

# Rules of the Atlantic Class Association

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<b>Drawings:</b>	Atlantic Class Sail Plan (4/19/1993)
	Atlantic Class Mast (12/4/2002)
	Atlantic Class Boom (4/19/1993)
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	Atlantic Class Rudder (R-A)
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	Atlantic Class Jib Measurement Template (Feb., 1985)
	Atlantic Class Spinnaker

**Revisions:**    **6/20/2005**    **Major revision, all pages**  
                  **6/1/2009**        **Add rule 16.2.1**

# ATLANTIC CLASS ASSOCIATION RULES

## 1 PURPOSE

1.1 The Atlantic Class Association serves to promote Atlantic Class racing under its own rules, and the rules issued by the International Yacht Racing Union as adopted by the United States Sailing Association. The purpose of the Atlantic Class Association is to maintain the one-design character of the class, and to further amateur competition.

## 2 RACING RULES

2.1 Except as modified below, The Racing Rules of Sailing with prescriptions of U.S. Sailing shall apply.

2.2 The rules of the Atlantic Class Association cannot cover all aspects of safety. It is the responsibility of each Atlantic owner and/or skipper to make certain that his or her yacht complies with federal and state safety regulations, and to ensure proper maintenance and seamanship as appropriate to the prevailing conditions.

## 3 AMENDMENTS

3.1 These rules may be amended by a majority vote of the active members, but no amendment shall be considered unless it first has been submitted to the Rules Committee and presented to the Association by the Rules Committee with its recommendation 30 days prior to a meeting of the Association. The recommendation of the Rules Committee may include discussion of the pros and cons relating to the issue.

3.2 The Rules Committee, when the Association is not in session, may submit an amendment to the membership and take a vote thereon by mail, but no such amendment shall be effective until votes have been received from at least two-thirds of the active membership.

3.3 Before an amendment may be presented to the membership for approval, it must be offered for discussion at a regular meeting of the Rules Committee, and passed by a majority of Committee members present at a subsequent meeting, having been published in final form with notice of such meeting.

## 4 QUESTIONS REGARDING RULES

4.1 To qualify for racing, an Atlantic and its equipment and crew shall in no way deviate from these rules. In cases of presumed ambiguity in the rules, or innovations which may be deemed desirable but are not clearly permitted under the rules, no action may be taken to alter a boat or its equipment until application is made to and a favorable ruling is received in writing from the Rules Committee whose decision shall be final.

## 5 MEMBERSHIP

5.1 Active membership in the Association shall be restricted to owners of, or those who charter, Atlantic Class sloops. Subject to approval by the Rules Committee, membership may be obtained by notifying the secretary of the ownership or chartering of a boat and by paying the annual dues. Only active members are entitled to vote on class affairs.

5.2 Associate membership is available to members of the immediate family or crew of an active member or other non owners interested in the Atlantic Class and may be obtained by application to the secretary and the payment of annual dues. Associate members are not entitled to vote at meetings of the Association.

5.3 Honorary members may be proposed from time to time by the Rules Committee. These memberships shall be restricted to former active members who have retired from racing and who by their long standing support and active interest and participation in Association affairs have made a substantial contribution to the success and development of the Atlantic Class. The Rules Committee shall nominate such candidates, and their names shall be placed before the membership for election at the annual meeting. An honorary member shall enjoy the privileges of an active member except that he shall be exempt from dues and shall not be entitled to vote or hold office.

5.4 Sustaining members shall consist of those former active members who have retired from racing but have a continuing interest in its affairs. A sustaining member shall not be entitled to vote at meetings of the Association. Sustaining memberships may be obtained by application to the secretary and the payment of annual dues.

5.5 Association dues shall be determined annually by the Rules Committee.

## 6 ANNUAL MEETING

6.1 The annual meeting of the Association shall be held at the call of the Rules Committee upon 30 days written notice to all members of the Association by mail directed to their last address appearing on the records of the Association. Additional special meetings may be called upon 30 days written notice to all members of the Association.

6.2 Voting on questions coming before the Association shall be restricted to active members in good standing and may be in person or by proxy. Each boat is entitled to one vote, whether or not she is owned by more than one active member.

## 7 ORGANIZATION

7.1 The affairs of the Association shall be managed by the Rules Committee consisting of the officers and not more than ten other active, associate or sustaining members elected at the annual meeting who shall serve for one year or until their successors are elected. The Rules Committee also shall perform the duties of an executive committee when the Association is not in session.

