



RYA YTC, powered by the RORC RATING OFFICE

2024 POLICY AND PROCEDURES

Valid from 1 January 2024

YTC.RORCRATING.COM

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The YTC Committee thanks Professor Linda Wolstenholme (Cass Business School and Emsworth Slipper SC) for her kind permission to use her original handicap models and further developed by the RORC Rating Office using Machine Learning models.

Version 1 March 2024

1. INTRODUCTION

- 1.1. The RYA YTC, powered by the RORC Rating Office (abbreviated to YTC) has been developed over recent years to assist the wide variety of monohull yacht-types that take part in local and club-based events to race competitively and fairly. It is originally based on the statistical models developed by Professor Linda Wolstenholme, of the Cass Business School and Emsworth Slipper SC and has subsequently been updated by the RORC Rating Office using Machine Learning tools. The system is jointly owned by the RYA, YTC Main Committee and RORC Rating Office. The system is administered by the RORC Rating Office with the kind assistance of the YTC Main Committee.
- 1.2. The aim of this document is to set out the process by which a boat's YTC number is developed. The ethos throughout is to develop the number in a fair, open and transparent manner, if necessary, bringing the yacht's skipper into the discussion where appropriate. It is intended that the YTC process will assist the achievement of fair racing as required by the Racing Rules of Sailing.
- 1.3. Boats competing in racing will be allocated a YTC number using the process shown in Section 3 below.
- 1.4. A boat's YTC number may be used by individual clubs at their discretion: for club racing only, the YTC system allows a club's handicapping team to adjust a boat's YTC number as it sees fit.

2. APPLICATION PROCESS

- 2.1. Boats wishing to apply for a YTC number are to complete and submit a web-based YTC Application Form. This is obtained by following the process set out at ytc.rorcrating.com.
- 2.2. The first step is to request a code to access the application form (see the example screenshots at Appendix B). The user is informed of the code by email and this should take a few moments only. The code is then entered (see the example screenshots at Appendix C) and the application form is completed (see the screenshots at Appendix D). If the system already has data about the boat on the YTC system, a recall code will be emailed to the user that when applied will automatically upload those data and populate the form with minimal input from the user, but the user will be able to edit those data if necessary and be asked to confirm that the data is correct.
- 2.3. A new form should be submitted if there is a change to a boat's data during the season.
- 2.4. The RORC Rating Office or YTC Main Committee will use the data supplied as a basis for calculating a YTC number but reserves the right to overrule specific data or to standardise dimensions, e.g. for a one-design class.
- 2.5. The boat weight and other hull data will be based on the RORC Rating Office standard hull data. If that is not available, then boat brochure data or other available data will be used.
- 2.6. It is a breach of the rules for any owner to intentionally supply false information.
- 2.7. The RORC Rating Office and/or YTC Main Committee at their sole discretion may refuse to issue or re-issue a YTC certificate.
- 2.8. Boats with the following features shall not be issued a YTC certificate:
 - Hull Length Overall, LH > 15m
 - Foils and other lifting appendages
 - Water ballast or canting keel (moveable or variable ballast)
 - Non-ballasted sailing dinghy (generally < 5m in length)

3. YTC CERTIFICATE

- 3.1. **A boat while racing using YTC shall comply with the rules of the event and shall comply with their YTC certificate in accordance with Racing Rules of Sailing RRS 78.**
- 3.2. Boat-owners will receive a YTC certificate by email showing the boat's allocated YTC number and the data on which that YTC number is based (see the example at Appendix F); this is generated by the YTC software under the control of the YTC administrators.
- 3.3. If a boat's sails are measured by a sail measurer during that process, a YTC sail measurement certificate will be issued: see the example at Appendix G. Sails may be measured using the in-house certification system, RYA sail measurer or other measurer approved by the RORC Rating Office or YTC Main Committee.

