INNOVATIVE MEASUREMENT TECHNOLOGY LTD.

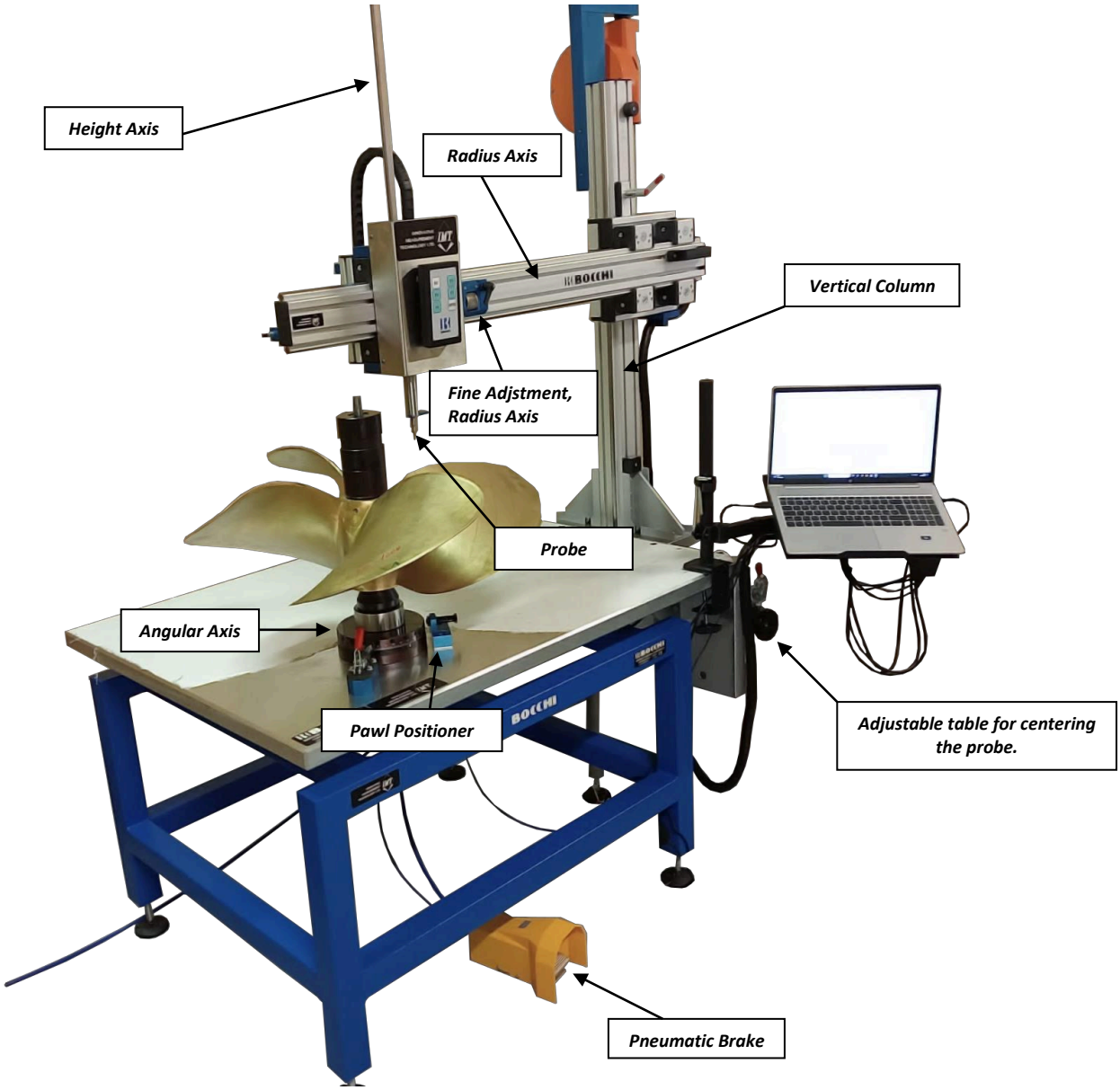
Pitchometer user manual

For the precision measurement of marine propellers

Main features

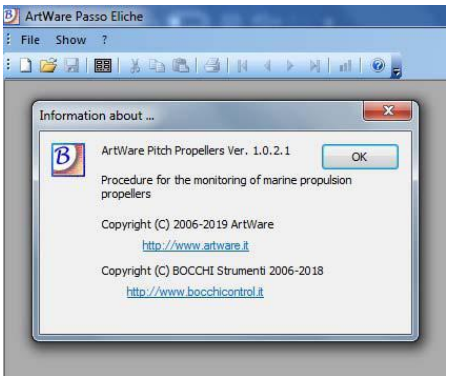
Control equipment for measuring the pitch of marine propellers, connected to PC with dedicated software.

Measuring range Radius axis = 750 mm
Measuring range Height axis = 0÷400 mm
Angular axis range = 360°



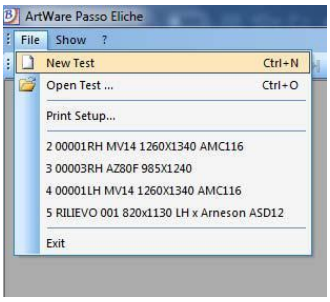
Software Version

Launch the measurement software by clicking on the mail icon on the Desktop, clicking on the "?" in the toolbar, you can verify the version of the software or change the language.



