

# Hydraulic Investigator 2



**When pumps stop, so does everything.**

## *Johnson Pump*

Johnson Pump designs, manufactures and markets pumps world-wide. 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. Johnson Pump Water B.V. is one of the few pump producers in the Netherlands for centrifugal pumps, we have an outstanding Research & Development department and a testbed 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 service department which completes our philosophy; a solution provider in the transport of low viscosity liquids. In the Netherlands we mainly focus on the horticulture, shipbuilding and (chemical) industry. Besides the Netherlands we are represented in several European countries. There are production facilities in the Netherlands, Belgium, Sweden, the U.S.A. and India, as well as joint ventures in a number of African and Asian countries. All together we work to achieve *successful customers*.

## *Hydraulic Investigator*

The Hydraulic Investigator is made for you to be able to select the right pump out of the delivery program of Johnson Pump Water B.V. You can select a graphic that satisfies the given standards.

# Main menu HYDRAULIC INVESTIGATOR

## Starting up



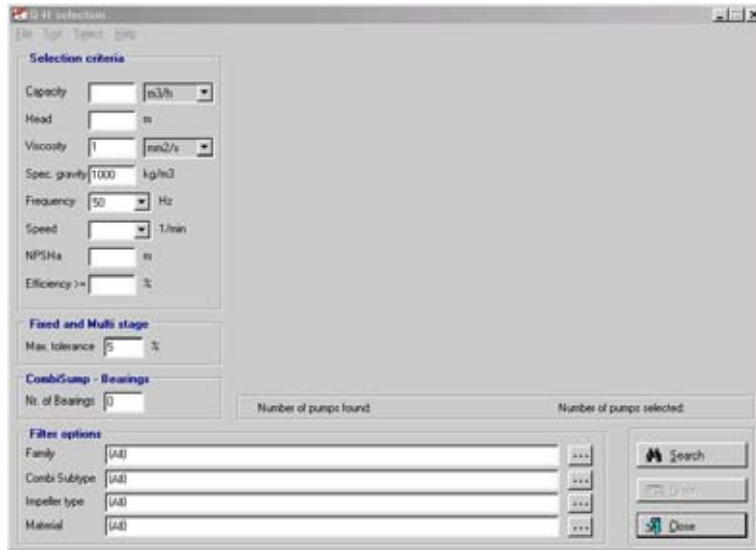
The program is started by clicking the HI2 icon on your desktop or from the program menu.

The main menu gives various options for using the database.



1. **Q-H selection:** by entering a Q-H value (and possibly several criteria) the whole database is automatically searched through 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.

# Q-H selection



## minimum information required

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<sup>3</sup>/h is chosen here, then all capacities are entered in m<sup>3</sup>/h and all pressures in metres. If USGPM is chosen, the capacity must be entered in USGPM and the pressure in feet.

## Information about the medium

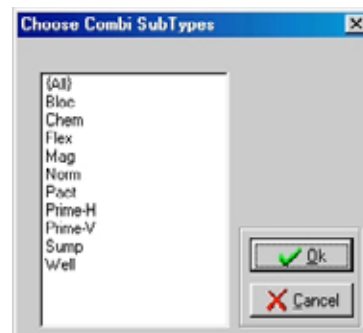
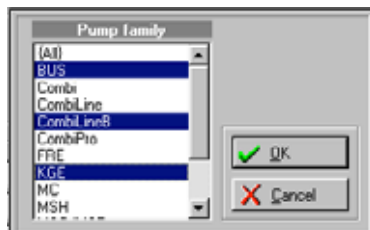
Information about the medium to be pumped can be filled in under **Viscosity** and **Spec. gravity**.

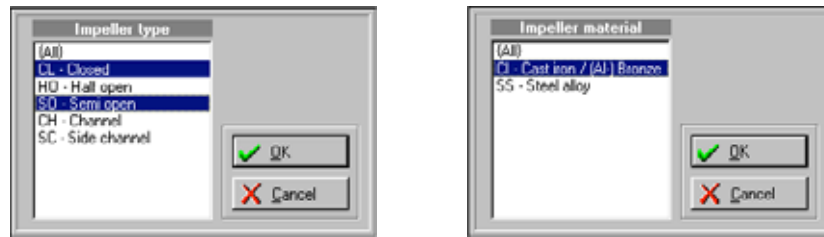
## NPSHa

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 heeded (for trimmed impellers at the end of the curve: 1 m.).

