

Hydraulic Investigator 2

"When pumps stop, so does everything"

Johnson Pump

SPX Process Equipment NL B.V., part of SPX Flow Technology segment, designs, manufactures and markets Johnson Pump Brand pumps. The tradition in the pump industry goes back to the 19th century and combines a high level of technological know-how with long lasting quality pumps. SPX Process Equipment NL B.V. is one of a few pump producers in the Netherlands for centrifugal pumps. We have an outstanding Research & Development department and a test bed to perform all the tests required. The design standards for our centrifugal pumps are EN (DIN), ISO and API. The rule for assembly is: one person one pump. In our assembly cells, highly skilled employees have everything needed within reach. Within a short time, they can assemble most common required variations exactly according to customer specifications.

Last but not least we have an extended After Sales & Service department which completes our philosophy; a solution provider in the transport of low viscosity liquids.

In the Netherlands we focus mainly on horticulture, shipbuilding and (chemical) industry. Besides the Netherlands we are represented in several European countries and the USA by SPX sales offices, as well as through distributors and agents world-wide. Production facilities are in the Netherlands, Belgium, Sweden, the U.S.A. and India.

For more information about Johnson Pump products please visit www.johnson-pump.com

SPX

SPX is a Fortune 500, global multi-industry manufacturing leader. SPX divides its business into four segments and one of these is the SPX Flow Technology segment. SPX Flow Technology designs, manufactures and markets engineered solutions & products used to process, blend, meter and transport fluids. We also have products for heat transfer applications, and products for air & gas filtration and dehydration. We are recognized globally for our leading brands and products, and our systems capability – particularly in the Food & Beverage, Power & Energy and Industrial markets. Visit our website at www.spxft.com to learn more about the brands in the SPX Flow Technology portfolio.

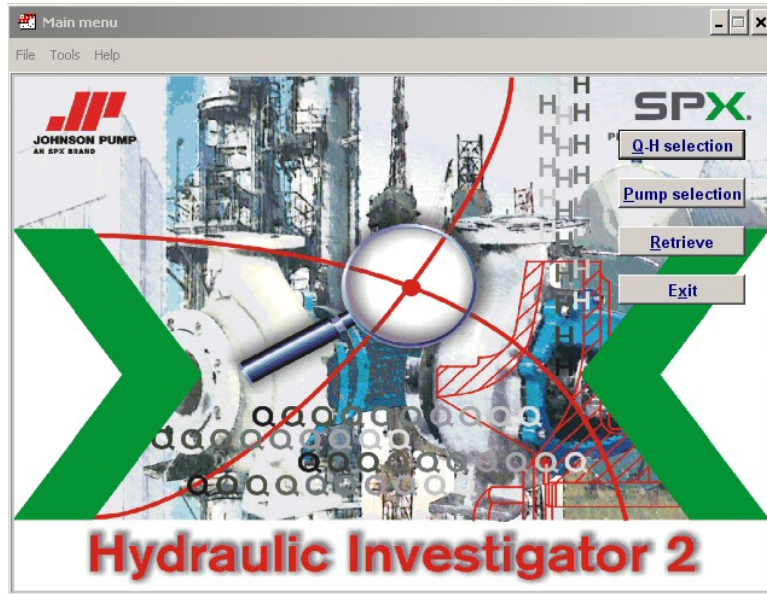
Main menu HYDRAULIC INVESTIGATOR

Starting up

The program is started by clicking the HI2 icon on your desktop or from the program menu.



The main menu gives various options for using the database.



1. **Q-H selection:** by entering a Q-H value (and supplementary criteria) the whole database is automatically searched for suitable pumps.
2. **Pump selection:** a pump family and pump type can be entered directly. The graph is then displayed on the screen.
3. **Retrieve:** a previously saved pump curve can be viewed once again.
4. **Exit:** after making a selection, saving and if necessary printing this out, the program can be closed.

Version information

First of all, you have to check the HI2 version you are working with. Select the **Help** pull-down menu, and then the **about** option. On top of the new window, the current version will appear.