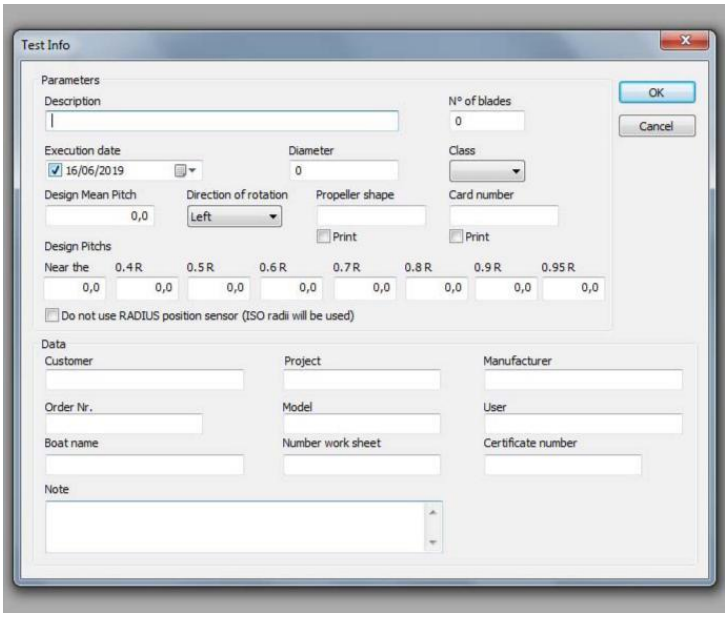
Inserting a new Test Data

By clicking on "File" in the toolbar, press "New Test".



Opens the form that must be filled by inserting some information of the propeller, which:
- Description
- No. of the propeller blades
- Radius of the propeller
- Direction of rotation (left or right)
- Pitch Class
- Design Pitches

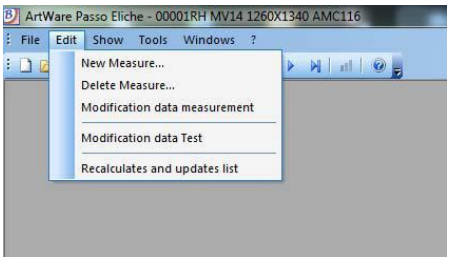
And some customer personal information:
- Name
- Project
- Manufacturer
- No. Order
- Model
- Operator
- Boat name
- Serial number
- Certificate Number



All this data will appear in the final certificate of conformity.

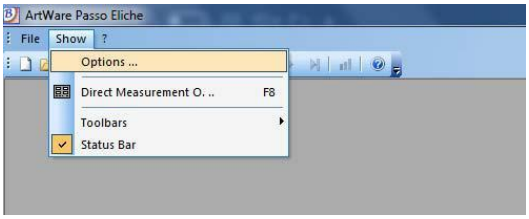
Edit a Test Data

By clicking on "Edit" located in the toolbar, and press "Modification data Test", you can modify the personal data of a test.



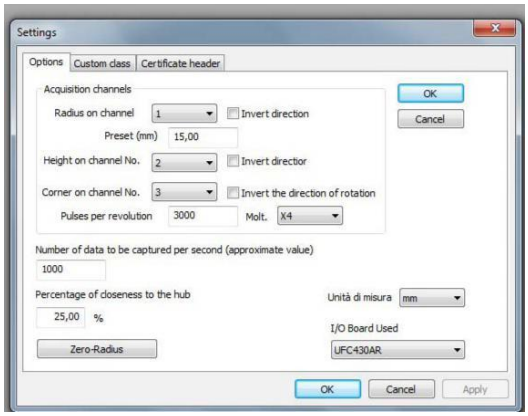
Edit Acquisition Data and Custom class

By clicking on "View" in the toolbar, and press "Options", you can change the acquisition data of the transducers.



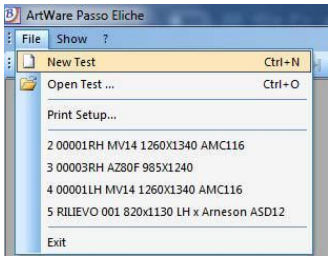
You can:
• select the appropriate channels of the respective axes.
• can be set to the number of data to be captured per second.
• can be reset to zero or preset a value of the radius axis.
• can be set the counting direction, the percentage of proximity to the center of the hub and the I/O board used.

By clicking on "Custom Class" you can create a manufacture class completely custom beginning from the ISO class.



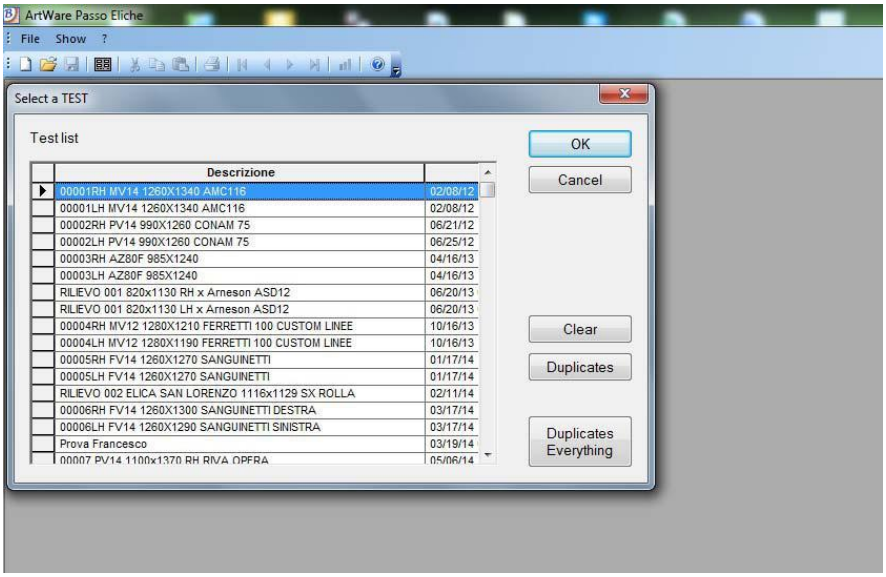
Opens an existing Test

If you want to open a test that has already been performed, click on "File" in the toolbar, and press "Open Test".

