



Nicotra **Ventil** selection software

Ver. 3.1.2

Installation Guide

and

User Manual

April 2005

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1 System Requirements

The minimum system requirements to run Ventil Selection software are the following:

- a PC with an Intel 486/50 MHz (or 100% compatible) or higher processor (Pentium recommended)
- a minimum amount of memory of 64 MB (128 MB recommended with Win95; more modern Windows versions have larger memory requirements)
- a hard disk with 60 MB of free space
- a screen minimum resolution of 800x600 pixel with a 256 colours video mode (1024x768, 16K colours video mode recommended)
- a CD ROM drive to install Ventil selection software
- a mouse pointing device

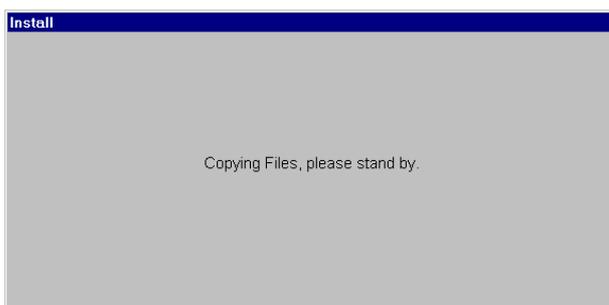
2 Installation Guide

WARNING: before starting the installation process, ALWAYS check if an older version of Ventil is still present on your Hard Disk. If so, please refer to the "Delete steps" section at the end of this chapter.

To install the Ventil selection program, perform the following steps:

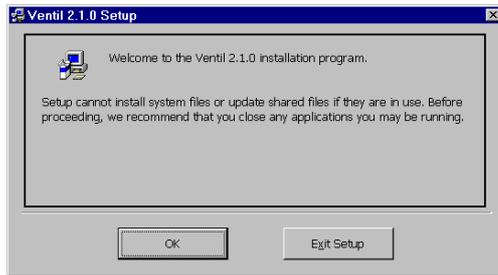
- 1) Close any other application running on your system, to avoid any conflict with the installation program.
- 2) Insert the Ventil installation CD-ROM inside your CD drive unit.
- 3) Click on the Start button and, from the Start menu, select the Run option.
- 4) Type "<DriveLetter>:\setup.exe" (where <DriveLetter> is your CD-ROM drive letter unit, usually D or E) inside the empty text-box, and then click the OK button.
- 5) During the installation process, the setup program will show a first message box to inform you that copy of the files is proceeding

1



and then a second message to remind you to close any other program still running on your PC:

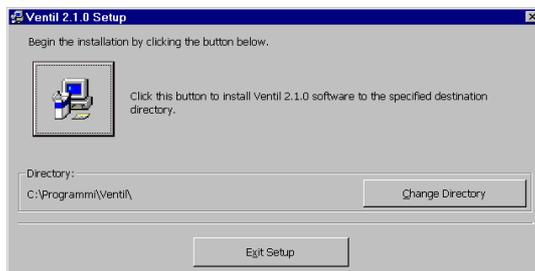
2



Press the **OK** button to proceed.

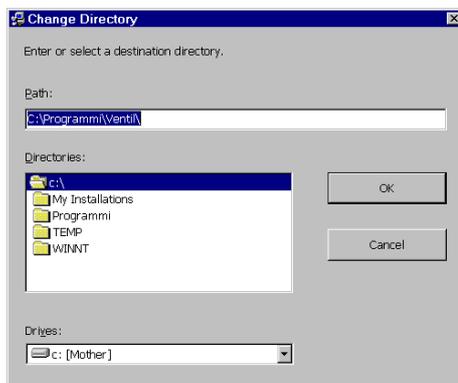
6) A new window will open.

3



This dialog box allows you to specify the directory where you want to install the Ventil selection software. If you want to change the default path, click the **Change Directory** button to open a new window:

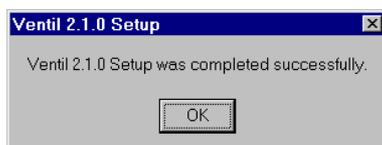
4



Select the path you wish and confirm pressing the **OK** button. This will close this window and take you back to the previous one. Click the button with the set-up icon to start the installation process.

7) Wait until the setup.exe finishes to install all the files

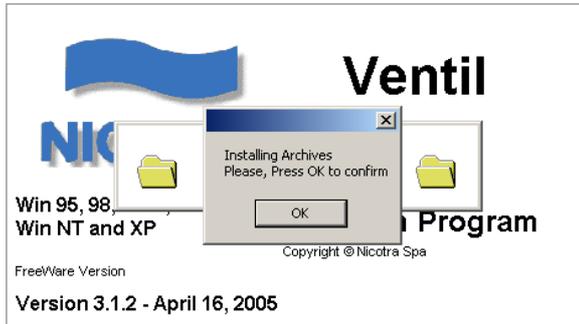
5



and then press the **OK** button.

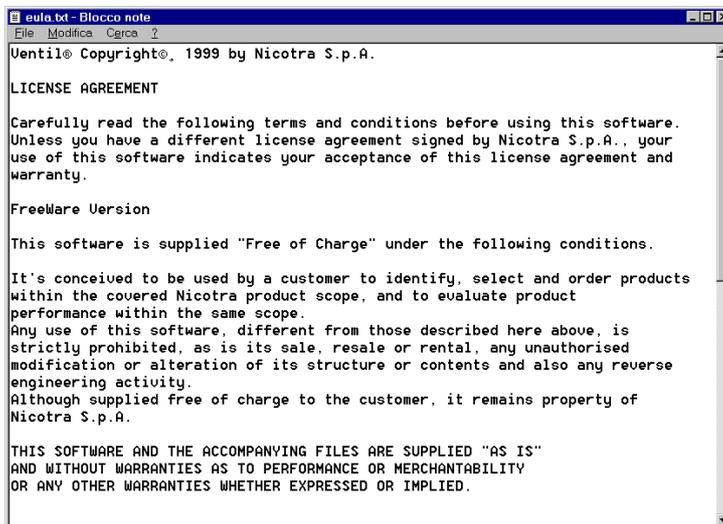
- 8) To complete the installation process, remove the Ventil CD-ROM from your drive and run the selection program. When you run Ventil for the first time, the program extracts all the archive files inside the Nicotra_it directory; press **OK** to proceed

6



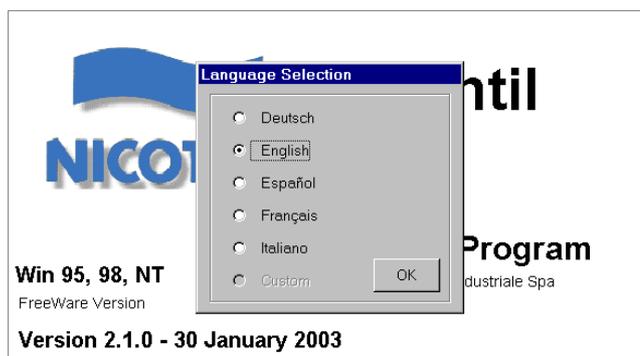
At the end of this step (which may last a few minutes) the program will show the User License text:

7



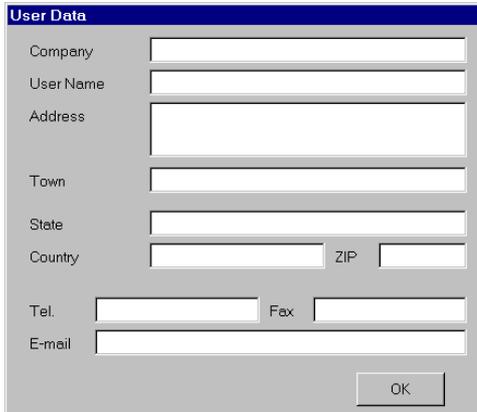
After closing the window above, you will be asked to select a language

8



and then to compile the user data card. This “User Data” will be used in the default headings of the program printout. Insert all your data and then press **OK** to confirm.

9



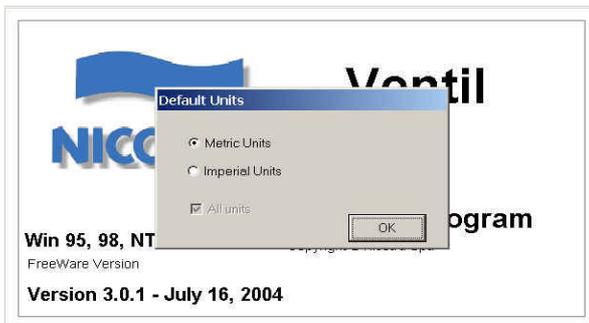
The 'User Data' dialog box contains the following fields:

- Company
- User Name
- Address
- Town
- State
- Country
- ZIP
- Tel.
- Fax
- E-mail

An 'OK' button is located at the bottom right of the dialog.

The following step is to choose the Default Units. Select the preferred option and press the **OK** button.

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A new window opens showing a list of the available product Subsets. Choose the one you are interested in and then press the **OK** button.

11



Now the Nicotra Ventil selection software is correctly installed and configured.

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2.1 Delete steps

Be sure that any former installation of Ventil has been completely removed, before starting with a new one.

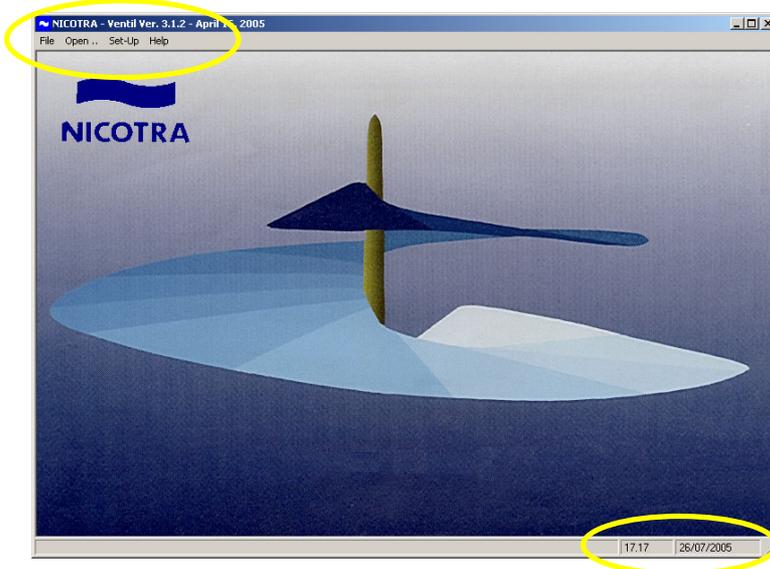
In the **Start** menu, click on the **Settings** option and then on **Control Panel**. Start the **Add/Remove Programs** utility and then search for Ventil in the available applications list; select it and click on the **Add/Remove Applications** button. Follow the program instructions until finished.

The automatic program removal can be unable to delete all the installed files, so look for the Ventil program installation directory (by default "C:\Program Files\Ventil") and delete any remaining file manually.

3 User Manual

When you start-up Ventil, a work-space window is brought up;

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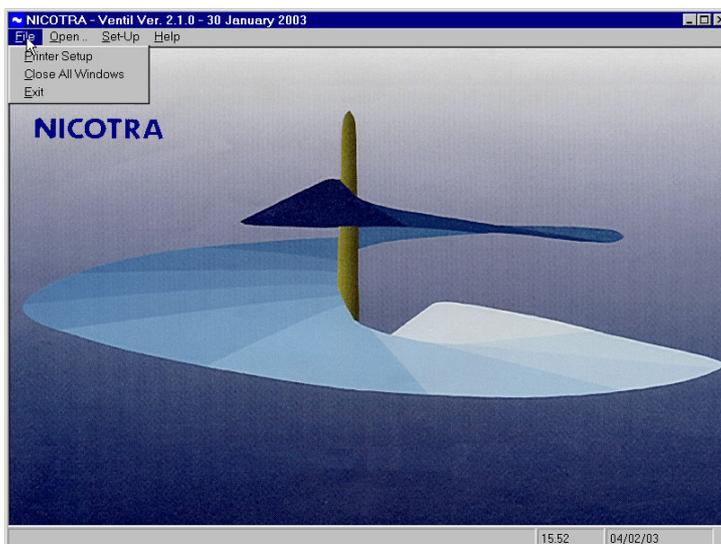
On its top you can see a Menu Bar with four Menu Items: **F**ile, **O**pen, **S**et-Up and **H**elp; these are the commands you use to work with Ventil. On the right bottom side of this window, the system date and time are shown.

