INNOVATIVE
MEASUREMENT
TECHNOLOGY LTD.

Pitchometer

For marine propellers pitch control

1- This system is able to:

The device can control the pitch of marine propellers, right and left with radius till 1000mm and define the conformity under the rule ISO 484.

Dimensions:

- Propeller's radius 1000 mm
- Height 500 mm
- Angular 360°

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2- Characteristics of the system:

Manual measurement cycle for the determination of right-hand and left-hand propellers. Interface: man reading on notebook PCs on which are displayed the three axes which determine the pitch of the propeller (RADIUS, and Elevation angle) as well as software that allows you to perform the following controls: Control or Propeller Radius or angular deviation Control or control or Inclination or Axial Position Control characterization of propeller pitch according to the class of membership to ISO 484.
Membrane Keypad that allows you to quickly select the main software options without having to use the mouse or keyboard.
Possibility of Calibration report printing with customer's logo.

3 - Description of Pitchometer

The pitchometer consists essentially of:

• Structure-based aluminium alloy designed to withstand the weight of the structure, in addition to the weight of the propeller to be verified.
• Nr. 1 spindle rotating precision and robustness, designed and made by our workshops, rotating on ball bearings precision. Graduation engraved for the rapid determination of the angle, reading with resolution 0.1 ° of digital transducer. The possibility of locking the spindle in any position or at predefined positions with a pitch of 18 ° with the insertion of mechanical position.
• Nr. 1 system for linear axes made of aluminium profile with hardened steel guide rails. Axe "Z" in profile 120X120 mm length 1300 mm, stroke 800 mm, with 14 mm diameter shafts and rigid cross slide by 320x40x320 mm having free movement; axis "X" in profile 120X40 mm length 1700 mm, stroke 1100 mm, with 14 mm diameter shafts and slide 240X40x160 mm having free movement.
• Nr. 3 transducers with digital output TTL square 5V line driver with magnetic technology, particularly suitable in harsh environments with dust and dirt.
• Nr. 1 interface HEIDENHAIN Mod. UFC-430 when connecting the digital translators.
• Nr. 1 keyboard membrane applied in comfortable position to select the main functions of the software.
• Nr. 2 balancers spring system, to counterbalance the weight of the structure and make easier the sliding axis with minimum effort.
• Nr. 1 probe tip with feeler point, suitable for drawing the blade surface.

• Nr. 1 pneumatic brake for locking of height via actuation of foot valve in order to make operator's hands free, necessary to the control and acquisition of the points.
• Nr. 1 probe special with digital display, suitable for measurements of propellers in areas in which two blades overlap.
• Nr. 1 set of tips and tailstock for clamping the propeller on the spindle.
• Nr. 1 support structure welded steel painted blue RAL 5017 textured finish complete with anti-vibration feet and a drawer for utensils.
• Nr. 1 Notebook PC Complete PC port

4 - Duty cycle for pad pitch

a. The operator loads the propeller and the locks on the spindle by means of a system of spikes and tailstocks.
b. The operator brings the probe to the chosen radius. According to the characteristic of the propeller, it will be the software itself to suggest what position move.
c. The operator positions the probe in the first item on the flap input of the blade and securing the tracer through the foot valve.
d. The operator resets the axes (I lift and angle) and starts the measuring cycle by pressing the function key and dedicated unlocking the probe with the foot valve. The operator, while the propeller rotates the spindle, with the probe reaches the second item on the flap out of the blade.
f. The operator by pressing the function key dedicated ending the measure.
g. The operator raises the touch probe at the free position and locks it by means of the foot valve.
h. The software will display and store the step detected, by verifying compliance with the limits of acceptability imposed by Norma.
i. The operator will repeat the operations from "b" to "g" for the remaining rays and for the remaining blades of the propeller.

