

**HYDROCAL 1011 *genX* P**  
**Portable dissolved gas analysis  
for power transformers and  
oil-filled electrical equipment**  
**Operation manual**



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# 1. General information

References to other chapters in this operating manual are enclosed in square brackets. Example: [5.5.9]



**The device is to be used exclusively in accordance with the instructions stated in this manual.**  
**If this device is used in a manner not specified by the manufacturer, the warranty may be voided. The device manufacturer does not accept any liability for property damage or personal injury resulting from improper use or non-observance of the safety instructions.**



## Note!

**To prevent the loss of data, it is recommended to save the measurement data with the Windows-based optional software: HydroSOFTHybrid App.**



**Important:** MTE and EMH accept no liability for any kind of data loss.

## 1.1 Advantages and special features

The HYDROCAL 1011 *genX* P is a portable instrument for analysing dissolved and free gases from the insulating fluid of oil-filled power transformers and other electrical equipment. It individually measures moisture in oil (H<sub>2</sub>O) and the key gases hydrogen (H<sub>2</sub>), carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), acetylene (C<sub>2</sub>H<sub>2</sub>), ethylene (C<sub>2</sub>H<sub>4</sub>), ethane (C<sub>2</sub>H<sub>6</sub>), oxygen (O<sub>2</sub>), nitrogen (N<sub>2</sub>) and propane (C<sub>3</sub>H<sub>8</sub>) dissolved in transformer oil.

Given that hydrogen (H<sub>2</sub>) is involved in almost every power transformer insulation system fault and carbon monoxide (CO) is a sign of cellulose/paper insulation involvement, the presence and increase of the other light hydrocarbon gases further classifies the nature of a fault as overheating, partial discharge or high energy arcing. Oxygen (O<sub>2</sub>) can be a sign of excessive ageing or leaks from hermetically sealed transformers.

### The key advantages

- Individual measurement of hydrogen (H<sub>2</sub>), carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), acetylene (C<sub>2</sub>H<sub>2</sub>), ethylene (C<sub>2</sub>H<sub>4</sub>), ethane (C<sub>2</sub>H<sub>6</sub>), oxygen (O<sub>2</sub>), nitrogen (N<sub>2</sub>) and propane (C<sub>3</sub>H<sub>8</sub>).
- Measurement of moisture in oil (H<sub>2</sub>O)
- Maintenance-free near-infrared measuring system with headspace gas extraction according to IEC 60567
- Operation via integrated 7" colour TFT (800x480 pixels) touch screen or via *genX* web server from any smartphone, notepad or PC
- Communication interfaces WLAN, USB or ETHERNET 10/100 Mbit/s
- SD memory for test results, history and diagnostic data of power transformers and oil-filled electrical equipment
- Integrated thermal printer

## 1.2 Application

HYDROCAL 1011 *genX* P was developed for various applications besides the classical laboratory and online DGA:

- Monitoring a group of smaller (e.g. distribution) transformers where on-line DGA would not be commercially viable.
- Monitoring of other oil-filled high-voltage equipment, e.g. instrumentation/protection transformers, CTs/PTs, circuit breakers, etc.
- Assistance with the installation and/or repair of power transformers.
- Analysis of gas samples from Buchholz relays
- Confirmation of warnings from online DGA devices or Buchholz relays.

### 1.3 Operation

The operation of the HYDROCAL 1011 *genX* P is particularly user-friendly:

- Operation via a large 7" colour TFT touchscreen display (800x480 pixels).
- Animations integrated into the firmware menu explain the entire analysis, step by step, in order to make operation as simple and user-friendly as possible and to avoid undetected errors
- Integrated WLAN interface

## 2. Safety instructions

The following safety instructions must be strictly adhered to when using the instrument. Otherwise no warranty claims can be made.



**Note:** Before using the HYDROCAL 1011 *genX* P, please read and follow the operating- and safety instructions.



**Never close the ventilation opening for the ambient air supply.**

This is located on the front panel of the device, see also [3.2.8].



**Never use or store compounds containing hydrocarbons near the measuring cell or use these for cleaning,** since the gases will greatly impair the measuring accuracy and sensitivity of the sensors.



**Note!**

**Incorrect or improper handling will invalidate all warranty claims.**



**When taking oil samples and analysing them, hazardous substances must be prevented from escaping into the environment. Collect pollutants directly at the outlet points.**



**Note:** When the cover is open, the device must be protected from environmental influences such as sunlight and moisture.



**Note:** Hazardous voltage. The device may only be opened by the Service department. When the user replaces the fuse, the mains plug must be disconnected.



Unauthorised opening or damage to seals etc. will jeopardise the warranty.

### 3. Hardware components

#### 3.1 Device case



##### 3.1.1 Opening

To open the case, pull the locking levers on both sides of the HYDROCAL *genX* P upwards,



Note: When the levers are snapped up, the case is vacuum compensated through the compensation openings behind the locking lever. After closing, the case is both water- and dust-proof.

**Note:** A prerequisite for tightness is that the seals and their counterparts in the cover and on the locking levers are clean and undamaged.



**Note:** If the installation instructions are not observed, there is a possibility that the cover of the device may swing down and pose a danger to the user and the sensitive sample syringes. Make sure that the device is set up correctly according to [3.1.2].

### 3.1.2 Installation instructions

**Note:** The HYDROCAL 1011 *genX* P must be placed straight and stable on a firm, non-slip surface.



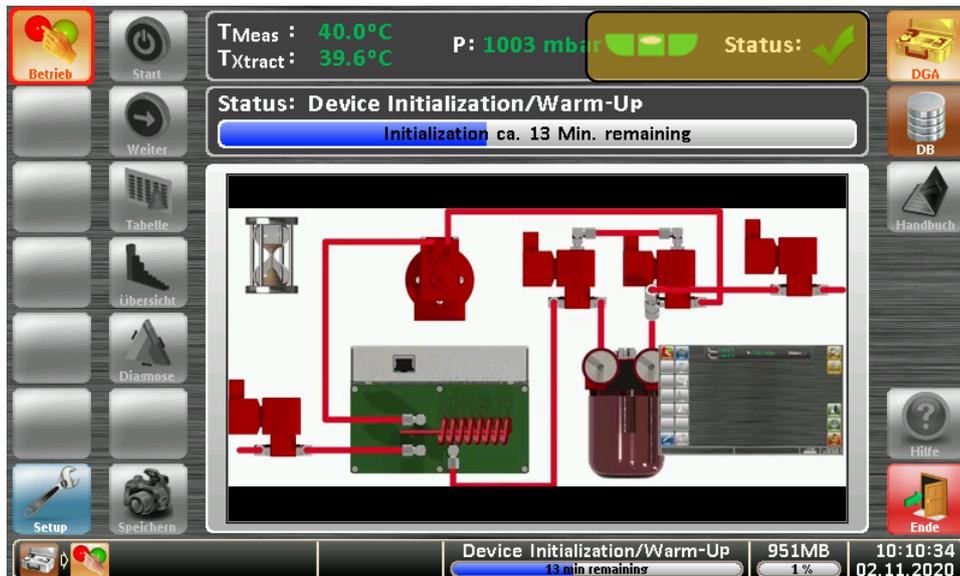
Place the device on a level surface. Alignment with a spirit level is not necessary. Possible deviations are detected by the integrated position sensor [3.1.2.1].



### 3.1.2.1 Position sensor

To ensure measuring accuracy and process reliability, as well as environmental protection, a position sensor is integrated to monitor the correct position of the HYDROCAL 1011 *genX* P. The position sensor detects the angle of inclination of the device and a deviation from the horizontal is shown in the display via the spirit level. Reaching the limit value is indicated by a colour change from green to red in the display. In addition, the status behind the spirit level is indicated by a green arrow or an exclamation mark in the yellow triangle.

In the DGA menu, after pressing the operation button, the following screen can provide further information about the operating status of the device.



The device is in the correct position, an oil analysis can be carried out.



The device is in the incorrect position (the device is too high at the front and/or left), an oil analysis is not possible. The device must be aligned correctly until the spirit level is green and a green arrow appears behind "Status".



The device is in the incorrect position (the device is too high at the back or/and on the right), an oil analysis is not possible. The device must be aligned correctly until the spirit level is green and a green arrow appears behind "Status".

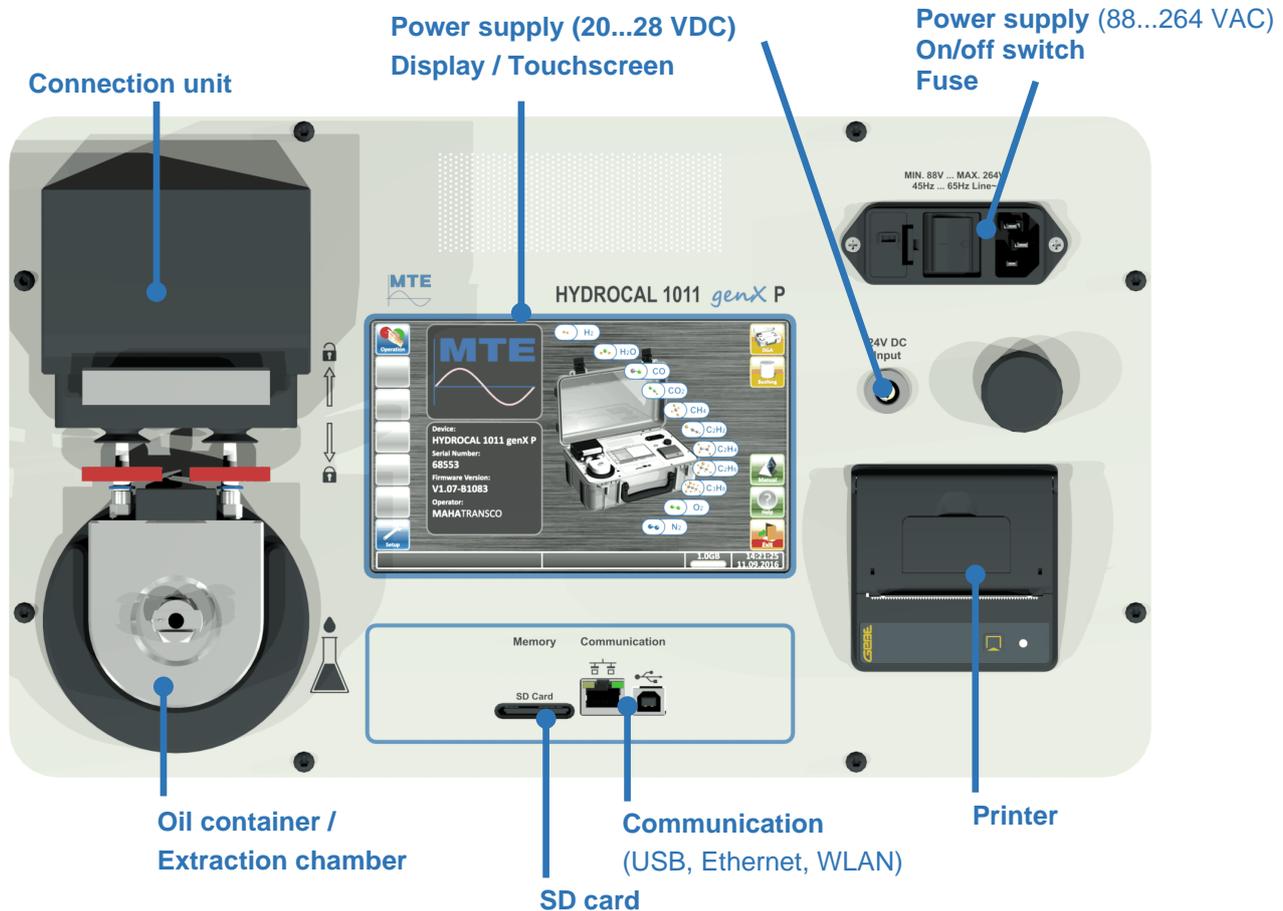
## 3.2 Operating devices – Connections – Oil sample injection

After opening the two snap locks, the cover of the device can be moved upwards into the vertical position.