7.1.1 Associate and sustaining members elected to office may not vote on Class affairs other than matters under consideration by the Rules Committee

7.2 The officers of the Association shall be a chairman, a secretary, a treasurer, and a chairman of the Rules Committee. They shall be elected at the annual meeting to serve for one year and shall exercise the usual functions of their offices.

7.3 The chairman, the secretary and the treasurer shall be ex-officio members of all standing and special committees.

7.4 The treasurer is authorized to open and maintain an account in a bank of deposit, to endorse checks for deposit therein, and to draw checks thereon.

7.5 A three person nominating committee including at least one of the three immediate past class chairmen shall recommend a slate of candidates to serve as officers and Rules Committee members to the membership for election at the annual meeting.

7.5.1 If none of the eligible past Chairmen are available to serve, the officers shall appoint Active or Sustaining members to bring the Nominating committee up to three people.

7.6 Vacancies caused by the resignation of a member of the Rules Committee between annual meetings may be filled by majority vote of the Rules Committee.

7.7 An official class measurer may be appointed annually by, and shall report to, the Rules Committee on the conformance with the class rules specifying hull and equipment of Atlantic Class yachts owned and raced by members of the Association.

## 8 CLASS

8.1 The Class shall consist of the Atlantic Class One Design sloops, designed by Starling Burgess and built by Abeking and Rasmussen of wood construction, or replacement hulls of fiberglass built by an approved builder with sail numbers one through one hundred (100) inclusive, and fiberglass yachts numbered over one hundred (100) as produced from molds authorized by the Atlantic Class Association and built by an approved builder.

8.2 All molded fiberglass replacement parts shall be made from molds authorized by the Class.

## 9 HULLS

9.1 No changes whatsoever may be made in the hull, mast step, keel, deadwood and rudder except upon application to and receipt of written permission from the Rules Committee. Frames, stringers, floors, and vertical struts, in place of original watertight bulkheads, may be added for the purpose of strengthening wooden boats. Through-hull fittings are prohibited except as originally supplied on the Seafarer cuddy model, except one may be installed no more than one foot forward of the transom, of a maximum nominal inside diameter of 1-1/2", to accommodate overboard discharge of a permanently installed bilge pump. Installation of such a pump must include hose, through-hull, and through-bulkhead fittings of such quality as to prevent impairment of the integrity of the aft flotation tank. Provisions of Rule 16, EQUIPMENT are in no way altered by this rule.

9.2 A print of the Atlantic deck plan and an elevation view is included herein and all measurements shown thereon must be strictly adhered to. In the event of conflict, the specifications take precedence over any drawings.

9.3 Wooden rudders must conform to drawing R-A and fiberglass rudders to drawing R-B included herein.

9.4 Watertight doors fitted with gaskets to flotation chambers on all fiberglass boats so equipped shall be closed and secured while racing to preserve the watertight integrity of the hull.

9.5 Special bottom treatments that utilize long-chain polymer constituents are specifically prohibited. Rule 53 of the Racing Rules of Sailing, SKIN FRICTION, shall apply in determining whether or not a particular kind of bottom treatment is permitted.

## 10 WEIGHTS

10.1 Provisions of this section shall apply to fiberglass yachts and aluminum spars. Yachts and spars built of wood in accordance with rules in effect at the time of construction continue to be authorized, but new and replacement parts built hereafter shall be built in accordance with the provisions of this section.

10.2 Hull: The bare hull--which is here defined as including the deck, bulkheads, and tanks, but without deadwood and ballast keel, and prior to installation of coaming, toe rails, floor boards, deck hardware and all other fixtures--shall weigh no less than 1,150 nor more than 1,300 pounds. An aggregate amount of lead ballast equal to the difference between 1,785 pounds and the recorded bare hull weight shall be carried in the bilge. Bare hulls weighing less than 1,150 pounds shall be increased by adding weight in the fore and aft tanks.

10.3 Deadwood: The deadwood, prior to attachment of lead ballast keel, shall weigh not less than 350 nor more than 360 pounds.

10.3.1 Keel and deadwood shall conform to parameters listed in Appendix A of these rules.

10.4 Ballast Keel: The lead ballast keel shall conform to the drawing included with these rules, shall be cast from a mold authorized by the class, and shall weigh not less than 2,178 nor more than 2,222 pounds.