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5 - Software features

- **Insertion of a new test**

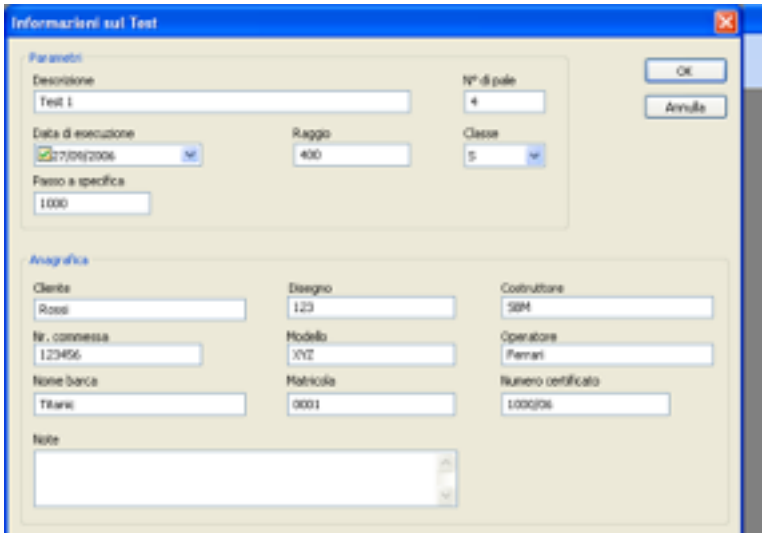
By clicking on “File”, placed in the toolbar, press the “New Test”.

This opens the mask that must be completed by entering some information such as the propeller:

- Description
- Nr. The propeller blades
- Radius propeller
- Class propeller
- Pitch by specific

And some reference data of the customer:

- Name
- Design
- Manufacturer
- Nr. Saleswoman
- Model
- Operator
- Name of the boat
- Serial
- Number Certificate



All these data will appear later in the Certificate of Conformity final.

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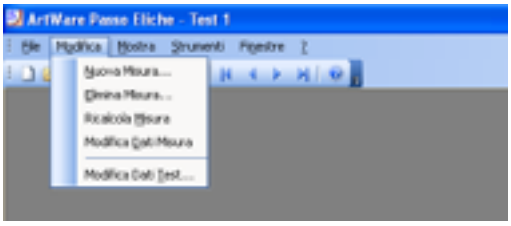
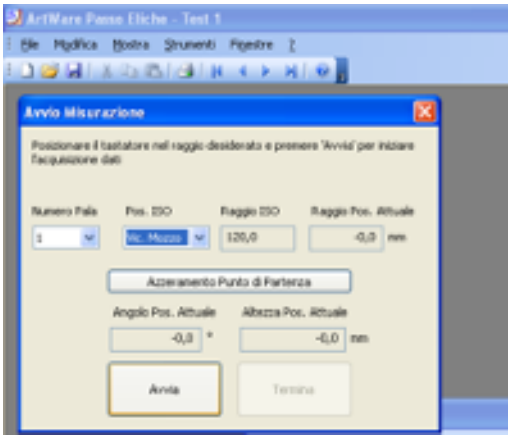
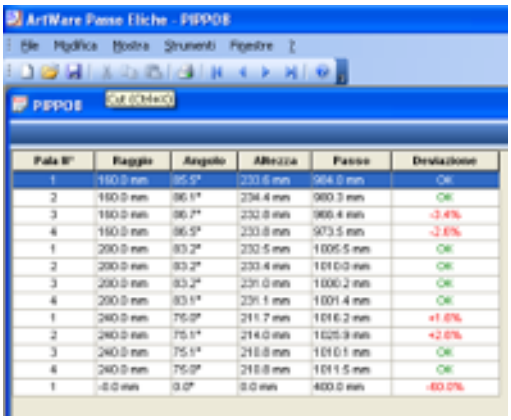
- **Measurement of pitch**

Clicking “Edit”, placed in the toolbar, click “New Measures”.



Set the desired number of blade and the radius in which you want to measure the Pitch propeller.
The “Radius ISO”, will indicate how far to place our probe according to the radius selected.
The “Radius Pos. Current” indicates where really our probe during the displacement of the beam.
Once you placed the probe to the “Radius ISO” indicated, bringing the axis height abutting with the reference block and the axis Angular the point of zero. Pull down the tip of the feeler in contact with the blade, the position of the beginning measure. Lock the right lever and loosen the left. Remove the positioner axis Angle, press the “Start”; slowly rotate the axis Angular, you will notice that the tip feeler will begin its descent, stop the axis Angular when the probe reaches the end position measurement. Press the button “Finish”, the software will calculate the Pitch reporting: the number of Pala, the angle detected, the height measured and the deviation of the Pitch than the tolerance class master data set of tests.
Move the axis height abutting with the reference block and lock the left lever.
Repeat the same operations to the desired rays and other blades.