Note: The device cover must be completely open during operation of the HYDROCAL 1011 *genX* P for sufficient ventilation. It is important for the trouble-free operation of the HYDROCAL 1011 *genX* P that there is always sufficient air exchange with the ambient surroundings

The front panel consists of the following components:



### 3.2.1 Display / Touchscreen

To operate the HYDROCAL 1011 *genX* P, the menus are controlled via the touch-sensitive display, see chapter [4].

### 3.2.2 Connection unit

The connection unit connects the removable oil container to the analysis system of the HYDROCAL 1011 *genX* P, see chapter [4.5].

### 3.2.3 Oil container / Extraction chamber / Heater

The oil samples to be analysed are injected into the oil container. See chapter [4.5.4].

### 3.2.4 Communication

Communication for the evaluation and management of measurement results can be done via the following connections

- USB
- Ethernet
- WLAN

### 3.2.5 SD card

A 1 GB SD memory card is included in the delivery. The memory card is used to store measurement results and service data.

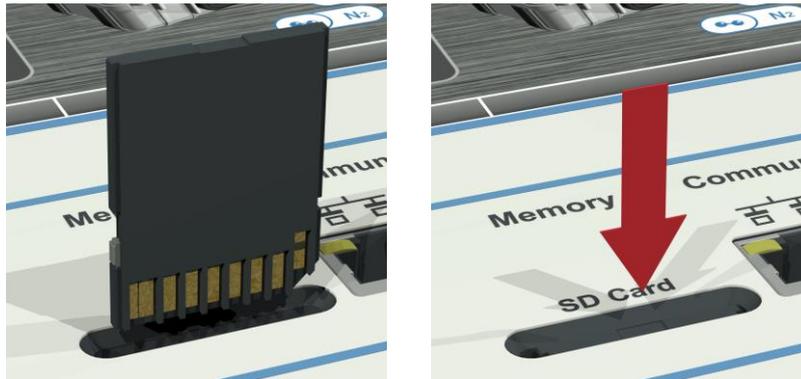
**Note:** A memory card must be inserted in the HYDROCAL 1011 *genX* P before a measurement is taken. Otherwise, it is not possible to save the results.

When a memory card is inserted into the device, it is automatically formatted and provided with the required folder structure.

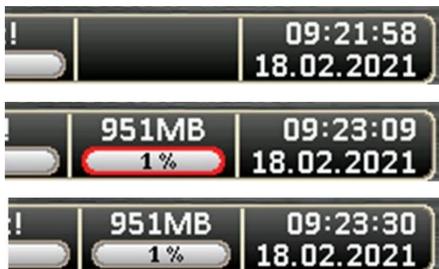
#### 3.2.5.1 Insert the memory card:

Push the memory card into the compartment until you hear it click into place.

**Note:** Make sure that you **insert the memory card the right way**; otherwise, a malfunction may occur, or the device or memory card may be damaged.



SD card recognition is shown in the lower right corner of the display:



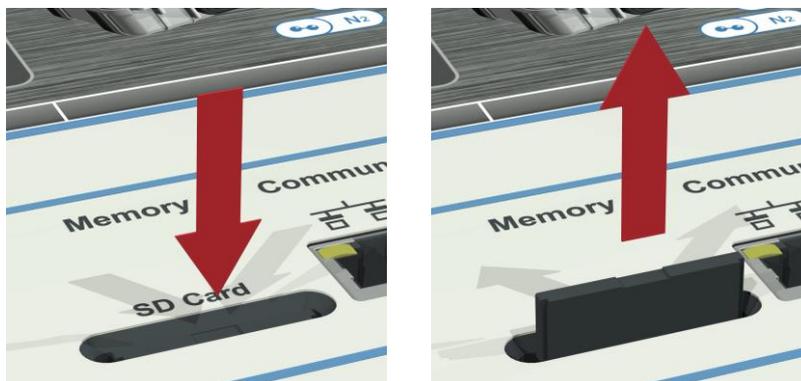
SD card not recognised

SD card recognised and in initialisation

SD card recognised and ready for use

#### 3.2.5.2 Remove the memory card:

Press on the memory card and then release it. It now protrudes a little from the device so that it can be pulled upwards out of the device.



### 3.2.6 Power supply

The power supply of the HYDROCAL 1011 *genX* P is optionally via the mains input or via an auxiliary power supply.

#### 3.2.6.1 Mains input / Fuse / On/Off switch

- **Mains input:** The mains connection cable [6.1] supplied is used for connection to the mains power supply.

**Note:** The voltage range according to the chapter [7.1] must be adhered to.

- **On/Off switch:** The device is switched on and off using the on/off switch.

**Note:** If the device is supplied with auxiliary power chapter[3.2.6.2], it cannot be switched on or off via the switch.

- **Fuse:** The mains input is protected by fuses. See [5.2.1.2].

#### 3.2.6.2 24 volt auxiliary power

If no mains connection is available 3.2.6.1 for operation of the HYDROCAL 1011 *genX* P, it is possible to use an auxiliary power supply either via an optionally available HYDROCAL 1011 *genX* P Battery Pack [6.2.1] or a HYDROCAL 1011 *genX* P Automotive supply [6.2.2].

**Note:** The voltage range according to the chapter 7.1 must be adhered to.

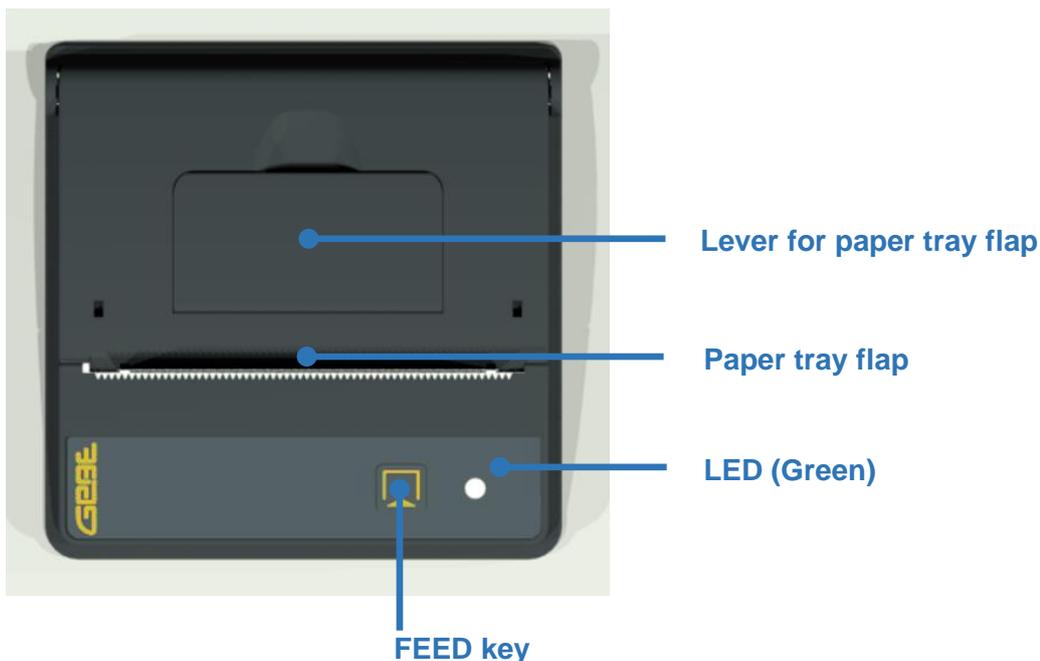
**Note:** Supplying the auxiliary power with a non-original product [6.2] will void the warranty. Possible consequences include loss of data and, in the worst case, destruction of the HYDROCAL 1011 *genX* P.

**Note:** If the device is supplied with auxiliary power, it cannot be switched on or off using the switch [3.2.6.1].

### 3.2.7 Printer

The built-in thermal printer enables printing of result files on paper [4.4.2.5].

#### 3.2.7.1 Operation



#### Key function

The key functions can have different meanings depending on their status. The key press duration is also evaluated.

## FEED key

The FEED key can be used to advance the paper. When the FEED key is pressed, initially only one line is advanced. If the FEED key is pressed for more than 2 seconds, the paper is advanced permanently.

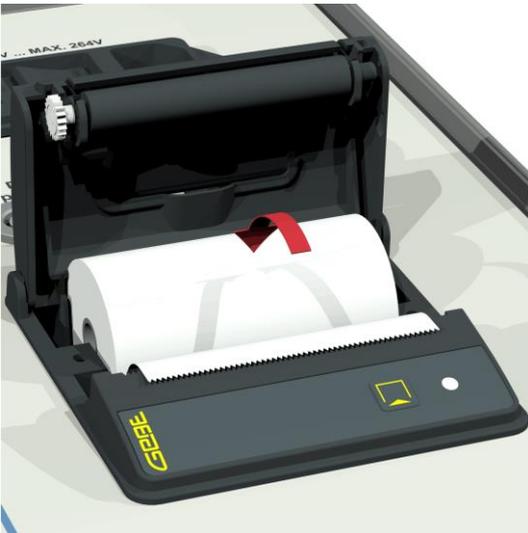
## SELF-TEST

The printer is checked for its internal functioning by starting a printout in the self-test mode. To do this, press and hold the FEED key when switching on the HYDROCAL 1011 *genX* P. A printout with software version and character set is printed.

### 3.2.7.2 Loading paper

Which side of the thermal paper can be printed on? Normally, paper coated on the outside is used. On the paper roll, the side facing out is almost always the printable side. This is how to load the paper:

Open the printer cover by pulling the lever on the cover slightly upwards. The cover can now be opened easily.



Unwind a few cm of paper from the roll.

Keep the layers tightly wound and place the paper roll in the paper supply tray so that the outside faces the printing device.

Close the cover with a firm push. It will audibly snap shut so that you can now tear off the paper at the tear-off edge without the cover opening again or the paper slipping through the printing device.



Suitable paper: For suitable paper, please refer to the table in the section Scope of delivery [6.1].