10.5 Rudder: The rudder prior to attachment of rudder port and fixtures shall weigh not less than 53 nor more than 57 pounds.

10.6 Authorized builders shall file with the class secretary certificates of weights of bare hull, deadwood, ballast keel, and rudder, all as defined above. Authorized builders of spars shall file with the class secretary a certificate of conformance with class rules for each Atlantic mast and main boom built, and such certificate shall specify weight and location of center of gravity of masts.

10.7 Weight Distribution: Unusual equipment which alters the trim or stability of the yacht is prohibited. Hiking aids other than authorized equipment in its normal position are prohibited. Lead ballast must be restrained in its permanent location in the bilge so as to prevent accidental shifting.

## 11 DECK

11.1 The deck shall remain bonded to the hull as manufactured and shall be maintained so as to prevent leaks through the joint or seam. The deck shall not be altered or cut in any way other than for affixing hardware such as cleats, winches, blocks, and compasses. Through deck jib downhaul and backstay rigs are permitted, provided watertight integrity of the fore and aft tanks is maintained. Fittings mounted over flotation tanks shall be properly bedded so as to preserve watertight integrity.

11.2 The following fittings shall be maintained as specified by the class and originally installed by an approved builder. Rules Committee approval is required for equivalent fittings to be installed.

11.2.1 Bow chock

11.2.2 Head stay/jib tack fitting, chainplates and back stay fitting. Shroud chain plates and headstay fitting shall have 3/8" pin holes in boats built after 11/1/2004.

11.2.3 Eight inch bow cleat of bronze, stainless steel, or marine alloy, properly secured by bolting through backup blocking.

11.2.4 Mast collar. If the original mast collar has been removed, stainless steel flat stock shall be permanently attached to the deck to prevent movement of the mast forward of a point 8'8" aft of the intersection of the jib stay and deck.

11.2.5 Toe rails of wood or aluminum with a minimum height of 5/8" from stem to stern on the deck, no more than 1/4" inboard of the topsides.

11.2.6 Coaming

11.2.7 Six inch stern cleat of bronze, stainless steel, or marine alloy, properly secured by bolting through backup blocking.

11.2.8 Stern chock, properly secured and offset from the backstay fitting and incorporating a feature to prevent a stern line from escaping from the chock during towing.

## 12 SPARS

12.1 The mast and main boom may be of wood or aluminum alloy, but must be constructed by a builder approved by the class in strict accordance with the Atlantic Class spar plans included herein. Internal spinnaker halyards or internal topping lifts are not permitted. Permanently bent or rotating masts are not permitted. Masts shall not be adjusted at the partners during a race.

12.2 Masts shall be fitted with spreaders in accordance with Atlantic Class spar plans. The angle between spreaders in fixed or swinging sockets must not exceed 150 degrees. To check compliance, a straight edge shall be placed across the aft side of the assembled spreaders and the distance from inside the straight edge to the after side of the mast shall not be less than six inches.

12.3 The mast with permanently fixed fittings, including tangs, sheaves, track, tenon, and masthead and spinnaker halyard cranes, shall weigh  $93 \pm 2$  pounds, and its center of gravity shall be not less than 19'2" above the top of the tenon plate.

12.4 All masts shall be marked with a black band, the upper edge of which shall be 4'5" from the top of the mast tenon plate. No part of the mainsail or its tack may be brought below the upper edge of this black band.

12.5 Mast tenon shall be 5" long by 1 3/8" wide by 1 1/8" deep, mounted on a tenon plate, which is not to exceed 3/8" thick. Mast step slot shall not exceed 5-1/4" in length, and 1 3/8" in width..

12.6 The distance along the boom from the after side of the mast to the center of the clew pin shall not exceed 15'9". If the boom length permits this distance to exceed 15'9", a permanent stop must be installed to limit the travel of the outhaul slide.

12.7 Main booms shall not be fitted with any form of mechanical bending apparatus. The boom vang shall consist of a block and tackle installed between the stock boom bale mounted 5'5" ± ½" from the after side of the mast and the mast vang bracket.

12.7.1 The main boom may be connected by a slide to a track on the mast, and the slide may be permanently fixed in a position to comply with Rule 12.4.