- **Viewing charts inherent in pitch**

After making the measurements of Pitch, by clicking on “show”, placed in the toolbar, and pressing choice “Single Chart”, “Graph profiles on Radius” or “Bar Graph Profiles”, you can view the following graphics that we’re going to specify in detail.

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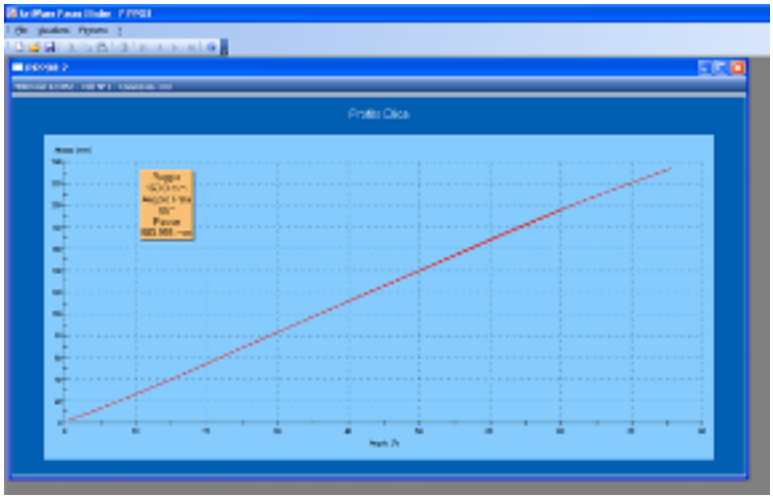
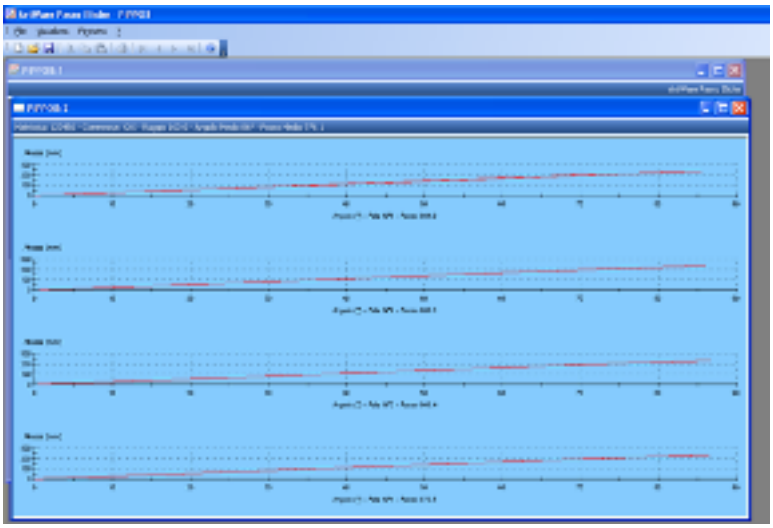
- **Single graph**

Displays the single blade profile selected giving an idea of any excess or lack of material. The axis of ordinates shows heights, on that of the abscissas shows corners. In addition to the freshman of the propeller, the number of job processing and the number of blade, are shown: the radius in which you made the measurements, the angle of rotation of the blade and the Passo determined.



- **Profile graph on radius**

Allows you to make a comparison of the profiles of the blades at a given radius that will be selected at the request of the software. In addition to the freshman of the propeller, the number of job processing and the number of blade, are shown: the radius in which you made the measurements, the angle of rotation of the blade, the pass determined on each blade and Step Middle.