Version 10.18C stands for:

Program revision : 10
Database revision : 18
Program source : C = Citrix server
 H = Horticulture version
 X = beta release
 = stand alone Full version

The current version is also shown at the bottom of every print, made in HI2.

Q-H selection

Minimum information

The minimum information required is a Q-value and H-value. If these are not entered an error message appears.



Capacity / Head

For the Capacity, the units can be selected. If m^3/h is chosen here, then all capacities are entered in m^3/h and all pressures in metres. If USGPM is chosen, the capacity must be entered in USGPM and the pressure in feet.

Viscosity

The viscosity can be entered in mm^2/sec (=cSt) or in $\text{mPa}\cdot\text{s}$ (=cP). When entered in $\text{mPa}\cdot\text{s}$, it is very important to fill in the Information about the specific gravity correctly, as this is part of the viscosity correction calculation.

Density

The density affects viscosity and power. Default value is $1000 \text{ kg}/\text{m}^3$, as for water.

NPSHa

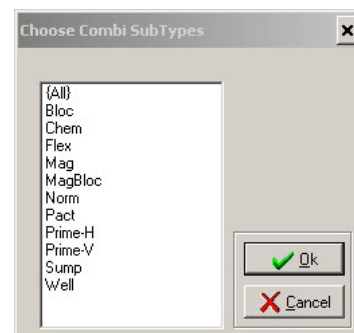
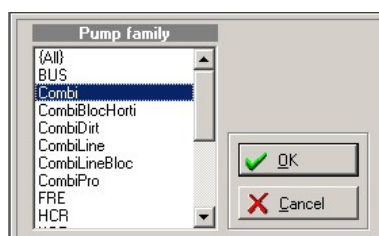
If the available NPSH is known, this value can also be included in the selection. Here, a safety margin of 0.5 metres must be kept (for trimmed impellers or at the end of the curve: 1 m.).

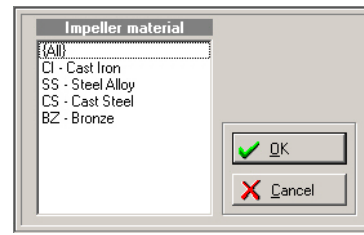
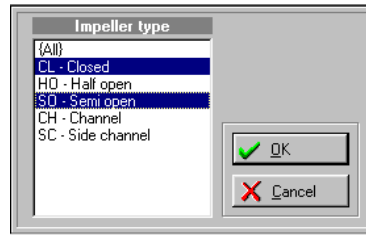
Oper. Region

The operating region has a standard value of 20% - 120% of BEP. All pumps shown in the selection that are outside this region, will be coloured red. This region can be changed into API 610, corresponding to 80% - 110% of BEP. Also a user defined region is available.

Pre-selection

A pre-selection of pump family, impeller type and impeller material type can be made. This is done by clicking at the boxes with 3 points which are after these fields.





Several items can be selected simultaneously in these selection windows. Some choices under pump family represent several pump families together. When Combi has been chosen as pump family, a selection of Combi Subtypes can be made.

Sub-classification of pump families

The table below gives an overview of the sub-classification of pump families.

Pump family	Subtype	Embedded Pump families
BUS		BUS BULS RBU
Combi	CombiBloc CombiChem CombiFlex CombiMag CombiMagBloc CombiNorm CombiPact CombiPrime H CombiPrime V CombiSump CombiWell	CombiBloc CombiChem CombiFlex CombiMag CombiMagBloc CombiNorm CombiPact CombiPrime H CombiPrime V CombiSump CombiWell
CombiBlocHorti		CombiBlocHorti
CombiDirt		CombiDirt
CombiLine		CombiLine
CombiLine B		CombiLine B
CombiPro		CombiPro
FRE		FRE FRES FREF FREM
HCR		HCR PHA
KGE		KGE KGEF KGEL
MCH		MCH MCHW MCHS
MCHZ		MCHZ MCHZS
MCV		MCV MCVS
MDR		MDR
MSH		MSH MSHS
MSO/MSF		MSO MSF
NURT		NURT
VRD		VRD VRD O VRDA VRDA O
(R) NUK		NUK RNUK

Impeller diameter

For pumps having variable impeller diameter, the impeller diameter is calculated in such a way that the curve goes straight through the entered duty point. Pumps with fixed impeller diameter always have a curve with a deviation from the entered duty point.