3.1 The **F**ile Menu

The File menu contains a number of auxiliary commands.

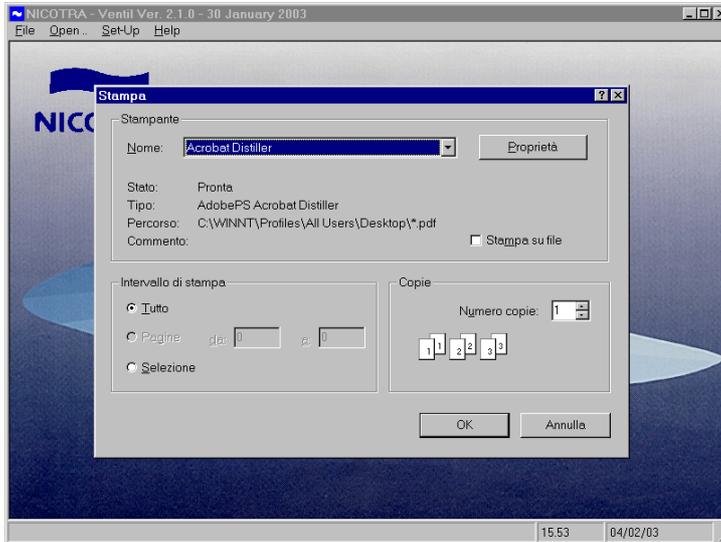
When you click on the **F**ile menu title, the Menu opens showing three commands: **P**rinter Setup, **C**lose all windows and **E**xit.

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Printer setup: the “Printer Setup” command opens a new window to let you change the printer device or its properties.

15



Close all windows: this command will close all the windows that may have been opened working with Ventil.

Exit: the “Exit” command closes the Ventil program.

3.2 The Open Menu

This menu gives access to the main working windows of the selection program.

When you click on the Open item, the Open menu is shown, with four menu items: Catalog, Selection, Orders and Info.

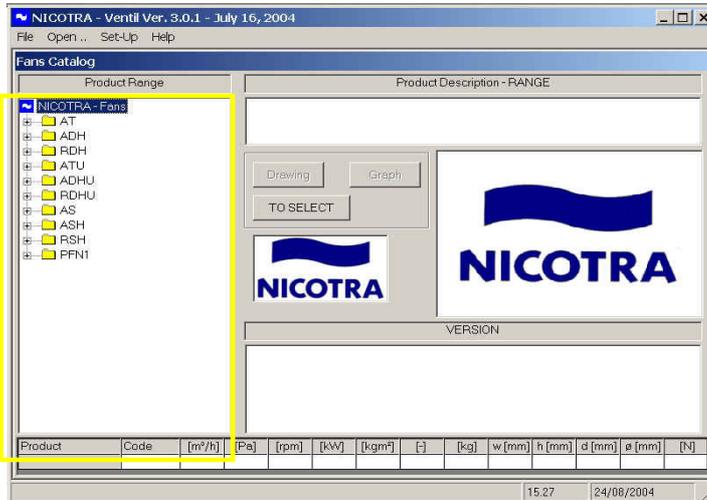
16



3.2.1 The **Catalogue** Window

Catalog: the “Catalog” command opens a new window where you can browse through the product range and find essential information about each fan:

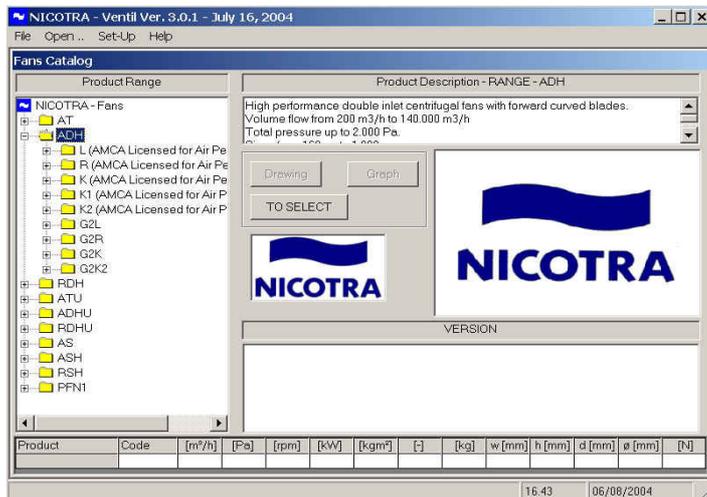
17



3.2.1.1 The **Product Tree**

In the leftmost part of this window (highlighted by a yellow rectangle), a tree-shaped structure shows the complete available product range. You can choose the particular fan you wish to see in detail by selecting its range, version, and size. When you expand a range node, Licensed versions and sizes are identified by an appropriate statement ("AMCA Licensed for Air Performance" or "AMCA Licensed for Sound and Air Performance").

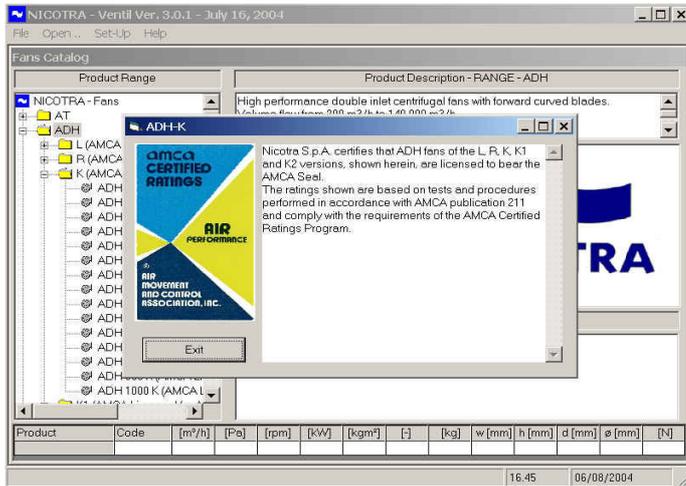
18



When you expand the version node, into individual sizes, Ventil opens a new window providing more detailed information about each AMCA Licensed Product (Seal and Qualifying Statement). Press the **Exit** button to proceed.

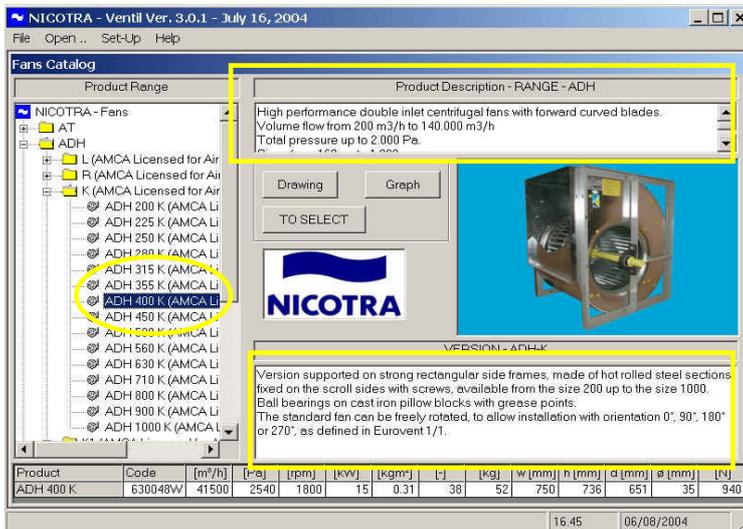
When the program is used intensively, the continuous need to close the informative window with AMCA seal and qualifying statement may be a nuisance: the user can temporarily deactivate the Seal window by pressing the key combination Ctrl-N, till the following start-up, when this feature will be reactivated by default.

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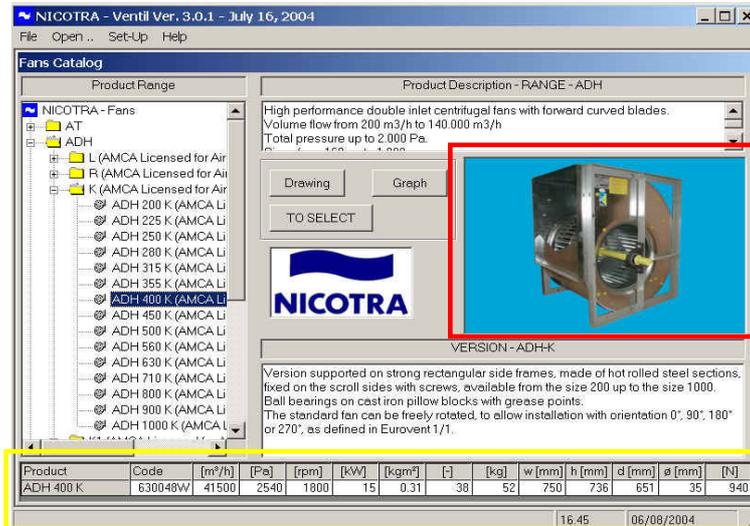


To find an ADH 400 K, for example, you must choose the ADH range first, then the K version and, in the end, size 400. The catalog window will change to show, inside the two yellow highlighted text boxes, a description of the selected range and version.

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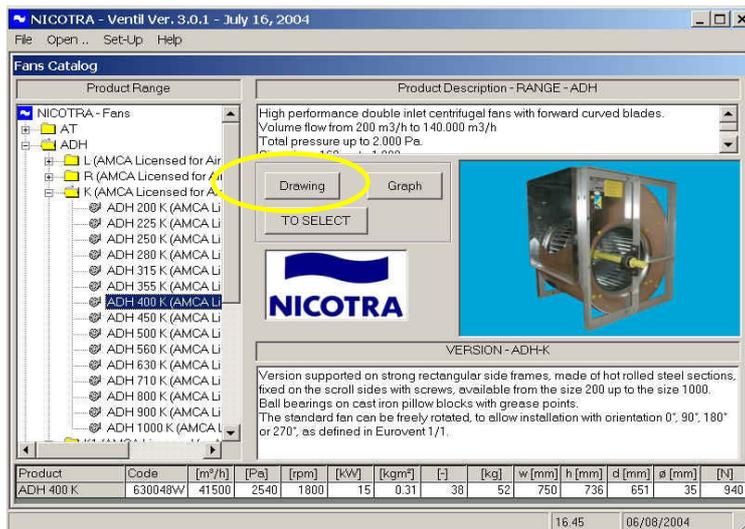
The red highlighted area may show a photo of the selected fan.

The yellow highlighted table on the bottom of the window shows nominal dimensions and performance data of the selected fan. The second line, starting from the first column on the left, shows: the product name (range – size – version), the part number of the selected fan (base version, without add-on accessories), the maximum flow rate, pressure, speed and power, the moment of inertia, the number of blades, the fan weight, width, height and depth, the shaft diameter and the max radial force allowed on the bearing. If you move the cursor on to a column title, a small pop-up text will describe the meaning of each particular value.

The catalogue window contains three buttons: **Drawing**, **Graph** and **TO SELECT**.

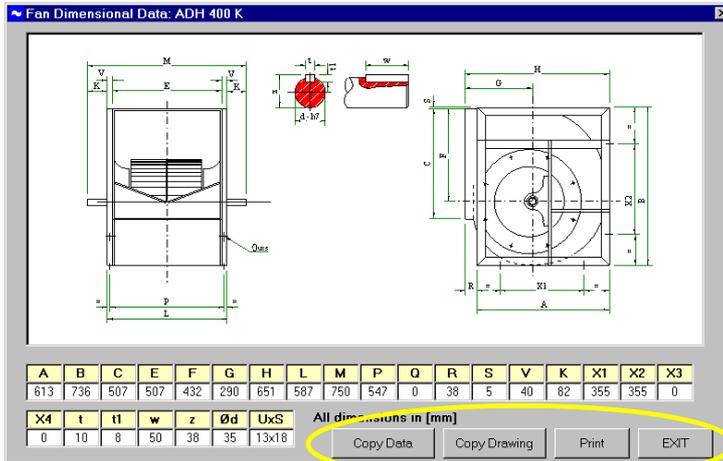
3.2.1.2 The **Drawing** button:

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The **Drawing** button opens a new window showing the fan dimensional drawing, with the principal dimensions, like the following example:

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On the right bottom side of this window there are four buttons: **Copy Data**, **Copy Drawing**, **Print** and **EXIT**.