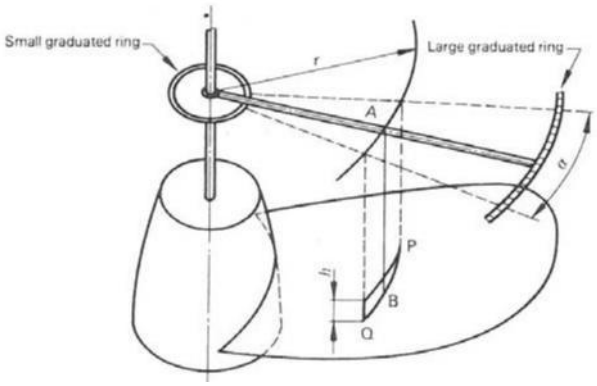


Select the test you want and confirm with "OK".

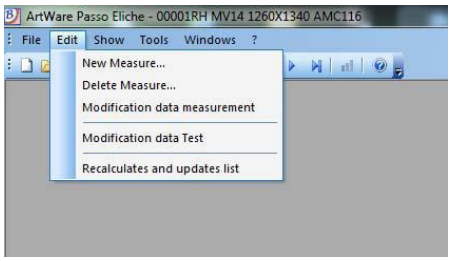
You can also choose to delete or duplicate a test.



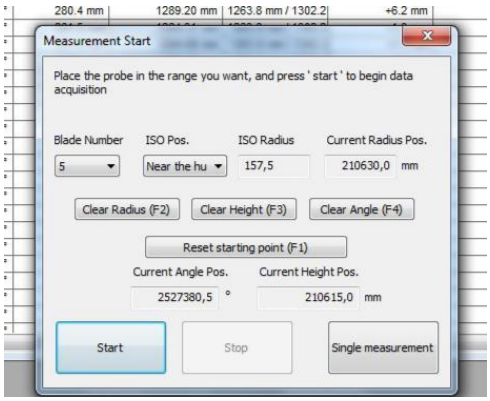
Measuring pitch

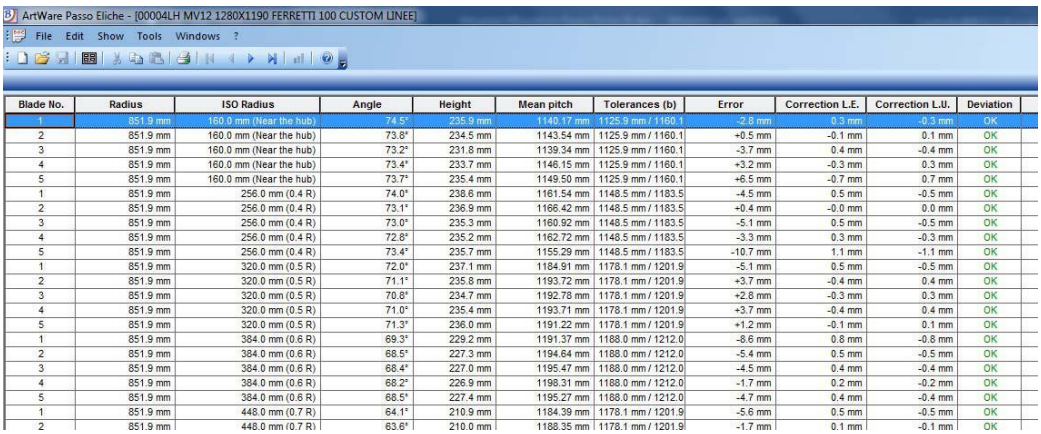


By clicking on "Edit" located in the toolbar, press "New Measure".



Set the number of desired blade and the radius in which you want to measure the pitch of the propeller.
The “ISO Radius” indicates to which value to place the probe.
The "Current Radius Pos." indicates where is located the probe.
Once you have placed the probe to "ISO Radius" specified, bring the height probe in contact with the leading edge of the blade and the angular axis at the point of zero. Unlock the probe with pneumatic foot switch. Press the "Reset starting point" [F1].
Remove the positioner from angular axis, press the "Start" key [ENTER]; rotate slowly the Angular axis, you will notice that the probe will begin its descent, stop the angular axis when the probe reaches the end position.
Press the "Stop" key [ENTER], the software will calculate: the pitch, the number of blades, the measured angle, the measured height and pitch deviation with respect to tolerance class set in the test data.
Lift the probe and lock it with the pneumatic foot switch.
Repeat the same operations to desired radii and the other blades.