Multistage centrifugal pumps

With multistage pumps the maximum speed depends on the number of stages. To prevent selection of pumps beyond maximum speed, the multistage pumps have been divided into a number of sub-groups, like in the TSM on page “operational range”.

Maximum permitted deviation

Curves of pumps with fixed impeller diameter never go straight through the duty point. The maximum permitted deviation is entered under **Tolerance**. This is set at 5% by default.

Adjustment of absorbed power

CombiSump pumps have an increased absorbed power consumption because of the use of intermediate bearings. The number of bearings can be put in the field **CS Bearings**. The power will be adjusted according to the number of bearings. Also the self-priming part of the CombiPrime H and CombiPrime V and MCHZ pumps causes an increase of absorbed power. This will be calculated automatically.

Net frequency and speed

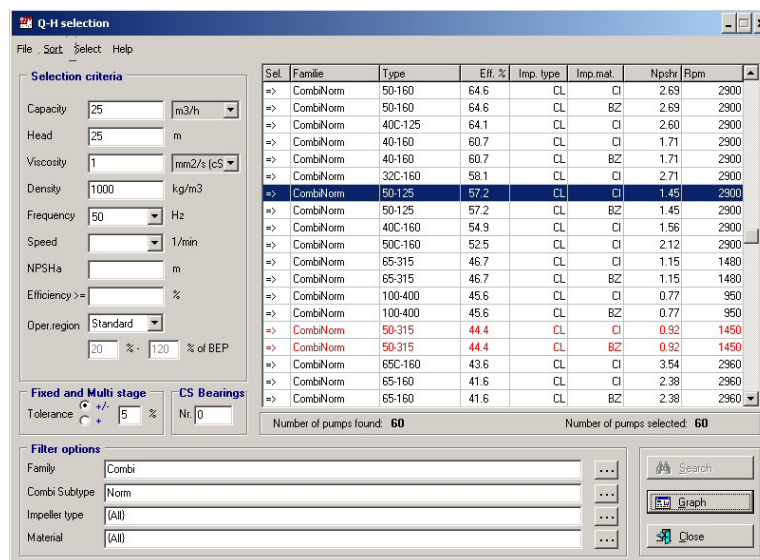
Under **Frequency**, the net frequency can be entered: 50Hz or 60Hz. When making a selection, the correct speeds are then automatically used. A specific speed can also be entered in the **Speed** field.

Required efficiency

Under **Efficiency**, the required minimum efficiency can be entered (if known). This concerns the hydraulic efficiency associated with the graph.

Activating the selection

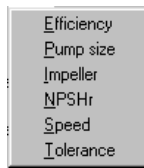
After all the required settings have been made the selection is activated using the **Search** button in the Q-H selection window.



A list is shown of all graphs that meet the specified requirements. Pumps outside the chosen operating region are shown in red. If desired, pumps can be removed from the selection list by double-clicking on the relevant pump. By doing this, the selection arrow at the front of the line is removed.

Sorting

By default the pumps are sorted by their efficiency. However using the **Sort** menu various other sorting keys are possible.



