Numbers and country letters must all be the same colour and strongly contrasting to that of the sail. Numbers are very likely to be checked at major events. The Class Emblem at the top of the sail is normally the same colour as the numbers and must be compliant with the dimensions in the class rules on page 5 (CR 2.7.1).

18. Completion of the Sail Measurement

Once completed and measurement compliant, both the form AND the sail at the tack on the starboard side, need to be signed and dated by the measurer. The form is then given to the sailor to hold in his measurement booklet. The measurer may also elect to keep a copy, as I do, as they unfortunately do get lost from time to time. I also fill out the blue and white sheet in the measurement booklet in the boxes that record sail serial or button number. The blue and white sheet lists all the items that have been measured for the boat being spars, foils, and sails. I encourage measurers to fill out this form as it can be useful for sailors who need to substitute damaged items at events as proof that the replacement item has been measured and approved for use.

Sails and sail numbers Reference photos

1

Tack point & serial number.

2

Head length flaked

3

Luff length flaked

4

Luff length and red band flaked

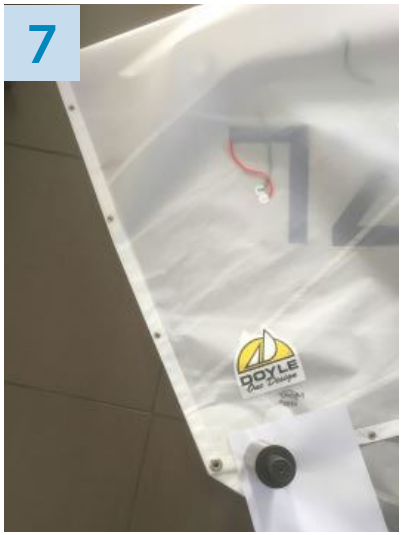
5

Half height width flaked

6

Diagonal flaked

7



Half luff with pencil in the fold

8

Half leech pencil in fold.

9

Peak point and the sprit attachment

04 Spars

How to measure

The three Optimist spars are: Mast, Boom and Sprit. They are all alloy tubes these days. Ideally working on a table is the best way to measure spars. Alternatively, a smooth floor can be used but this becomes hard on the back if you are measuring spars continuously.

You'll need the following items

- 5m class 2 (ii) tape
- Vernier caliper
- 300mm alloy ruler
- Pen / pencil / white and black permanent markers
- Square blocks approximately 50mm high
- 6mm or 8mm rod 0.5m long
- Label maker or access to one
- Spar Check Sheet
- Spar Final Sign-off Form

Download the forms from our website: optimist.org.nz/officials-2/

Paragraph numbers on this section correspond to those on the Spar Check Sheet.

NOTE:

All spars manufactured after 1st Jan 2025 require an Equipment Label.

Once the spars are measured a copy of the Spar Check Sheet and the Spar Final Sign-off Form are given to the sailor and a copy of each retained by the measurer.

MAST

1. Buoyancy

The mast needs to be checked to see that it has buoyant material located inside it. The heel (base of the mast) will have a nylon or acetal plug with a hole of about 10 mm in the centre. A rod can be carefully and gently inserted through this hole until you feel resistance which indicates you have reached the foam or buoyancy material in the bottom section. The top of the mast is open. Insertion of a rod will determine if there is any buoyancy in the upper section. The mast should be checked for any holes or damage that might affect the buoyancy. All the spars need to float; the test is for 30 minutes. Time at events will not always allow for the flotation test, so sailors need to be made aware that they must also check this from time to time.

2. Diameter

(Photo 1)

The diameter of the mast should be the same at all points along the mast (no tapered sections or diameter changes at any point). CR 3.5.2.1 states the mast shall be approximately circular in section. The size is 45mm +/ - 0.5mm. The mast is allowed to have a sleeve fitted at the point where the mast contacts the mast collar in the forward thwart. The quickest and most accurate way to measure the mast diameter is with a Vernier caliper. Measurements are taken in several positions along the mast and at each point the mast is rotated to check for any ovality. If a Vernier is not available a measurement taken across the top of the mast can be done using a metal ruler but this would be a guide only and is not accurate. Ovality would also be difficult to detect with this method. If no Vernier caliper is available, obtaining measurements along the mast requires a table and square blocks *(explain this)* The tolerance on this measurement is 1 mm between minimum and maximum allowable size.

Explain this procedure.