## pre-selection

A pre-selection of pump family, impeller type and impeller material type can be made. This is done by clicking on 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, a second selection of Sub-type 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	CombiBlok CombiChem CombiFlex CombiMag CombiNorm CombiPact CombiPrime H CombiPrime V CombiSump CombiWell	CombiBlok CombiChem CombiFlex CombiMag CombiNorm CombiPact CombiPrime H CombiPrime V CombiSump CombiWell
CombiLine		CombiLine
CombiLine B		CombiLine B
CombiPro		CombiPro
FRE		FRE FRES FREF FREM
KGE		KGE KGEF KGEL
MCH		MCH MCHW MCHS
MCHZ		MCHZ MCHZS
MCV		MCV MCVS
MSH		MSH MSHS
MSO/MSF		MSO MSF
NURT		NURT
VRD		VRD VRD O VRDA VRDA O
(R) NUK		NUK RNUK

*effect of impeller diameter*

For the graphs of pumps having variable impeller diameters, the impeller diameter is so calculated that the curve passes through the entered working point exactly. Graphs of pumps having fixed impeller diameters always have a deviation from the entered working 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 **Max. 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 **Nr. of Bearings**. The power will be adjusted according to the number of bearings. Also the self-priming part of the CombiPrime H and CombiPrime V pumps causes an increase of absorbed power. This will be calculated automatically.

*net frequency and speed*

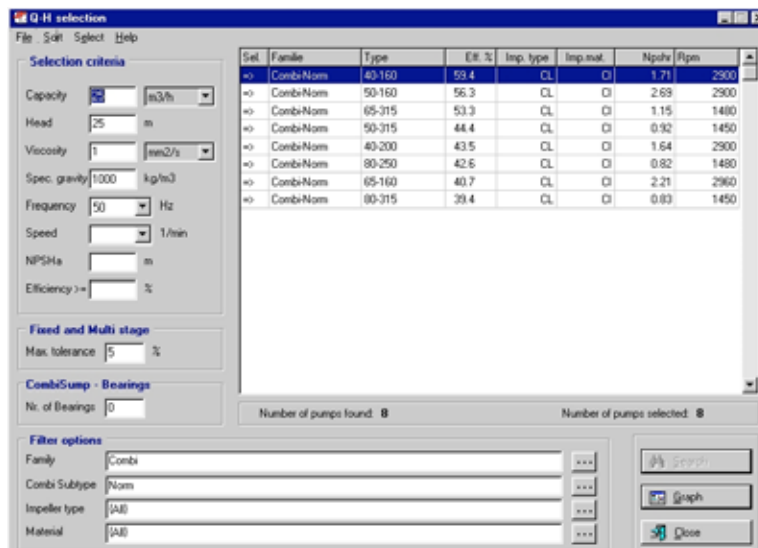
Under **Frequency**, the net frequency can be entered: 50 or 60Hz. When making a selection, the correct speeds are then automatically used. A specific speed can also be entered in the **Speed** field.

*required minimum 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 desired 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 which meet the specified requirements. 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 (for the Combi 40-160 in the example in the figure shown above).

