

## 1. Introduction

 is a calculation tool.

*hheader* is a collection of at least 48 single calculation programs. These 48 programs are divided up into 8 different categories including 6 independent programs each. The categories are the following.

<u>Category 1</u>	Pressure	<u>Category 5</u>	Electrics
<u>Category 2</u>	Flow	<u>Category 6</u>	Mechanics
<u>Category 3</u>	Chemical	<u>Category 7</u>	Mixed
<u>Category 4</u>	Energy	<u>Category 8</u>	General

The content selection has figured out within more than ten years of commissioning in the field of water- and exhaust air treatment. Regarding this the most often used calculation- and cross check functions have been picked out to be part of the program header. Beside the theoretical basics also practical experiences have been taken into consideration for the calculations.

The complexity of the programs is partly very different. Some calculations which are required more or less often for project documentation or design criteria can be quite expensive, if they are done by external companies. This means at least that there is a certain probability to save money and costs in the future by using this tool.

## 2. Software Installation

For operating the tool on your personal computer you need the *hheader*-software and the VB-Power-Packs in case they are not installed already. A Net Framework Version and a Windows Installer Version are usually not required, because they are in general installed already beside the operating system. The package contains the executable file *hheader.exe* and a couple of folders with internal required files. The *hheader*-software is provided on the dongle or can be downloaded on the website [www.hheader.com](http://www.hheader.com).

Here it is possible to download the user manual separately from the *hheader*-software. Anyhow the manual is also included in the download of the *hheader*-software package, as well as the VB-Power-Packs, which can be found in the folder *hh\_BasicInst*. The VB-Power-Packs should be installed only on demand.

The download area on the website [www.hheader.com](http://www.hheader.com) provides the following files:



*hheader* - Calculation Tool Manual  
19 MByte



*hheader* - Calculation Tool Software  
23 MByte

You can download the software and view all the programs, but be aware that calculations and printouts are only possible and legal if you have proper dongle. To order a dongle refer to the website [www.hheader.com](http://www.hheader.com) under “Order”.

Regarding the *hheader* – Calculation Tool Software itself there is no installation routine required. For using the *hheader* – Calculation Tool Software just double click the left mouse button over the executable file *hheader.exe*. You can find it directly on the dongle source.

Beside the executive file *hheader.exe* there are different folders provided inside the main folder *hheader* on the dongle. It is obvious that the folders themselves and also the files inside the folders should not be deleted, renamed or moved. The folder structure itself has to be kept as it is in order to ensure the proper and complete functionality of the program. The provided folder structure is described on the next page. Thereby the names of the folders are given and their purposes are described. Some of the folders have the property “hidden”. Changes which are done here will take effect on the functionality of the program.

	<b>hheader</b>	
+	 <b>hh_BasicInst</b>	This folder contains basic installation files, which are required for operating the <i>hheader</i> -Calculation Tool. In general the basic software requirements are already included in operating system. In case if this is not given, it is possible to complete the software requirements. Anyhow the VB-Power-Packs are stored in this folder.
+	 <b>hh_CommonDat</b>	This folder is provided for common data and exemplary tables. The styles-library is also content of this folder. In the styles-library the actual selected style is stored, which is adjusted automatically while starting up <i>hheader</i> . Refer to chapter 3.5 (01_Introduction_and_Startup).
+	 <b>hh_CustomerDat</b>	This folder is provided for the customer data files, which are in the first the company data shown on the forms splash-screen, header and license. Further the company logo and the report logo are content of this folder. Refer to chapter 3.7 (01_Introduction_and_Startup).
+	 <b>hh_Limits</b>	This folder contains the limit files for the parser programs. The limits for the parser programs can be user defined. The defined limits can be stored in files accordingly. These files are saved in this folder as library files. Refer to chapter 13.3 (10_Category_General).
+	 <b>hh_Manual</b>	This folder contains the manual chapters as PDF-files: 00_CoverSheet_and_Content, 01_Introduction_and_Startup, 02_General_Program_Description, 03_Category_Pressure, 04_Category_Flow, 05_Category_Chemical, 06_Category_Energy, 07_Category_Electrics, 08_Category_Mechanics, 09_Category_Mixed, 10_Category_General.
+	 <b>hh_Messages</b>	This folder contains all the message files that can be called according to the current program state. Some messages are called due to implausible input values and some messages are called by the provided program hints in some the forms. This folder usually has the property "hidden".
+	 <b>hh_Notes</b>	It is possible to save and restore user defined notes for the each activated program. The file name will be defined automatically. For each program there is one sheet of notes provided. The files will be stored in this folder as library files. Refer to chapter 5 (02_General_Program_Description).
+	 <b>hh_ParserProgs</b>	This folder contains the saved program files for the user defined parser programs. The user defined parser programs can be stored in files accordingly. These files are saved in this folder as library files. Refer to chapter 13.3 (10_Category_General).
+	 <b>hh_Prints</b>	The calculated results for each activated program can be printed into a file. These files will be stored in this folder. The filename will be generated automatically. It consists out of three sections: the prefix "Print_", the program name plus a date and time code with the format YYYY_MM_DD_hh_mm_ss. Refer to chapter 5 (02_General_Program_Description).
+	 <b>hh_ProgInf</b>	This folder contains the program information files for all the programs of all categories plus some additional files for general information. Refer to chapter 5 (02_General_Program_Description). This folder usually has the property "hidden".
+	 <b>hh_Steps</b>	This folder contains the program steps for all the programs of all categories, which are shown for the actual activated program after clicking the "More"-Button" on the program info form. Refer to chapter 5 (02_General_Program_Description). This folder usually has the property "hidden".
+	 <b>hh_UnDo</b>	It is possible to step backwards and forwards through the already carried out calculations by the buttons ("<" and ">"). These buttons will appear after a new calculation has been initiated. The value sets are stored in this folder and they are only temporary available. They will be reset whenever the corresponding program form is closed. This folder usually has the property "hidden".
+	 <b>hh_Values</b>	It is possible to save and restore values from carried out calculations. Therefore files are created, which are directly dedicated to the activated program. These files are stored in this folder. Refer to chapter 5 (02_General_Program_Description).

### 3. Starting-Up



*hheader* is started by double clicking the left mouse button on the *hheader*-icon. You can find it directly on the dongle source.

After double click on the icon the Startup-Screen (splash-screen) will be opened. Beside the *hheader*-logo, release and copyright, the splash-screen shows information for the licensed company. The data can be changed by the user anytime via the menu item "Company Data".