12.7.2 In lieu of the slide and track arrangement, the main boom may be connected to a permanent bracket on the mast which in combination with the necessary universal joint will bring the tack pin into a position to comply with Rule 12.4 and in line with the luff slot in the mast.

12.8 The spinnaker pole may be single or double ended, shall not be less than 9'6" or more than 10' long overall, and when in use must be carried on the mast, except when gybing. The pole shall be made of un-tapered aluminum tubing, outside diameter minimum two inches. Older design wooden poles are permitted.

### 13 RIGGING

13.1 No standing rigging shall be secured below deck. Standing rigging shall be 1 x 19 stainless steel wire rope, the ends of which shall be swaged or fitted with patent fittings.

13.2 Minimum sizes:

Jib stay and shrouds: 3/16" wire to 3/8" bronze or 5/16" stainless steel alloy turnbuckle

Backstay: 1/8" wire to 1/4" turnbuckle or comparable adjuster

13.3 Standing rigging, with the exception of the backstay, shall not be adjusted or altered during a race. A backstay adjuster, at least as strong as the backstay, may be substituted for the backstay turnbuckle, in which case a limiting safety strap must be installed between the chain plate and the backstay, above the adjuster.

13.4 The backstay shall be rigged so that it leads in a straight line from a point not more than 5-3/4" horizontally aft of a point three inches directly above the center of the masthead sheave, to the centerline chain plate mounted on the exterior of the transom.

13.5 Halyard hooks may not be located more than six feet above the deck.

13.6 Running rigging shall be optional except where specifically restricted.

13.7 Only one main sheet control is allowed which may be adjustable at both ends. Main sheet control must incorporate an aft boom bale as shown on the current boom plan, together with at least one 2-1/4" minimum sheave diameter block hung from the bale. Additionally, the deck or traveler mounted block(s) shall have a minimum sheave diameter of 2-1/4". The main sheet must be led through these two blocks.

## 14 HAULING OUT

14.1 All competing boats must be wet-berthed. Haul outs during the season are permitted for bottom maintenance and repairs. Only one haul out per week is permitted. A boat that has been out of the water for more than 24 hours must remain in the water for more than 72 hours before competing in a club race or in the championship series. Haul outs during the championship series are not allowed.

14.2 A member of the Rules Committee may waive any of the above haul out restrictions, except that waivers for the championship series shall require approval by a majority of the Rules Committee members present.

## 15 SAILS

15.1 The insignia of the Atlantic Class shall be the capital letter "A" as defined on the sail plan.

15.2 An official sail number shall be allocated to new boats upon application to the Rules Committee.

15.3 Sails shall consist of mainsail, jib, and spinnaker, and shall conform to the following specifications and the drawings which are included herewith. (Letter designations are as defined by the United States Sailing Association.) The term "sail" shall be taken to include headboard, tabling, bolt, and foot ropes (or tapes). It shall not include cringles which are wholly outside the sail.

15.4 Number of sails: Only one mainsail, jib, and spinnaker may be tested and/or added to a boat's inventory in any one calendar year. The intention of this rule is to prohibit multiple experimentation of sails. In case of accident, the Rules Committee may waive this rule. Buyers of new and used Atlantics may apply to the Rules committee for exception to this rule during the first calendar year of ownership. Any number of extra sails may be carried when racing.

15.5 A member of the Rules Committee must measure each new sail before it may be used. Marking on the sail in indelible ink the initials of the measurer, the boat number, and the date shall indicate approval. A sail which has been re-cut to change its measurement dimensions must be re-measured.

15.6 Sails shall be single ply only, except as provided for in corner reinforcement rules. Small local reinforcements in heavily loaded areas of a sail (for example, seam end patches, batten pocket reinforcements, spreader chafing patches, etc.) are permitted.

15.7 Material, Mainsails and jibs shall be of Dacron, not lighter than 6.5 ounce per yard.

15.8 Mainsail: P-35', B-15'9"

15.8.1 Four battens only, evenly spaced, are permitted, their width not to exceed two inches, their length not to exceed 32" for upper and lower battens and 38" for the middle battens. Loose footed mainsails are prohibited. The foot must be attached to the boom by a bolt rope that extends to within 1' of the clew and tack, run in the slot provided in the boom.

15.8.2 The mainsail shall be fitted with no less than 16 or more than 18 slides evenly spaced along the luff and permanently attached to the sail. No mechanical device shall be used to adjust the size, tension, or shape of a mainsail other than leech line, downhaul, outhaul, main sheet, halyard, vang, cunningham, and backstay. The cunningham hole shall be positioned on the mainsail immediately adjacent to the luff not more than one foot from the tack cringle.