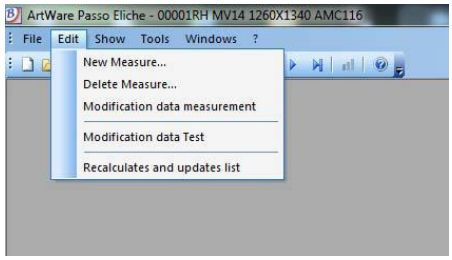




Blade No.	Radius	ISO Radius	Angle	Height	Mean pitch	Tolerances (b)	Error	Correction L.E.	Correction L.U.	Deviation
1	851.9 mm	160.0 mm (Near the hub)	74.5°	235.9 mm	1140.17 mm	1125.9 mm / 1160.1	-2.8 mm	0.3 mm	-0.3 mm	OK
2	851.9 mm	160.0 mm (Near the hub)	73.8°	234.5 mm	1143.54 mm	1125.9 mm / 1160.1	+0.5 mm	-0.1 mm	0.1 mm	OK
3	851.9 mm	160.0 mm (Near the hub)	73.2°	231.8 mm	1139.34 mm	1125.9 mm / 1160.1	-3.7 mm	0.4 mm	-0.4 mm	OK
4	851.9 mm	160.0 mm (Near the hub)	73.4°	233.7 mm	1146.15 mm	1125.9 mm / 1160.1	+3.2 mm	-0.3 mm	0.3 mm	OK
5	851.9 mm	160.0 mm (Near the hub)	73.7°	235.4 mm	1149.50 mm	1125.9 mm / 1160.1	+6.5 mm	-0.7 mm	0.7 mm	OK
1	851.9 mm	256.0 mm (0.4 R)	74.0°	238.6 mm	1161.54 mm	1148.5 mm / 1183.5	-4.5 mm	0.5 mm	-0.5 mm	OK
2	851.9 mm	256.0 mm (0.4 R)	73.1°	236.9 mm	1166.42 mm	1148.5 mm / 1183.5	+0.4 mm	-0.0 mm	0.0 mm	OK
3	851.9 mm	256.0 mm (0.4 R)	73.0°	235.3 mm	1160.92 mm	1148.5 mm / 1183.5	-5.1 mm	0.5 mm	-0.5 mm	OK
4	851.9 mm	256.0 mm (0.4 R)	72.8°	235.2 mm	1162.72 mm	1148.5 mm / 1183.5	-3.3 mm	0.3 mm	-0.3 mm	OK
5	851.9 mm	256.0 mm (0.4 R)	73.4°	235.7 mm	1155.29 mm	1148.5 mm / 1183.5	-10.7 mm	1.1 mm	-1.1 mm	OK
1	851.9 mm	320.0 mm (0.5 R)	72.0°	237.1 mm	1184.91 mm	1178.1 mm / 1201.9	-5.1 mm	0.5 mm	-0.5 mm	OK
2	851.9 mm	320.0 mm (0.5 R)	71.1°	235.8 mm	1193.72 mm	1178.1 mm / 1201.9	+3.7 mm	-0.4 mm	0.4 mm	OK
3	851.9 mm	320.0 mm (0.5 R)	70.8°	234.7 mm	1192.78 mm	1178.1 mm / 1201.9	+2.8 mm	-0.3 mm	0.3 mm	OK
4	851.9 mm	320.0 mm (0.5 R)	71.0°	235.4 mm	1193.71 mm	1178.1 mm / 1201.9	+3.7 mm	-0.4 mm	0.4 mm	OK
5	851.9 mm	320.0 mm (0.5 R)	71.3°	236.0 mm	1191.22 mm	1178.1 mm / 1201.9	+1.2 mm	-0.1 mm	0.1 mm	OK
1	851.9 mm	384.0 mm (0.6 R)	69.3°	229.2 mm	1191.37 mm	1188.0 mm / 1212.0	-8.6 mm	0.8 mm	-0.8 mm	OK
2	851.9 mm	384.0 mm (0.6 R)	68.5°	227.3 mm	1194.64 mm	1188.0 mm / 1212.0	-5.4 mm	0.5 mm	-0.5 mm	OK
3	851.9 mm	384.0 mm (0.6 R)	68.4°	227.0 mm	1195.47 mm	1188.0 mm / 1212.0	-4.5 mm	0.4 mm	-0.4 mm	OK
4	851.9 mm	384.0 mm (0.6 R)	68.2°	226.9 mm	1198.31 mm	1188.0 mm / 1212.0	-1.7 mm	0.2 mm	-0.2 mm	OK
5	851.9 mm	384.0 mm (0.6 R)	68.5°	227.4 mm	1195.27 mm	1188.0 mm / 1212.0	-4.7 mm	0.4 mm	-0.4 mm	OK
1	851.9 mm	448.0 mm (0.7 R)	64.1°	210.9 mm	1184.39 mm	1178.1 mm / 1201.9	-5.6 mm	0.5 mm	-0.5 mm	OK
2	851.9 mm	448.0 mm (0.7 R)	63.6°	210.0 mm	1188.35 mm	1178.1 mm / 1201.9	-1.7 mm	0.1 mm	-0.1 mm	OK

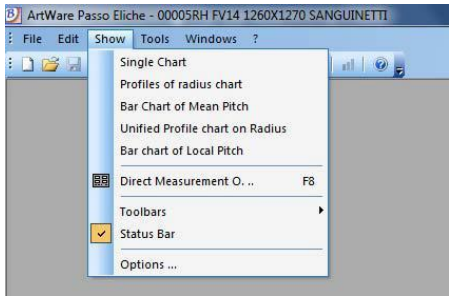
Modification of pitch Measurements

By clicking on "Edit" located in the toolbar, and pressing "Delete Measure", “Modification data measurement”, "Recalculates and updates list”, you can delete or modify the measurements for the determination of the pitch.