3. Overall Length

(Photo 3)

The overall length of the mast can be checked with the tape. The bottom of the mast has a plastic nylon or acetal / fitting which is shaped / curved to allow for changing mast rake. The overall length can be measured accurately using blocks.

Explain how to accurately do this.

4. 5. Holes, Saddles at Top of Mast

(Photos 4, 5, 6)

The mast must have two holes or two saddles or one hole and one eye at the top section of the mast. The hole positions are checked from the top of the hole edge to the top of the mast with the Vernier or with the 300mm alloy ruler. If saddles are used I would take the measurement to the edge of the half round portion of the saddle.

6. 7. 8. Mast Bands

(Photos 2, 7, 8, 9, 10)

The mast has two coloured bands in the top section that must be square to the axis of the mast at all points around the circumference. *(explain this)* The bands must be of a contrasting colour to that of the mast and be able to be seen on the water from 8 to 10m away. The position of these bands is a critical measurement and ties in with the luff band mentioned in the sail section of this document. The band positions are tabled on the measurement check sheet and must be accurately positioned on the mast. The bands do fade and need to be replaced from time to time. Replacing bands can be tricky and positioning must be accurate. *Demonstrate the use of an alloy angle used to keep the band true to the mast axis.*

The bands must be at least 10 mm wide and the space between the bands 25mm or less. This can be checked with the Vernier or very carefully with the alloy ruler.

9. Pin Stop Position

This measurement is to the centre line of the pin-stop from the top of the mast. Use the tape to measure this.

10. 11. Pin Stop Height and Diameter

Pin stop height and Pin stop diameter are both vernier measurements.

12. Position of the Wind Indicator Fitting

This is not always present. Check the wind indicator, if available, for sharp corners.

NOTE Spars manufactured after 1st of January 2025 must carry an IODA Equipment Label CR 3.5.1.6 CR 3.5.2.14. The IODA Equipment Label should be placed between 150mm and 250mm below Band No1 on the forward side of the mast.

Mast reference photos

1

Mast diameter

2

The band spacing from top of mast

3

Mast overall length

4

The top mast hole

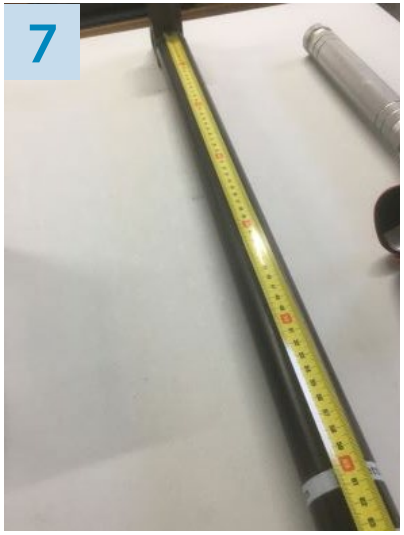
5

The lower mast hole

6

The lower mast hole

7



Tape to band positions on mast

8

Tape to both bands 610 & 635

9

Close up mast bands

10

Mast band widths

BOOM

1. Buoyancy

Like the mast, the boom must float. As the boom has jaws at one end and a fitting at the outer end it will normally be sealed. As long as there are no holes in the boom then it is highly likely to float. A quick inspection will indicate the state of the boom in terms of buoyancy.

2. Diameter

The boom diameter is measured with the Vernier, and like the mast, it must be a uniform tube. The CR 3.5.3.1 states it should be approximately circular. Approximately means the diameter (roundness) should not vary by more than 1mm around the circumference. The Vernier is the quickest and most accurate way of measuring the diameter in several places along the length. The range of diameters is between 29.5mm and 55.5mm.

3. Boom Length excluding Jaws

(Photo 11)

This is a tape measurement. Clip the tape measure over the end of the boom and read the measurement at the jaw end where the boom contacts the jaws' fitting.

4.5. Boom Jaws Thickness / Length

(Photos 12, 13, 14)

Most jaws are made of GR reinforced nylon and the width and length can be accurately measured with a vernier or an aluminium ruler. Any size less than the maximum size stated on the form will be acceptable as long as the jaws look sufficiently robust enough for the forces applied when sailing.