#### 3.1. Startup-Screen

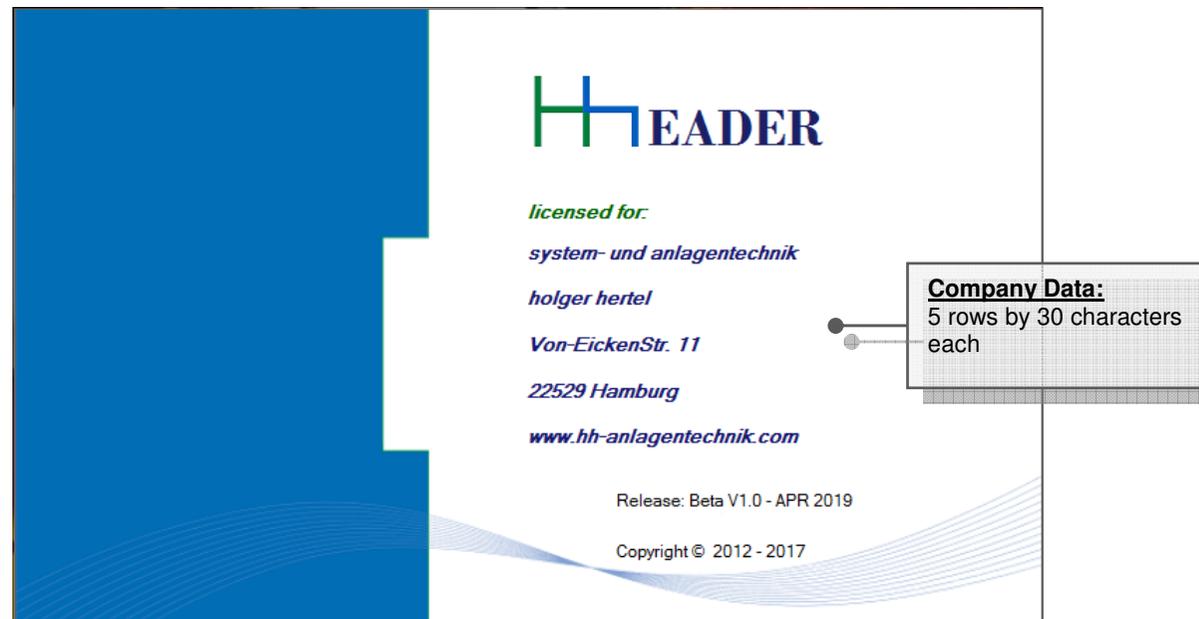
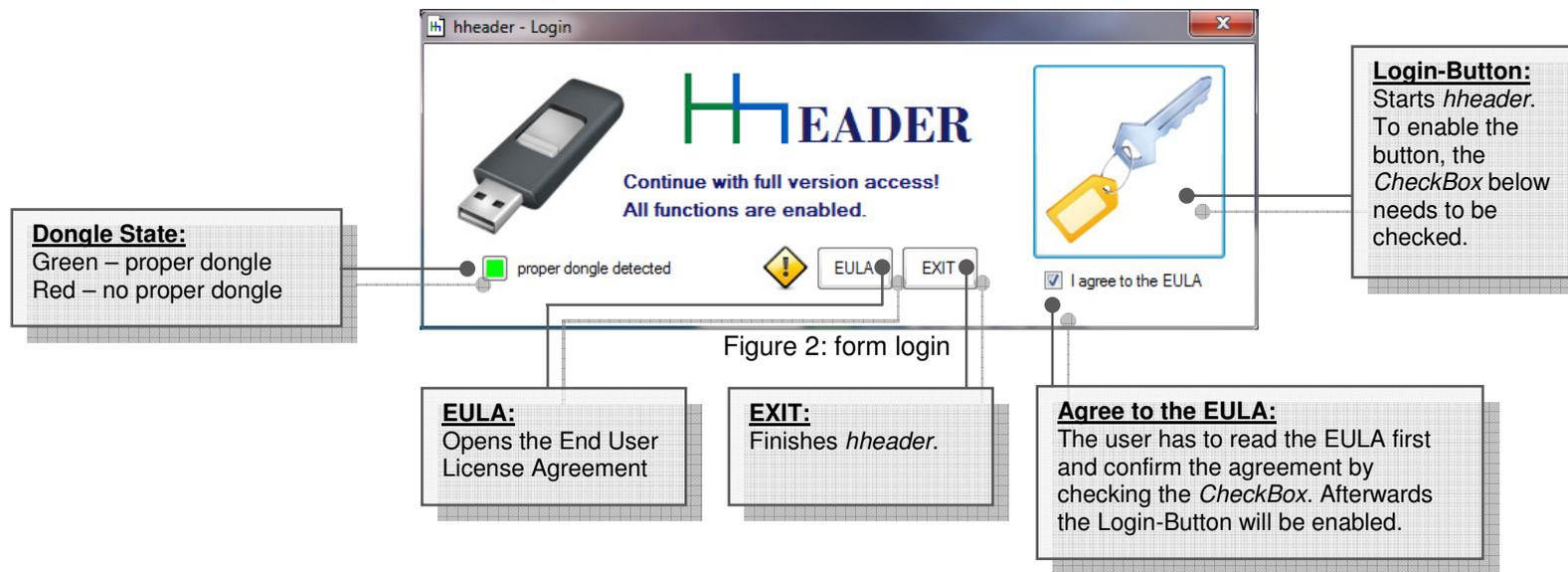


Figure 1: form startup-screen / splash-screen

### 3.2. Login

For the execution of the calculations and for printing the results a dongle is required. Only with a proper dongle all functions are enabled. The login form shows the actual dongle state (Green – proper dongle / Red – no proper dongle detected). Anyhow starting up *hheader* is always possible whether with or without a proper dongle. But without a proper dongle the program functions are limited.



If no proper dongle is detected there will be a message following up: “*You continue in view mode! Calculations and Printout: not possible. Loading or saving of value sets: not possible.*”. After confirming this message the header form will be opened.