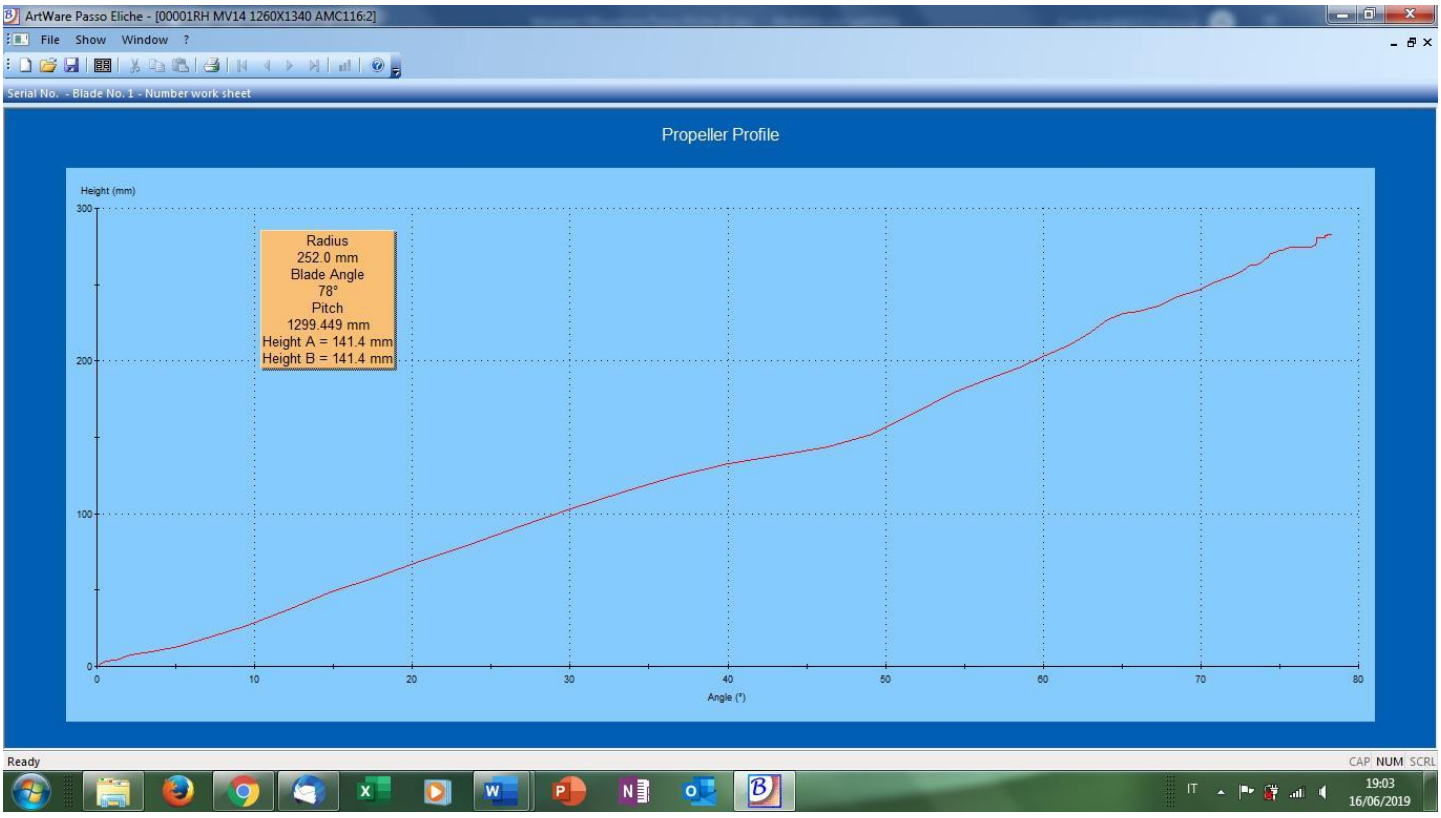
Visualization of Graphs relating to the Pitch

Once carried out the measurements of the pitch, click "Show" in the toolbar and then pressing either "Single Chart", "Profiles of radius chart", "Bar Chart of Mean Pitch or Bar Chart of Local Pitch” or “Unified Profile chart on Radius”, you will see the following graphs that we specify in detail.