6.7. Measurement Band

(Photo 15)

At the outer end of the boom there is a glass reinforced nylon end cap fitting that has a section that extends above the top level of the boom. The fitting has a hole through the upstanding portion that is used to secure the clew of the sail. The lug is in most cases 10mm thick and the fitting must be a different (contrasting) colour to that of the boom. This fitting doubles as the boom band and must be 10mm thick. The sail cannot be stretched beyond the inside edge of the fitting. A measurement from the forward facing side of this fitting to the position on the jaws that makes contact with the mast, is required. This is number 6 on the measurement sheet. Measure this with the tape.

8. Outhaul Eye

The boom end cap may also be a lacing eye. If a seperate lacing eye is used the forward edge of the hole cannot be more than 40mm from the inner edge of the boom band at the outboard end of the boom. *Explain.*

9. Outhaul Cleat

An outhaul cleat is permitted at a minimum distance of 400mm from the end of the boom. This is a tape or ruler measurement.

10. The Downhaul Bearing Point

The fitting on the top side of the boom is to allow the downhaul rope to pass through. In some cases it may be a round pin that is undercut to capture the downhaul rope. The forward rope bearing edge of either of these fittings must not be more than 200mm from the inner edge of the boom excluding the jaws.

11. Boom Bridle

(Photo 16)

The underside of the boom to the lowest point on the bridle ring must not exceed 100mm. The ring must not be able to move in a fore and aft direction. Multiple rings are permitted CR 3.5.3.8. This is a measurement and safety rule. Measure this with the ruler, vernier or tape.

NOTE Spars manufactured after 1st of January 2025 must carry an IODA Equipment Label CR 3.5.1.6 CR 3.5.3.10. The Equipment Label, as per the class rule, should be placed between 450 mm and 550 mm from the fore end of the boom on the top side when the boom is set at 90 degrees from the mast.

Boom reference photos

11

Boom length excluding jaws

12

Width of the boom jaw

13

Length of the boom jaws

14

Width of the boom jaw

15

Boom band and fitting

16

Span and bridle

Sprit

1. Buoyancy

The sprit usually has a glass reinforced nylon fitting at each end and provided there are no holes in the sprit they will normally float.

2. The Diameter

This can be measured with the Vernier in several places along the length. Photo15

3. Overall Length

(Photos 17, 18)

This is measured with the tape. Square blocks at each end allows this to be done accurately.

4. Widening

(Photo 19)

The widening after the narrowing of the end fitting is easily measured with the Vernier. This has been measured oversize recently by one manufacturer who has since remedied this.

5. The Length of the Fitting

(Photo 18)

These Polymer fittings can be measured with the ruler or the Vernier. Most sprits have a fitting at each end. A hole or hook at one end is permitted but must be within 60mm of the sprit end. If a hole is used the buoyancy of the Sprit could be compromised.

6. The Protective Tubing

The length and thickness can be measured with the Vernier. There is some talk that this might not be required in the future. If it is not in place I consider the sprit is still legal.

NOTE Sprits manufactured after the 1st of January 2025 must carry an IODA equipment label CR 3.5.16. The label should be positioned on the sprit between 1000mm and 1100mm from one end of the sprit. CR 3.5.4.4

If you are measuring spars where the serial numbers are no longer visible, then the spar should be given a unique number and a label printed and fixed to the spar after it meets the measurement criteria. For example my unique numbers are 001 onwards. I have a register of all spars that I have measured and all that have had new numbers issued.

When the measurer is satisfied the spars measure correctly they should be signed and dated with a white or black permanent marker and have NZIODA hand printed to indicate an approved measurer has measured the items. The Spar Final Sign-off Form and the Spar Check Sheet can be given to the sailor and a copy of both retained for the measurer.

Sprit reference photos

Blocks at sprit end

Sprit block and tape at end fitting

Sprit end diameter

05 Foils

How to measure

The two foils are the rudder and the dagger board (also called a centre board). The rudder is quite a complex item to measure. Both items need to be weighed and the daggerboard centre of effort (COE) needs to be checked. I measure these items on a table which I recommend.

Paragraph numbers on this section correspond to those on the Foil Check Sheet.

Check the current class rules for the positions of the manufacturer's logos, the lettering sizes and positions of the serial numbers, and mould numbers on both foils. This has changed recently and both foils now need to have the IODA equipment label in the positions stated in the class rules. This applies to foils manufactured after January 1st 2025.