Copy Data: the “Copy Data” button saves a copy of the dimensional data into the Clipboard, so they can be pasted into a document (e.g. into an Excel spreadsheet).

Copy Drawing: the “Copy Drawing” button works in the same way as the **Copy Data** button; but it saves the dimensional drawing instead.

EXIT: the “EXIT” button closes this window and takes you back to the previous one.

Print: the “Print” button opens a new window, used to configure and start a printout of the drawing, including dimensions. Inside it you can see three text lines and three buttons: **Print**, **Printer SetUp** and **Exit**.

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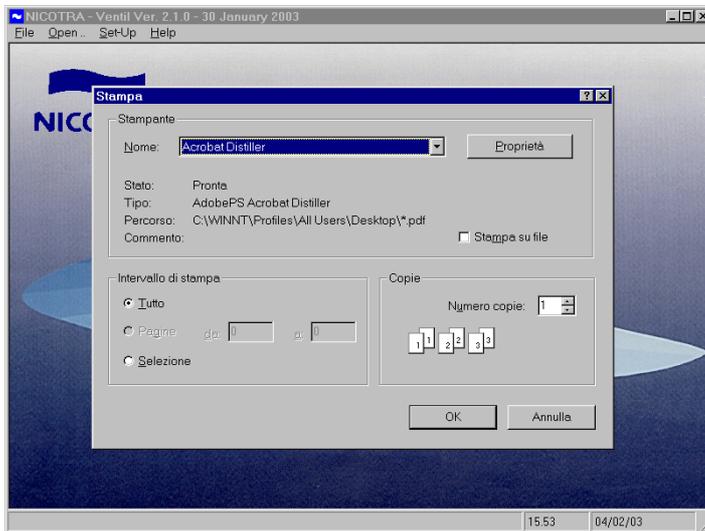


The text lines can be used to insert notes in the printed page; each field may contain a string up to 30 characters long. The **Customer** field shows, by default, the content of the User Name field of the User Data window. This field is automatically padded with blanks to its maximum length of 30 characters. To change its content with something else (e.g. a customer's name), this must be selected and overwritten. Any attempt to insert additional characters will produce just a beep. To select all the contents of the field, move the mouse to the right edge of the text box, double click (so all the characters will be selected) and press the “Del” key to delete the blanks, or just overwrite them with your note.

Print: the “Print” button actually starts printing.

Printer SetUp: the “Printer SetUp” button is used to open the system window used to select or configure the printer device. Note: this is a window of the operating system; its language cannot be selected inside Ventil.

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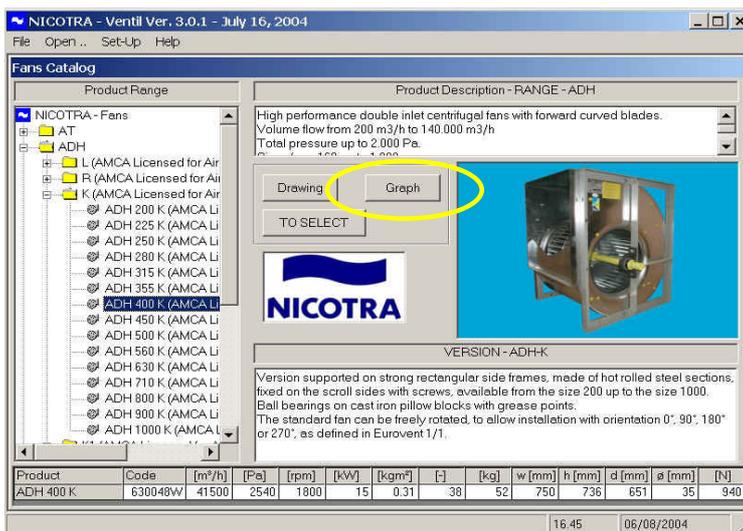


Exit: the “Exit” button (“Annulla” in the picture above) closes down the Print Options window and takes you back to the previous one.

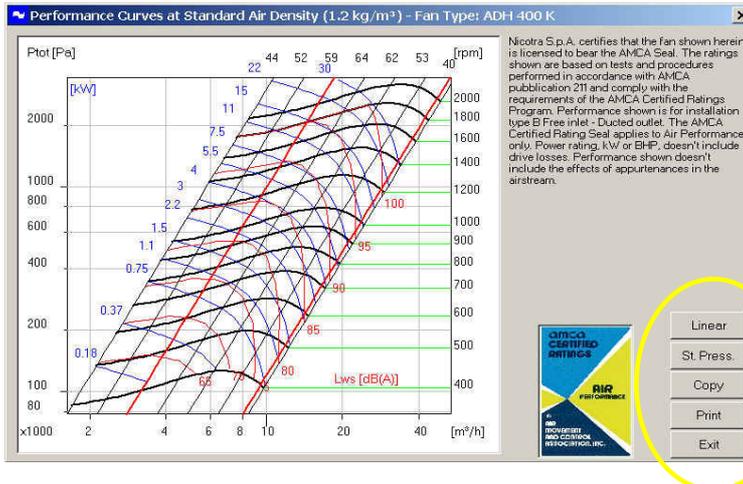
3.2.1.3 The Graph button:

The “Graph” button, in the Catalogue window, opens a new window showing the performance diagram of the selected fan (ratings are referred to installation type “B” and to the standard air density of 1.20 kg / m³ or 0.075 lbm / ft³).

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When a Licensed product is selected, the right side of the current window shows the AMCA Seal and the required qualifying statement. On the right bottom side of the current window, you can see five buttons (highlighted in yellow): starting from the top, the first button is identified either by the **Linear** or by the **Bilog** label, the second is identified either by the **St. Press.** or by the **Tot. Press.** label, the others are **Copy**, **Print** and **Exit**.

Linear / Bilog button: the layout of the performance diagram depends on the plot options. At the time of the first start-up, these options are set according to the selected system of units; if you choose Metric units, the diagram default is set to Logarithmic scales and Total pressure, if you choose U.S. customary units, the diagram default is set to Linear scales and Static pressure. Using the **Plot** option in the **Set-up** menu item, you can always change the default setting for diagram scales (either linear or logarithmic). Using the **Linear / Bilog** button in the diagram window, you can temporarily toggle the scaling mode used for each diagram. If the button shows the **Linear** label, the diagram is drawn using logarithmic scales and; pressing the button, the diagram scales will change to linear. The button label will then change to **Bilog**. Pressing again this button will reverse the change.

St. Press. / Tot. Press. button: the default value of the pressure shown on the performance diagram depends, again, on the plot options. Using the **Plot** option of the **Set-up** menu item, you can modify your default settings. Using the **St. Press. / Tot. Press.** button you can override defaults and toggle between static pressure and total pressure for each individual diagram. If the button shows the **St. Press.** label, the diagram shows total pressure values and, pressing the button, will be redrawn to show static pressure. The button label will change into **Tot. Press.**

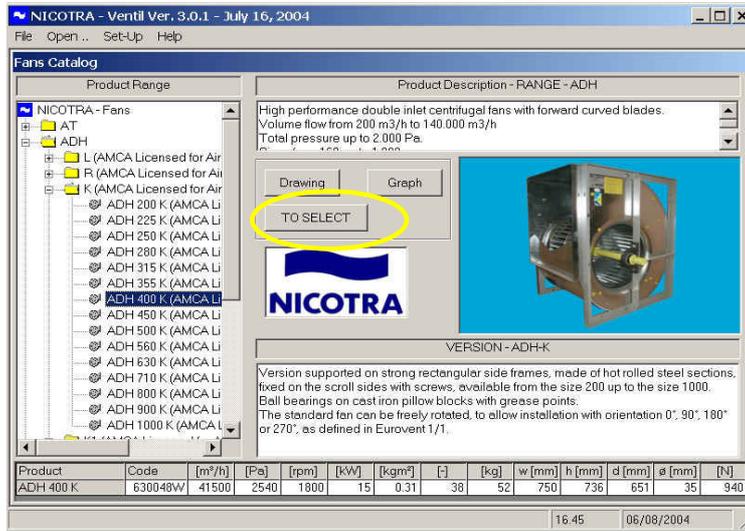
Copy: the “Copy” button is used to copy the performance diagram to the Clipboard.

Print: the “Print” button opens the same window opened by the **Print** button of the Drawing window, refer to page 11 of this manual for its description.

Exit: the “Exit” button closes the current window.

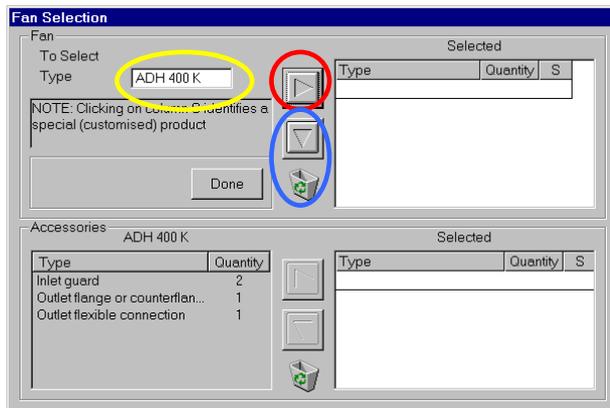
3.2.1.4 The button “TO SELECT”

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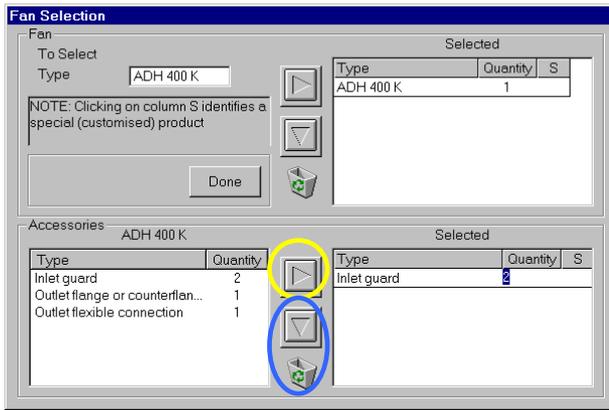
the button with the label “TO SELECT” opens a new window used to add the highlighted fan, together with any required accessory, to a “purchase list” which may be loaded into a standardised “request of offer”, to be sent to a Nicotra sales department, agent or representative.

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In the text box you can see the name of the fan currently highlighted in the product “tree”; the first step is to select the fan clicking on the upper button (highlighted in red). The name of the fan will appear in the first column of the upper table, the quantity (number of pieces to order) must be specified in the second, while the third is left to identify a special (customised) product. If you need to delete any item in the list, select it and click on the button placed above the waste-bin. Once you add the selected fan, the list of the available accessories will become active. You can select any accessory you may need clicking the button highlighted in yellow in the following picture.

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Each list of accessories is related with the fan model shown in the highlighted line of the fan list. Selecting different lines in the fan list will show different tables of selected accessories, one for each fan entry.

If you need to delete any item from a list of selected accessories, select the line in the list and click the blue circled button.