**Note:** Other types of paper may cause faults to occur.

### 3.2.7.3 Cleaning the printer

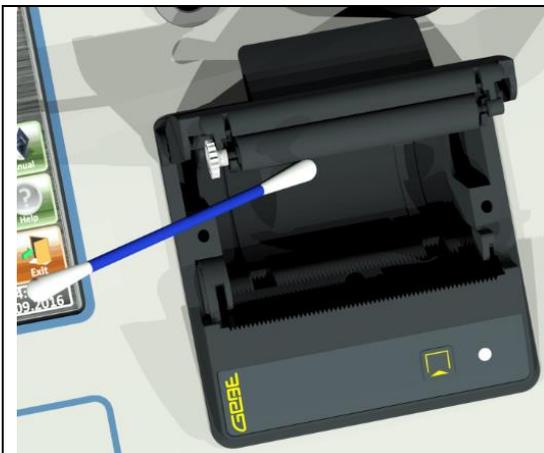
After large print runs (and depending on the paper quality and adverse environmental conditions), it may be necessary to clean the print head, sensor and drive roller, especially if certain areas no longer print properly.

**Note:** Never use sharp objects for cleaning. This could damage the print head.

**Cleaning procedure:** Open the paper tray door and remove the paper roll, see chapter [3.2.7.2],

**Note:** Do not touch the print head as it could be damaged by electrostatic charge.

Use a small brush to remove dirt from the paper, the sensor and the tear-off edge. Blow hard into the paper tray to remove the coarse dust.



Soak a cotton swab in isopropyl alcohol to clean the sensor, drive roller and printhead bar, as well as other instances of soiling.

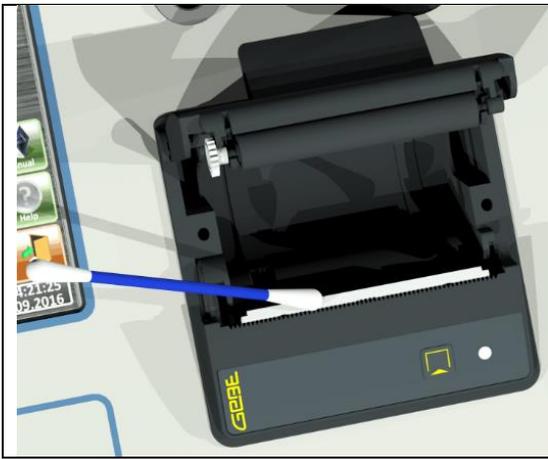
**Note:** When using isopropanol, it is essential to observe the hazard information in the safety data sheet.

**Note:** In principle, the printer must be kept free of dust.

**Drive roller**



**Sensor**



Alternatively, you can use a print head cleaning pen or a cleaning card to clean the printhead bar.

**Printhead bar**

### 3.2.8 Ventilation

The ventilation opening serves as an inlet and outlet point for the compressor (gas/air mixture of the measuring cell).



**Note:** The ventilation holes must always be kept free to ensure air/gas exchange. Do not cover or block the ventilation holes.

## 4. Operation

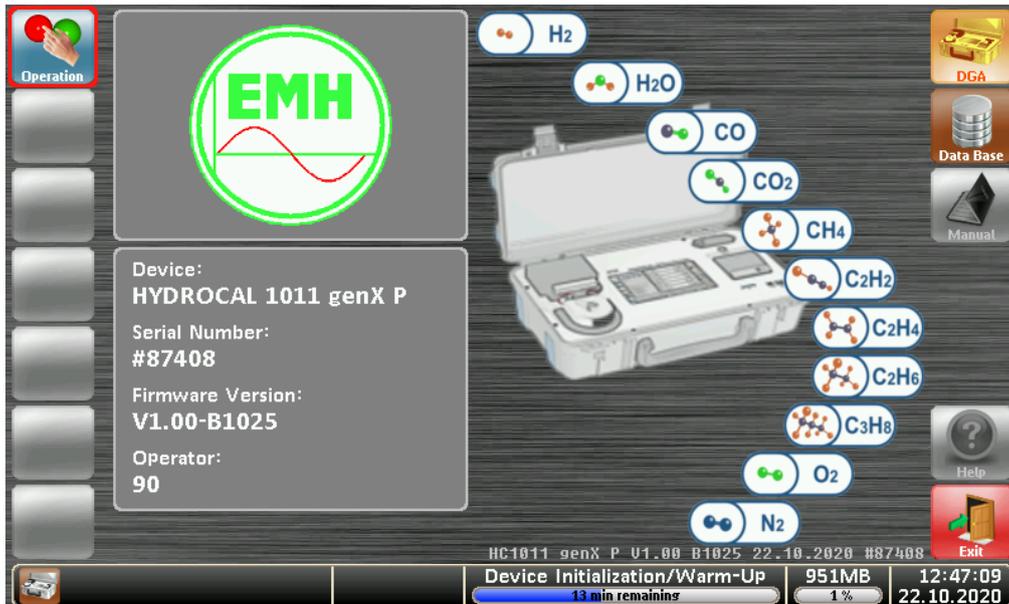
### 4.1 General notes about menu navigation

To facilitate the operation of the device in the respective screens, the menu sequence is documented in this manual in the respective chapter headings. See example:

4.4.3   DGA Menu -  Setup -  Alarm Setup

### 4.2 Switching on the HYDROCAL 1011 *genX* P / Start screen

After switching on the HYDROCAL 1011 *genX* P, the following screen content appears



The device is initialised and heated up. This process takes up to 20 minutes, depending on the device and ambient temperature.

#### 4.2.1 Start screen

##### 4.2.1.1 Control panels – Start screen

A new menu is selected by pressing the following fields:



Operation, DGA Measuring and analysis area [4.3].



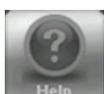
DGA (Dissolved Gas Analysis) menu. In the DGA menu, oil analyses are performed, results of the oil analysis currently being performed are displayed and alarms are set.



Database menu. In the database menu, the stored results are displayed and the basic settings of the device and the customer are determined.



Manual (not yet possible)



Help (not yet available)



End – Exit the current menu

#### 4.2.1.1.1 Field colouring of the control panels



Light yellow coloured field: Menu currently selected. See also [4.2.1.2].

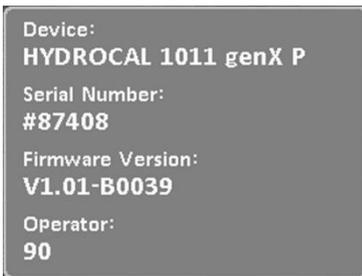


Dark coloured field: Menu selection possible.



Greyed out field: Not selectable / not available.

#### 4.2.1.2 Display fields – Start screen



Device	Display of the device type.
Serial number:	Display of the serial number of the device.
Firmware version:	Display of the firmware currently installed on the device.
Operator:	Display of the operator, see [4.4.3.6].

The same information is displayed again in the lower part of the screen:



When a field is pressed, a help text appears in the left-hand area; the length of the display can be set individually, see [4.4.3.3].



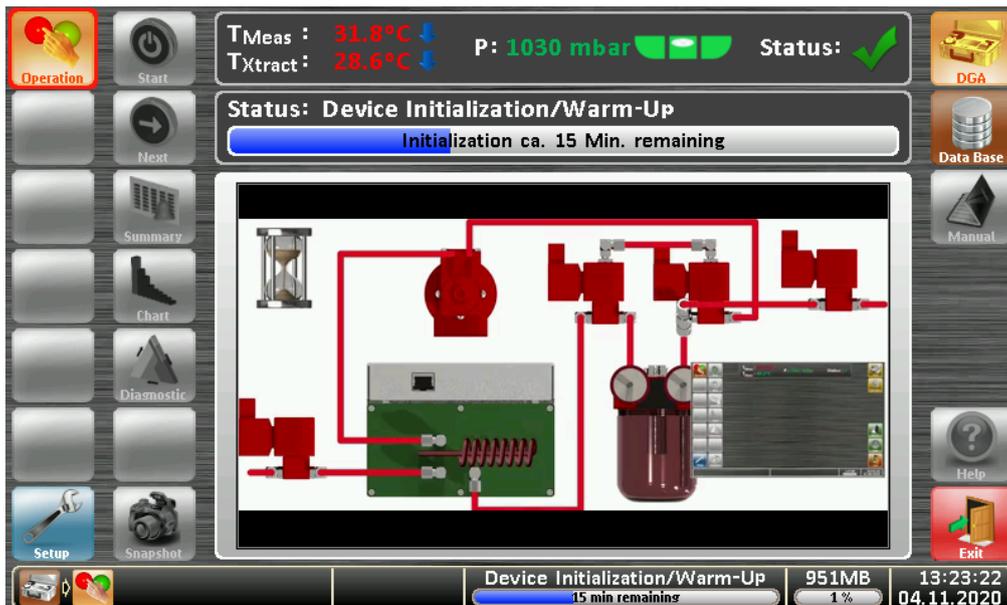
### 4.3 DGA menu

In the DGA menu, oil analyses are carried out, results of the oil analysis currently being carried out are displayed and alarms are set.

#### 4.3.1 DGA start screen initialisation / heating up

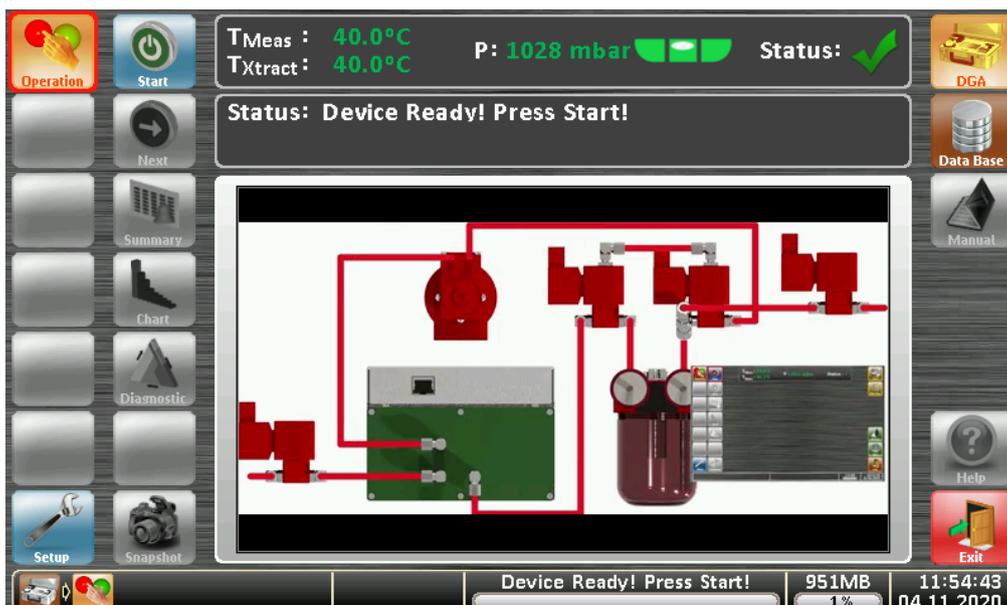
When the HYDROCAL 1011 *genX* P is switched on, the device is automatically initialised, and the operating temperature of the measuring cell and extraction chamber is brought up to a temperature of 40°C.