You'll need the following items

- Small platform (kitchen) scale 5kg x 1 gm and a piece of plastic tube about 200mm long and 100 / 150 mm in diameter
- Vernier caliper
- Tape class 2 ii, 3 metre
- 2 Square blocks 75mm x 75mm x 75mm
- Divider and compass
- Roll of masking tape
- Alloy ruler 300mm
- Permanent marker black
- Pencil and sharpener
- Piece of aluminium angle 50mm x 50mm x 300mm long
- 4 timber or plastic wedges
- 2 Short straight edges about 100mm long
- Protractor
- Square
- 800 mm straight edge
- Thickness caliper
- Foil Check Sheet
- Foil Final Sign-off Form

Download the forms from our website: optimist.org.nz/officials-2/

RUDDER

1. Head

(Photo 20)

Lay the rudder on the table and use timber or plastic wedges to stop it from rocking. Have the tiller extension positioned clear of the rudder head for this first measurement. As the head of the rudder is radiused at each end, use the straight edges to provide extensions that allow an accurate measurement to be taken with the 300mm rule. You may need another pair of hands to hold the straight edges while you take the measurement. This is measurement X on the drawing, Rudder Head top width.

2. Rudder Width

(Photo 21)

Place one square block against the Z edge and the other on the trailing edge to allow measurement of Y. Using the 300mm ruler, measure the distance between the blocks. The blocks are used because the blade has beveled edges and without the blocks it is difficult to get accurate measurements. This is Rudder Blade width Y.

3. Variation in Width

By moving the blocks (in 2 above) along the length of Z and the trailing edge, the variation in the width Y can be measured to not exceed 3mm.

4. Length Z and P

This is where it starts to get a bit tricky. Rudder length P is from the top of the blade X to the apex of the angle Alpha. I have a clear plastic gauge that has the max and minimum angles marked from the apex. A clear protractor may be useful. Mark the apex with a pencil. The Alpha angle apex on the blade tends to be radiused and P and Z both end at the apex. This can have a bearing on the size of both P and Z. If your mark is not dead centre of Alpha, P or Z may end up outside the tolerance which is + 0 / - 2 in both cases. Both these measurements are tape measurements unless you have a longer ruler.

Explanation of alpha apex movement (Photos 22 and 23)

5. Rudder Blade Angle

(Photo 24)

Alpha (angle) can be measured with a protractor.

6. Rudder Blade Forward Corner Angle

(Photo 25)

Check this with a square or protractor. This is the angle at r, bottom of the blade. 40mm radius.

7. Rudder Blade Aft Corner Angle

(Photo 26)

As above in 6 but at corner R 90mm radius.

8. Rudder Blade Forward Corner Radius

The radii on the new rudders are easier to measure as they are unlikely to be worn. I draw lines with a sharp pencil 40mm parallel to Z and Y. This assumes 40mm is the radius. At the intersection of the two lines is the circle centre. Using the compass set to 40 mm you can see if the arc follows the blade. As the tolerance is 40mm + / - 5, 35mm and 45mm lines can be drawn if 40mm does not fit. Other parallel lines may also be drawn within the tolerance.

9. Rudder Blade Aft Corner Radius

As in 8 but change to 90mm + /- 5

10. Beveling

This is often difficult to see. Use a ruler or straight edge and sight to see where the angle finishes. Mark with pencil and measure with a ruler.

11. Thickness

(Photo 27, 28)

I generally measure this with either a gauge I have made or with the callipers. Use the vernier's internal legs to carefully measure the caliper thickness. Alternatively, a thickness gauge can be used.

12. Tiller Bolts

Visual and Vernier check of the diameters.

13. Length of Tiller

(Photo 29)

Length includes any plastic end caps. Use the tape to measure.

14. Length of Tiller Extension

(Photo 30)

Have the tiller extension at right angles to the tiller. Measure from the top of the tiller to the end of the tiller extension. Includes any end caps on the extension. Use the tape to measure.

15. Length of Tiller and Tiller Extension

(Photos 31, 32)

Have the tiller extension parallel to the line of the tiller and extend it to produce a straight length which is measured from the end of the tiller to the end of the tiller extension. Use the tape to measure. As the end of the extension may be curved a square block can be used to measure to.

16. Aluminium Tiller

Tap the tiller and the extension with the alloy ruler. Both should sound metallic when tapped. A dull thud indicates that they may not be aluminium. Carbon fibre is NOT permitted for either the tiller or the extension.