- 3.4. A boat shall only hold one valid YTC certificate and Issue of a new YTC certificate automatically invalidates the old one.
- 3.5. The RORC Rating Office, YTC Main Committee or RYA at their sole discretion may withdraw a YTC certificate where there is reasonable evidence that a boat does not conform to its certificate, an error in determining the rating or any other reason involving breach of the rules, good manners or sportsmanship.
- 3.6. The RORC Rating Office or YTC Main Committee may require a boat to be submitted for measurement at any time without giving reason.
- 3.7.

4. PROCESS FOR DEVELOPING A YTC NUMBER

- 4.1. In general, a boat's basic YTC number will be calculated automatically by the YTC software using the boat measurement data in section 5 below and the formulae in section 6 below.
- 4.2. The YTC number will then be adjusted to reflect the yacht's engine and propeller configuration, rig and downwind sail area using the tables in section 7 below.
- 4.3. Some boats (e.g. light displacement boats, gaff-rigged boats and others) will be allocated a YTC number using the formulae and other pertinent data as necessary at the sole discretion of the RORC Rating Office or YTC Main Committee
- 4.4. The calculated number shall be the boat's YTC number for events and inter-club racing, and the basic number for club events. A boat's YTC number may be used at other events, at the discretion of the relevant organising authority.
- 4.5. Failure to complete the YTC Form before racing may result in a temporary YTC number being issued until the necessary boat data has been obtained and checked and the necessary calculations have been completed. Late entries may also be allocated a temporary YTC number, until the necessary calculations can be completed.
- 4.6. When issued, a temporary YTC number shall not be altered; also, any results using this number shall not be altered retrospectively.
- 4.7. YTC numbers are calculated in good faith from the data available. Neither the RORC Rating Office, YTC Main Committee or RYA shall have any liability whatsoever for any error in the application of the policies or the determination of any YTC number or changes in the policy or rules.
- 4.8. Queries concerning individual YTC numbers shall be made in writing to the RORC Rating Office at ytic@rorcrating.com.

5. YTC DATA

- 5.1. YTC uses boat measurements and data to calculate a YTC number. The required measurement data and units are as follows:

| Data | Description |
|------|---|
| LH | Hull length overall (metres) |
| LWL | Waterline length (metres) |
| D | Boat weight (displacement), empty/dry (kilograms) |
| d | Draft (metres) |
| SA | Total upwind sail area (metres ²) Sum of mainsail and headsail (genoa or jib) area |
| DSA | Total downwind sail area (metres ²) Sum of mainsail and spinnaker area |

- 5.2. Boat data are the maximum value except for boat weight which is the minimum value.
- 5.3. In addition, the propeller type and keel configuration are required, see Section 6 and 7.
- 5.4. To calculate mainsail, headsail and spinnaker areas from linear sail measurements see Appendix A.

6. YTC FORMULAE

6.1. Yachts will be issued a YTC number which will be based on the formulae in the table below:

| | |
|-----------------------------------|--|
| YTC Formula Fin-keeled boats | $YTC = k_f \left(2123 - 386d + 82.8d^2 - 30.4L - 49 \frac{D}{100L^3} - 1005 \frac{SA^{1/3}}{D^{1/4}} \right)$ |
| YTC Formula Bilge-keeled boats | $YTC = k_f \left(1817 - 290d + 62.2d^2 - 22.8L - 37 \frac{D}{100L^3} - 755 \frac{SA^{1/3}}{D^{1/4}} \right)$ |
| Notes | flat single keels, $k_f = 1.00$ long keels $k_f = 0.98$ for non-flat keels (bulbs, winged, etc.), $k_f = 1 - 0.003 * k_g$ k_g ranges from 1 for a slight flare or bulb to 5 for a winged keel. twin bilge keels, $k_f = 1.00$ triple bilge keels, $k_f = 1.01$ $L = LH - 0.5 * (LH - LWL)$ |