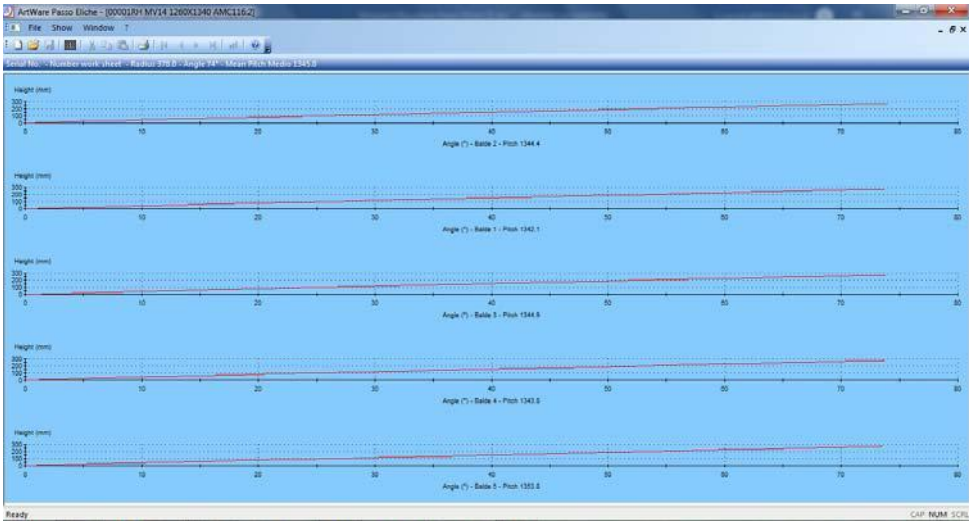
Single Chart

Displays the selected single blade profile to give an idea of any excess or lack of material. The axis of ordinates represents the height, that of the abscissa represents the angles. In addition to the serial number of the propeller, the number of the work sheet and the number of blades, are presented: the radius in which you made the measurements, the angle of rotation of the blade and the pitch determined.

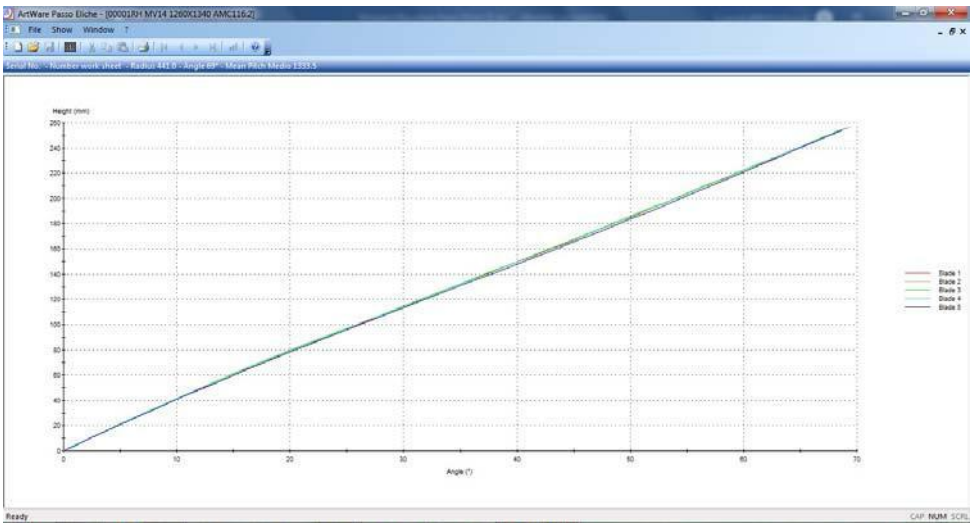


Profiles of radius chart

Allows you to compare blade profiles to a given radius that must be selected at the request of the software. In addition to the serial number of the propeller, the number of the work sheet and the number of blades, are represented: the radius in which you made the measurements, the angle of rotation of the blade, the pitch determined on each blade and the mean pitch.



Selecting "Unified Profile chart on Radius" the profiles, at the specified radius, are displayed all together. With "Ctrl + A" and dragging a selection window on the profiles, they will be enlarged, with F3 you return to the normal display.



Bar Chart of Mean Pitch

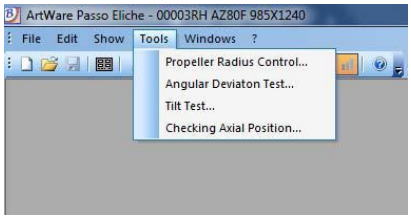
Displays the pitchs on bar graph and evaluate goodness referred to the theoretical pitch line to specify and their tolerance range. Each individual blade is distinguished by a different color and the radius in which the measures were carried out, it is displayed on the x-axis of the chart.
In addition, allows the display of the "Blade Pitch" and "Propeller Pitch" this graphic will appear in the final Certificate of Conformity to show to the customer.

Bar Chart of Local Pitch

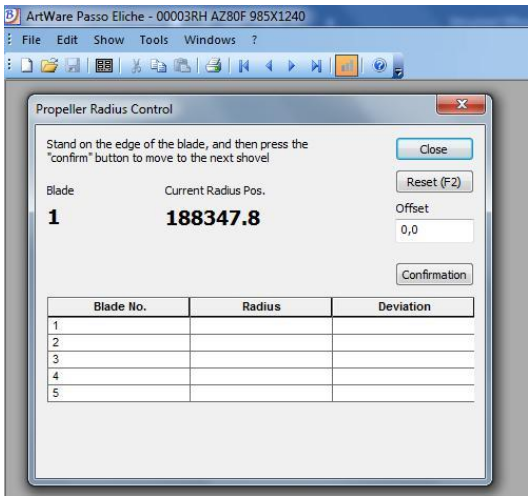
Displays the local pitch on bar graph and evaluate goodness referred to the theoretical pitch line to specify and their tolerance range. Each individual blade is distinguished by a different color; at the beginning of the evaluation the radius must be chosen.
At any time you can choose to change the value of the local pitch and the chart will automatically be updated, you can also choose to display or hide the bars.

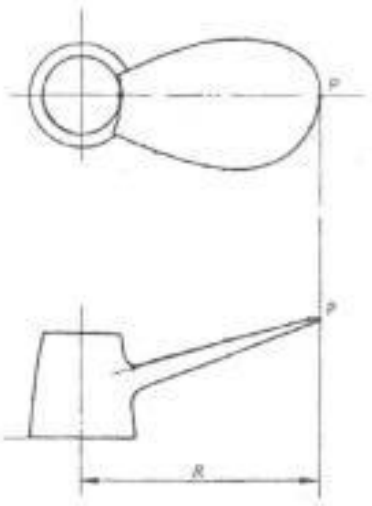
Propeller Radius Control

By clicking on "Tools" in the toolbar, press "Propeller Radius Control".