17. Diameter of Pintles

The diameter of the pintles is best done using the vernier.

18. Distance between Upper Pintle and Top of Tiller

Again, this is a Vernier measurement. If this is not correct the bolts attaching the tiller to the blade can be loosened and the tiller moved up or down and re-tightened to correct this measurement. The tiller does tend to move over time. I often need to adjust this.

19. Distance between Upper and Lower Pintle

(Photo 33)

Another Vernier measurement.

20. Retaining Clip Below Upper Bearing Line

The Vernier should work on this measurement; if not a ruler will need to be used. This measurement ensures the rudder will not fall off in a capsize.

21. Assembled Rudder Weight

(Photo 34)

Tape the tiller extension to the tiller. Place the piece of rigid plastic tubing on the scale and reset the scale to zero. The tube is used to support the rudder and to allow the scale recording the weight to be seen. Find the balance point for the rudder on the tube. Record the weight. Ballasting is not permitted for an assembly that is underweight. Make sure the whole assembly is dry when weighed.

22. Assembled Rudder Flotation

Check that the rudder and tiller assembly float.

23. Non-Metallic Bushes

Some rudders have non-metallic bushes around the fixing bolts. If used, these must be a maximum diameter of 20mm.

If the rudder measures in compliance with the check sheet and the class rules, fill out the final sign off form and the check sheet. Give the sailor copies for their measurement book and keep copies on file.

Sign and date the rudder with a permanent marker.

Rudder reference photos

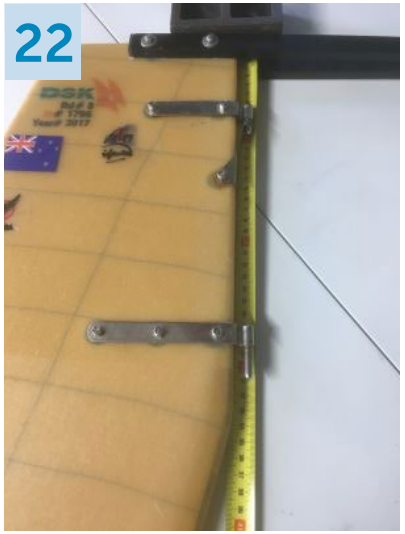
20

Rudder head length X

21

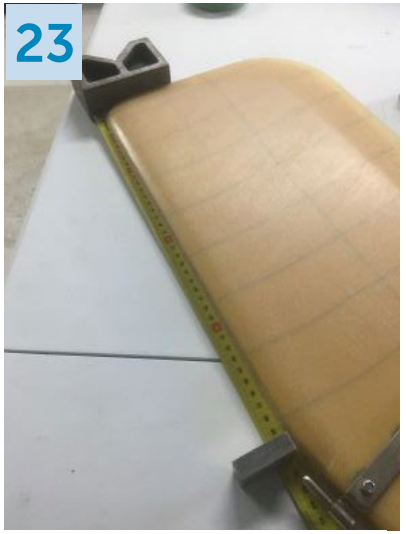
Rudder width Y with blocks.

22



Rudder length P

23

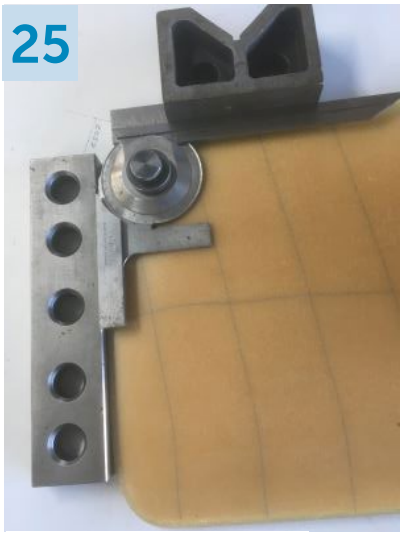


Rudder length Z

24

Rudder length Alpha

25



Rudder corner angle

26

Rudder angle R

27

Rudder thickness

28

Thickness measurement on callipers

29

Length of the tiller

Rudder reference photos

30

Length of the tiller extension

31

Tiller and extension overall length

32

End of the tiller extension with blocks

33

Distance between rudder pintels

34

Weighing rudder

DAGGERBOARD / CENTREBOARD

Fill out the top section of the sheet. The information you need to record will be laminated into the area below the timber stop battens. Check the size of the letters as stated on the top of the form. Check the current class rules for the positions of manufacturer's logos, lettering sizes and positions as these have changed recently. IODA Equipment labels are required on Daggerboards beside the ID number on the starboard side for boards manufactured after 1st January 2025.