6.2. To calculate a YTC corrected time the formula is as follows:

$$\text{Corrected Time} = \text{Elapsed Time} * 1000 / YTC$$

7. YTC RIG AND ENGINE RELATED ADJUSTMENTS

7.1. The formulae in paragraph 6.1 above assume a boat has a two-blade fixed propeller and a spinnaker.

7.2. Calculated basic YTC numbers will be adjusted to reflect declared engine, propeller and sail configurations, using the tables below:

| Engine related | Percentage allowance |
|---|--|
| 2-blade fixed propeller | 0% (this configuration is assumed in the formulae) |
| 3-blade fixed propeller | +2% |
| Folding propeller | -1% |
| Outboard (able to be lifted clear of water) | -2% |

| Rig related | Percentage allowance |
|---|--|
| Use of conventional or asymmetric spinnaker | 0% (this configuration is assumed in the formulae) |
| No use of spinnaker or other downwind sail | +2.5% |
| In mast reefing | +2% |
| Twin mast ketch | +3% |
| Spinnaker Area Allowance (to account for variation in spinnaker area) | The formula $1.75 - (DSA/SA)$ generates the percentage required. |

The YTC configuration code guide can be seen in Appendix B.

8. COLLECTION OF RACE TIMINGS DATA

8.1. An important part of the YTC quality control process lies in verifying that under normal race conditions, boats perform approximately to their YTC number. This is achieved by comparing their calculated performance number in a race or series of races, with their YTC number. This performance number can be calculated using the YR2 process, from the elapsed times recorded for each boat on a race spotting or recording sheet.

8.2. A specimen proforma for recording these data in a fleet race is at Appendix D. A specimen proforma for a pursuit race is at Appendix E. These forms are normally completed by the race committee team. Clubs in the YTC scheme should compile a file of these recording sheets as the season progresses; these data files will then inform the end-of-season performance review process.

Note. Quite clearly, normal club spotting or recording sheets, or Sailwave print-outs, could be adapted for this task. However, in order to achieve proper analysis of the results, all the data fields shown on the templates should be on such an adapted form and should be completed for each race and the boats sailing in that race.

APPENDIX A – SAIL AREA CALCULATIONS

$$\text{Mainsail Area} = (P/8) * (2.04 * E + 3 * \text{MHW} + 1.5 * \text{MTW} + \text{MUW})$$

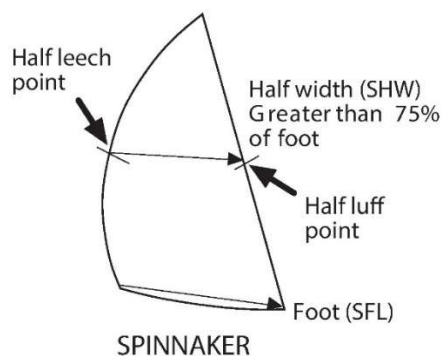
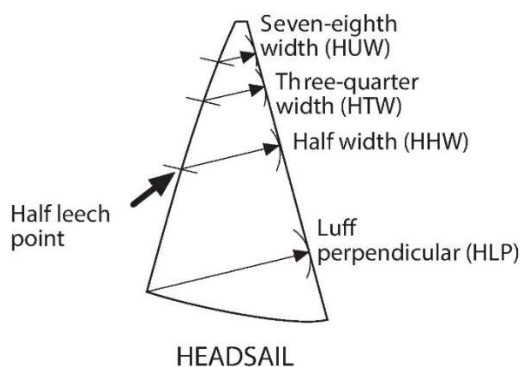
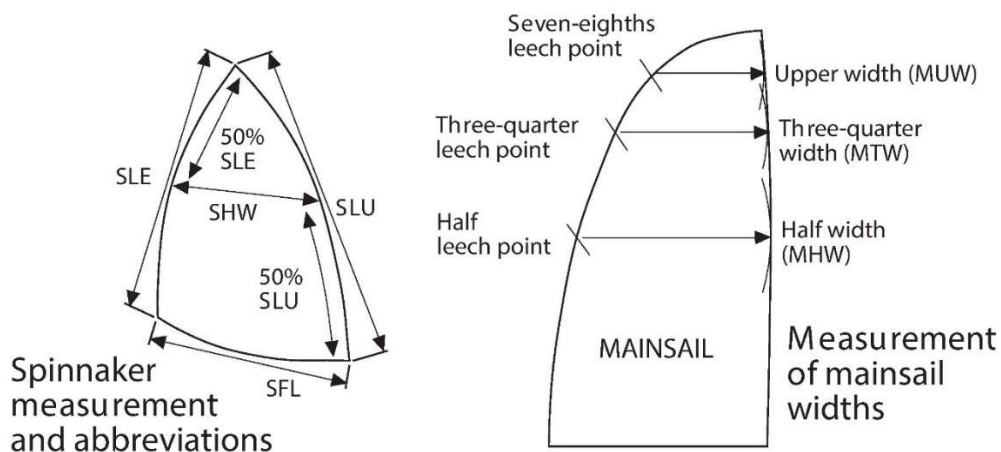
Where P is the **Mainsail Luff Mast Distance** – See Equipment Rules of Sailing F.2.3(d)