*sorting*



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

*displaying the graph*

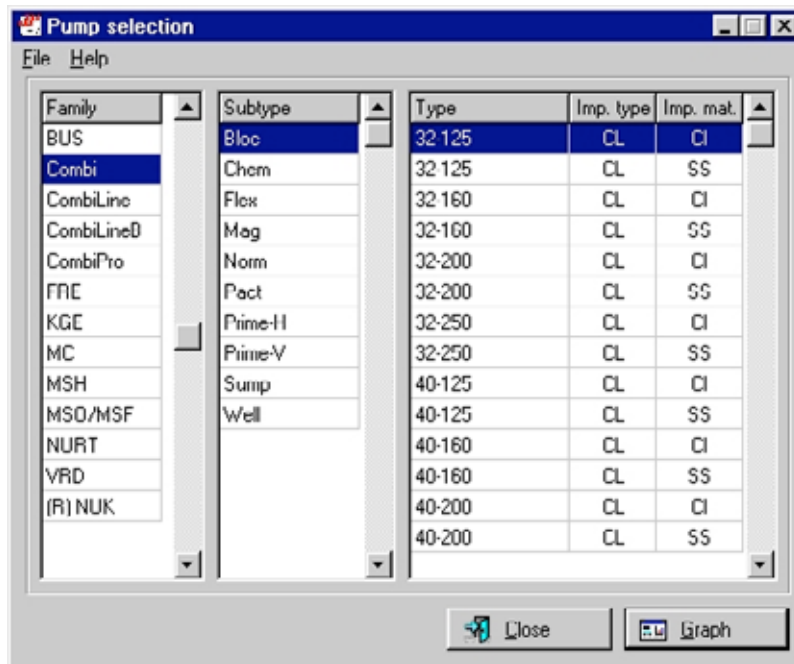
The graph is displayed by selecting the relevant type and then clicking the **Graph** button.

## Interpretation of the selection results

Pay attention to following points

- 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.
- Selection of the CombiMag motorpower must be done according to CM/03.07

## Pump selection



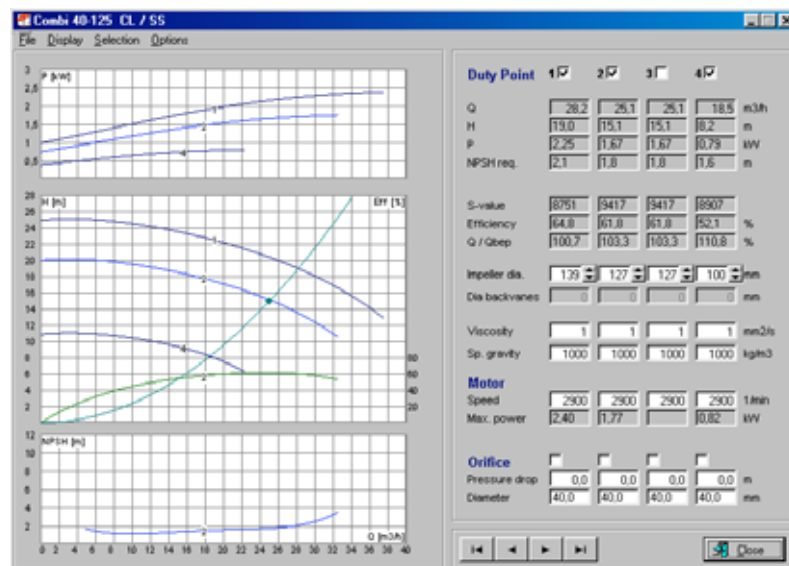
Available pump families

Select pump type

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

After choosing a pump family, a pump type can be selected. If the *Ctrl* key is kept pressed in, several types can be selected at the same time.

## Pump curves

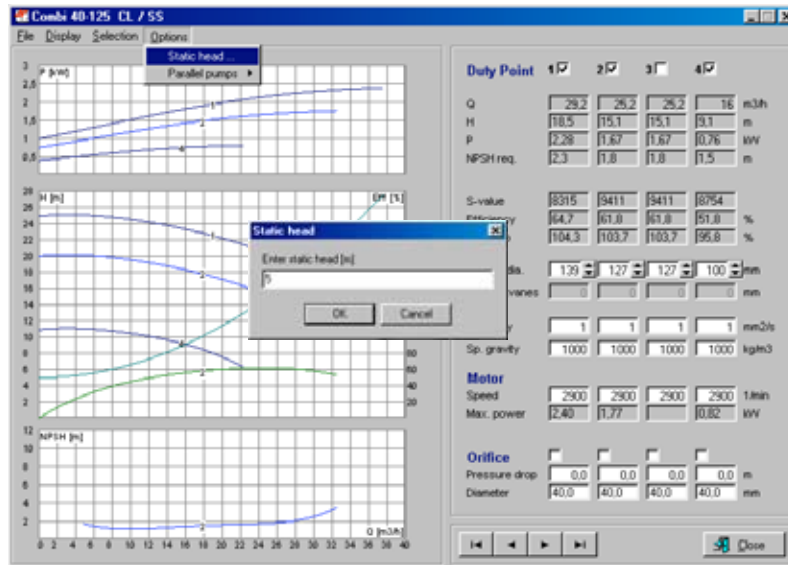


Requesting graphs

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:

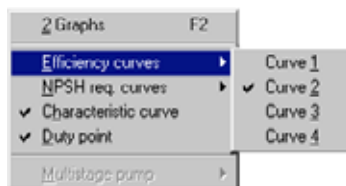
1. the selected **capacity – head curve**.
2. the **efficiency curve** (2nd Y-axis on right side of the graph)
3. the **capacity – system resistance curve** (system curve) based on the specified working point.  
The static head can be set using the menu-item *Options... Static head*.
4. The specified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

*Bottom:*

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

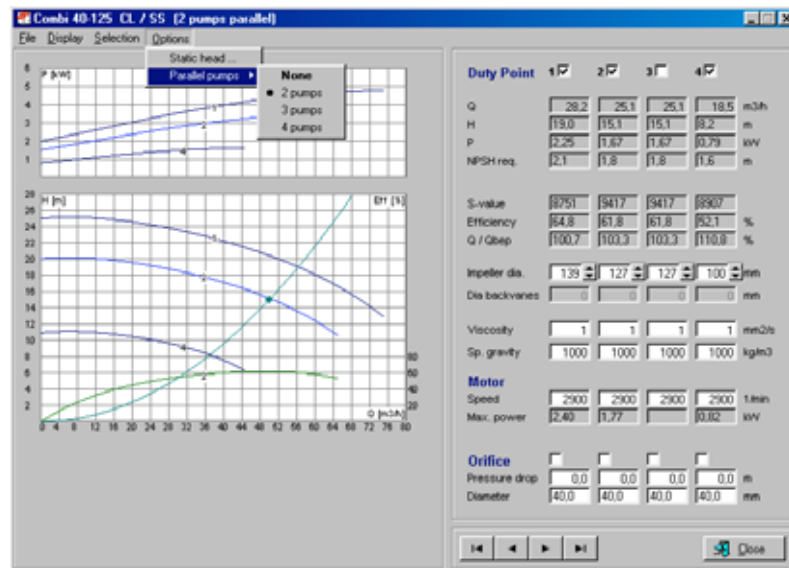
*Display menu*

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** is used to do this.



## Data window

The data window consists of 4 columns, each of which 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 on another field.

### *Impeller diameter*

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

### *Viscosity*

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

### *Sp. Gravity*

The relative 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.

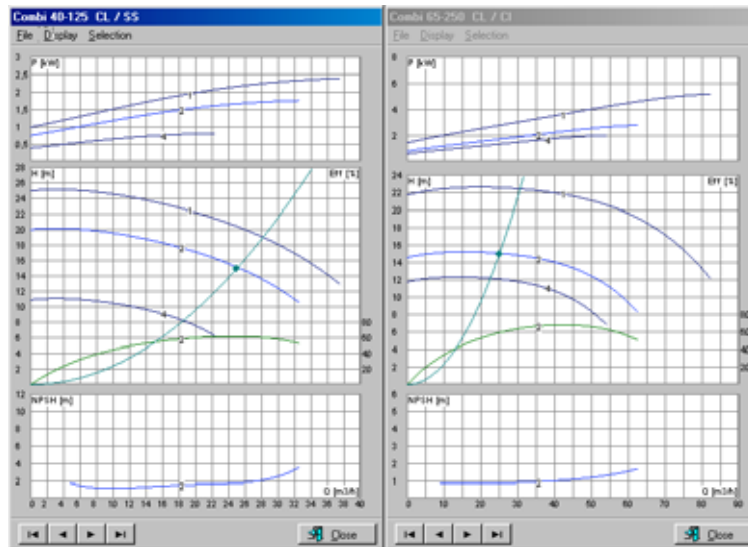
### navigation keys



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**.