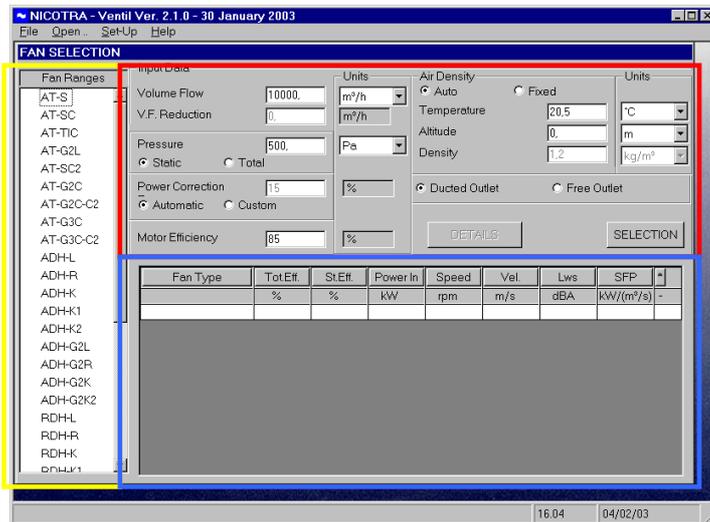
Once you have added all the items you need to your “purchase list”, close this window and return to the catalog, by clicking on the **Done** button; all you have selected will be added later on to your request of offer.

Suggestion: to order just an accessory, select a fan model to which the accessory applies, set the number of fans to 0 (zero) and then select the type and number of accessories you need.

3.2.2 The Selection Window

Selection: the **S**election command opens a new window, where the user may calculate and compare the performance of different fans, when providing a specified duty.

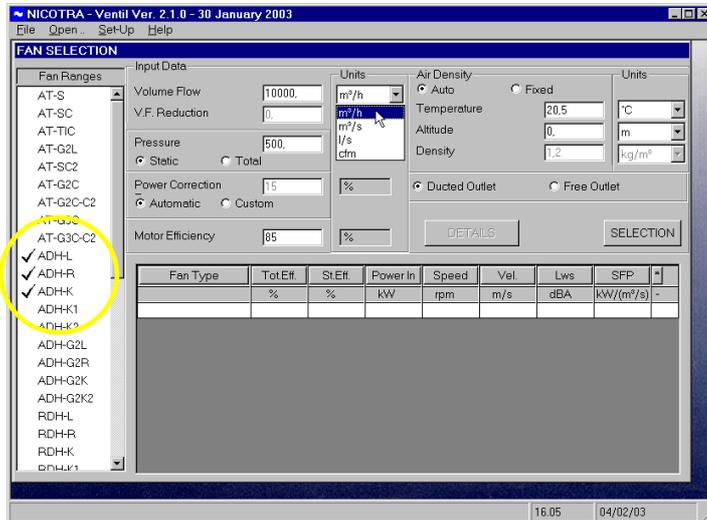
31



Inside this window, you can recognise three different areas: the yellow highlighted one, is a list of the available fan ranges and versions, the red highlighted section contains all the parameters required to define the operating point of the fan and the environmental data while the blue highlighted one is a grid where Ventil will write the list of all the fans, within the selected fan ranges, which may provide the specified performance.

The first step, during a selection, is to choose one or more fan ranges among those available, clicking on them with the left button of your mouse. For example you can select ADH-L, ADH-R, and ADH-K. Next you have to define the operating point in which the fan must work: you can start selecting the unit for volume flow (e.g. m³ / h) and its value (10000).

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Then you can choose the unit of pressure (e.g. Pa), the required pressure at duty point (e.g. 700 Pa) and specify if the pressure value refers to a static pressure or total pressure (i.e. including velocity pressure).

Beginning from Ventil 3.1.2, the selection window can now accept pasting (with the keyboard shortcut Ctrl-V) of a specified duty from a spreadsheet: a pair of side-by-side cells, containing a volume flow and a pressure value can be copied out of a spreadsheet. Pressing Ctrl-V when viewing the selection window will insert the two values in the appropriate cells, and move the focus to the "Selection" button, ready to press the "Enter" key and start the calculation. The selection of installation type, pressure type (either static or total) fan ranges and versions must be carried out before pasting the duty point. This feature is intended to simplify the calculation of a long series of different fans for different duties, avoiding any lengthy re-typing of values already listed into a spreadsheet.

The **Power Correction** value is a safety margin for minimum motor power, required to cope with drive power loss, small changes in the actual operating point and any difference between the design fan speed and the actual one produced by the selected motor and drive.

If the program is left in **Automatic** mode, it will automatically select the safety margin in accordance with the applicable Nicotra catalogue.

Sometimes, the motor must be selected with a specified safety margin, different from that automatically provided by Ventil. In this case, the user can specify "**Custom**" mode, and provide a percentage of power margin, between 0% and 100%.

The program will provide the Fan Shaft Power requirement, and then the "Minimum Motor Power", i.e. the fan shaft power value, plus the power correction margin. Both values are listed in the calculation results. Any motor capable of providing a power equal or higher than the minimum motor power is suitable for the application.

Please, note that this procedure applies to motors driving the fan through a belt drive, and run with a standard 50 or 60 Hz frequency supply.

Motors to be connected to the fan with a coupling, instead of a belt drive, or motors for direct driven single inlet fans (including plug fans / plenum fans), and having their speed controlled using a Variable Frequency Drive (Inverter Drive), must be selected with a different procedure. Consult the specific manual entitled "Selection of direct driven, frequency controlled fans", for guidance on this process.

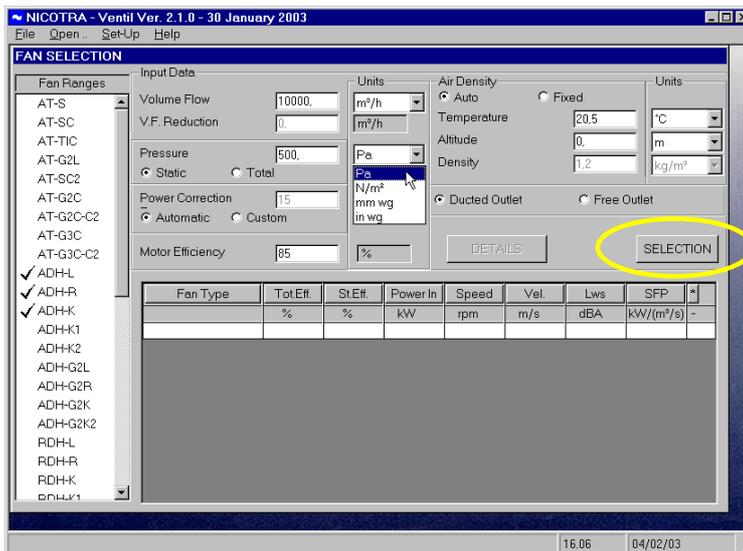
The **Motor Efficiency** value is the cumulative efficiency of the electric motor and coupling/belt drive, given as a percentage, or the ratio between the useful mechanical power, delivered to the fan shaft, and the electrical power absorbed by the motor, from the electrical line. It is given as a percentage. If required, the default value of 85% may be changed to a more specific value.

This Motor Efficiency is used to calculate the Specific Fan Power (SFP) value. The SFP is the expected electrical power consumption for each unit of volume flow, or the electrical power consumption divided by volume flow rate.

The air density may be provided in **Auto** or **Fixed** modes. With the Auto mode selected, you can change the units and values for both the Temperature and the Altitude (changing the unit first and then the value) and a new Density value will be calculated by Ventil (in this mode you don't have direct access to its value). If you choose the **Fixed** mode you have access to the Density value but not any longer to Temperature and Altitude. You can directly insert the new Density value, changing the unit first and then the value (as usual).

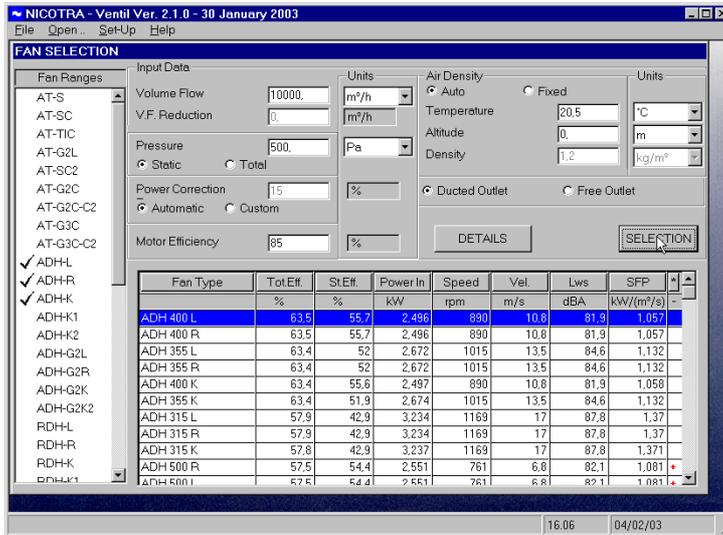
The last step is to choose if you are calculating fan performance for a Ducted Outlet (Installation category "B") or Free Outlet installation (Installation category "A") selecting the appropriate option.

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Once you click the **"Selection"** button the selection program fills the grid with all the fans, in the selected group of ranges and versions, matching your query.

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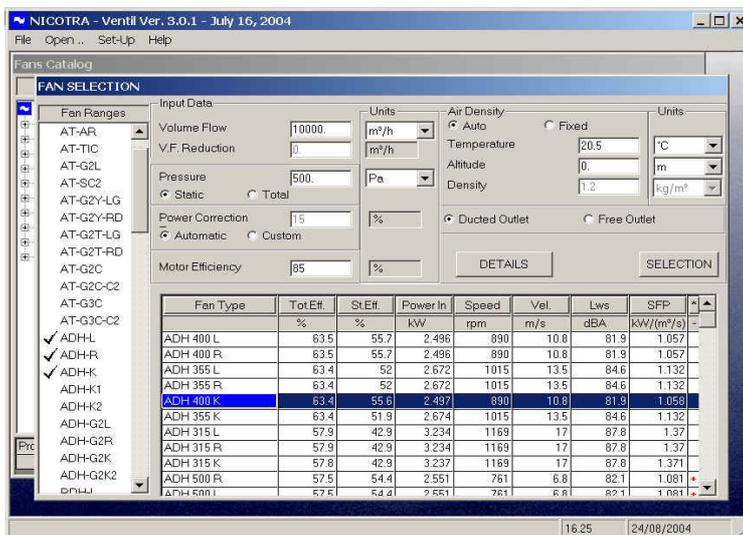


From left to right you find: the Fan Name (range – size – version), Total Efficiency, Static Efficiency, Fan Shaft Power, Fan Speed, Average Outlet Air Velocity, Sound Power Level, Specific Fan Power. The last column, which is used to notify an Out Of Limit problem, is either empty or filled with one of the following markers: +, - or *.

If the last field is empty, the fan works without any problem; a + symbol means that the selection point is on the left of the normal operation range, the fan still works but a smaller one is recommended; a – symbol means that the selection point is on the right of the normal operation range; the fan still works but, now, a larger one is recommended; a * symbol means that one of the safety limits: maximum speed, maximum power, minimum or maximum temperature, has been exceeded: either a different version or a specially modified product must be used! In case a suitable product cannot be found in the standard range, contact Nicotra for assistance.

By default the fan list is ordered by decreasing value of total efficiency. Every time you click on the label of the total efficiency column, you can reverse the order in which the fans are listed. The same rule applies to all the other columns: if you click on the label button of the speed column, for example, the fan list will be ordered by the speed values; by clicking again, you can reverse the order.

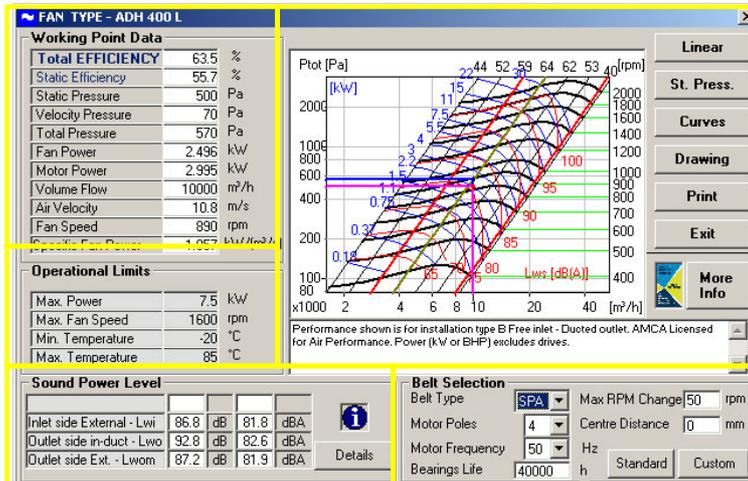
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To view details about the performance of a particular fan in the list, select the one you want to see (move your mouse pointer on its line and click the left button) and then click on the “**Details**” button (or, more quickly, double – click on the line); a new “Performance Details” window will open.