3.3. Header

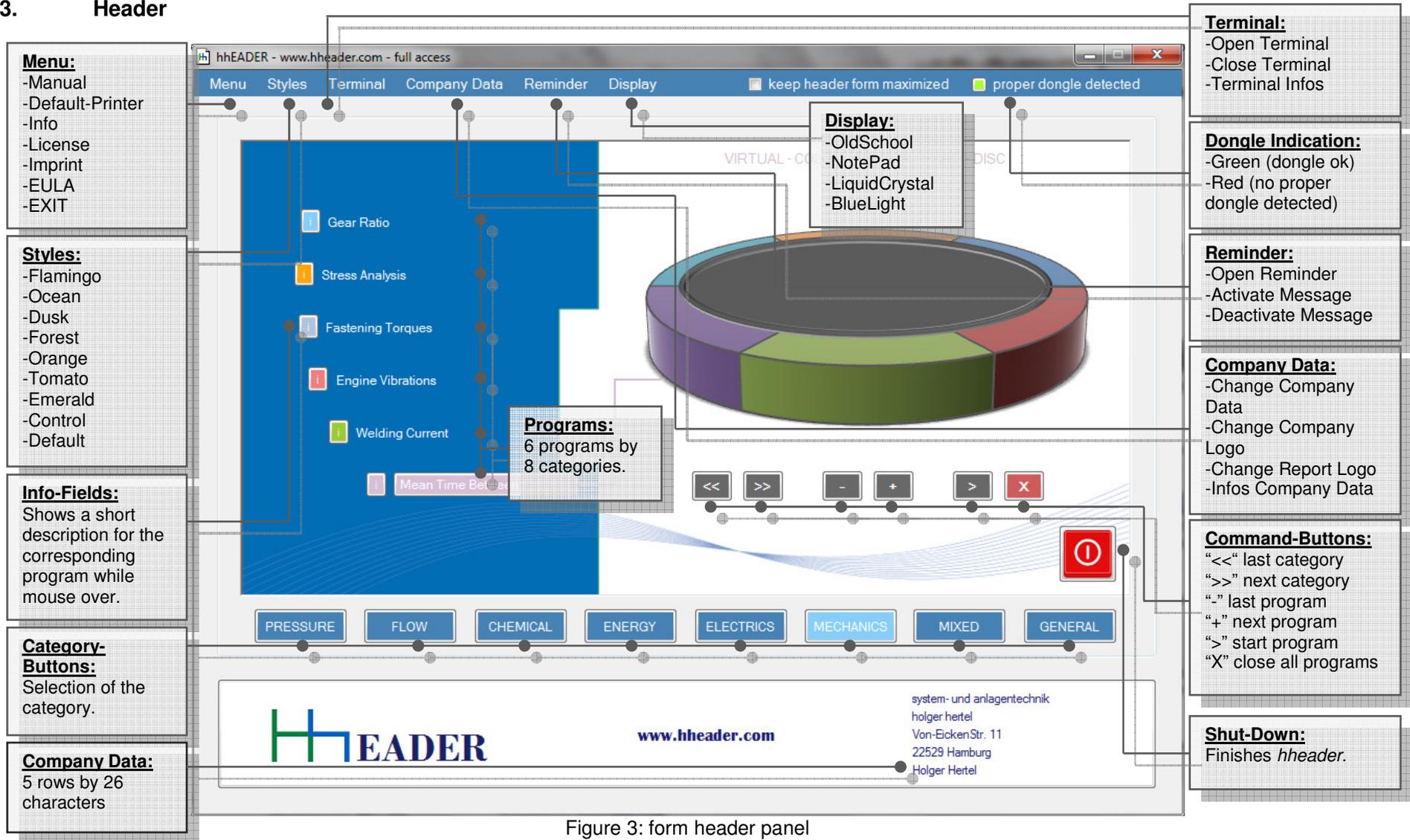


Figure 3: form header panel

**3.4. Menu**

**3.4.1. Manual**

Selecting this menu item will open the user manual as a PDF-file with the software that actually set as standard PDF-viewer.

**3.4.2. Set Default Printer**

Selecting this menu item will open the form that is shown below, where all the installed printers are displayed in a list. The printer that should be used for printing can be selected. The selected printer will be set as default printer. After that the OK-Button has to be clicked in order to confirm the setting and to close the form again.

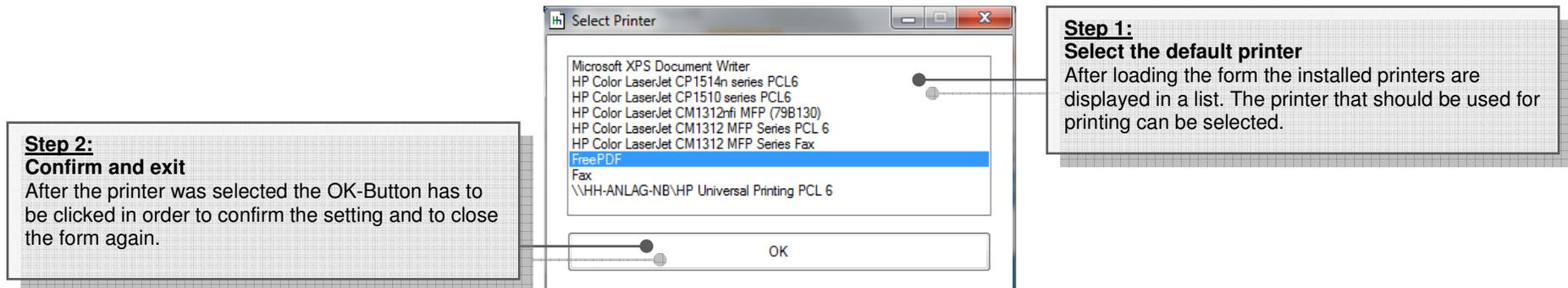


Figure 4: form set default printer

**3.4.3. Info**

Selecting this menu item will open the program info form showing up the introduction text, which is displayed on the first page of this chapter.

### 3.4.4. License

Selecting this menu item will open the form that is shown below, where the company data is displayed. For this information there are 5 rows with 30 characters provided. The displayed data is editable via the scroll down menu for the company data in the header form.