The temperatures of the measuring cell  $T_{Meas}$  and the extraction chamber  $T_{Xtract}$  are displayed in the upper part of the screen. As long as the setpoint is not reached, the temperature is displayed in red with a blue downward arrow behind it:  $T_{Meas} : 34.1^{\circ}\text{C} \downarrow$ . This indicates that the temperature is still too low.

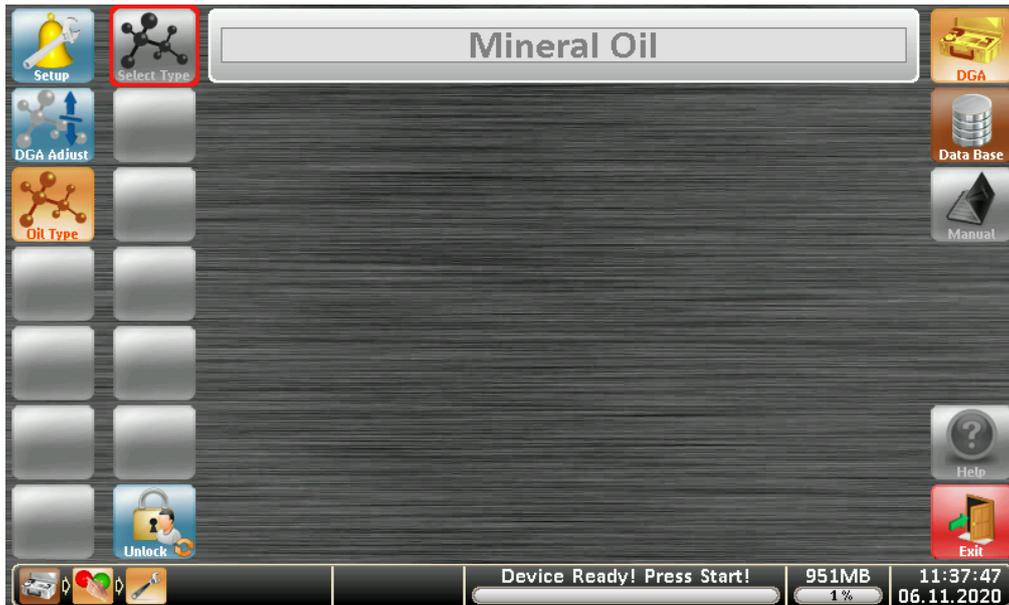


After the setpoint temperature has been reached, the displayed value is shown in green:

$T_{Meas} : 40.0^{\circ}\text{C}$



### 4.3.2 DGA Menu - Setup



The following settings are made in the setup of the DGA menu:



Configure alarms



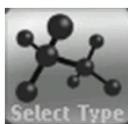
(Perform DGA adjustment) Currently not possible



Select oil type

### 4.3.3 Enabling and disabling submenus

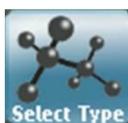
To be able to make settings in a submenu, it is sometimes necessary to release the setting beforehand. The release, locking and selection of submenus explained below can thus be used in all submenus.



A menu field that has not been released is shown greyed out.



In addition, the following symbol indicates a menu item that has not been released.



A menu field that has been released is shown in colour



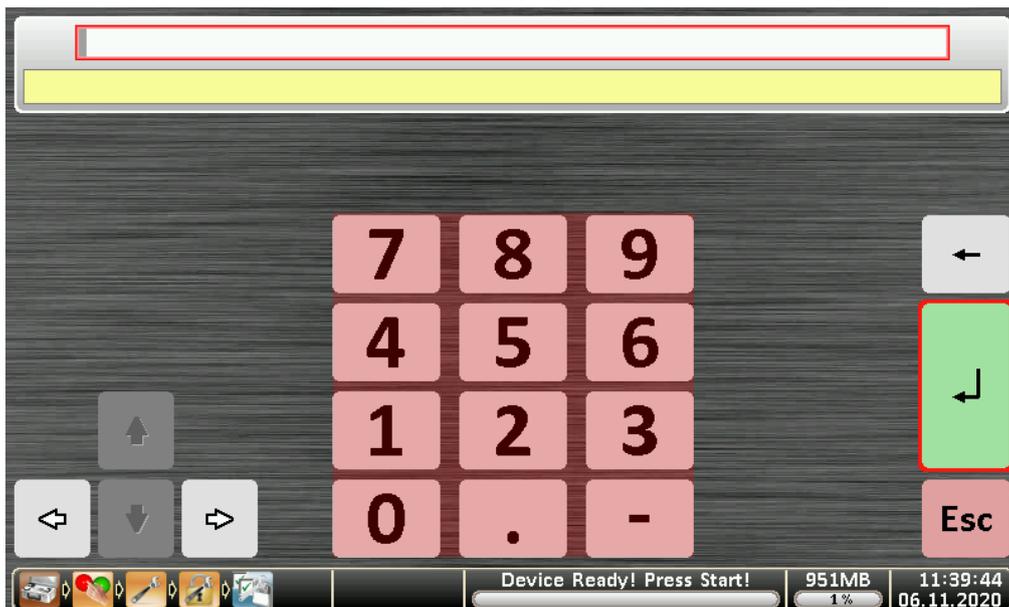
In addition, the following symbol will indicate a released setup

The release procedure is described below.

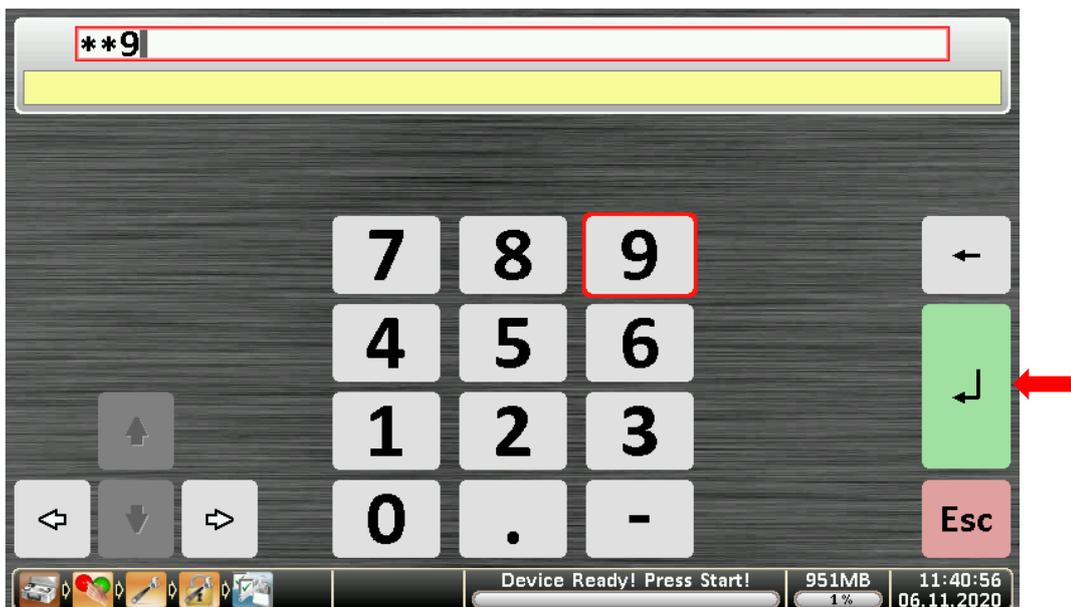
To carry out the release, press the Release field .  
Then tap with your finger on the empty field.



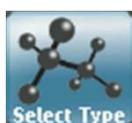
Now the password can be entered via the numeric keypad. The default password is 999. The password can be changed see [4.4.3.6].



Then press the green green "Enter" Button.



Then press the confirmation field for the setup.



The released menu field is shown in colour.



In addition, the following symbol indicates the released setup.



To lock the release again, press the lock symbol.



Afterwards, the release is locked and no more changes can be made in the selection menus.

#### 4.3.4 **DGA Menu - Setup - Alarm Setup**

Configuration of the alarms is carried out in the alarm setup. It is not necessary to unlock this menu. In the alarm setup, it is possible to save various transformer-specific threshold value data in a configuration and to get a quicker overview of possible breaches in result files later.



In the following image, no alarm has been configured yet. On the one hand, this can be recognised by the open-ended spanner in the symbols of the different gases. And for the selected gas (here H<sub>2</sub>), there is also the note “Alarm not yet set!”.



#### 4.3.4.1 **High alarm**

In the following image, you can see that the CO<sub>2</sub> alarm has been configured as a high alarm. This can be recognised by the fact that, after accessing the alarm setup and selecting the measured variable (i.e. CO<sub>2</sub>), the high-alarm symbol is highlighted in orange and that there is only one field with a grey background with alarm parameters (in this case “High” threshold) in the middle of the screen.



#### 4.3.4.2 High-high alarm

A high-high alarm is an extended high alarm with a second threshold (if a warning threshold is required first, for example)

In the following image, you can see that the H<sub>2</sub> alarm has been configured as a high-high alarm. This can be recognised by the fact that after accessing the alarm setup and selecting the measured variable (i.e. H<sub>2</sub>), the high-high alarm symbol is highlighted in orange and that there are two fields with alarm parameters (here threshold “High-High”) highlighted in grey in the middle of the screen.



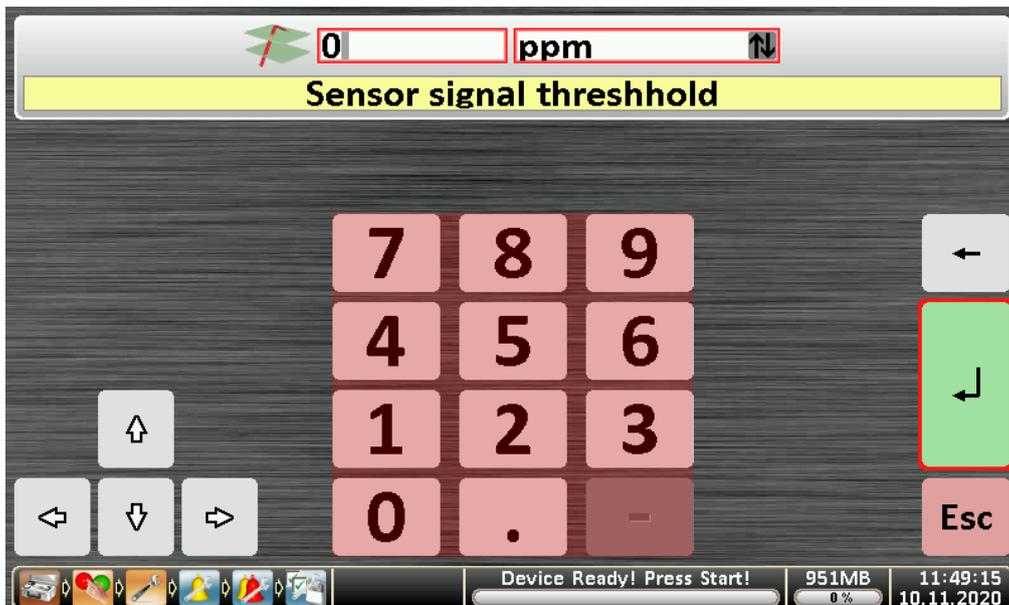
Alarm thresholds are set in the alarm configuration by pressing the respective field for the gas to be configured. Then select the Hi or Hi-Hi alarm on the left and tap on the threshold value that has not yet been set with your finger.