3.2.3 Performance **Details** Window:

36.1



There are five different areas inside this window; the first is the **Working Point Data** table, used to show the numerical values of the fan performance characteristics, when the fan is working in the specified condition.

The second area (located just below the **Working Point Data** table) shows the **Operational Limits** of the selected fan (exceeded values are shown in red).

3.2.3.1 Sound power level details

On the bottom left side of the window, you can see the **Sound Power Level** area: a four line grid provides the total sound power levels from the fan, either A-weighted (in dBA) or Un-weighted (in dB).

When fan performance is calculated for a ducted outlet installation (Installation category B), three different sound power level ratings are provided:

1. “Inlet side External – Lwi”, i.e. sound power level in the suction environment, diffused through the fan inlet/s and radiated from the scroll surfaces;
2. “Outlet side in-duct – Lwo”, i.e. sound power level inside the discharge duct;
3. “Outlet side External – Lwom”, i.e. sound power level outside the end of a short section of this duct, as specified in some testing procedures for AHUs.

When fan performance is calculated for a free outlet installation (Installation category A), only two sound power level ratings are provided:

1. “Inlet side External – Lwi”, i.e. sound power level in the suction environment, diffused through the fan inlet/s and radiated from the scroll surfaces;
2. “Outlet side External – Lwo”, i.e. sound power level outside the discharge flange of the scroll case.

In the top-right corner of this sound power level frame, a small icon reminds which noise calculation model is used for each fan range. If you move the mouse over the small icon over the icon, a pop-up text will show which type of noise calculation model has been used.

A new button, “**Details**” opens now a new window, listing the same total sound power level ratings already seen in the main window, but showing also the eight octave-band sound power levels for each type of noise rating. These octave band ratings are un-weighted sound power levels, in dB referenced to 10^{-12} W.

36.2

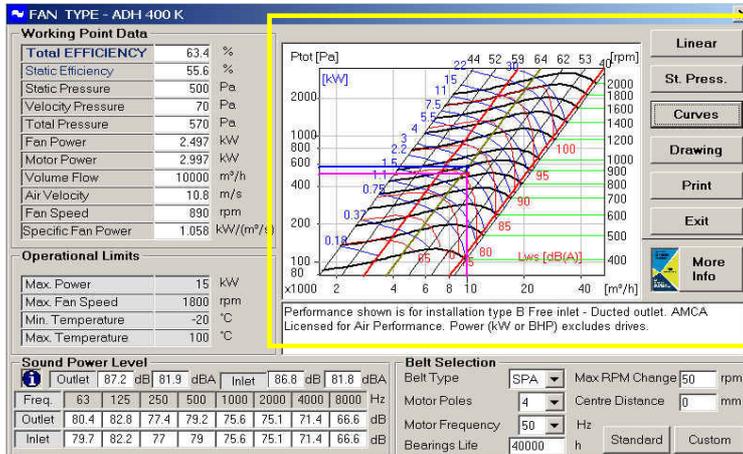
Sound Power Level													
Lw													
Frequency	63	125	250	500	1000	2000	4000	8000	Hz	Total	A/w Total		
Inlet side External - Lwi	79.7	82.2	77	79	75.6	75.1	71.4	66.6	dB	86.8	dB	81.8	dB(A)
Outlet side in-duct - Lwo	90	87.9	79.4	79.8	75.8	75.2	71.4	66.6	dB	92.8	dB	82.6	dB(A)
Outlet side Ext. - Lwom	80.4	82.8	77.4	79.2	75.6	75.1	71.4	66.6	dB	87.2	dB	81.9	dB(A)

From the main Details window, pressing the key combination Ctrl-C copies the working point and sound power level data (including octave band sound power levels) into the clipboard, so you can paste them into a document or a spreadsheet.

3.2.3.2 Performance Diagram and additional information

The top-right area in the **Fan Details** window contains the performance diagram:

43



The thick black lines show either Total or Static Pressure (depending on the diagram set-up options) vs Volume Flow Rate curves at a constant fan speed [rpm], shown on the right side of the diagram. Pressure and volume flow units are the same specified in the selection window. The thin black inclined lines show constant values of efficiency. Their values are written over the top of the diagram. The thin red lines show constant values of Sound Power Level; the numerical value corresponding to each line is written close to the right end of each curve [dB(A)]. The blue lines mark constant values of shaft power; the numerical values [kW or HP] are written close to the left end of the curves.

The two thick red straight lines are the borders the normal operating range of the fan.

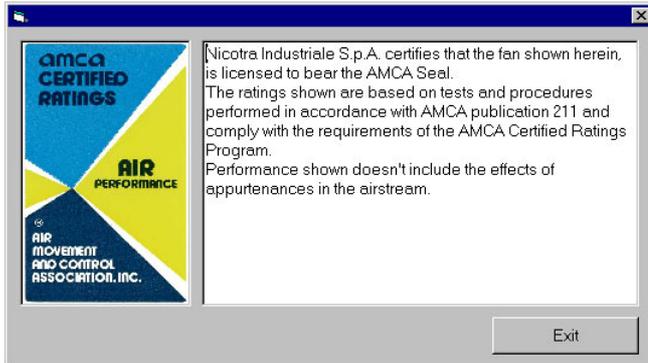
The upper horizontal line, from the operating point to the Pressure axis, shows the Total Pressure value; the lower horizontal line shows the Static Pressure value, while the vertical line marks the Flow Rate value. The thick green straight line indicates the parabolic system line.

If you want to change the selection point, you can do it without leaving this window. Just move the mouse to the new point on the diagram, click the left button and wait a little.

When you click outside the operating range of the fan, the pointer is relocated in the original working point.

If you are viewing data about a Licensed fan, on the bottom of the diagram field, you will find a text box showing primary information about the Licensed product. On the top right side of the text box there will be a small AMCA Seal and a button labelled “**More Info**”. If you press the “**More Info**” button the following window will open.

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The text box contains additional information about the Licensed product. If you press the “**Exit**” button you go back to the Fan Details window.

On the top right side of the Fan Details window, besides the diagram, you can see six buttons; starting from the top: the first button is identified either by the **Linear** or th **Bilog**. label, the second is identified by the **St. Press.** or by the **Tot. Press.** label, the third is the **Curves** button, the fourth is the **Drawing** button, the fifth is the **Print** button and the sixth is the **Exit** button.

3.2.3.3 Changing the format of the performance diagram

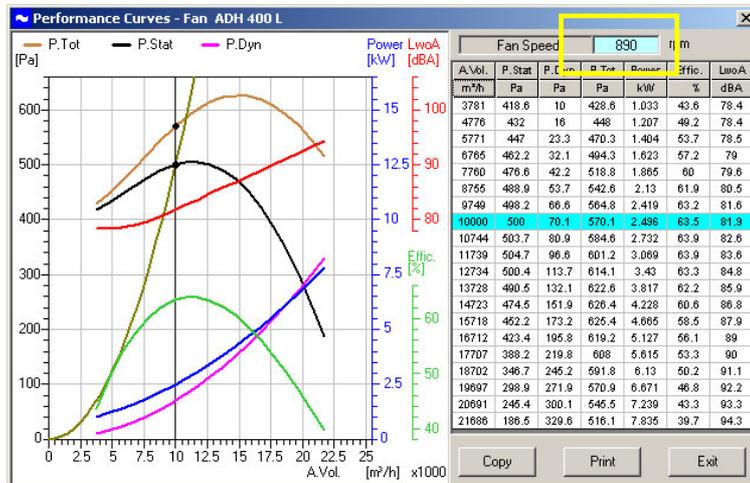
Linear / Bilog button: the default scales used to draw the performance diagram depend on the plot options. At the time of the first start-up, these options are set up according to the units selected; if you choose Metric units, the diagram default is set to logarithmic scales and total pressure, if you choose U.S. customary units, the diagram default is set to linear scales and static pressure. Using the **Plot** option of the **Set-up** menu item, you can always change the default setting for diagram scales (linear or logarithmic) and type of pressure. Using the **Linear / Bilog** button in the diagram window, you can temporarily toggle the scaling mode used for each individual diagram. If the button shows the **Linear** label, the diagram is presently drawn using logarithmic scales and; pressing the button, the diagram scales will change to linear. The button label will then change to **Bilog**. Pressing again this button will revert the change.

St. Press. / Tot. Press. button: the default value of the pressure used to draw the performance diagram depends, again, on the plot options, either set up at installation time, or modified using the **Plot** option of the **Set-up** menu item. Using the **St. Press. / Tot. Press.** button you can toggle between static pressure and total pressure for each individual diagram. If the button shows the **St. Press.** label, the diagram is showing total pressure values and, pressing the button, may be redrawn showing static pressure. The button label will change into **Tot. Press.**

3.2.3.4 Constant Speed curves

Curves: the “Curves” button opens a new window.

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On the right side of this new window there is a table listing the fan performance curves at the specified speed (shown inside the text box on top of the window). You can see values for Flow Rate, Static Pressure, Dynamic (Velocity) Pressure, Total Pressure, Mechanical Power, Total (Mechanical) Efficiency and Sound Power Level. The line with the original duty point is highlighted with a light blue background.

On the left side there is a graphical representation of the numerical data described above.

Two keyboard shortcuts are now available, “Ctrl-O” and “Ctrl-I”, to switch both the diagram and the table to show respectively outlet side LwoA and inlet side LwiA .

For outlet side Lw, in a ducted installation only, the kind of noise rating shown both in the diagram and in the data table is currently LwoA sound power level inside the duct, for fans having noise ratings calculated in accordance with the AMCA 301 standard, and Lwoma “outside the duct end” noise ratings for these fans where the noise ratings are calculated in accordance with BS 848 Part 2 Annex G.

On the bottom right side of this window you there are three buttons: **Copy**, **Print** and **Exit**.

Copy: the “Copy” button writes the numerical data into the Clipboard.

Print: the “Print” button opens the **Print Options** window previously described on page 11. This command will print out a page with a copy of the diagram and of the data table as well.

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Printer: Acrobat Distiller

Customer:

Project:

Reference:

Notes:

Print

Printer SetUp

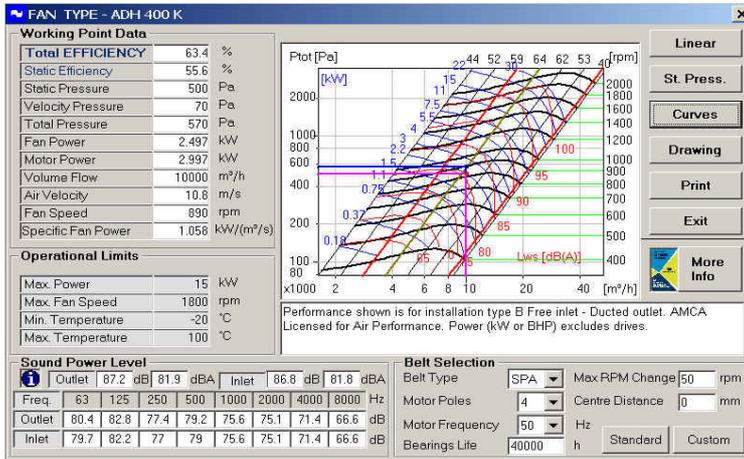
Exit

Exit: the “Exit” button closes the current window and brings you back to the previous one.