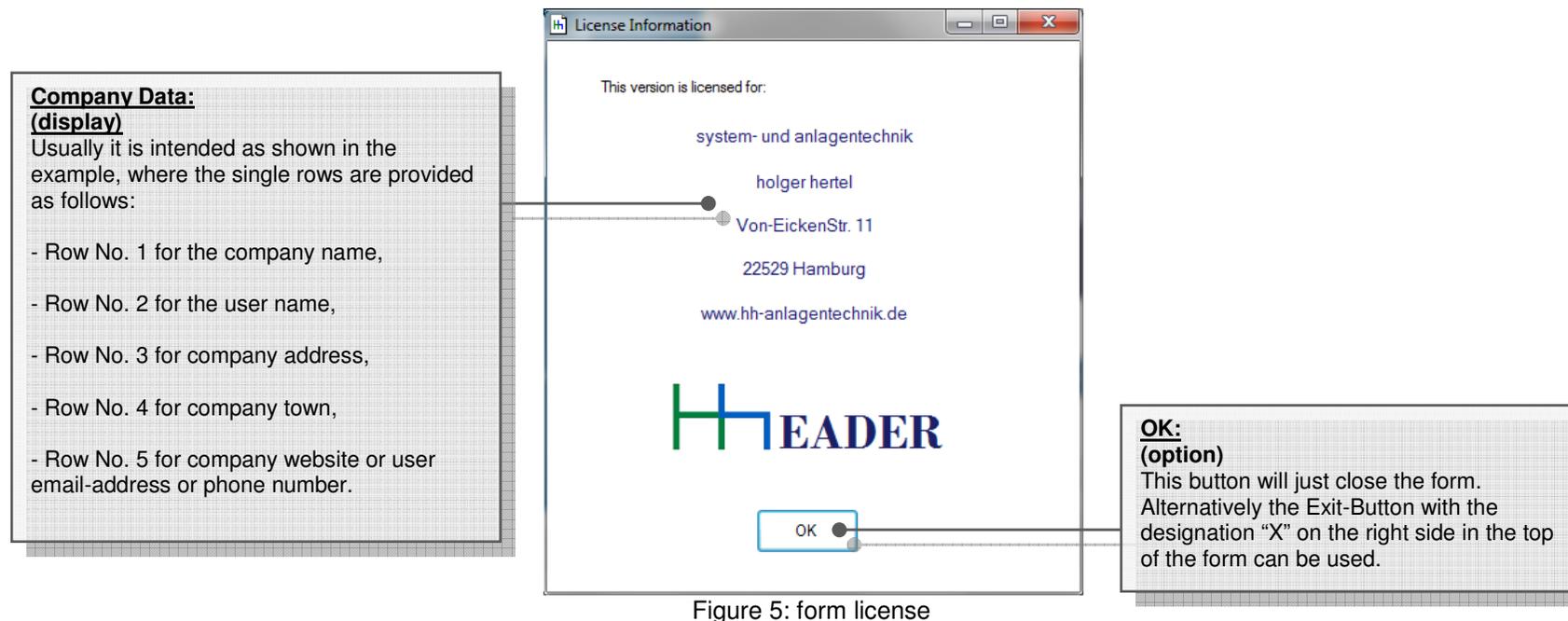


Figure 5: form license

### 3.4.5. Imprint

Selecting this menu item will open the form that is shown below, where the data of the company that developed this program is shown.

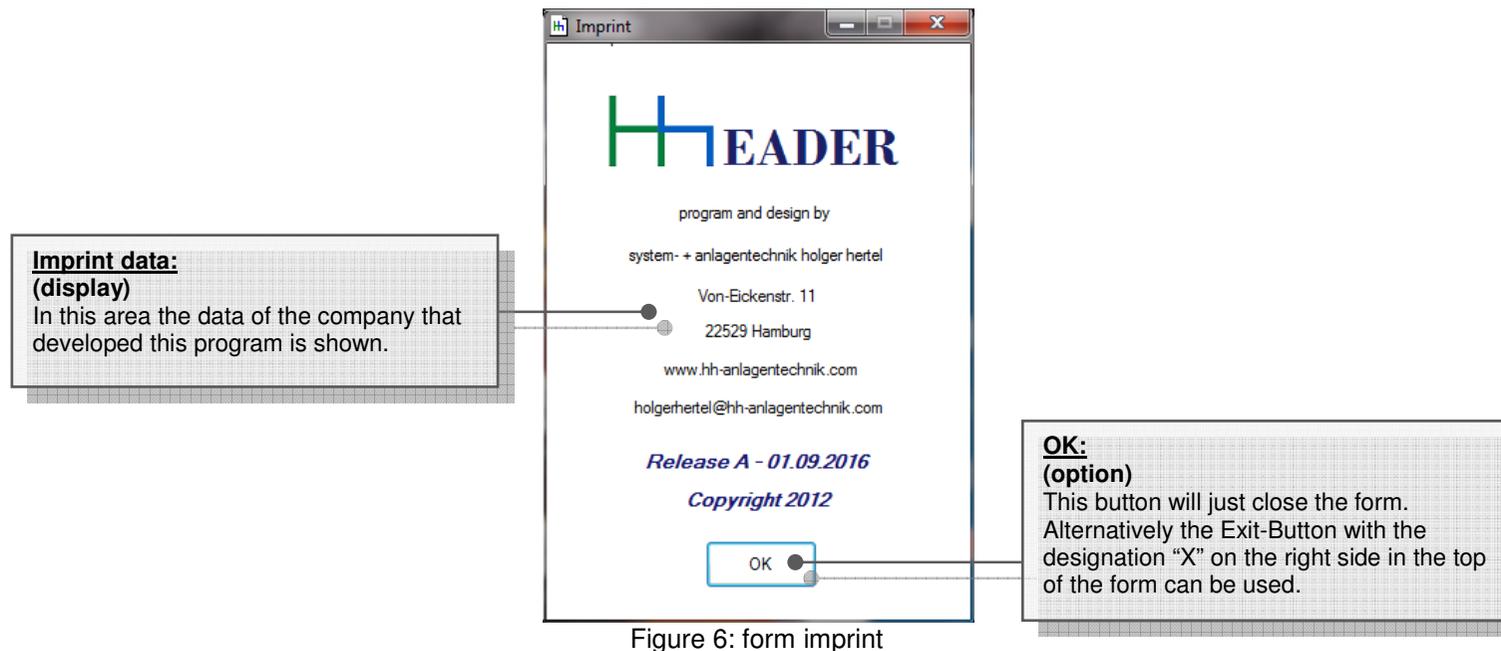


Figure 6: form imprint

### 3.4.6. EULA

Selecting this menu item will open a form with the "End User License Agreement".

### 3.4.7. EXIT

Selecting this menu item will shut down the header software. It has the same function as the red shut-down-button on the right side of the main form.

### 3.5. Styles and Display

Tastes are different and from time to time some kind of variation animates the business. This is why *hheader* provides different color styles for the program forms. In general there are two different colors relevant. The first color is for the command button panel and the second color is for the selected buttons in the header form. It can be chosen between nine different styles.