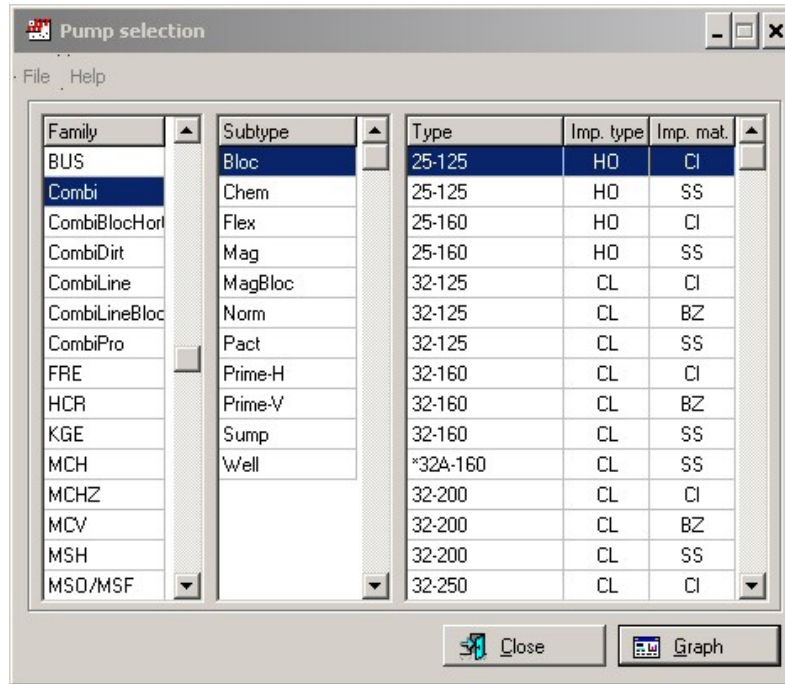
Displaying the graph

The graph is displayed by selecting the relevant type and then clicking the **Graph** button.

Interpretation of the selection results

Pay attention to following point:

- Selected curves concern a selection of hydraulics, **not** pumps. This means that the selected graph must always be checked for its availability in the product supply range. Especially the speed / bearing-type combination must be checked using the TSM.



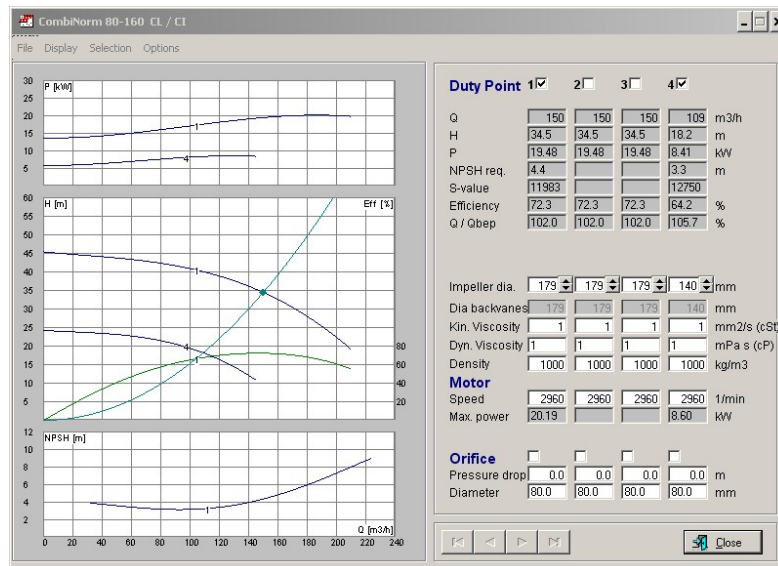
Available pump families

The second way of selecting a graph is through the option: **Pump Selection**. Using this, a list of all pump families available in HI2 is displayed.

Select pump type

After choosing a pump family, a pump type can be selected. When holding down the Ctrl key while pressing the left mouse button, several types can be selected at the same time.