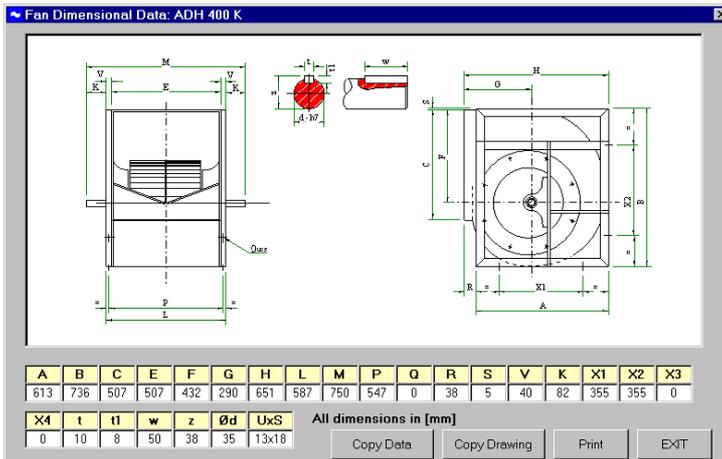
3.2.3.5 Drawings and Printouts

Drawing button: Back in the main “Details” window, the “Drawing” button opens the same window we introduced on page 11, designed to show the fan drawing, with dimensional data.

47

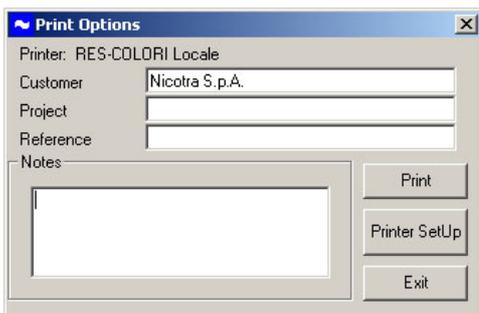


48



Print: the “Print” command produces a printout made of a single page with the performance of the selected fan in the specified condition, a performance diagram, with the duty point suitably marked, and a drawing of the selected fan, with the applicable dimensions. A click on the “Print” button opens the **Print Options** window described on page 11. Here a fourth text field is made available, to add a few lines of explanatory notes to each performance printout. If the fan was selected, for any reason, outside of its safety limits, a warning string will be written inside this area.

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Exit: the “Exit” button closes the “Performance Details” window and brings back to the main selection window.

3.2.3.6 Calculation of a Belt Drive

On the bottom right side of the window you can find the **Belt Selection** area.

This part of the Ventil Selection program provides a powerful set of functions, to assist with proper design of a belt drive to be used with one of the Nicotra belt-driven fans.

To select a belt drive, the first step is to choose the type (number of poles) of the electric motor. Four pole motors are more readily available, are normally cheaper and have a better efficiency than motors with other pole numbers, but sometimes a four pole motor (running approximately at 1450 or 1750 rpm, at 50 or 60 Hz respectively) may lead to odd drive ratios. Generally speaking, the nearer the speeds of the motor end fan shafts, the better the efficiency of the drive. Motor cost and availability may have a significant weight in the final motor choice as well.

The only exception to this rule is sometimes for low power, fast running fans (above 2500 rpm), where a four poles motor may sometimes be preferred to a two poles motor, even if this may require a 4:1 or more drive ratio, to get rid of the high vibrations often produced by the 2 poles motor, and bring the frequency of the motor-induced vibrations below the acoustic frequency range, keeping the mechanical noise as low as possible.

The motor supply frequency (50 or 60 Hz) is clearly dictated by the standard of the available electrical supply. Motor data contained inside Ventil is typical of the IEC normalised motors designed for 50 Hz operation. The alternative 60Hz motor performance data is typical of the same motors when used with 60 Hz supply.

Having chosen the motor, the following step is the choice of the motor position: on the mounting base, besides the scroll (i.e. on the opposite side of the belt plane, motor positions X or Y, according to ISO and AMCA standards), on the same base, behind the scroll (e.g. mounting position W, according to the same standards), on top of the fan frame, or even piggyback on the scroll (for light duty applications only).

An estimate of the shaft distance should be inserted to have a more reasonable approximation of the drive design. If the default 0 value is left unchanged, Ventil will calculate the smaller physically possible distance (sum of the radii of the pulleys, plus a margin for fitting and tensioning the belts). This will produce a conservative estimate of the drive power capacity. For a motor mounted on the same base plane, behind the scroll (motor mounting position W, the most frequent case inside AHUs), a shaft distance estimate equal to 1.3-1.5 times the impeller diameter gives a close approximation. The resulting drive will show a better power capacity than that calculated with the pulleys as near as possible, thanks to the different angle formed between the straight legs of the belt or belts.

The final step is the choice of **Belt Type**. Belt manufacturers provide nice selection diagrams, guiding the choice to SPZ, SPA, SPB and SPC belts, according to the speed of the faster drive of the shaft, and to the design power (nominal power of the motor multiplied for a drive service factor).

As a service factor, Ventil uses by default a value equal to 1.3, appropriate for continuous duty, smooth running fans, driven by electric motors.

In practice, a rough but effective rule of thumb is to use SPZ when the design power is not more than 2 kW; to use SPA between 1 and 10 kW, SPB between 7.5 and 37 kW, and SPC only for 30 kW and above. This is not an absolute rule, but is satisfactory in most applications. Other appropriately engineered choices may still work effectively, anyway.

The “**Bearings Life**“ figure is the desired design life of the bearings, L_{10h} (mechanical design life to 10 % of failures, in hours of operation). Drives providing a calculated life much shorter than the specified value will be discarded from the table of results. A default value of 40000 h is set, but may be modified if required.

The only other input parameter is the maximum allowed difference between the desired fan speed and that achievable with the acceptable drives. A 50 rpm margin is set, but sometimes this may be too small, when selecting drives for very fast fans (3000 rpm and above). If the calculation should not provide any result, try increasing this value, e.g. to 300 rpm.

When you have configured all the parameters, you can click either the **Standard** button or the **Custom** button.

At the first attempt to calculate a suitable drive, the use of the Standard procedure is recommended.

If you click the **Standard** button, Ventil will look for all the standard belt drives satisfying your requirements, and the result of your query will be shown into the following window: a list of alternative drive designs is provided in the grid at the bottom of the window.

37

The screenshot shows a software window titled "Belt Selection - FAN TYPE - ADH 400 K". It is divided into several sections:

- Belt Details 125/200 x 1 SPA:** A table of parameters for the selected belt drive.

Belt Type	SPA	Belt Speed	9.3 m/s	Static Shaft Load	448 N
Belt Number	1	Design Power	3.9 kW	Static Belt Tension	226 N
Belt Length	1082 mm	Max Allowed Power	4.332 kW	Test Belt Deflection	9.9 mm
Centre dist.	281 mm	Dynamic Shaft Load	616 N	Test Force	50 N
- MOTOR:** Parameters for the motor.

Pulley Diameter	125 mm
Shaft Diameter	28 mm
Conical Bush Code	1610
Bearings Life	112505 h
Nominal Power	3 kW
Nom. Motor Speed	1415 rpm
Poles Number	4
Frequency	50 Hz
- FAN:** Parameters for the fan.

Pulley Diameter	200 mm
Shaft Diameter	35 mm
Conical Bush Code	2012
Bearings Life	608297 h
Required Power	2.997 kW
Fan Speed	884 rpm
Fan Speed Change	-6 rpm
- New Working Point:** Performance metrics.

Static Pressure	494 Pa
Velocity Pressure	69 Pa
Total Pressure	563 Pa
Fan Power	2.45 kW
Volume Flow	9936 m³/h
Sound Power Level	81.7 dBA
- Required Point:** A table with columns for "Fst" (500 Pa) and "V" (10000 m³/h).
- Belt Selection:** A table listing alternative drive designs.

Grooves	Mot Pul. mm	Fan Pul. mm	Speed rpm	Bear. Life h	Centre dist. mm	B Length mm	Per Vel. m/s
-	125	200	884	608297	281	1082	9.3
1	132	200	934	687477	296	1120	9.8
1	140	224	884	857829	327	1232	10.4
1	150	250	849	1083368	340	1320	11.1
1	160	250	906	1256714	373	1400	11.9
1	180	280	910	1780525	412	1557	13.3

The numerical data in the top highlighted region refers to the belt drive selected in the lower grid. If you select a new line, all the numerical data will change, according with the new selected drive. Again, pressing the key combination Ctrl-C copies the belt selection data into the clipboard, so you can paste them into a document or a spreadsheet.

The choice of the preferred drive, among the calculated alternatives, may change according to the priorities of the designer.

The first calculated parameter to look at, is the calculated life of the fan bearings and motor bearings. Nicotra recommends that the L_{10h} calculated life should be equal or exceed 40000 h, for continuously running fans, and above 20000 h for fans running occasionally (not for fans running with frequent start and stop cycles; these are MORE stressing on the bearings than a continuously running fan). Fans with a drive design life much shorter than the proposed values would easily be too much prone to failure in case of any installation or maintenance error or mistake.

Sometimes the motor bearings have a shorter life than those of the fan side. Some motors may be ordered with stronger roller bearings, instead of the standard ball bearings on the drive side, to provide a longer life under the heavy radial load applied by a belt drive.

Please, note that the calculated life is just a theoretical estimate of the fatigue life of the metal components of the bearings. Grease contamination, improper installation, transport or

maintenance, or the use under unexpected loads or vibrations, may considerably reduce the real life of the bearings. The life of the grease inside the bearings, particularly for heavy-duty applications, may be considerably shorter than the life of the metal parts: these bearings require periodic re-lubrication.

Consult the Nicotra Fan Installation and Maintenance Manual for guidance on these subjects.

The second parameter which must be checked, when evaluating alternative drives, is the actual fan speed: using standardised pulley diameters, the choice of fan speed is restricted to finite speed steps. The actual fan speed may differ, more or less, from that required to achieve the original duty. Some combinations of pulley diameters may provide a closer approximation than others. The acceptable amount of deviation must be evaluated against the existing design allowance. When the fan speed is INCREASED above the original duty speed, the fan power requirement increases as well, and the motor power should be re-checked, to be sure that it can still bear the increased load with an acceptable margin.

The final choice is a combination of pulley diameters and belt numbers: smaller diameter pulleys, to transmit the same design power require more belts in parallel, and apply a higher load on the bearings, reducing their useful life. On the other side, single belt pulleys provide the best bearing life, but may have unacceptably large diameters. Another factor, limiting the maximum pulley diameter, is the peripheral velocity of the pulleys: there is a maximum permissible value, guaranteed by each pulley manufacturer, which must not be exceeded. The ideal choice is frequently selected looking also at the cost and availability in stock of the required pulleys, bushings and belts.

An important warning regards the maximum number of belts to be used: the selection program calculates the permissible drives under the assumption that the belts will be tightened exactly as much as required to transmit the design power, but drives with a large number of belts are prone to frequent over-tightening, especially by inadequately trained field maintenance personnel. Drives with a high number of parallel belts are also more difficult to tension evenly, and this also may lead to over-tensioning.

To prevent overstressing too easily the mechanical structure of its fans, Nicotra recommends a maximum number of belts to be used in parallel, according to the fan model and its mechanical toughness.

The following table summarizes the maximum recommended number of belts for different product ranges and versions.

Detailed and updated values are always contained inside the latest print catalogues for each product range.

Fan Range	Maximum Number of Belts		
	2	3	4
AT	S SC CG2L SC2	AR TIC G2C G3C	G2C-C2 G3C-C2
ADH	L R G2L G2R	K K1 G2K	K2 G2K2
RDH	L R	K K1 G2K	K2 G2K2
RDA	L R	K K1 G2K	K2 G2K2
ASH	L R	K T	K1 T1
RSH	L R	K T	K1 T1

Drives with a higher number of belts may be satisfactorily calculated and also effectively used in practice, but their installation and maintenance require specific competence and care to prevent mechanical problems.

In the bottom right side of the Drive Details window there are three buttons: **Save**, **Print** and **Exit**.

Save: the “Save” button saves the selected motor data; you can use these informations as start-up values for a subsequent Custom selection of the belt drive, from the main Performance Details window.

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Print: the “Print” button opens the printout control window previously described on page 11. This command will produce a printout of the selected belt drive components and performance.