Flamingo: Pink and Hot-Pink

Tomato: Tomato and Forest-Green

Ocean: Light-Sky-Blue and Cornflower-Blue

Emerald: Dark-Cyan and Violet

Dusk: Control-Dark-Dark and Control-Dark

Control: Light-Gray and Gray

Forest: Forest-Green and Light-Green

Default: Steel-Blue and Light-Sky-Blue

Orange: Dark-Orange and Forest-Green

Also for the displays in the forms with the program information and the steps different layouts are provided for selection. The display layouts have two fixed colors for each selection. The first color defines the back color of the display and the second color defines the color of the text (fore color).

OldSchool: Control-Dark-Dark and Lawn-Green

LiquidCrystal: Lawn-Green and Control-Dark-Dark

NotePad: Window and Control-Dark-Dark

BlueLight: Dodger-Blue and Alice-Blue

The actual activated form and display style and will be ticked and automatically be activated again while the next start-up of *hheader*.

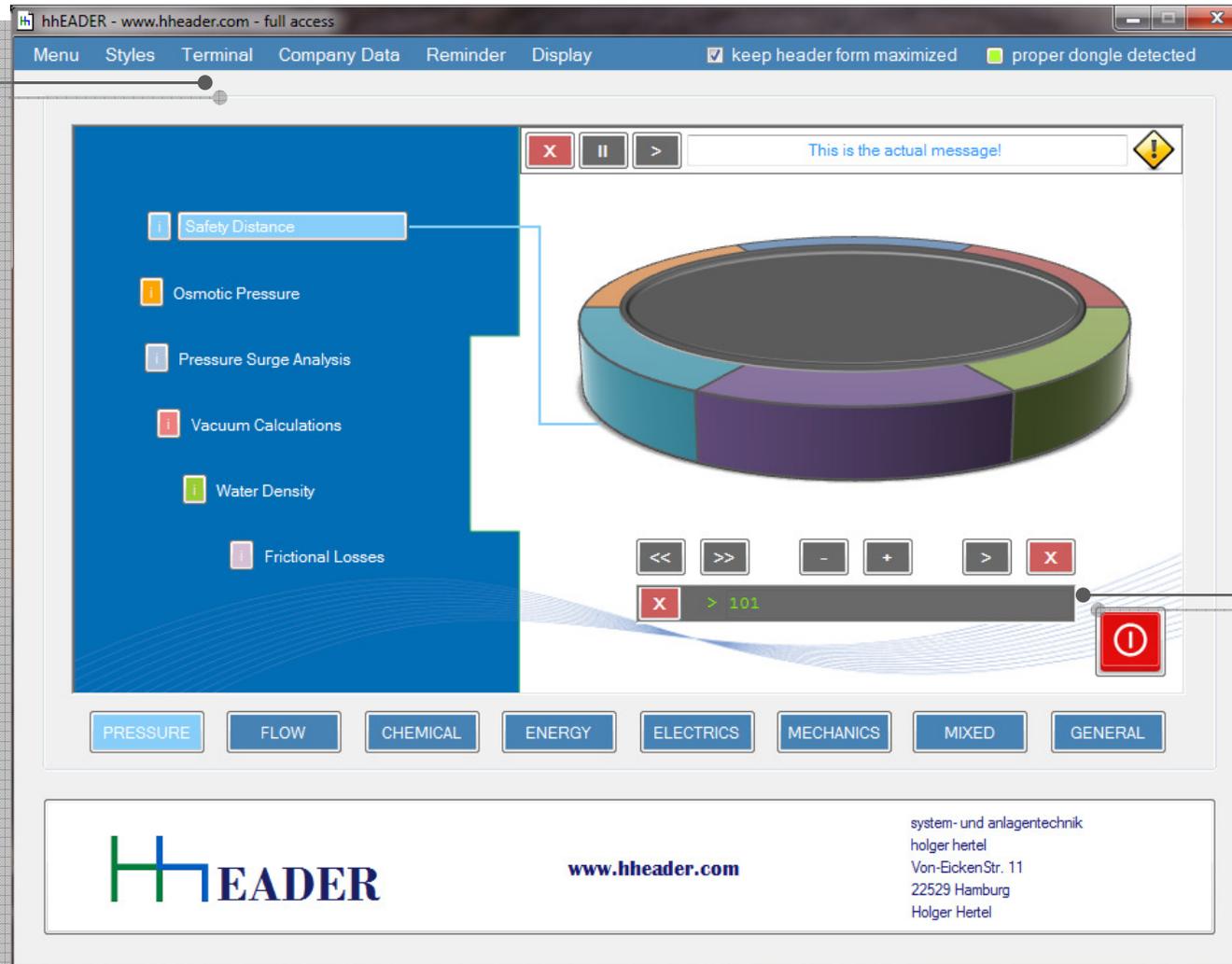
3.6. Terminal

**Terminal:  
(commands)**

The program provides an own small terminal, where commands can be entered in order to accelerate the handling. The commands are divided up into two groups. These are user commands which are described on the following page and administrator commands. The terminal menu has three different options:

- Open Terminal,
- Close Terminal,
- Terminal Infos,

The terminal can be opened or closed. By the button "Terminal Infos" the description for the terminal can be displayed, where the main commands are shown.



**Terminal:  
(application)**

After clicking the button "Open Terminal", the terminal command line will appear below the program command buttons in the header form. Here different commands can be entered. A list of the user commands is shown on the next page. In the first all the forms that are included in the header program can be opened by a number code that is corresponding to the internal form order. Thereby the general forms and the category forms are divided up. Further there are text commands for some forms and for closing the terminal again. Beside this there are some administrator commands that are not required for the user and due to this not mentioned in this manual.