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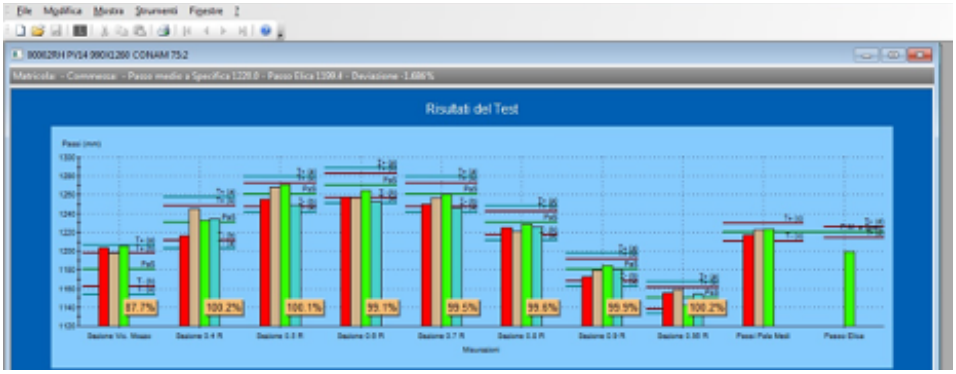
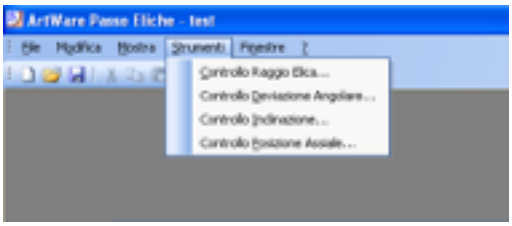
- **Bar graph of profile**

Displays the steps of the bar graph and evaluate the goodness referred to the theory of a specific step and the respective range of tolerances. Each individual blade is distinguished by a different color and the radius, in which the measurements were made, it is displayed on the abscissa axis of the graph.
It also allows the display of the “Step Pala” and “Pitch Propeller” this graph will appear in the Certificate of Conformity to show to the final customer.

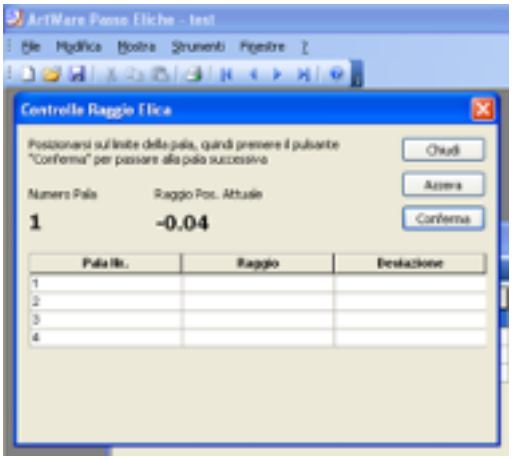


- **Radius procelle control**

By clicking “Tools”, located in the toolbar, click “Control Radius propeller”.



Ensure that the axis of the beam is in contact against the fixed reference (mechanical zero) and press “Reset”.
By moving the axis of the beam, place the probe end of the blade pointing to “1” and press “Confirm”.
The table will be shown the value of the radius of the blades “1” and the deviation of the beam with respect to tolerance class set in the master records of the tests.
Turn the propeller so as to pass on the next shovel, move the axis of the beam and place the probe in pointing end of the blade, press “Confirm”.
Repeat the same operations for the other blades.



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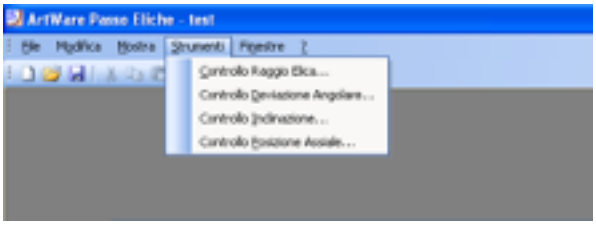
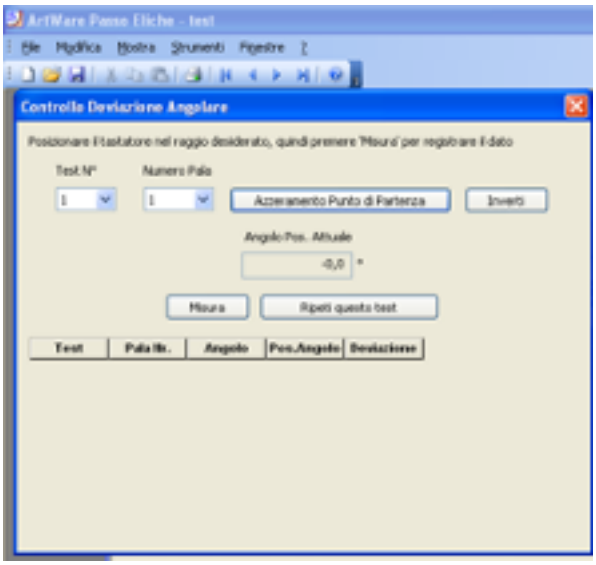
- **Angular deviation control**

Clicking instruments, placed in the toolbar, click “Control deviation Angular”.