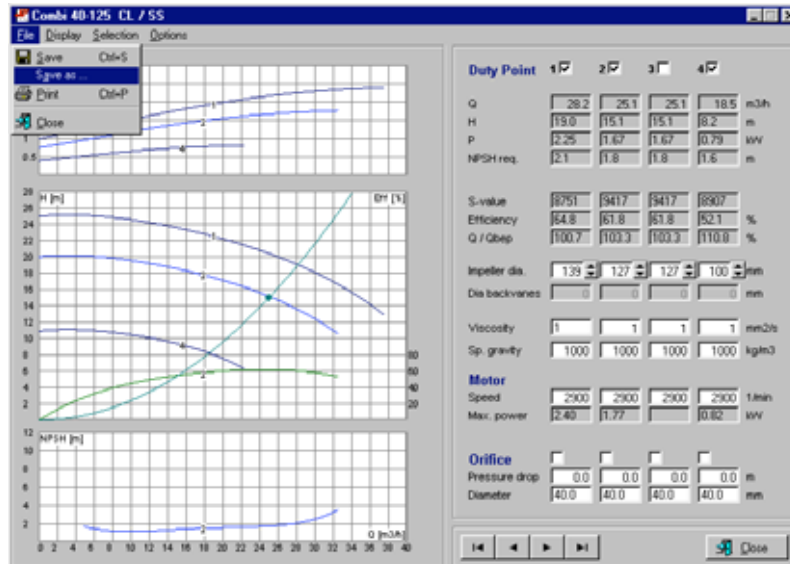
### Comparing 2 graphs

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.



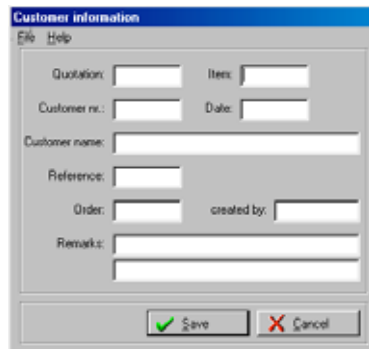
### Saving graphs

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**.



The 'Customer information' dialogue box contains the following fields:

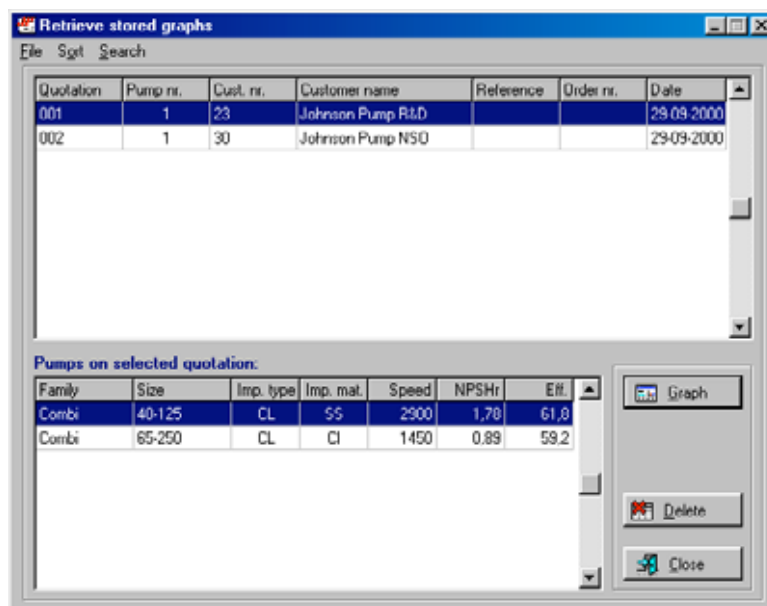
- Quotation:
- Item:
- Customer nr.:
- Date:
- Customer name:
- Reference:
- Order:  created by:
- Remarks:

Buttons:

## Retrieve

### Retrieving graphs

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



The 'Retrieve stored graphs' window displays a table of saved quotations and a sub-table for pumps on the selected quotation.

Quotation	Pump nr.	Cust. nr.	Customer name	Reference	Order nr.	Date
001	1	23	Johnson Pump R&D			29-09-2000
002	1	30	Johnson Pump NSO			29-09-2000

Pumps on selected quotation:						
Family	Size	Imp. type	Imp. mat.	Speed	NPSHr	Eff.
Combi	40-125	CL	SS	2900	1,70	61,8
Combi	65-250	CL	CI	1450	0,89	59,2

Buttons:

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.