Figure 7: form header with open terminal and message display

<b>General Forms</b>	license - opens the form License imprint - opens the form Imprint printer - opens the form SelPrinter compdata - opens the form Company Data	<b>Category 5 Electrics</b>	501 - opens the form Consumption 502 - opens the form Cross Section 503 - opens the form Intrinsic Safety 504 - opens the form Measure Range 505 - opens the form Power Rates 506 - opens the form Resistance
<b>Category 1 Pressure</b>	101 - opens the form Safety Distance 102 - opens the form Osmotic Pressure 103 - opens the form Pressure Surge Analysis 104 - opens the form Vacuum Calculations 105 - opens the form Water Density 106 - opens the form Friction	<b>Category 6 Mechanics</b>	601 - opens the form Gear Ratio 602 - opens the form Stress Analysis 603 - opens the form Torques 604 - opens the form Vibration 605 - opens the form Welding Current 606 - opens the form MTBF
<b>Category 2 Flow</b>	201 - opens the form Flow Rates 202 - opens the form Charges 203 - opens the form Operating Conditions 204 - opens the form Standard Conditions 205 - opens the form Permeability 206 - opens the form Membrane Flux	<b>Category 7 Mixed</b>	701 - opens the form Kinematics 702 - opens the form Steam Table 703 - opens the form Coefficient Valve 704 - opens the form Open Area Valve 705 - opens the form Reduction Rate 706 - opens the form Geometry
<b>Category 3 Chemical</b>	301 - opens the form Chemical Dosing 302 - opens the form Water Hardness 303 - opens the form Cryst. Diagram NaOH 304 - opens the form Stoichiometry 305 - opens the form Periodic Table 306 - opens the form Chemical Resistance	<b>Category 8 General</b>	801 - opens the form Small Business Offer 802 - opens the form Commissioning Protocol 803 - opens the form Program Parser 804 - opens the form IP-Address 805 - opens the form Randomize 806 - opens the form Date and Day
<b>Category 4 Energy</b>	401 - opens the form Heat Exchange 402 - opens the form Combustion 403 - opens the form Energy Balance 404 - opens the form Heat Capacity 405 - opens the form ISO-Conditions 406 - opens the form ISEN-Conditions	<b>Additional Commands</b>	types – shows the different variable types manual – shows the selection for the manual chapters eula – shows the EULA info – shows general program information for hheader exit – closes the Terminal

Figure 8: table terminal commands

**3.7. Company Data**

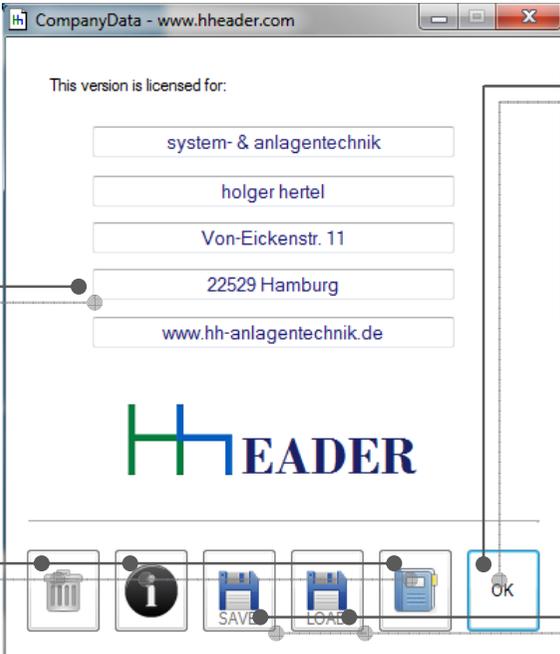
**3.7.1. Change Company Data**

Selecting this menu item will open the form that is shown below, where the company data can be defined. For this information there are 5 rows with 30 characters each provided. The displayed data is editable directly in this form.

**Company Data:**  
**(edit data)**

Usually it is intended as shown in the example, where the single rows are provided as follows:

- Row No. 1 for the company name,
- Row No. 2 for the user name,
- Row No. 3 for company address,
- Row No. 4 for company town,
- Row No. 5 for company website or user email-address or phone number.



**OK:**  
**(option)**

This button will just close the form. Alternatively the Exit-Button with the designation "X" on the right side in the top of the form can be used.

**Save and Restore:**  
**(option)**

It is possible to save and restore the company data (5 rows with 30 characters each). The file name will be defined automatically. The company data will be displayed at four different positions:

- in this form,
- in the right corner in the lower part of the header form,
- on the splash screen while starting up the program,
- in the license form.

Figure 9: form company data

### 3.7.2. Change Company Logo

Selecting this menu item will open the actual company logo with the Paint-Tool. The company logo can be changed by the user to his own belongs. The optimal resolution is reached if the picture measures are 226 x 66 pixels. The company logo is displayed in the program at two different positions: in the license form and in the Company Data form.

### 3.7.3. Change Report Logo

Selecting this menu item will open the actual report with the Paint-Tool. The report logo can be changed by the user to his own belongs. The optimal resolution is reached if the picture measures are 176 x 51 pixels. The report logo is shown on the calculation print outs. The report logo is smaller than the company logo.

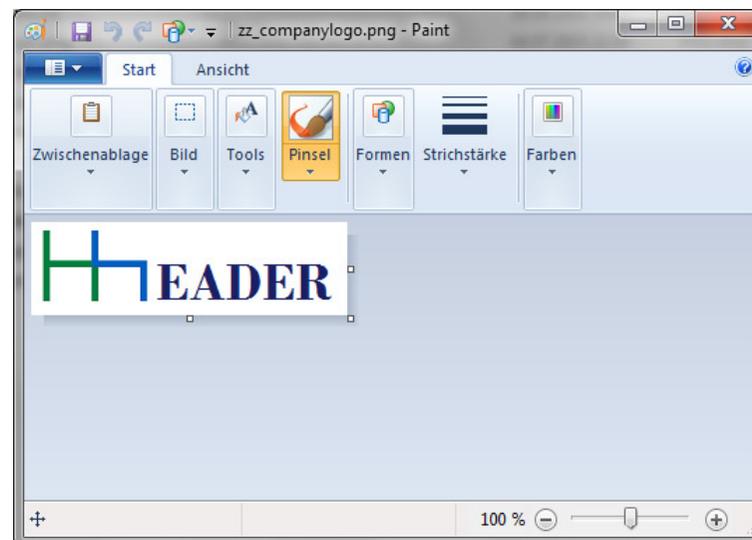


Figure 10: form company logo / report logo

### 3.8. Reminder

Selecting this menu item will open the form that is shown below, where hundred message (10 x10) texts can be defined. Further the date of the appearance can be set by day, month and year. It is also possible to enable or disable each message and to select if the message should be repeated annually or not.

**Step 1:**  
**Select message block**  
There are hundred messages provided that can be defined and activated. The hundred messages are divided up into ten blocks with 10 messages each. I can select the block by clicking the corresponding *TabPage*.