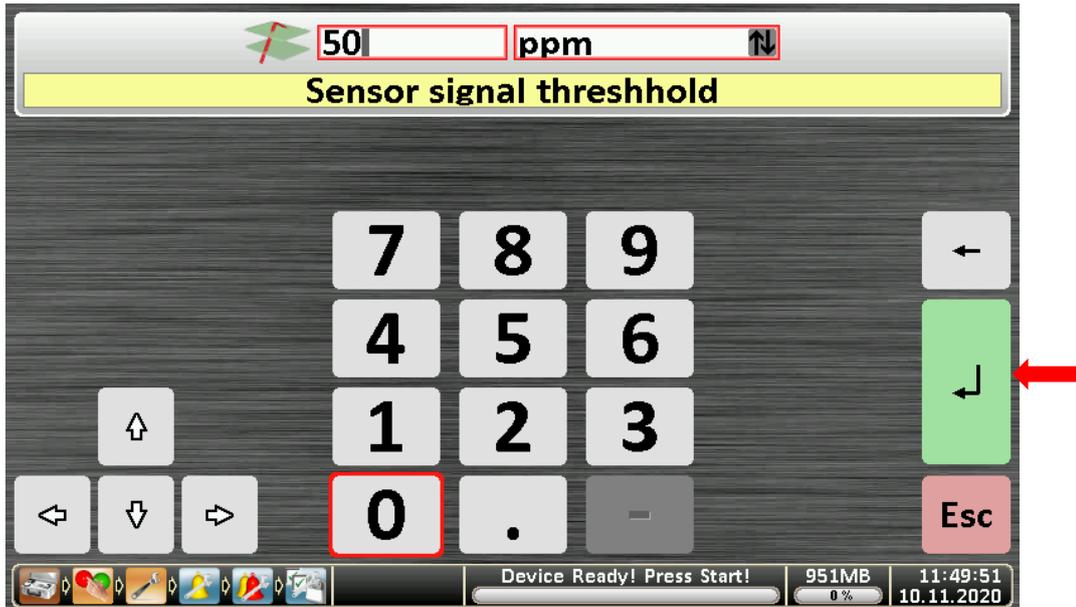
Then the following menu opens, in which the value must be clicked on again.



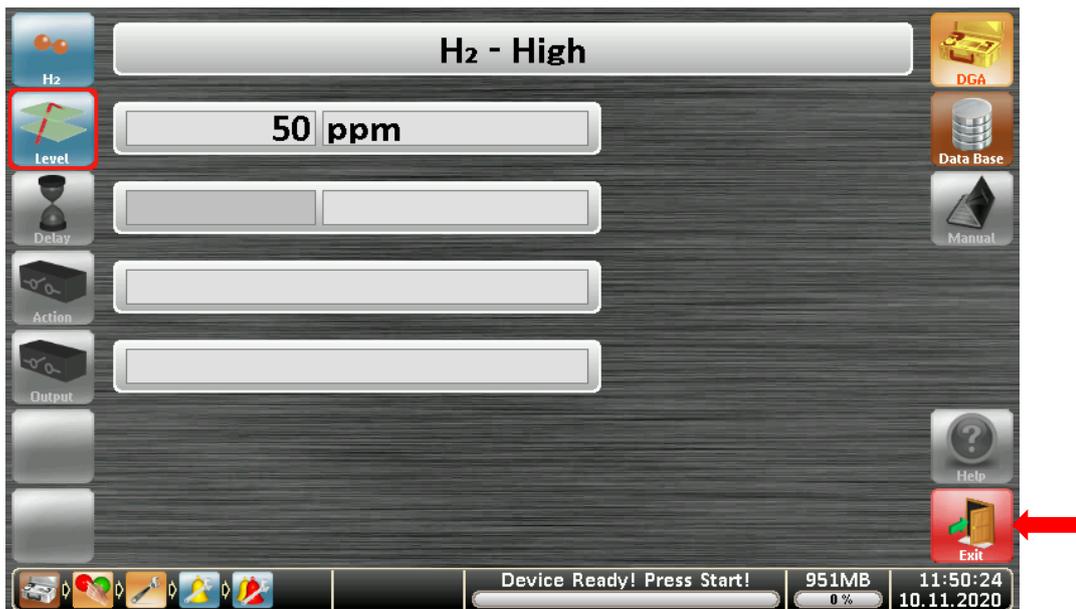
Afterwards, the setting menu opens.



Here, the threshold value is entered via the numeric keypad and then confirmed with the green “Enter” button.



**Note:** The three greyed-out symbols , , and  are not selectable for this device type.



The “Exit” button brings you back to the alarm setup.

The threshold value of H<sub>2</sub> is now displayed.



In the symbol of the gas, the spanner has now changed to two arrows arranged in a circle. This means that an alarm configuration has been carried out for the gas concerned, but it has not yet been saved.



One after the other, the alarm for each gas can be set in this way.

**Note:** If the alarm configuration of the gases has not been saved, the menu should not be exited via the  field, as this leads to the deletion of the prior entered preset values.



All gases not shown on the display become visible via the up and down fields.

#### 4.3.4.3 Loading and saving alarm configurations

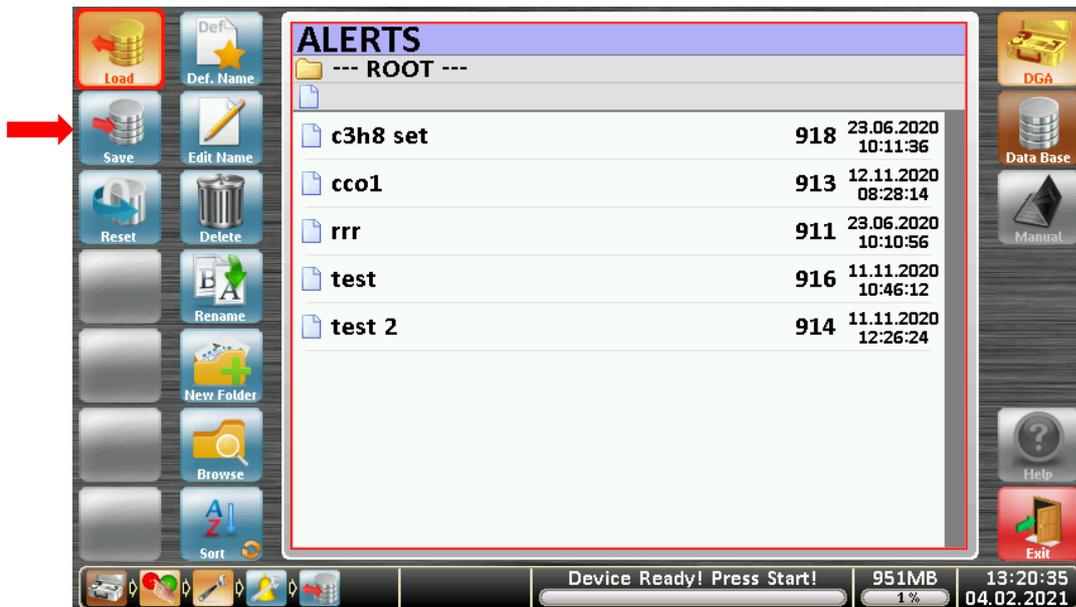
After the alarm configuration for all gases has been completed, this configuration can be saved as follows.



After clicking on the Load/Save field, the alarm database opens.

In addition to saving, you can also load an alarm configuration from the database.

To save the alarm configuration just created, press the “Save” button.



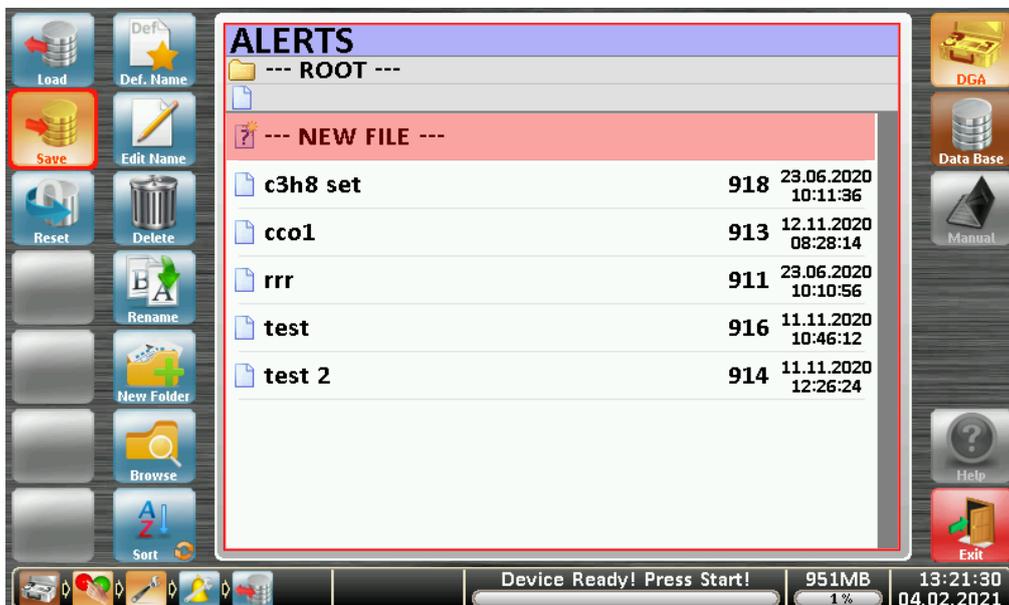
There are two possibilities to save the alarm configuration:

#### 4.3.4.3.1 Alarms / Select a new file name

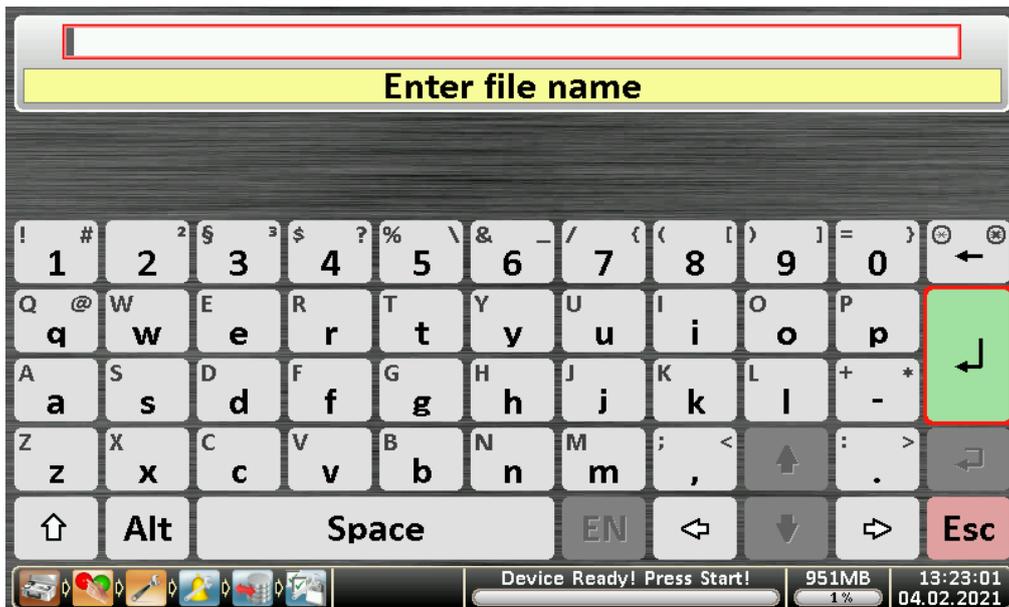


After pressing the “Save” button, the alarm configuration can be saved as a new file as follows:

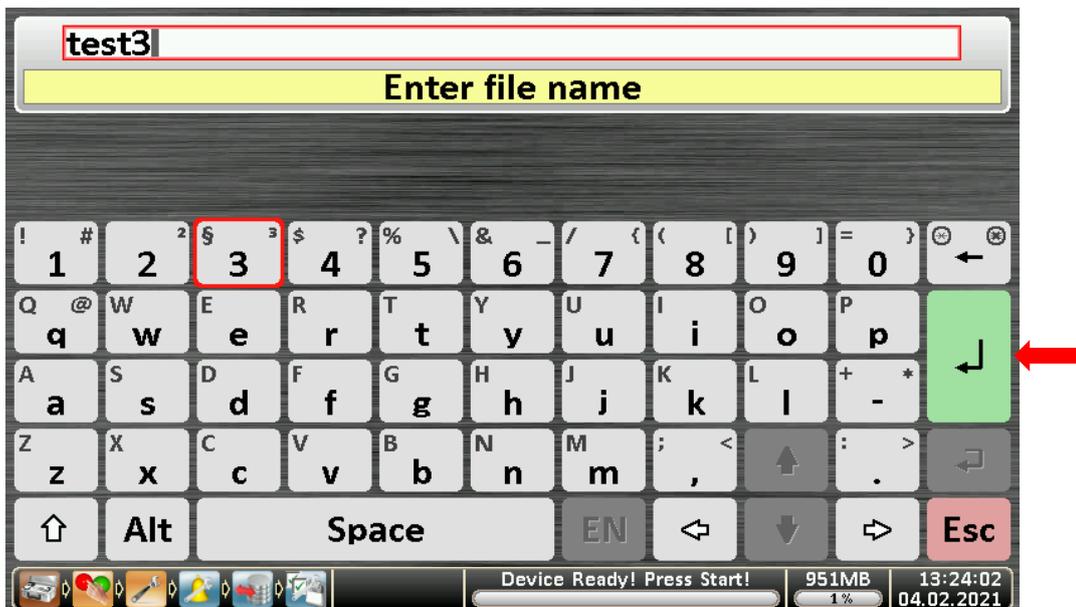
To save the data set under a new name, tap on “--- NEW FILE ---”.



The dialogue window for entering the name appears.



Then enter the name via the input mask and confirm it by pressing the green "Enter" key.



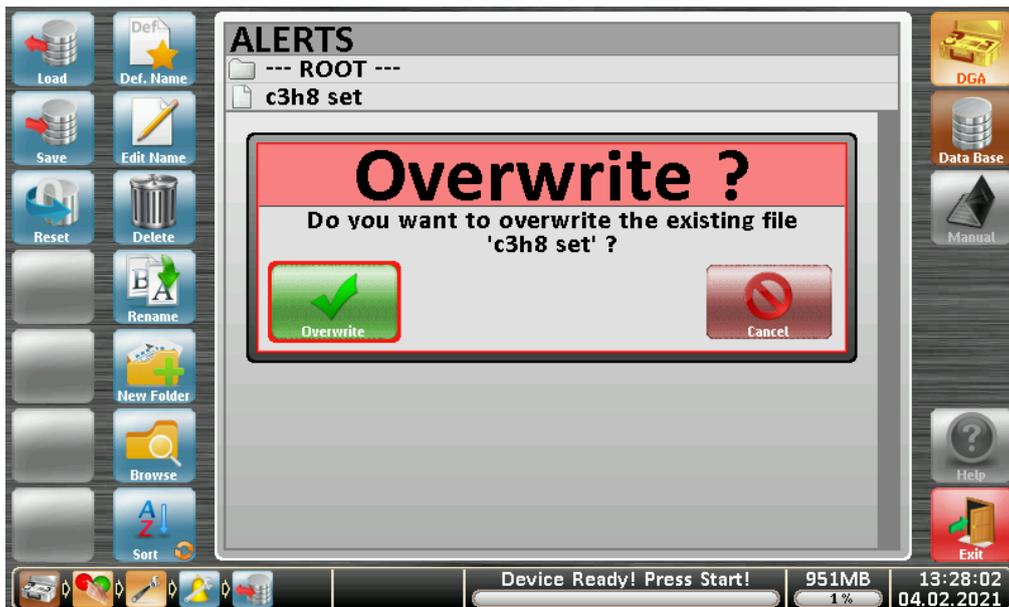
#### 4.3.4.3.2 Alarms / Select an existing file name

**Note:** The file is then overwritten. To do this, tap on the file name of the alarm configuration that is to be overwritten.



After pressing the “Save” button, the alarm configuration can be saved as a new file as follows:

If an existing alarm configuration shall be overwritten, the dialogue window for overwriting appears, in which the overwriting is confirmed once again by pressing the green button.



After successful saving, a green bell appears in the buttons of the gases for which an alarm configuration was made.



A green bell indicates that the alarm has been configured.

Reaching the Hi and Hi-Hi thresholds is indicated by a coloured bell in the result files, see [4.4.2.3].

#### 4.3.4.4



#### Copying and saving the alarm configurations of individual measurement parameters



Entire alarm configuration parameters of a measurement type can be copied by pressing the “Copy” field.



These alarm configuration parameters can be assigned to another measurement type by pressing the “Paste” field.

To do this, first press the field (e.g. H<sub>2</sub>) from which the values are to be copied. Then the “Copy” field is pressed. Then the field of a gas is selected where this information is to be copied and, with the “Paste” field, the content from H<sub>2</sub> is automatically entered there.

#### 4.3.5 DGA Menu - Setup - Oil Type

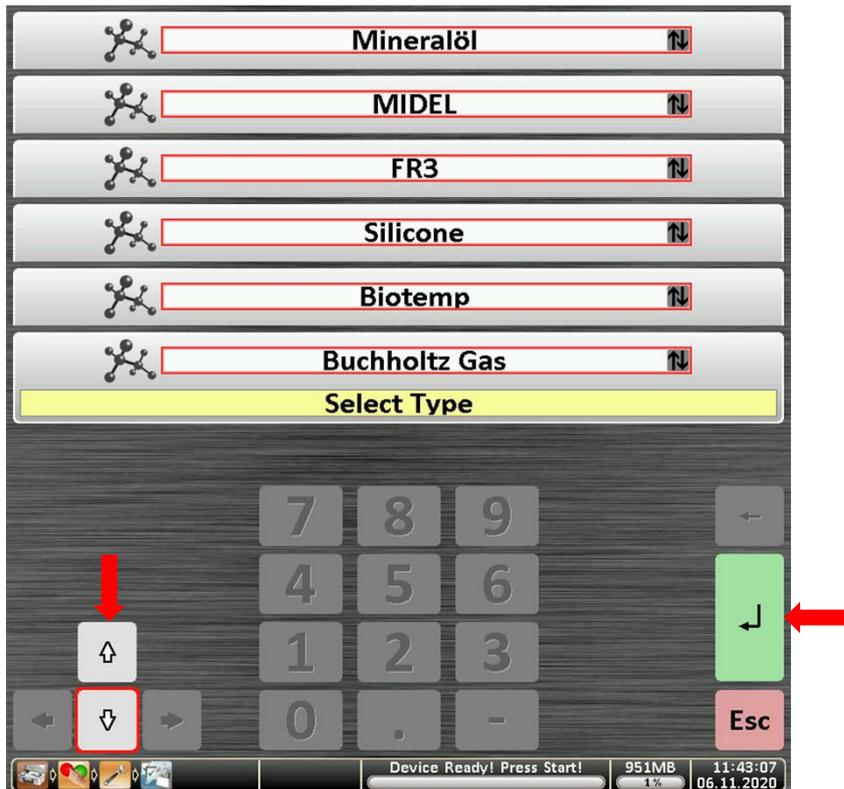


A selection of the oil type is possible if the menu field  is displayed in colour. If this button is displayed in grey tones, the release must be carried out see [4.3.3].

To change the oil type, press the “Oil” selection button or tap directly on the field with the name of the oil type



Afterwards, the suitable oil can be selected via the up/down arrows.



And by pressing “Enter”, the selection will be confirmed.

To lock the release again, press the lock symbol.



The release is then locked and no more changes can be made in the selection menus.



In the database menu, the stored results can be displayed and the basic settings of the device and the customer can be made.



Admin: Enter and manage customer data, stations and transformers, see [4.4.1]



Results: For accessing and viewing results, see [4.4.2]



Parameters: Basic settings of the device, see [4.4.3]

#### 4.4.1 Database - Admin / Customer data



In the “Admin” menu, customer-specific data can be entered, stored in a database and retrieved from it. These are as follows:



Company: Entry of customer data



Station: Entry of data of the stations

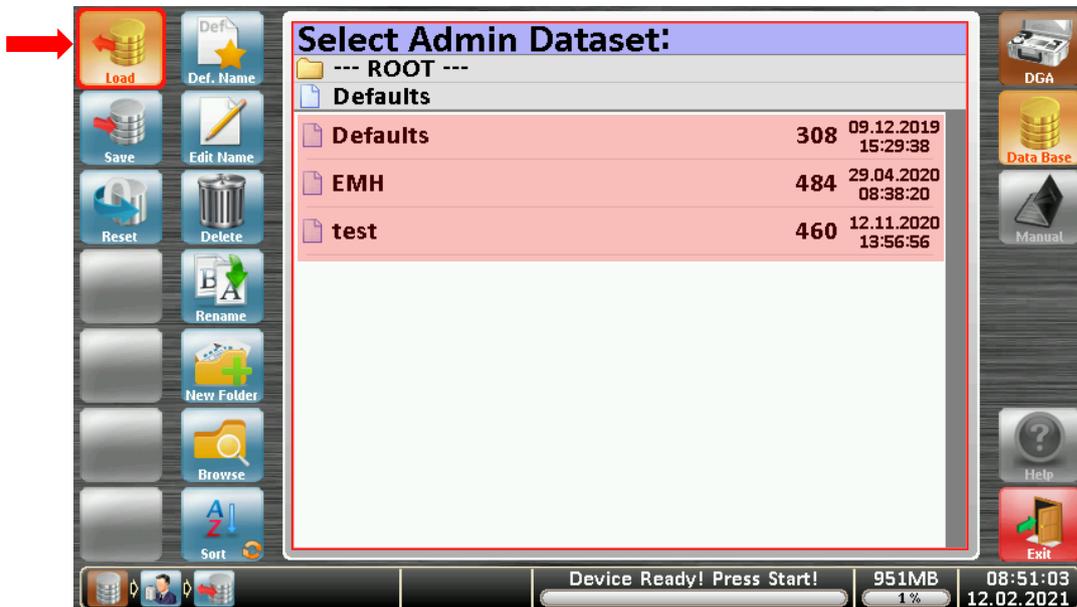


Transformer: Entry of data of the transformers.