This control allows the verification of the angular position between two consecutive blades, for example between the blade “1” and the shovel “2”, between the blade “2” and the shovel “3”, between the blade “3” and the shovel “4” and so on.
Press “Reverse” to reverse the direction of rotation of Angular.
Suppose we want to check the angular deviation between the blade “1” and the shovel “2”. “Select test number” 1 “, select the number of shovel” 1 “, moving the axis of the beam and the axis Angular, aiming to position the probe at the reference point of the blade” 1 “and press” Zero Point Departure “to reset the axis Angular and” Measure “to confirm the value.
Select the number of shovel “2”, move the axis of the beam and the axis Angle to position the probe in pointing at the reference point of the blade “2”, press “Measure” to confirm the value.



The table will be shown the angular position and the deviation from the set tolerance class master data of the Test.
If you want to continue in control, select the test number “2”, select the number of shovel “2”, press “Zero Point of Departure” to reset the axis Angular and “Measure” to confirm the value.
Select the number of shovel “3”, move the axis of the beam and the axis Angle to position the probe in pointing at the reference point of the blade “3”, press “Measure” to confirm the value.
Repeat the same operations for the remaining blades.
If a test should be repeated press “Repeat this test.”

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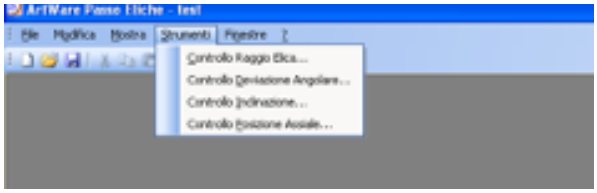
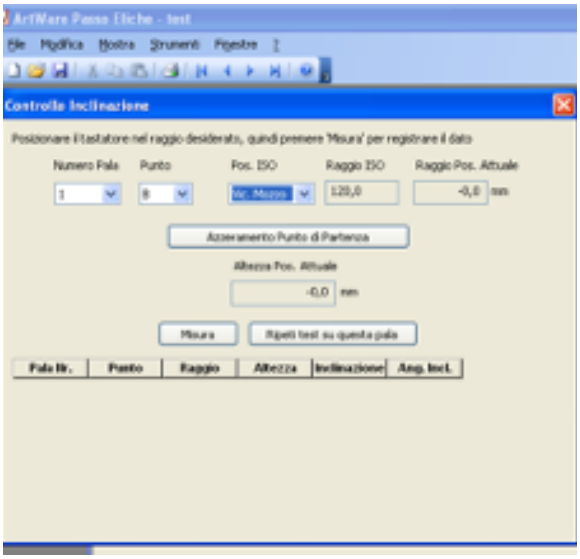
- **Tilt control (Rake)**

By clicking “Tools”, located in the toolbar, click “Control Tilt”.



This control allows the determination of the angle of inclination of the blade (Rake).
Select the number of the blade on which you want to maintain control, we assume “1”, select the first point “B”, set the radius in which you want is on the point “B”.
The “Radius ISO”, will indicate how far to place our probe according to the radius selected.
The “Radius Pos. Current”, indicates where really our probe during the displacement of the beam.
Once you placed the probe to the “Radius ISO” indicated, loosen the left lever and bring down the feeler tip until it contacts the blade and moving the axis Angular, centred at the point “B”. Press “Zero Point of Departure” to reset the axis height and “Measure” to confirm the value. Pick point “A” and set the radius in which you want is on the point “A”.



Raise the tip feeler and lock the left lever, place the probe in the “Radius ISO” indicated, loosen the left lever and bring down the feeler tip until it contacts the blade and moving the axis Angular, centred at the point “A”. Press “Measure” to confirm the value. The table will be shown the angle of inclination.
Move the axis height abutting with the reference block and lock the left lever.
Repeat the same operations to the desired rays and other blades.
If a test should be repeated press “Repeat tests on this shovel.”