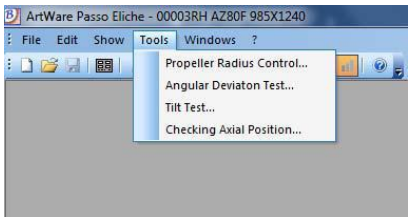


Make sure the radius axis is in contact with the fixed reference (mechanical zero) and press "Reset" [F2].
When moving the radius axis, place the probe at the end of blade No. "1" and press "Confirmation" [ENTER].
In the table will be shown the value of the blade radius No. "1" and the deviation of the radius from the tolerance class defined in the test sheets.
Turn the propeller so that you move to the next blade, move the radius axis and place the probe at the end of the blade, press "Confirmation" [ENTER].
Repeat the same operations for the other blades.



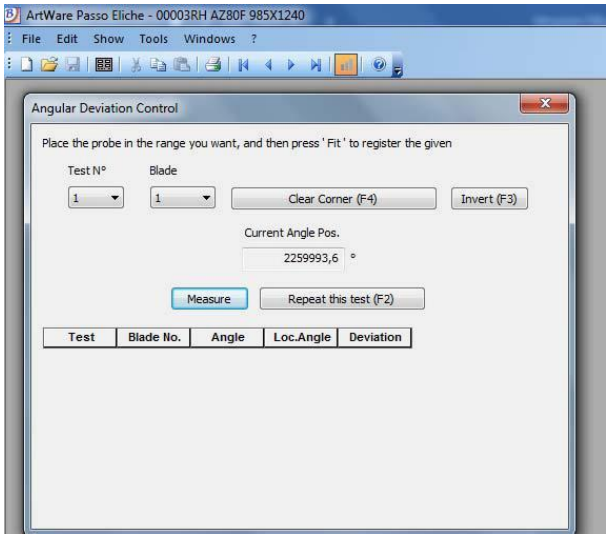


Angular Deviation Test



By clicking on "Tools" in the toolbar, press "Angular Deviation Test".

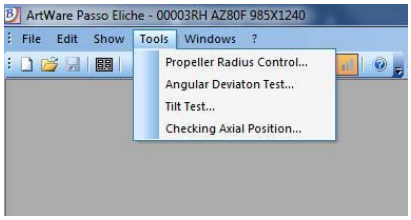
This control makes it possible to check the angular position between two consecutive blades, for example between blade No. "1" and blade No. "2", between blade No. "2" and blade No. "3". between blade No. "3" and blade No. "4" and so on.
Press "Invert" [F3] to reverse the direction of angular rotation.
Suppose we want to check the angular difference between blade No. 1 and blade No. 2.
Select a test number "1" and the number of blades "1", move the axis of the radius and the angular axis, place the probe at the reference point of the blade No. "1" and press "Clear angle" [F4] to reset the angular axis and "Measure" [ENTER] to confirm the value.
Select the number of blades "2", move the axis of the radius and the angular axis and position the probe at the reference point of the blade No. "2", press "Measure" [ENTER] to confirm the value.



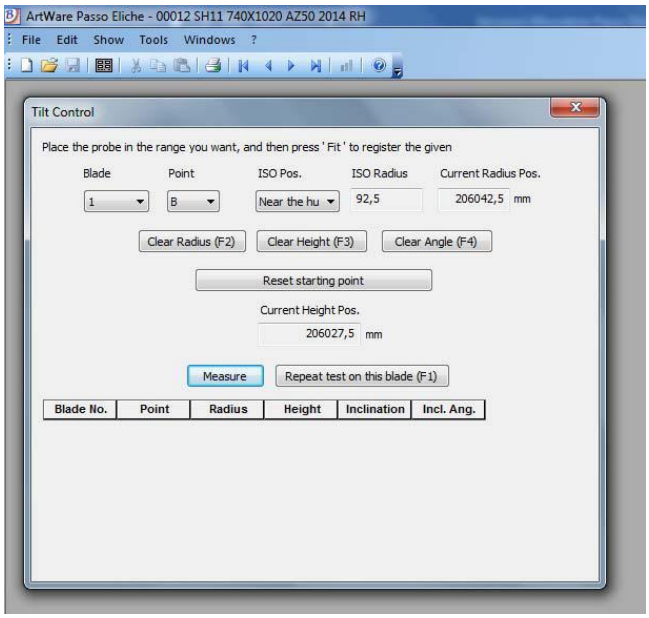
In the table will be presented the angular position and deviation from the tolerance class defined in the test sheets.
If you want to continue the test, select the number of test "2", select the number of blades "2", press "Clear angle" [F4] to reset the angular axis and "Measure" [ENTER] to confirm the value.
Select the number of blades "3", move the axis of the radius and the angular axis and position the probe at the reference point of the blade No. "3", press "Measure" [ENTER] to confirm the value.
Repeat the same operations for the remaining blades.
If a test should be repeated, press "Repeat this test" [F2].