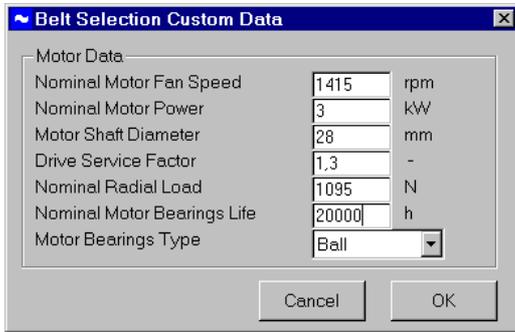
39

Exit: the “Exit” button closes the current window and brings you back to the previous one.

40

Custom: back to the main Performance Details window, after saving the results of a standard belt selection, the **Custom** button opens a new window designed to let you customise your belt drive design parameters:

41



The different fields of this window are filled up with default values, taken from the standard drive selection. These may be changed according to specific needs.

A typical case is when a two-speed motor must be used. These motors often use a larger frame size and shaft diameter than a standard, single speed motor of the same power. The shaft diameter may be corrected accordingly, to select the proper conical bush size.

The drive service factor may have to be changed, either because of a specific design requirement, or because the fan must be selected for frequent start and stop operation. In this case, the drive service factor should be increased from the standard 1.3 to 1.6 at least. Please, note that frequent start and stop cycles may also overstress the fan itself; In such a case, contact Nicotra to check whether the fatigue life of the fan, under the proposed start and stop cycles, may still be acceptable.

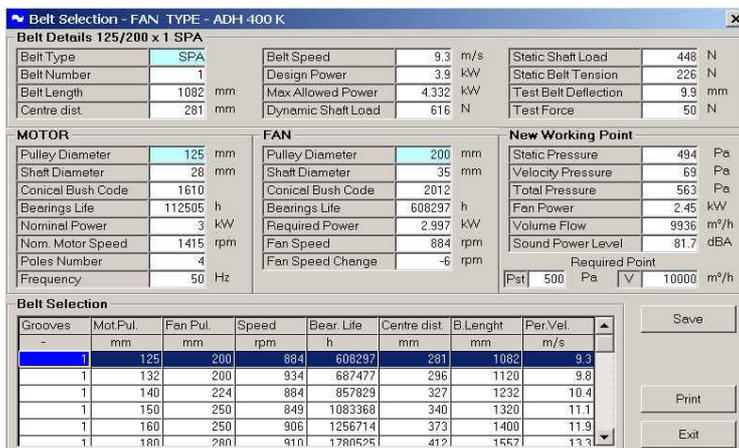
The actual life of the motor bearings may change according to the motor design from each manufacturer, or when heavy-duty optional roller bearings are mounted on the motor.

To achieve a more reliable life calculation of the motor bearings, insert the combination of reference radial load and corresponding bearing life, provided by the motor manufacturer, in the fields for “Nominal Radial Load” and “Nominal Motor Bearing Life”, and select the proper type of rolling elements (either balls or rollers), before proceeding further.

If data from a previous Standard selection was not previously saved, the **Custom** button will open the same window, but with all the fields empty. Enter all the required data and then press the **OK** button to start.

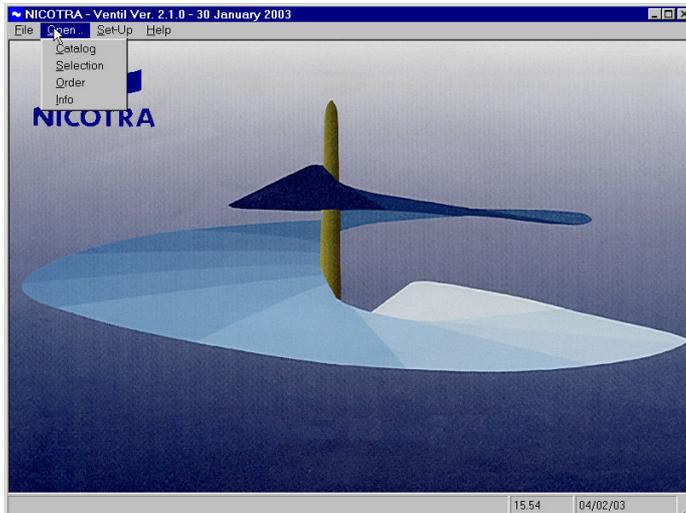
The selection program will look for all the belt drives satisfying your request and will show them as a list of alternative belt drives, like in a standard drive selection.

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3.2.4 The Order Window

50



Order: the “Order” command opens a new window, shown in the following picture, where the user can fill up a standardised “Request of Offer” form.

51

Requested Products			
Standard Products			
Code	Description	Quantity	Date
630026w/	ADH 315 R	2	15-09-05
R45047T	Inlet guard	4	15-09-05
R45072T	Shaft end guard	2	15-09-05
R60507A	Outlet flange or counterflar	2	15-09-05
RG0406T	Outlet flexible connection	2	15-09-05

Special Products			
Code	Description	Actual Quantity	Annual Quantity
632006w	RDH 315 L	1	25-09-05

Notes for RDH 315 L
 Double layer Epoxy Paint coating.
 Stainless steel shaft and bolts.

This window can be split into three areas named: **Receiver and Sender**, **Prescription** and **Requested Products**.

The upper left area (**Receiver and Sender**) contains the name and address of the Sender, and the address of the nearest Nicotra Sales Department; this may be selected in the list of Nicotra subsidiaries available inside the **Receiver** combo box. In the lower text box, you can see Sender data; this contains, by default, the same data entered in the **User Data** window. If nothing was inserted in this window, the text box will be left empty. To enter or modify the Sender name and address, click on the **Modify Sender** button, to open the following window.

52

User Data

Company

User Name

Address

Town

State

Country ZIP

Tel. Fax

E-mail

Fill in or update the appropriate fields and click the **OK** button to confirm.

Back in the “Offer Request” window, the left side of the **Prescription** field shows four common “out of standard” requirements; you can select one or more items between the available options: specify labeling of each product with a serial number, ask for any special accompanying documents (to be detailed in the “Notes for” field), ask for a customised packaging or for accompanying test results. Please confirm the existence of any additional document (attachments), which may be part of the specifications, selecting the **Yes** option on the right side of the **Prescription** field.

In the bottom left side of the window there are three buttons: **Load data**, **Modify** and **Print**.

To prepare a request of offer, the form must be filled up with the list of the products identified and selected through the Catalogue window, and the “**TO SELECT**” button in the catalogue, as described on page 14.

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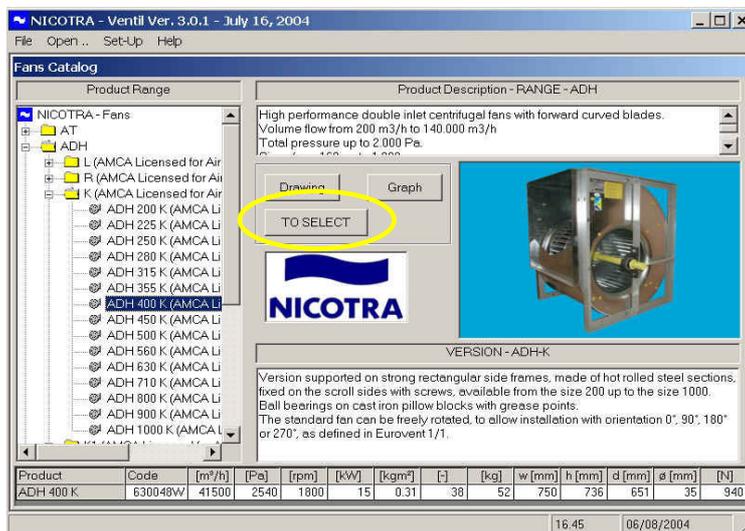


FIGURA 4

Load data: the “Load data” button fills the right-hand part of the current window with the list of the required products. It may be used to update the list when new items have been selected from the catalogue.

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Offer Request

Receiver and Sender
Receiver: NICOTRA S.p.A.
NICOTRA S.p.A.
I - 24040 Zingonia (BG)
Via Modena, 18
Tel. 0356731111 Fax: 035984319

Sender: Northern Territories Ltd
UK - JV 257 CV Fantasytown ()
Black Lake Road, 24
Tel. +44 395 285 - Fax: +41 456 789
E-mail: mlamb@fantasy.com

Date: 26/07/2005 Modify Sender
User Name

Prescription
 Product with S/N
 Accompanying Documents
 Customised Packaging
 Tests

Annexes
 Yes
 No

Requested Products

Standard Products			
Code	Description	Quantity	Date
630026W	ADH 315 R	2	15-09-05
R45047T	Inlet guard	4	15-09-05
R45072T	Shaft end guard	2	15-09-05
R60507A	Outlet flange or counterflar	2	15-09-05
RG0406T	Outlet flexible connection	2	15-09-05

Special Products			
Code	Description	Actual Quantity	Annual Quantity
632006W	RDH 315 L	1	25-09-05

Notes for RDH 315 L
Double layer Epoxy Paint coating.
Stainless steel shaft and bolts.

Load data Modify Print

The text box labelled **Notes for**, on the bottom of the **Requested Products** field, is used to specify additional requirements, when a product or accessory is listed as “Special”, or modified from a standard configuration, and its line in the list is highlighted. Each “Note” refers to a specific product or accessory item.

Anything you write inside this text box will be printed on the “Request of Offer” form, below each line containing the code and description of the standard product quoted as a reference.

Modify: the “Modify” button opens the same Fan Selection window, already used to add items to the purchase list from the catalogue; here it may be used to change number of pieces, remove items, or mark them as “Special”, or modified products.

55

Fan Selection

Fan

To Select

Type	Quantity	S
ADH 315 R	2	
RDH 315 L	1	S

NOTE: Clicking on column S identifies special (customised) product

Done

Selected

Type	Quantity	S
ADH 315 R	2	
RDH 315 L	1	S

Accessories: ADH 315 R

Type	Quan...	S
Inlet guard	2	
Shaft end guard	1	
Outlet flange or counterfla...	1	
Outlet flexible connection	1	

Selected

Type	Quantity	S
Inlet guard	4	
Shaft end guard	2	
Outlet flange or counterflar	2	
Outlet flexible connection	2	

Ventil312-55.0-ENU.tif

You can delete any fan and/or accessory in your list, by selecting it and clicking on the dustbin button, or mark/unmark them as special, customised versions.

Print: the “Print” button opens the usual **Print Options** window, already described on page 10.

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Print Options

Printer: Acrobat Distiller

Customer

Project

Reference

Notes

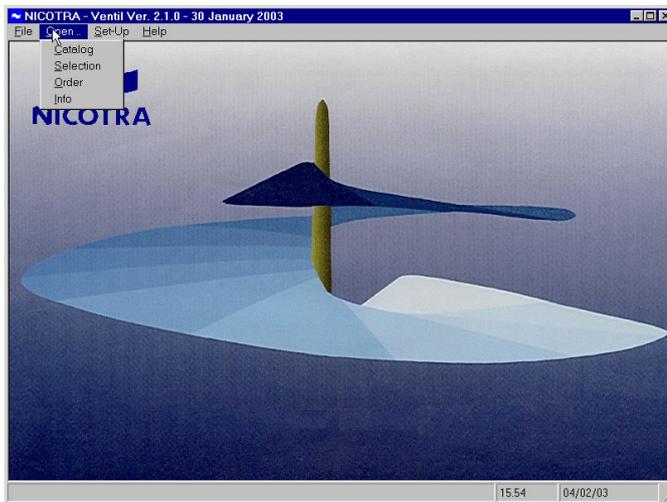
Print

Printer SetUp

Exit

3.2.5 The **Info** Window:

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The **Info** command opens a new window, showing an interactive HTML document, containing a brief description of the Nicotra Group of companies, its products and structure.