#### 4.4.1.1 Database - Admin / Customer data - Administrative record



If you click on the field “Load/Save” in the start menu, the file manager for administrative data records opens. Administrative data records consist of a data record with company, station and transformer data.



To load a data set, tap on the “Load” button and then on the data set that is now to be opened. For further explanations of the fields on the left side of data manager, as well as entering data, see [4.4.1.3].



Administrative data records consist of a data record with company, station and transformer data. Before this, it is necessary to create a data record, which is explained in the following chapters.



After tapping on a field (either on the symbol field or directly in the grey field next to it), the following company data can be entered:

- Name (this is the value that is displayed in the overview)
- Street
- Postcode, City,
- Country
- Phone
- E-mail
- GPS location



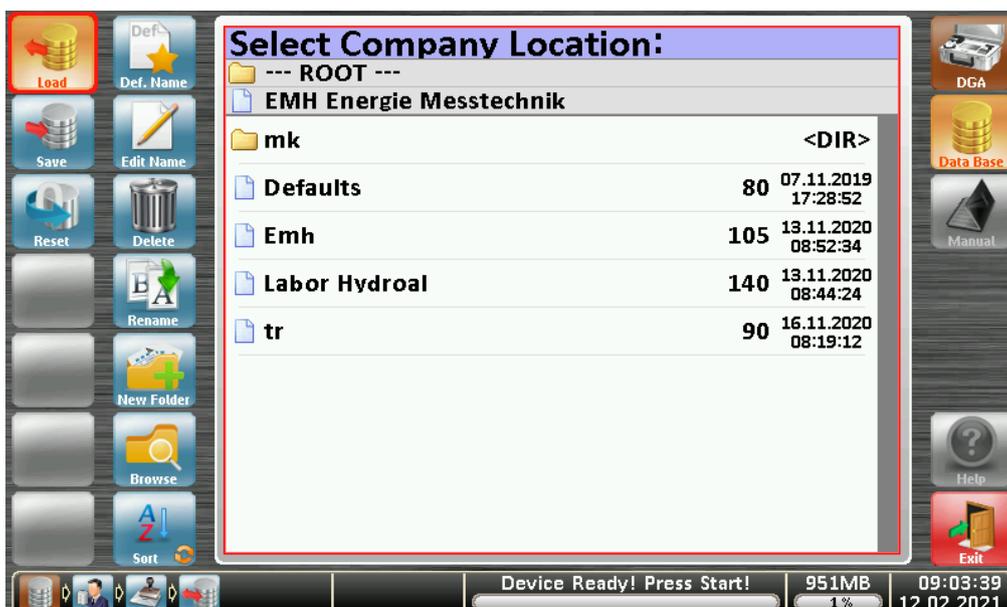
An input mask opens in which the desired information can be entered via the keypad.



The entry is then confirmed with the green "Enter" key.



If you click on the field “Load/Save” in the submenu for entering the company data, the file manager for company data opens. This is where the company data is managed. In contrast to the administrative data records, these consist only of the company data.



In the data manager, various administration tasks of the respective data sets can be carried out



A company address can be loaded by pressing the Load button. Pressing the button selects a company address from the data records.



By pressing this button, a previously entered company address can be saved. After pressing the button, press “---NEW FILE---” and then enter the desired file name. It is also possible to select an existing file name, which will then be overwritten.



By pressing this button, the fields of the input mask for company data are cleared. This is helpful if you want to create a new company address.



---



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By pressing this button, a company address, or a folder can be deleted. Thereafter, select the item to be deleted, then a deletion is possible after a further confirmation



By pressing this button, the name of a company address can be renamed. Select a company address from the data records after pressing the button; renaming is possible in the following



By pressing this button, a new folder can be created in the folder structure. After pressing the button, press "---NEW FOLDER---" and then enter the desired folder name.



By pressing this button, you can scroll through the folder structure.



Selecting this button sorts the data in the file manager from A-Z



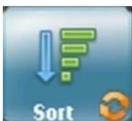
Selecting this button sorts the data in the file manager from Z-A.



Selecting this button sorts the data in the file manager so that the most recent record is at the top.



Selecting this button sorts the data in the file manager so that the most recent record is at the bottom.



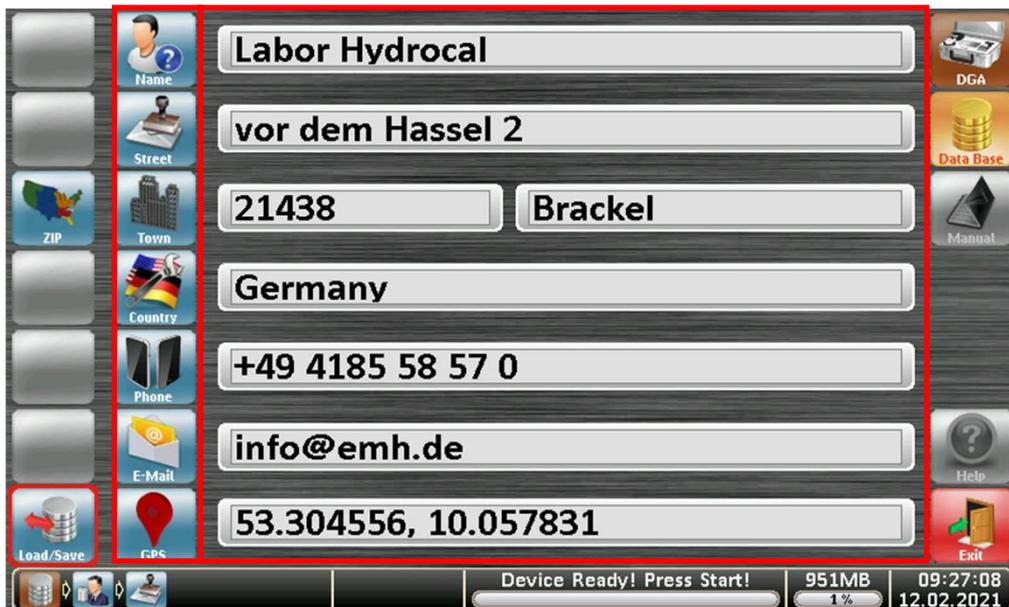
Selecting this button sorts the data in the file manager so that the largest data record is at the top



Selecting this button sorts the data in the file manager so that the largest data record is at the bottom.



Selecting this button means that the data in the file manager will not be sorted.



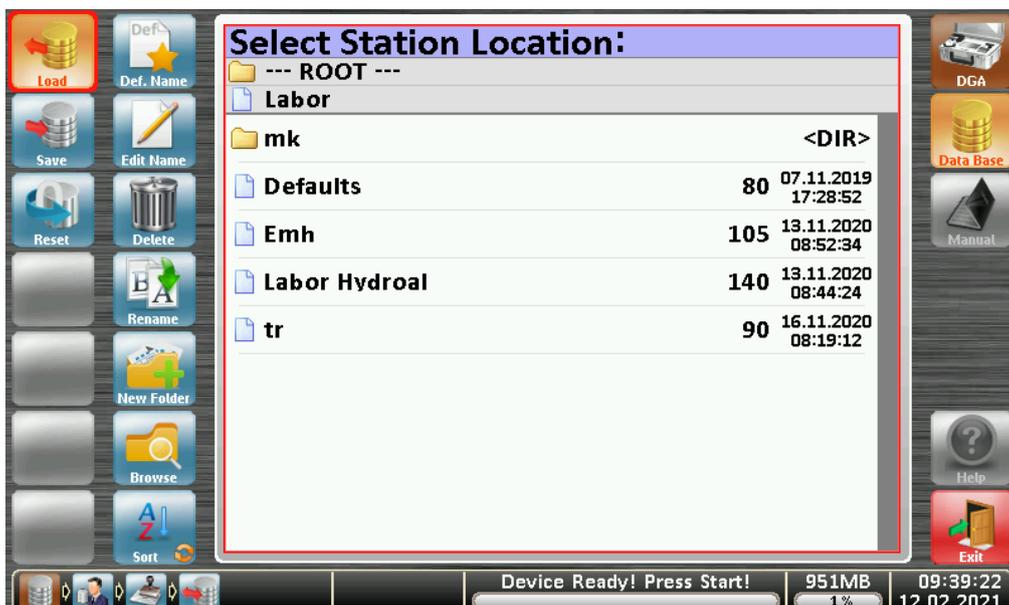
After tapping on a button (either on the symbol or directly in the grey field next to it) that is to be filled in, the following station data can be entered:

- Name (this is the value that is displayed in the overview)
- Street
- Postcode, City,
- Country
- Phone
- E-mail
- GPS location

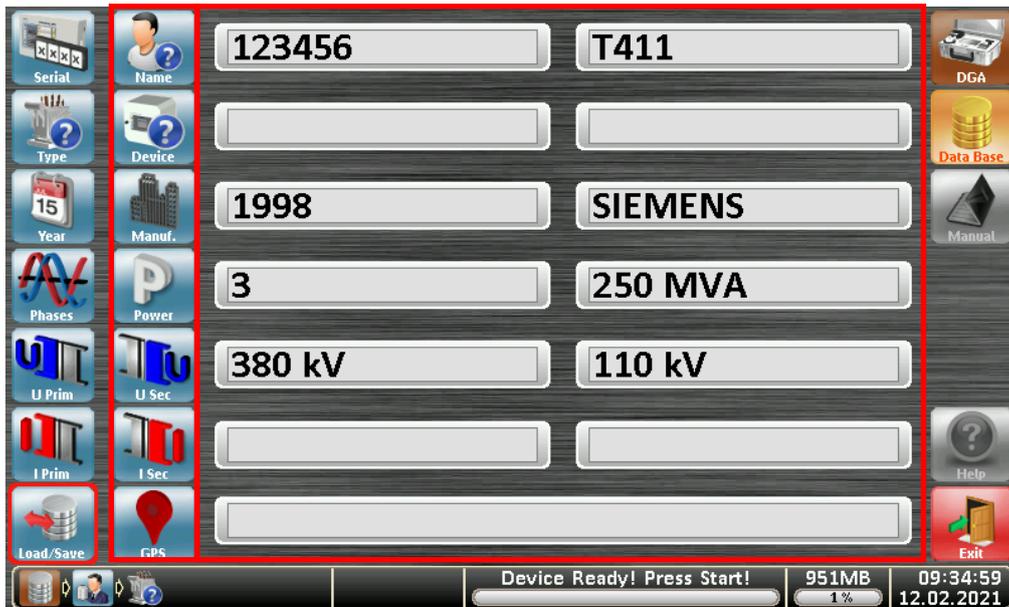
The registration procedure is described in chapter [4.5.1.1].