Pump curves

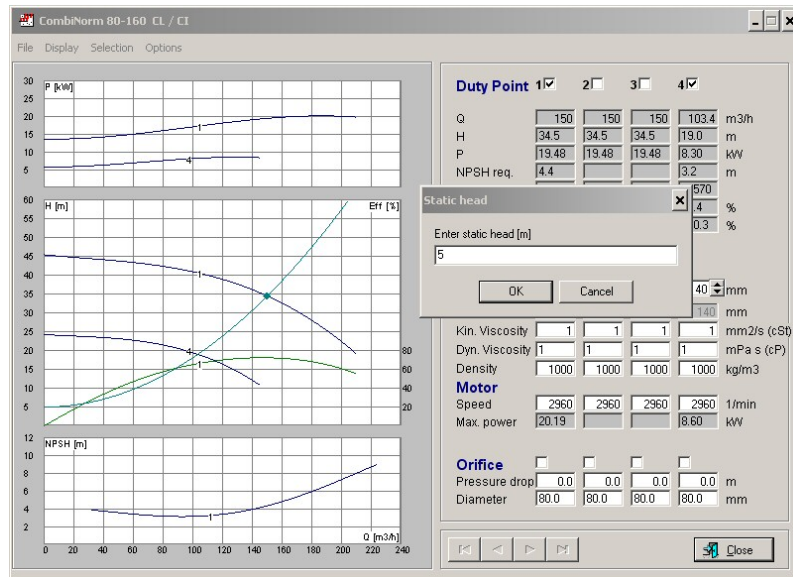


Requesting graphs

A graph can be requested from both the Q-H selection and the Pump selection. In both cases the screen displayed above becomes visible. This screen is split into a left and right window. The left window shows the graph, the right window the associated data.

Graph window

The graph window is divided into 3 parts.



Top

The upper part shows the **capacity - power curve**.

Middle

The middle part shows the following information:

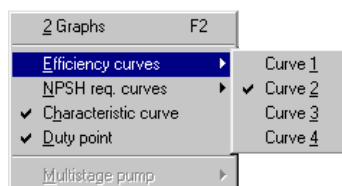
1. the selected **capacity – head curve**.
2. the **efficiency curve** (2nd Y-axis at right side of the graph)
3. the **capacity – system resistance curve** (system curve) based on the specified working point.
The static head can be set using the menu-item *Options... Static head*.
4. The specified **duty point**.

Bottom

The lower part shows the **capacity - NPSH curve**.

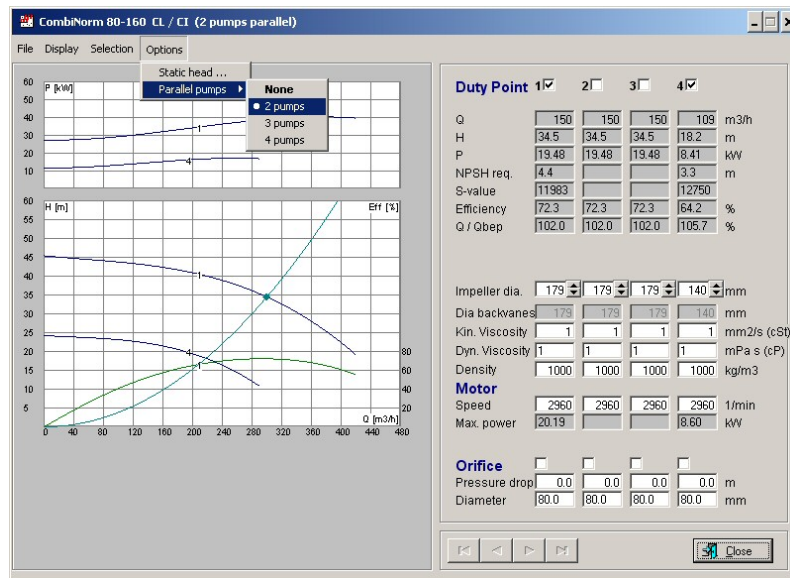
Display menu

Using the options in the **Display menu**, the aforementioned curves for all graphs can be switched on and off as desired.



Parallel arranged

It is possible to set a graph for 2, 3 or 4 pumps arranged in parallel. The option **Parallel pumps** in the **Options menu** must be used to do this.



Data window

The data window consists of 4 columns. Each one describes an individual situation.

Each column can be switched on and off by ticking the box at the top of the relevant column.

The grey fields in the column indicate values which cannot be altered. The light fields can be changed by the user. After filling in a field, the field must be left in order to activate the change. This can be done using the *Tab*-key or by clicking another field.

Impeller diameter

The impeller diameter can be varied between the minimum and maximum value for the relevant pump type.

Viscosity

When known, the viscosity of the medium to be pumped can be entered here.

Density

The density of the medium.

Speed

The motor speed can be varied up to the maximum speed for the type of pump.