**Step 2:**  
**Enable the messages**  
Each message can be enabled or disabled by activating or deactivating the corresponding *CheckBox* at the beginning of the row. Be aware that only enabled messages can be displayed. If the message is disabled it will not be shown.

**Step 3:**  
**Enter the date of appearance**  
I can enter the date of appearance for each message by day month and year. The message will be activated at the given date. Be aware that only one message is provided for each date.

The screenshot shows a web browser window titled 'Reminder - www.hheader.com'. The browser has a menu bar with 'File', 'Erase Data', 'Enable messages', and 'Enable annual selection'. Below the menu is a tabbed interface with tabs labeled '001 - 010', '011 - 020', '021 - 030', '031 - 040', '041 - 050', '051 - 060', '061 - 070', '071 - 080', '081 - 090', and '091 - 100'. The main content area is a table with the following columns: 'enable', 'day', 'month', 'year', 'anual', and 'message text'. The table contains 10 rows of data. Each row has a checkbox in the 'enable' column, a dropdown for 'day' (values 1-5), a dropdown for 'month' (values 5), a dropdown for 'year' (value 2016), a checkbox in the 'anual' column, and a text input field in the 'message text' column. A dashed box highlights the date selection area (day, month, year). The text input fields contain the placeholder text 'Enter message text here! Up to 9999 characters are possible.'

**Step 4:**  
**Define the message texts**  
I can define a message text for each message. For each line there are 9999 characters possible. The activated message text will be displayed on the header form. The text itself will scroll from the right to the left. The movement can be paused and played.

**Step 5:(option)**  
**Select annual repetition**  
I can select if the message should be repeated annually or not.  
  
The annual repetition can be enabled or disabled for each message by activating or deactivating the corresponding *CheckBox* at the end of the row.  
  
Be aware that only enabled messages can be displayed. If the message is disabled it will not be shown.

Figure 11: form reminder

## 3.8.1. The Reminder Menu

### Reminder

#### Open Reminder:

Selecting this menu item opens the reminder form.

#### Activate Message:

Selecting this menu item activates the reminder message. This means that the message will be displayed, if it is enables and in coherence with the actual date.

#### Deactivate Message:

Selecting this menu item activates the reminder message. This means that the message will be displayed, if it is enables and in coherence with the actual date.

### Erase Data

#### Erase Data on actual table:

Selecting this menu item will erase the message texts and set all dates to 01.10.2015 on the actual table.

#### Erase Data on all tables:

Selecting this menu item will erase the message texts and set all dates to 01.10.2015 on all tables.

### File

#### Save Data:

Selecting this menu item saves the data to a file. The file name will be defined automatically.

#### Restore Data:

Selecting this menu item restores the data from a file. The file name will be defined automatically.

### Enable messages

#### Enable all messages for actual table:

Selecting this menu item enables all messages for the actual table.

#### Disable all messages for actual table:

Selecting this menu item disables all messages for the actual table.

#### Enable all messages for all tables:

Selecting this menu item enables all messages for all ten tables.

#### Disable all messages for all tables:

Selecting this menu item disables all messages for all ten tables.

### Enable annual selection

#### Enable annual selection for all messages on actual table:

Selecting this menu item enables the annual selection for all messages on the actual table.

#### Disable annual selection for all messages on actual table:

Selecting this menu item disables the annual selection for all messages on the actual table.

#### Enable annual selection for all messages on all tables:

Selecting this menu item enables the annual selection for all messages on all ten tables.

#### Disable annual selection for all messages on all tables:

Selecting this menu item disables the annual selection for all messages on all ten tables.

3.8.2. The Message Display

**Reminder Menu:  
(commands)**

The reminder menu provides three different commands.

**Open Reminder:**

Selecting this menu item opens the reminder form.

**Activate Message:**

Selecting this menu item activates the reminder message. This means that the message will be displayed, if it is enabled and in coherence with the actual date.

**Deactivate Message:**

Selecting this menu item activates the reminder message. This means that the message will be displayed, if it is enabled and in coherence with the actual date.



**Reminder Message:  
(information)**

If the message is enabled and activated due to a matching date, the message text will be displayed in the upper part of the header form. For each line there are 9999 characters possible. The text itself will scroll from the right to the left. Further there are three command buttons provided:

**X-Button:**

Clicking this button will close the message window.

**II-Button:**

Clicking this button will stop the movement of the message text (Pause).

**>-Button:**

Clicking this button will start the movement of the message text (Play).