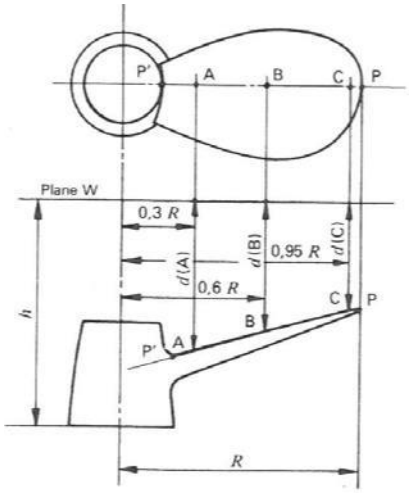
Tilt test (Rake)

By clicking on "Tools" in the toolbar, press "Tilt Test".



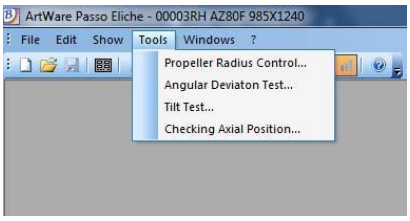
This control is used to determine the angle of inclination of the blade (Rake).
Select the number of the blade on which you wish to keep the control, we assume No. 1, select the first point "B", define the radius in which you want to find the point "B".
The "ISO Radius" indicates how much to set our probe according to the selected radius.
The "Current Radius Position" indicates where our transducer really is located. Once you have placed the probe in the "ISO Radius" position indicated, unlock the probe with pneumatic foot switch and lower the probing tip until it touches the blade and moves the angular axis, centered at point "B".
Press "Reset starting point" to clear the height axis and "Measure" [ENTER] to confirm the value.
Choose the point "C" and define the radius in which you want the point "C".
Lift the probe and lock with the pneumatic foot switch, place the probe at the indicated "ISO Radius" position, loosen the probe with the pneumatic foot switch and lower the probing tip until it touches the blade and moves the probe. angular axis centered at point "C". Press "Measure" [ENTER] to confirm the value. In the table will be displayed the angle of inclination.
Move the height axis and lock the probe with the pneumatic foot switch.
Repeat the same operations for the desired radius and the other blades.
If a test has to be repeated, press "Repeat the test on this blade" [F1].



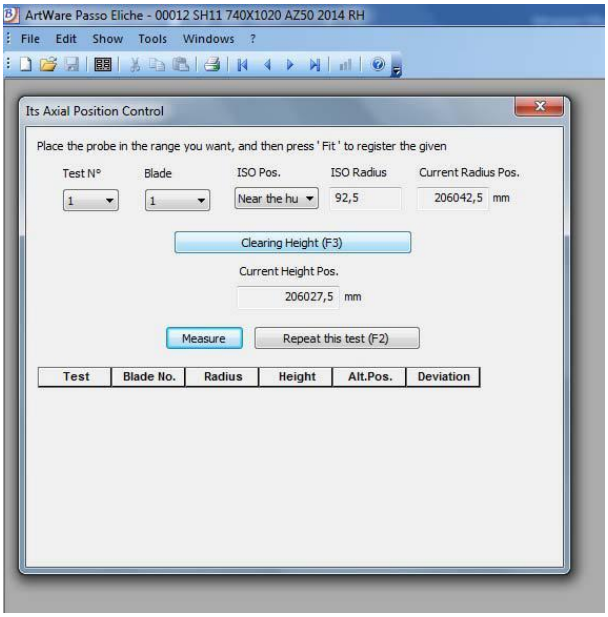


Checking Axial Position

By clicking on "Tools" in the toolbar, press "Checking Axial Position".



This control allows the verification of the relative axial position between two consecutive blades, for example between the blade No. "1" and the blade No. "2", between the blade No. "2" and the blade No. "3" between blade No. "3" and blade No. "4" and so on.
Suppose we want to check the relative axial position between blade No. 1 and blade No. 2.
Select a test number "1" and the number of blades "1", define the radius in which you wish to test.
The "ISO Radius" indicates where to set our probe according to the selected radius.
The "Current Radius Position" indicates where our transducer really is located.



Once you have placed the probe at the indicated "ISO Radius" position, loosen the probe with the pneumatic foot switch and lower the probe tip until it contacts the blade. Press "Clear Height" [F3] to reset the height axis and "Measure" [ENTER] to confirm the value.
Lift the probe and lock with the pneumatic foot switch, select the number of the blade "2" and move the angular axis on the new blade to measure, loosen the probe with the pneumatic foot switch and lower the probing tip until that it touches with the blade. Press "Measure" [ENTER] to confirm the value.
In the table will be shown the height difference between the two blades and the deviation from the tolerance class defined in the test sheets.
If you want to continue in control, select the number of test "2", select the number of blades "2", press "Clear height" [F3] to reset the height axis and "Measure" [ENTER] to confirm the value. Lift the probe and lock with the pneumatic foot switch, select the number of the blade "3" and move the angular axis on the new blade to measure, loosen the probe with the pneumatic foot switch and lower the probing tip until that it touches with the blade. Press "Measure" [ENTER] to confirm the value.
Repeat the same operations on the remaining blades.
If a test should be repeated, press "Repeat this test" [F2].

Print the Certificate of Conformity

At the end of the measurements, to print a Certificate of Conformity, click on "Show", located in the toolbar, and select "Bar Chart of Mean Pitch" You will see the graph; at this point, click on "File" , placed in the toolbar, and select "Print".
In this way, you will see a "Certificate of Conformity" with the most important data regarding: measurements, propeller data, customer's personal data and compliance or non-compliance with the class of membership.
By clicking on "View" in the toolbar, and press "Options" and “Certificate header”, you can customize the form with your logo and address.