Orifice

The effect of an orifice can be seen by ticking this option. The Pressure drop at the working point or the diameter (of the hole in the orifice) can then be entered.

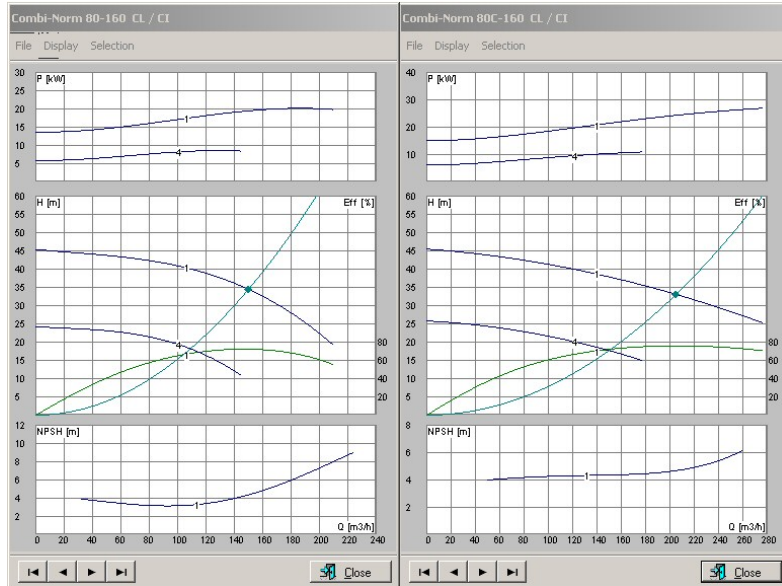
Navigation keys

In order to view another graph from the selection, use can be made of the navigation keys at the bottom of the data screen or the **selection menu**.



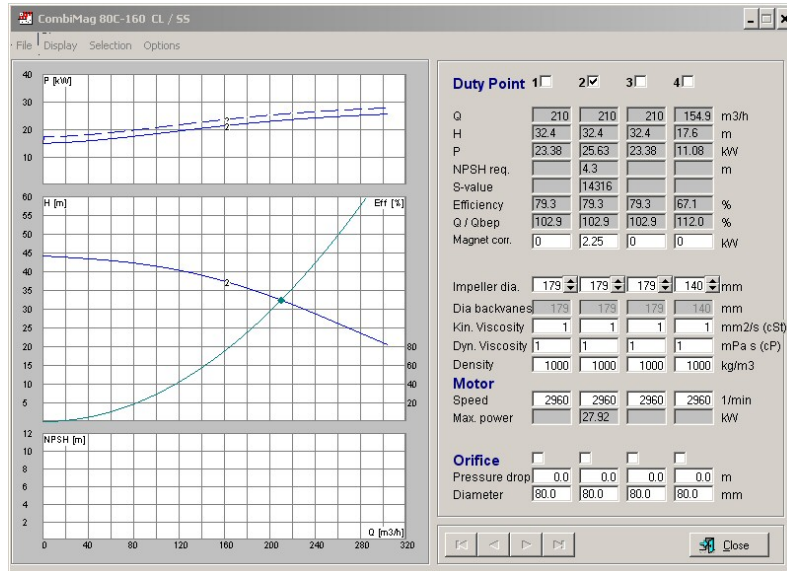
Comparing 2 graphs

It is also possible to compare two curves with each other. In order to do this, the option **2 Graphs** must be chosen from the **Display menu** (or using the function key F2). Using the navigation keys or the selection menu, all the curves in the selection can now be looked at one by one.