1. Length

Lay the Daggerboard on the table and level the board with wedges. The overall length is measured with a tape from the top edge of the timber stop battens to a square block held against the bottom of the board. The wedges allow for the thickness of the stop battens and keeps the tape reasonably parallel to the board.

2. Width

Using the two square blocks measure the width of the board. This is the same set up as width Y on the rudder.

3. Width and Length Variation

Move the blocks along the length of the board to establish any variations in the width.

4. Position of Centre of Gravity

(Photo 37)

The center of effort or the balance point must be no less than 520mm from the end of the board. Draw a line 520mm from the end of the board and position the aluminium angle iron apex at the 520mm point. The board should be top heavy falling at the stop batten end. Keep moving the angle alloy toward the stop battens until the board balances. Mark the balance point and measure from the bottom edge of the board to the balance point and record on the form.

5. Thickness

The thickness of the board is difficult to measure due to the beveling. If the vernier can span the beveling the thickness can be measured in several places. Failing this, use the calipers to record the thickness. Carefully slide the caliper off the board and measure the internal space between the legs with the vernier. Do not over clamp the caliper; it must slide off the board. Use the same process as was used in measuring rudder thickness.

6. Beveling

This is often difficult to see. Use a ruler or straight edge and sight to see where the angle finishes. Mark this with a pencil and measure with a ruler.

7. Radius of Lower Corners

Draw lines 32mm parallel to the edges and bottom of the board with a sharp pencil. This assumes 32mm is the radius. At the intersection of the two lines is the circle centre. Using the compass set to 32 mm it can be seen if the arc follows the blade. As this is a maximum only size it will quickly be seen if the radius is smaller. The actual size can be measured using the same parallel line method used on the rudder.

8. Depth of Stop Battens

This is a Vernier or tape measurement. Measure in several places and average.

9. Exposed Edges of Battens and the Maximum Allowable Radius

(Photo 38)

I have a gauge for this. Look for evidence to see if the edges have been filed away to lighten the board.

10. Battens

Visual check

11. Radius of Upper Corners

Another area where the gauge in 9 (above) can be used.

12. Thickness including Battens

Another vernier measurement

13. Hole in Centreboard

Another vernier measurement

14. Fixing of Battens

Visual check and vernier to check diameters.

15. Length of Fasteners

Visual and depth measurement with vernier.

16. Ballasting or cut outs of the Battens are Prohibited

Visual check. Battens need to be uniform throughout the width and thickness.

17. Weight

Weigh the dry Daggerboard on the platform scale balancing it on the plastic tube. Same process as used for the Rudder.

18. Flotation

Check that the Daggerboard floats.

If the Daggeboard measures in compliance with the check sheet and the class rules, fill out the final sign-off form then give the sailor a copy for their measurement book and keep a copy on file.

General

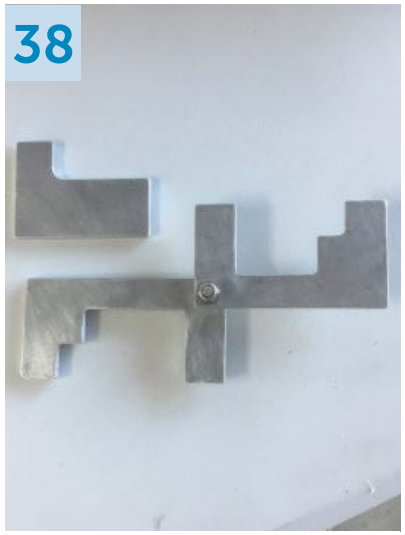
Do not assume that a new set of foils will measure. I have found new unused foils that did not measure. Although this was easily rectified, it was only as a result of measuring that the error was identified. New rudders also need to be measured on the hull CR 3.4.5.3. Explain this.

Daggerboard reference photos

37

Center of gravity of daggerboard

38



Gauge to measure radii daggerboard

Credits

Content: Bob Witham, NZIODA Chief Measurer
TEL 021 484950, EMAIL bobwitham49@gmail.com

Project Management: Veronica Aris, NZIODA
Design: Viivi Ronkko, Subzero Group

optimist.org.nz

October 2024