15.8.3 Girth or cross width measurements shall be taken at the  $\frac{1}{2}$  and  $\frac{3}{4}$  height points on the mainsail after laying out the sail on a flat surface and pulling out all wrinkles by hand. When measuring, the sail shall be pulled flat along the line of measurement. The  $\frac{1}{2}$  height (midpoints) of the luff and leech are defined as the points created by folding the top of the headboard down to the tack and clew respectively. The  $\frac{3}{4}$  height points are defined as the points created by folding the top of the headboard down to the  $\frac{1}{2}$  height points. The maximum widths between the leech and luff including the bolt rope shall not exceed -  $\frac{1}{2}$  height 9' 9",  $\frac{3}{4}$  height 5' 7". In addition a head cross measurement shall be the distance from a point on the leech 3-feet below the top of the headboard to the leading edge of the sail including the boltrope. The cross width dimension shall not exceed 2' 1" when measured to the closest point on the luff of the sail. The leech shall have a fair curve. The top of the headboard shall be defined as the point on the luff boltrope, or its extension, from which a perpendicular can be drawn to the highest point on the headboard. The rule does not apply until September 1, 1997 to any sail made, measured, and approved by a member of the Rules Committee before September 1, 1995

## 15.9 Jib

15.9.1 Three battens only are permitted located so as to divide the leech into equal parts. The length of the top, middle, and lower battens shall not exceed 12, 15, and 18" respectively. Batten width shall not exceed two inches.

15.9.2 Jibs shall be attached to the jib stay by means of metal hanks at all times while the sail is set, and shall have a minimum of eight hanks and a maximum of 17 metal hanks sizes 1 or 0, evenly spaced. Floating luff jibs are not permitted.

15.9.3 When measuring, the jib shall be laid in the jib template to be supplied by the class (see drawing enclosed herein). The luff shall be tensioned moderately by hand, only enough to eliminate "puckers" in luff tape/elastic, etc., and not stretched.

15.9.4 When laid flat and smoothed out as much as possible, all parts of the sail except for the foot round shall fall within the template. All parts of the clew and tack--grommets, clewboard, and reinforcement--must fit within the template. Should the dimensions of a template be questioned, the chairman of the Rules Committee shall arrange for re-certification or replacement of all templates by a designated sail maker.

15.9.5 Foot round shall not exceed eight inches as shown on the jib measurement template diagram.

15.9.6 A clewboard, if installed, shall be limited to four inches along the foot and four inches along the leech, measured from the intersection of straight foot and leech extensions.

## 15.10 Spinnaker

15.10.1 Spinnakers shall be cut to conform to the spinnaker plan included herein.

15.10.2 Finished spinnaker cloth shall not be less than 0.93 ounce per yard of 28 ½" width.

## 16 EQUIPMENT

16.1 The following equipment shall be carried in every race :

16.1.1 Anchor: One high tensile Danforth-type anchor weighing 12 pounds with ten feet of 3/8" chain, or one standard Danforth-type anchor weighing 22 pounds with five feet of 3/8" chain, or their equivalent; or one anchor weighing not less than 30 pounds. Two anchors may be carried having an aggregate weight of not more than 60 pounds.

16.1.2 Anchor Line: 100 feet - minimum diameter 1/2" nylon.

16.1.3 Life Preservers: Life preservers (PFD) must be of a type that may be worn. There shall be no less than four and always at least one for each person on board. They must be stowed within arm's reach of the cockpit.

16.1.4 A magnetic Compass, minimum three inch card or dial.

16.1.5 Manual Bilge Pump and Hose

16.1.6 Fog Horn

16.1.7 Paddle

16.1.8 Bucket - a minimum of two gallons

16.2 Hydraulics, electrical power assists and/or electronics are prohibited except for an electric bilge pump installed as provided by rule 9.1 with a properly mounted battery, and an electronic compass, the sole purpose of which is to provide compass headings. A simple, magnetic compass must also be aboard.

16.2.1 Handheld VHF radios are allowed, but must be turned off within five minutes after the starting signal. No transmission shall be sent by Atlantics while racing (after the preparatory signal) except in the case of an emergency.