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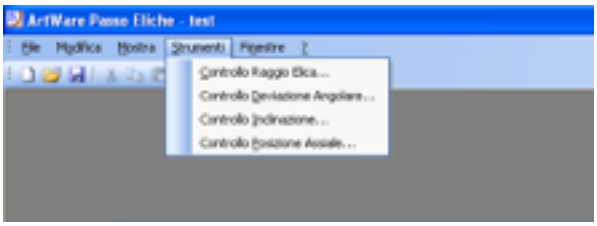
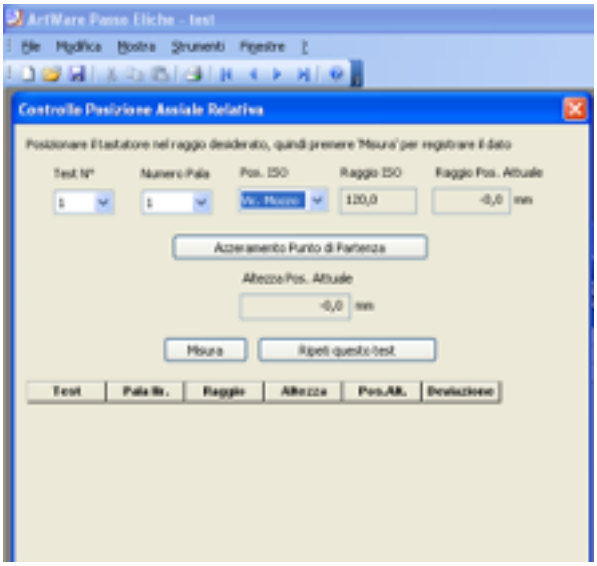
- **Positional control axial**

By clicking “Tools”, located in the toolbar, click “Control Axial Position”.



This control allows the verification of the relative axial position between two consecutive blades, for example between the blade “1” and the shovel “2”, between the blade “2” and the shovel “3”, between the blade “3” and the shovel “4” and so on.
Suppose we want to check the relative axial position between the blade “1” and the shovel “2”. Select test number “1”, select the number of shovel “1”, set the radius in which you want to test.
The “Radius ISO”, will indicate how far to place our probe according to the radius



Once you placed the probe to the “Radius ISO” indicated, loosen the left lever and bring down the feeler tip until it is in contact with the blade. Press “Zero Point of Departure” to reset the axis height and “Measure” to confirm the value.
Raise the tip feeler and lock the lever of the left, select the blade number “2” and move the axis Angle to turn onto the new blade to measure, release the lever to the left and bring down the feeler tip until it touches with the shovel. Press “Measure” to confirm the value.
The table will be shown the difference in height between the two blades and the deviation from the set tolerance class master data of the Test.
If you want to continue in control, select the test number “2”, select the number of shovel “2”, press “Zero Point of Departure” to reset the axis height and “Measure” to confirm the value.
Raise the tip feeler and lock the lever of the left, select the blade number “3” and move the axis Angle to turn onto the new blade to measure, release the lever to the left and bring down the feeler tip until it touches with the shovel. Press “Measure” to confirm the value.
Repeat the same operations on the blades remaining.
If a test should be repeated press “Repeat this test.”

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- **Print of certificate of compliance**

Upon completion of measurements, to be able to print a Certificate of Compliance, click “File”, placed in the toolbar, and press “Print”.
In this way you will see a report with the key data relating to the measurements, the data of the propeller and the data of the customer.

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6 - Protections and rules

All the dangerous areas of the bank will be marked and delimited with panels, cover or bellows.
The system will comply with the following guidelines:
• 98/37/CE machines directory.
•73/23 / EEC Low Voltage Directive (and amended)
•89/336/CEE Electromagnetic Compatibility Directive (and amended).

7 - Technical details

Power	230V, 50Hz
Pneumatic power	6 Bar
Dimensions working area	1500 x 700 x 2700 mm
Loading / unloading	Manual
Operator interface	PC notebook with personal software languages ITA, FR, GB
Repeatability with good piece	Cg ≥ 1,00

8 - Materials used (general list)

Linear transducer	ELGO Electronic
PC Notebook	ACER - HP
Pneumatic	Airtac - Parker
Bellows for protection	Tecnimetal International - PEI
Profiles	Item
Brakes	Zimmer

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9 - Included in offer

•The design and construction of mechanical pitchometer.
•Pre-testing and education at our headquarters in Pontoglio (BS) – Italy.

10 - Not included in offer

•Packaging, transport, installation and test to your Company.
•Installation in your departments.
•Any building works (civil works).
•Creation of various aspirations and drains.
•Drawing up the pitchometer of electrical cables and air tubes or other.

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