E is the **Boom Outer Point Distance** – See Equipment Rules of Sailing F.3.3(a)

$$\text{Headsail Area} = 0.0625 * \text{HLU} * (4 * \text{HLP} + 6 * \text{HHW} + 3 * \text{HTW} + 2 * \text{HUW} + 0.09)$$

Where HLU is the Headsail Luff Length

$$\text{Spinnaker Area} = ((\text{SLU} + \text{SLE})/2) * ((\text{SFL} + (4 * \text{SHW}))/5) * 0.83$$



APPENDIX B – YTC CONFIGURATION CODES

The YTC configuration is generated from configurations of the spinnaker, keel and engine and is generated from the following codes:

| SPINNAKER | |
|-------------|-----------------------------------|
| 0 | No Spinnaker |
| S | Symmetric Spinnaker |
| A | Asymmetric Spinnaker |
| C | Cruising Chute |
| KEEL | |
| F | Fin Keel |
| D | Drop/Lifting Keel |
| 2K | Twin Bilge Keel |
| 3K | Triple, Central and Bilge Keel |
| ENGINE/PROP | |
| OB | Outboard |
| IBF | Inboard – Folding/Feathering |
| IB2 | Inboard – Fixed 2-blade Propeller |
| IB3 | Inboard – Fixed 3-blade Propeller |
| NOENG | No Engine |

For example, a boat with the following configuration:

Symmetric Spinnaker = S

Fin Keel = F

Inboard – Fixed 2-blade Propeller = IB2

Would have the configuration code: SFIB2

APPENDIX C - AN EXAMPLE RYA YTC CERTIFICATE



RYA YTC CERTIFICATE 2024

Boat Name: Test Production

Sail Number: GBR1234

YTC Rating: 873

Non Spinnaker YTC Rating: 899 (White Sail)

Valid From: 01/03/2024 10:12

Valid To: 31 Dec 2024

Application ID: 33

Boat Design: X 37 SPORT 2.32

Configuration: SFIB2

| Hull, Keel and Engine Data | |
|----------------------------|---------------|
| Hull Length | 11.35 m |
| Waterline Length | 9.76 m |
| Maximum Beam | 3.48 m |
| Draft | 2.32 m |
| Boat Weight | 6,075 kg |
| Keel Type | Bulb/Flare |
| Engine Type | Inboard |
| Propeller Type | Fixed 2 Blade |

| Rig and Sail Data | |
|------------------------|----------------------|
| Ketch/Yawl | No |
| In Mast Reefing | No |
| Headsail Sail Area | 12.00 m ² |
| Mainsail Sail Area | 55.00 m ² |
| Other Upwind Sail Area | 0.00 m ² |
| Spinnaker Type | Symmetric |
| Spinnaker Sail Area | 90.00 m ² |

To get a link to revalidate or amend an existing certificate please go here:

[RYA YTC Existing Boat Link Request Form.](#)

If you have questions about your certificate, please first visit the frequently asked questions (FAQs) on the website ytc.rorcrating.com. For other enquiries, please contact the [RORC Rating Office](#)



You are on your way to apply for an IRC Certificate and the RORC Rating Office are ready to help. To apply for an IRC Certificate please go to the [MyIRC Application Portal](#). More information can be seen at the [IRC Information for Owners page](#).