Magnet Correction

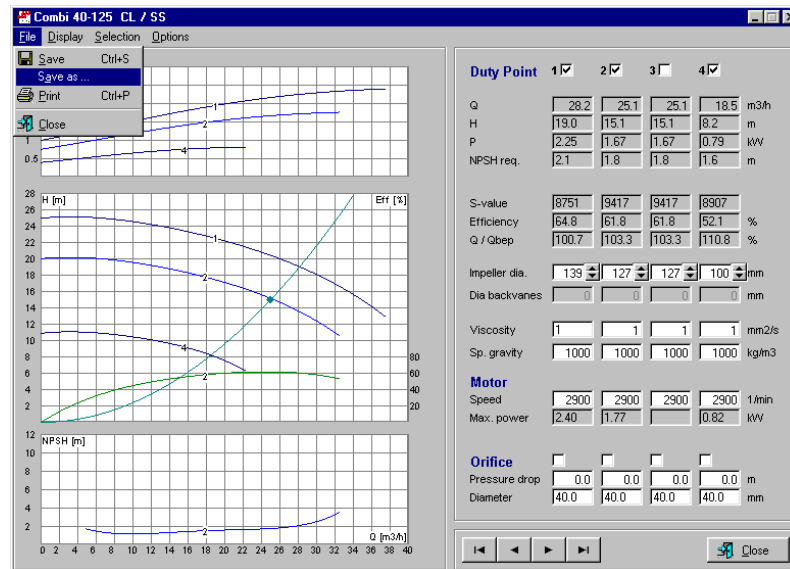
When a CombiMag or CombiMagBloc has been selected, an extra field appears in the Data Window: Magnet corr..



The value of the magnet correction has to be copied from the CombiMag calculation program and indicates the power absorption of the magnet coupling.

Saving graphs

The completely modified graph can be saved so that this can again be easily retrieved at a later moment in time (see **RETRIEVE**). The graph is saved by using the **File** menu and then choosing **Save as...**



*Compulsory entry fields
dialogue box*

In the next dialogue box, a number of details can be assigned to the graph. Compulsory entry fields are: **Quotation**, **Item**, **Customer nr**, **Date** and **Customer name**.

Customer information

File Help

Quotation: Item:

Customer nr.: Date:

Customer name:

Reference:

Order: created by:

Remarks:

Alternate saving method

An other way to store your graphs is the use of a PDF printer driver, like cutePDF. All you have to do is to start a print Job with the PDF printer as selected printer.

Afdrukken

Printer

Naam:

Status: Gereed

Type: CutePDF Writer

Locatie: CPW2

Opmerking:

Afdrukbereik

Alles

Pagina's van: t/m:

Selectie

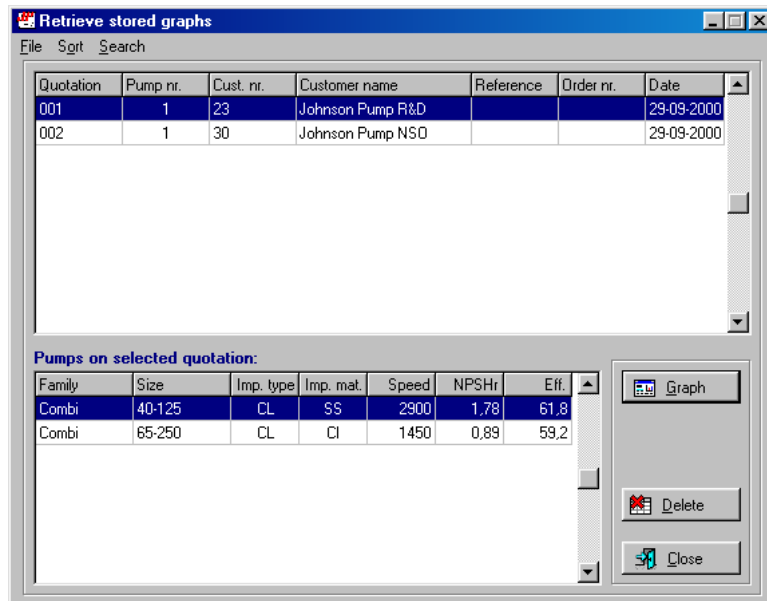
Aantal

Aantal exemplaren:

Retrieve

Retrieving graphs

Using the Retrieve option, all processed and saved graphs can be retrieved.



A selection can be made in the window shown above from the various saved quotations.

Searching and sorting

Using the **Sort menu**, a sorting sequence can be selected and using the **Search option** a specific quotation can be quickly found. The relevant item is selected in the lower window and the graph for this is then displayed.