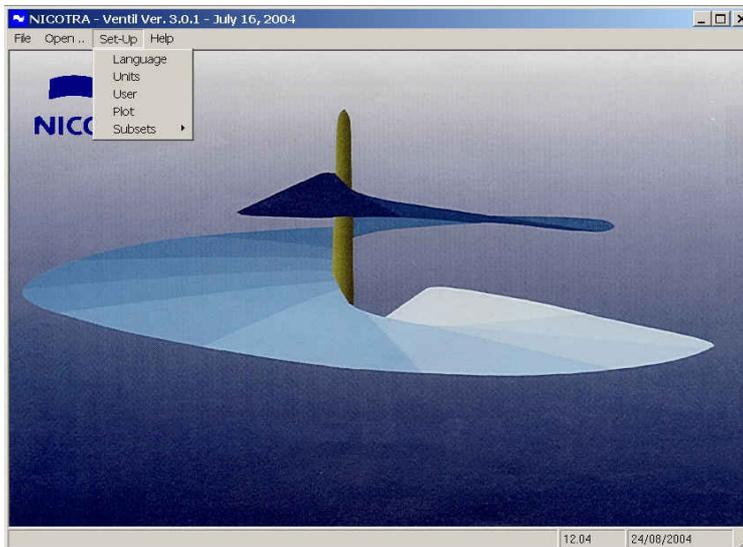
58



3.3 The Set-Up menu

When you click on the Set-Up item , the Set-Up menu shows five commands: Language, Units, User, Plot and SubSets.

59



Language: the “Language” command opens a new window, used to select the language in which the selection software will work.

60

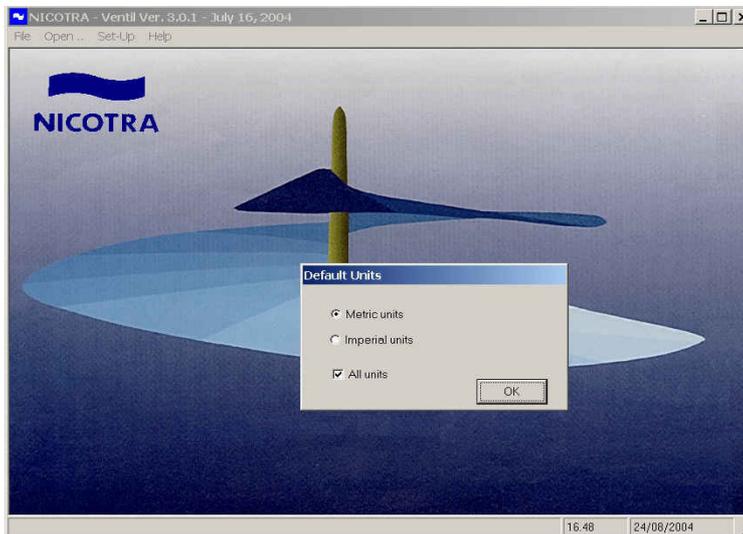


There are five different languages available by default: Deutsch, English, Español, Français, Italiano; the last option (Custom) is normally disabled. The language can always be changed at run time: you can make your selection work in your preferred language, and then switch language before printing any result (e.g. to the customer's preferred language).

The Custom option was developed to let the selection software work with any additional language, provided it is written with latin characters. To enable this option, you must copy into the same directory of the executable file (Ventil.exe) a special nic_lang.ini file containing a full translation of all the strings which the software needs to work correctly.

Units: the “Units” command opens a new window, where the user can select either Metric or Imperial units. A check box, which is normally selected, extends the change to all the units, including those selectable through individual pull-down menus in the selection window, providing a way to reset all the units to a coherent default with a single action. Deselecting this check box will change only those units which cannot be modified individually (like in older versions of Ventil). The selected units will be saved at program shut-down and re-called at the following start-up.

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User: the “User” command opens a window where the user can register his/her name and address, or “User Data”. This information will be used, by default, in the printout headings.

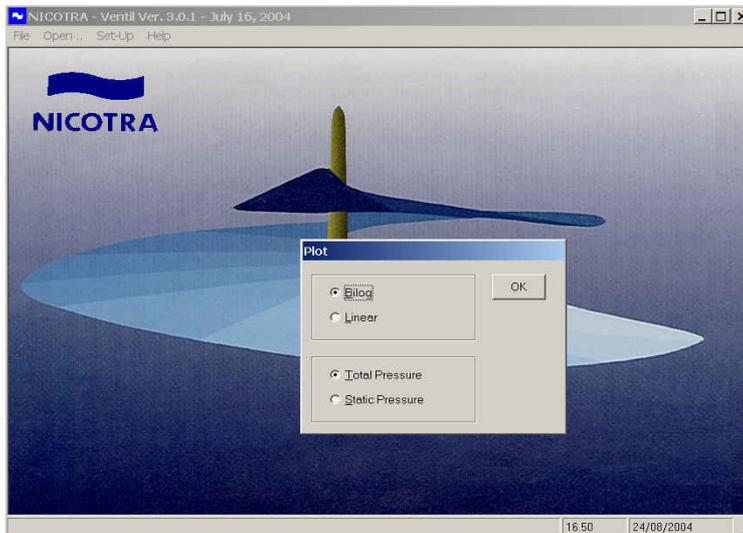
62

User Data	
Company	<input type="text"/>
User Name	<input type="text"/>
Address	<input type="text"/>
Town	<input type="text"/>
State	<input type="text"/>
Country	<input type="text"/> ZIP <input type="text"/>
Tel.	<input type="text"/> Fax <input type="text"/>
E-mail	<input type="text"/>
<input type="button" value="OK"/>	

The fields in this window may be left empty. The software will work anyway.

Plot: the “Plot” command opens a new window used to change the default configuration of the performance diagrams, selecting either static or total pressure, and linear or logarithmic scales.

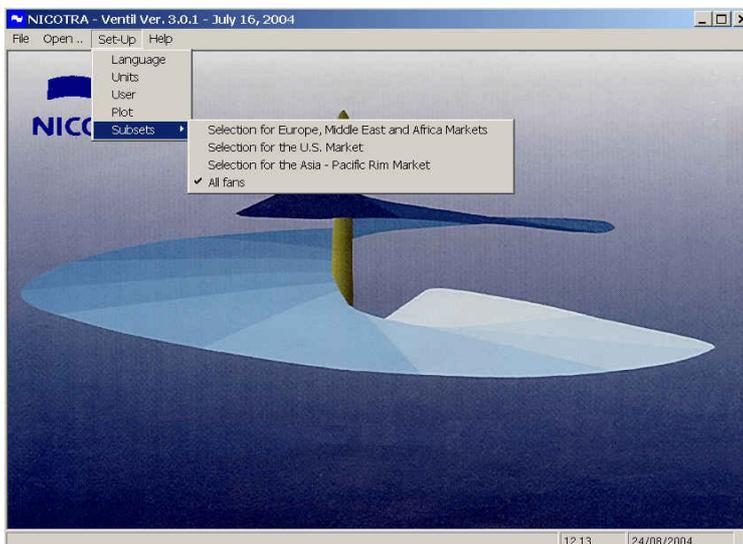
63



These options are set up at the time of the first start-up, according to the type of units selected. When the user selects metric units, the diagram default is set to total pressure and logarithmic scales. When the user selects U. S. customary units, the default options are set to static pressure and linear scales. These defaults can be changed at any time through this menu option.

Subsets: the “Subsets” command opens a submenu used to change the subset of products to be shown in the Catalogue and Selection windows.

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This is used to reduce the scope of the program to a more manageable size, by hiding products which may not be normally available on specific markets. A final option, "All products", shows the complete program scope.

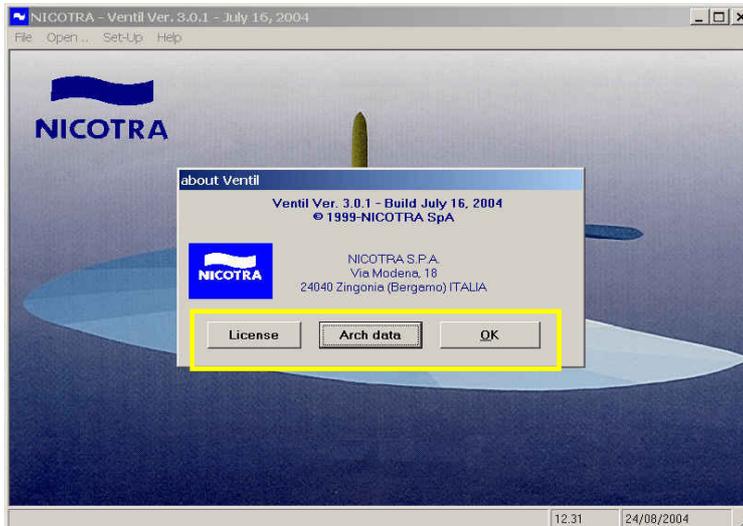
3.4 The Help menu

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The Help menu shows only one item: **about Ventil**. When you click on this item, a new window will open on the screen, showing three buttons: **License**, **Arch data** and **OK**.

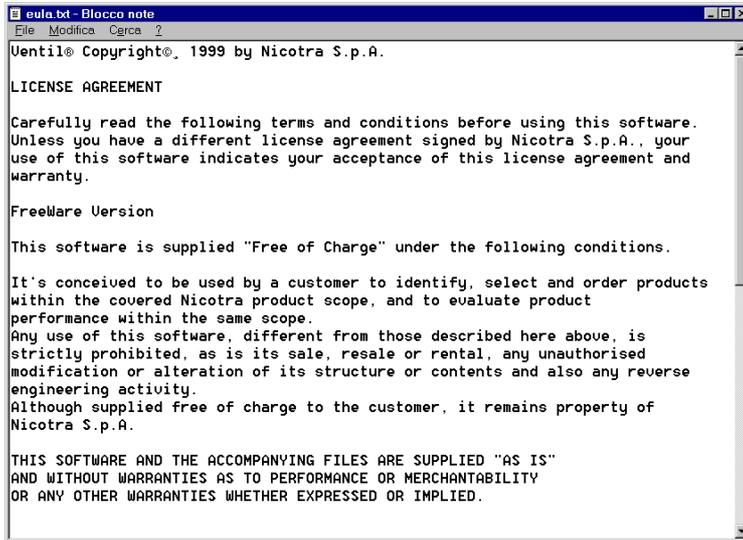
66



OK button: the **OK** button will just close the current window.

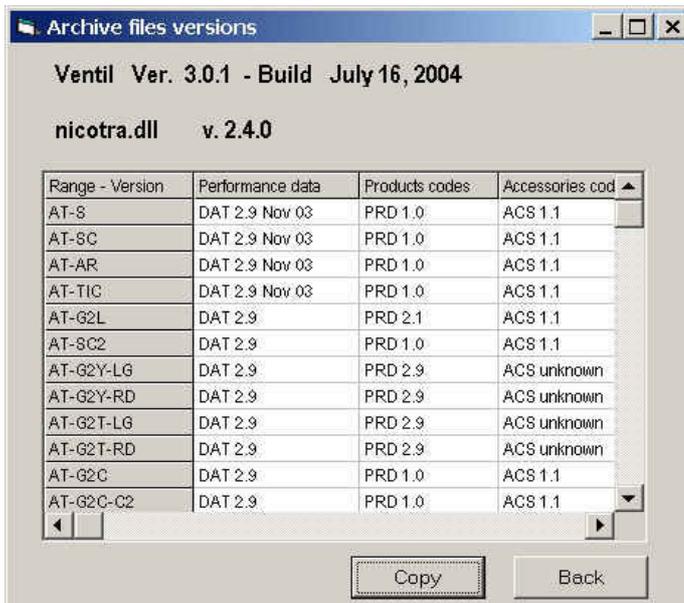
License button: the **License** button will open the Notepad program, to show the text of the license agreement for Ventil.

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Arch data button: the **Arch data** button will open a special window, showing a detailed list of all the archive files available. This information may be useful in case of technical problems, to help Nicotra to identify the source.

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On the bottom of this window there are two buttons: **Copy** and **Back**.

Copy: the “Copy” button will copy the archive data into the Clipboard. They can then be pasted into a document or e-mail, for later analysis.

Back: the “Back” button closes the window and brings you back to the previous one.