Figure 12: form header

4. The Programs

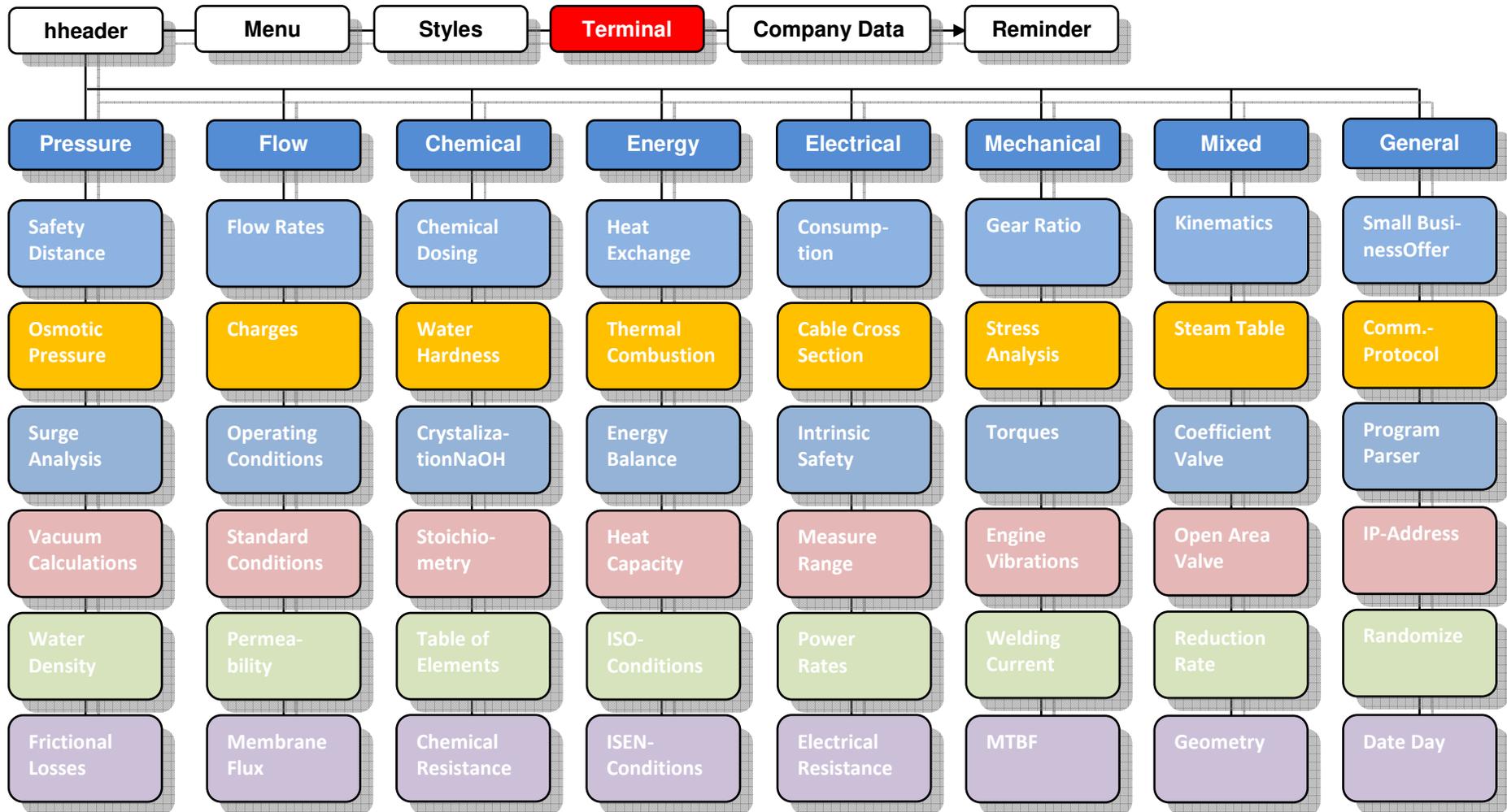


Figure 13: overview program selection

## 4.1. Category 1 – Pressure

### Safety Distance

Calculates the safety distance to be considered for pressure tests.

### Osmotic Pressure

Basic calculations for the Osmotic Pressure due to the ideal gas law.

### Pressure Surge Analysis

Evaluates the pressure surges to be expected by water hammering.

### Vacuum Calculations

Evaluates the risk for a round cross section pipe which is stressed by vacuum.

### Water Density

Provides coherences between temperature, water density and pressure as well as effluence considerations.

### Frictional Losses

Calculates the frictional losses for circular and rectangle cross section pipelines according to the approximate equation by Swamee and Jain.

## 4.2. Category 2 – Flow

### Flow Rates

Calculates flow rate, velocity and other parameters for circular cross-section vessels.

### Charges

Calculates the accumulation and durability of filter equipment at a constant charge.

### Operating Conditions

Calculates flow rates and other values for two different duty points based on the given pressure, temperature and humidity.

### Standard Conditions

Calculates the nominal flow based on 0°C and 1013mbar for a given flow rate at a certain pressure and temperature.

### Permeability

General theoretical calculations for the permeability of membranes.

### Membrane flux

Calculations regarding the flux of membranes with the corresponding values.

## 4.3. Category 3 – Chemical

### Chemical Dosing

Calculates dosing rates and dosing concentrations for chemical dosing procedures.

### Water Hardness

Calculates the carbon and magnesium water hardness and transforms the value into different international units.

### Crystallization Diagram NaOH

Shows the temperature of crystallization for the NaOH-solution based on the given concentration.

### Stoichiometry

It can check the stoichiometry of the entered chemical reactions considering the diverse given reactants.

### Periodic Table of Elements

It is just the Periodic Table of Elements.

### Chemical resistance

Table with materials and their resistance against different chemicals.

## 4.4. Category 4 – Energy

### Heat Exchange

General calculations for heat exchangers.

### Thermal post-combustion

Calculates the different energy consumptions of a thermal post-combustion unit.

### Energy Balance

Calculates values for the different forms of energy.

### Heat Capacity

Calculates values for a heating up process including losses and determination of the heat capacity.

### ISO-Conditions

Calculates the different values for isochore, isobar and isotherm changes in state.

### ISEN-Conditions

Calculates the different values for isentropic changes in state.

## 4.5. Category 5 – Electrical

### Consumption

Calculates electrical energy consumption and evaluates the costs.

### Cross Section

Provides factors for different cable types and calculations for current and voltage drop in order to determine the by rule permitted cable cross section.

### Intrinsic Safety

Interprets the intrinsic safety for electrical measurement equipment.

### Measure Range

Transforms process values into the corresponding measuring signals and reverse.

### Power Rates

Calculates the variables from the electrical input to the flux based on the efficiency.

### Electrical Resistance

Provides calculations for the electrical resistance, temp. influence, voltage drop, ohms law, impedance of RLC-Combinations and testing bridge design.

## 4.6. Category 6 – Mechanical

### Gear Ratio

It is just some gear ratio calculations.

### Stress Analysis

It is for different stress analysis with different load cases and a selection of profile types.

### Torques

Provides the fastening torques (nominal metric threads) for flange connections and steel constructions ( $\mu=0.125$ ).

### Engine Vibrations

Interprets the measured vibrations for engines according to the German VDI rule 2059.

### Welding Current

Provides tables and information for electrical welding current adjustments.

### MTBF

Calculations for the Mean Time Between Failures.

## 4.7. Category 7 – Mixed

### Kinematics

It is just some kinematic calculations regarding speed, distance, acceleration and time.

### Steam Table

Corresponding temperature, pressure and energy values from the steam table.

### Coefficient Valve

Calculates the valve coefficient for liquids, gases and steam.

### Open Area Valve

Calculates the open area for butterfly valve, ball valve and gate valve with respect to opening measure.

### Reduction Rate

Calculates the reduction time for biological reaction processes.

### Geometry

It is just some geometric calculations for different regular shapes regarding area and volume.

## 4.8. Category 8 – General

### Small business offer

Simple calculation for small business offers.

### Commissioning Protocol

Generates Commissioning Protocols for measurements, aggregates, valves, etc. from a defined table.

### Program Parser

It is a Program Parser for creating small individual user calculation programs.

### IP-Address

Changes the IP-Address, Subnet and Gateway easily - settings can be loaded and saved.

### Randomize

Gives back random values for different fields - limits can be adjusted.

### Date and Day

Determines the weekday Sunday to Saturday according to a given date consisting of day, month and year.