16.3 Outboard motors may be carried, but must be detached before the preparatory signal of a race and not reshipped until after the finish. The position of an outboard motor or auxiliary gas tank shall not be shifted during a race.

## 17 CHAMPIONSHIP SERIES

17.1 An entry and certification form shall be mailed to each regular member not less than 30 days before the Championship Series. The measurements and specifications on the form must be checked and the form signed by the boat owner and/or charter skipper certifying that the boat complies with the rules and witnessed by a member of the Rules Committee before an entry is accepted.

17.2 A boat belonging to or under charter to one or more active members in good standing with the Atlantic Class Association who are members of a recognized yacht club shall be eligible for entry in the Championship Series.

17.3 A boat under charter to be eligible shall have been under charter for a period of not less than two months prior to the Championship Series and notice of such charter shall have been filed with the secretary of the Association three weeks prior to the Championship Series. In every case the decision of the Rules Committee as to the good faith of the charter shall be final. In the case of a member residing more than 100 miles from the site of the Championship Series, the charter may cover simply the period of the series.

17.4 The helmsman shall be a Corinthian and an Active or Associate Member of the Association in good standing, or a part of the family of an active or associate member, or a regular member of the crew of such member.

17.5 The Championship Series shall be held on three successive days and shall, if possible, consist of six races, two of which may be over courses including major triangular segments and two of which shall be over courses including major windward - leeward segments. At least three races shall be required to constitute a Championship Series. Each race shall be of not less than six miles and not more than 10 miles. No course shall be shortened during a race. A race in which no boat has finished within four hours shall be deemed "No Race." In the event five races are completed, each boat is allowed one throwout race.

17.6 The course shall be laid in open water as free from headlands, harbors, or other restrictions to good racing as possible.

17.7 Scoring in the Championship Series shall be based on the Low Point Scoring System as defined in Appendix A of the Racing Rules of Sailing.

17.8 To assure compliance with the intent of requirements above, the Class Chairman, or in his absence the Chairman of the Rules Committee, will convene a meeting prior to the skippers' meeting with the following in attendance: available members of the Rules Committee, Race Committee Chairman, and Commodore of the host club. Pertinent information resulting from this meeting will be reported at the skippers' meeting.

17.9 When racing in the championship series, an Atlantic shall be sailed by no more than four persons. Individual fleets may permit additional crew members for club races only.

17.10 The Atlantic Class Association will furnish the Perpetual trophies for the Championship Series prizes.

APPENDIX A

**ATLANTIC CLASS ASSOCIATION  
KEEL MEASUREMENT PROGRAM**

**LEADING EDGE SECTIONS (3/31/96)**

■ **UPPER SECTION**

<b>STATION</b>	<b>THICKNESS (mm)</b>	<b>TOLERANCE (mm)</b>	<b>MAX</b>	<b>MIN</b>
10 mm	20	+/- 3	23	17
20 mm	25	+/- 3	28	22
30 mm	30	+/- 3	33	27
40 mm	34	+/- 4	38	30
50 mm	37	+/- 4	41	33
100 mm	56	+/- 5	61	51
150 mm	74	+/- 5	79	69
200 mm	90	+/- 5	95	85
250 mm	106	+/- 5	111	101

■ **MIDDLE SECTION**

<b>STATION</b>	<b>THICKNESS (mm)</b>	<b>TOLERANCE (mm)</b>	<b>MAX</b>	<b>MIN</b>
10 mm	31	+/- 4	35	27
20 mm	42	+/- 5	47	37
30 mm	51	+/- 5	56	46
40 mm	59	+/- 5	64	54
50 mm	66	+/- 5	71	61
100 mm	93	+/- 5	98	88
150 mm	114	+/- 5	119	109
200 mm	131	+/- 5	136	126
250 mm	145	+/- 5	150	140

■ **LOWER SECTION**

<b>STATION</b>	<b>THICKNESS (mm)</b>	<b>TOLERANCE (mm)</b>	<b>MAX</b>	<b>MIN</b>
10 mm	62	+/- 5	67	57
20 mm	78	+/- 5	83	73
30 mm	91	+/- 5	96	86
40 mm	101	+/- 5	106	96
50 mm	112	+/- 5	117	107
100 mm	144	+/- 5	149	139
150 mm	168	+/- 5	173	163
200 mm	187	+/- 5	192	182
250 mm	201	+/- 5	206	196