If you click on the field “Load/Save” in the submenu for entering the station data, the file manager for station data opens. The station data are managed here. In contrast to the administrative data records, these consist only of the station data.



For explanations of the fields on the left side of the data manager and the entry of data, see [4.4.1.3].



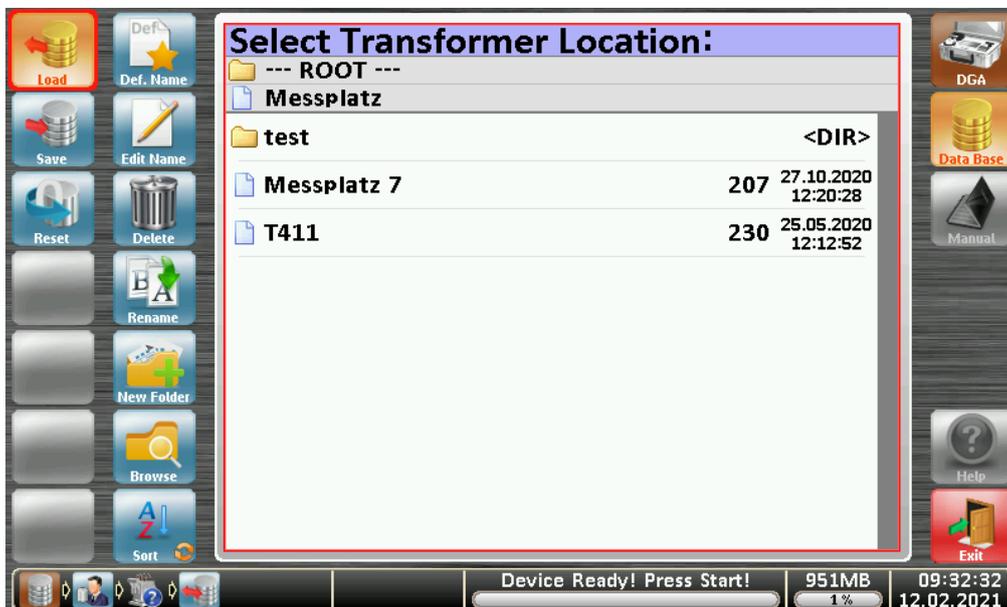
After tapping on a button (either on the symbol or directly in the grey field next to it) which is to be filled in, the following transformer data can be entered:

- Serial number
- Name (this is the value that is displayed in the overview)
- Type
- Device
- Year
- Manufacturer
- Phases
- Power
- U Primary
- U Secondary
- I Primary
- I Secondary
- GPS location

The registration procedure is described in chapter [4.5.1.1].



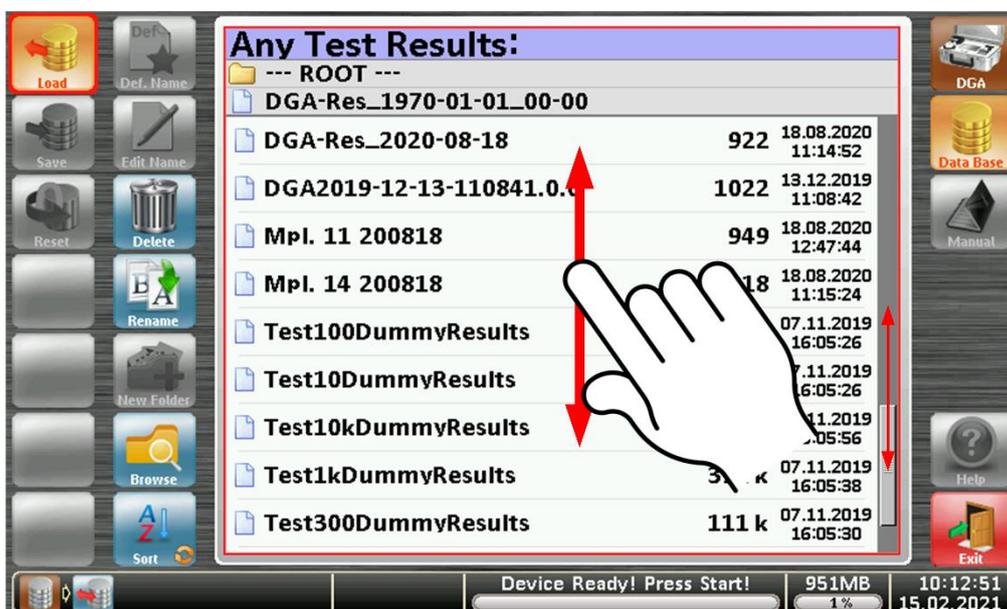
If you click on the field “Load/Save” in the submenu for entering the station data, the file manager for station data opens. The station data are managed here. In contrast to the administrative data records, these consist only of the station data.



For explanations of the fields on the left side of the data manager and the entry of data, see [4.4.1.3].

#### 4.4.2 Database - Results

In the database menu, saved test results can be accessed and managed via the item “Results”. After the data manager menu has been called up, the “Load” field is already activated, which is recognisable by the yellow coloured symbol. Now the desired data record of the test results can be selected directly in the data manager.



In case there are more entries than visible, you can use the scroll bar on the right to see all results or by swiping up/down directly on the screen.

After selecting a test result data set, the following screen content appears:



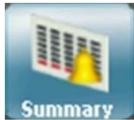
The following display options can be selected via the control panels on the left side:



Bar graph of measurement results



Measured value history as line graph (only possible with more than one measured value)



Measurement history as a table in text form

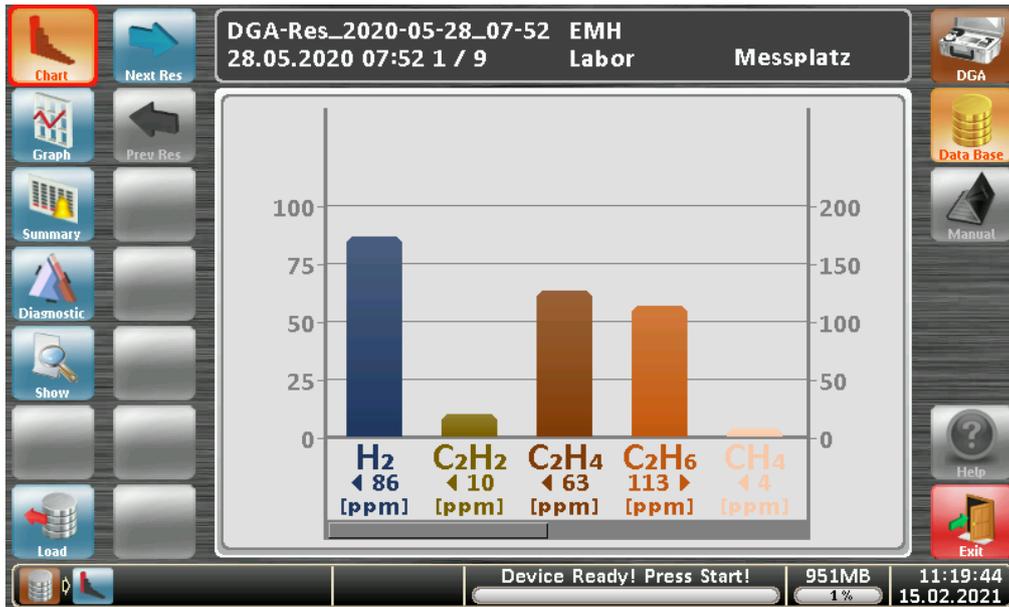


Measurement history as Duval triangle



Show the current result as a list: This is used to print out the data via the integrated printer.

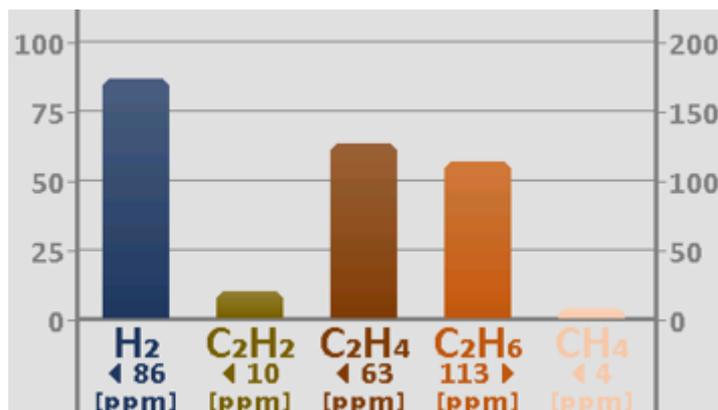
4.4.2.1 Database - Results - Chart / Bar graph



DGA-Res\_2020-05-28\_07-52 EMH  
28.05.2020 07:52 1 / 9 Labor Messplatz

The following information is contained in the screen header:

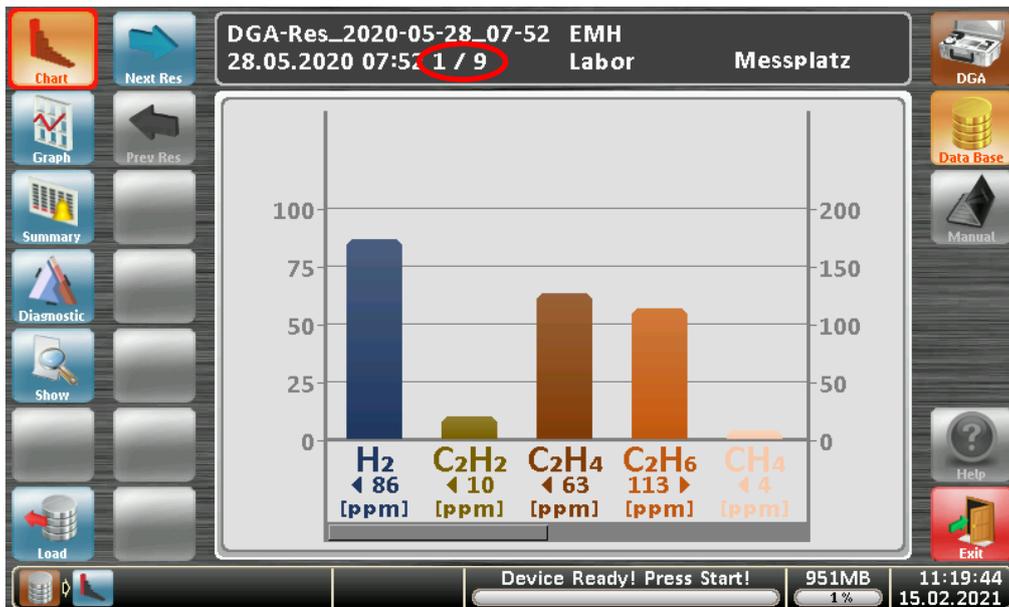
- File name DGA-Res\_2020-05-28\_07-52
- Storage date/time 28.05.2020 07:52
- Number of the measurement/of 1 / 9
- Company EMH
- Station Labor
- Transformer Messplatz



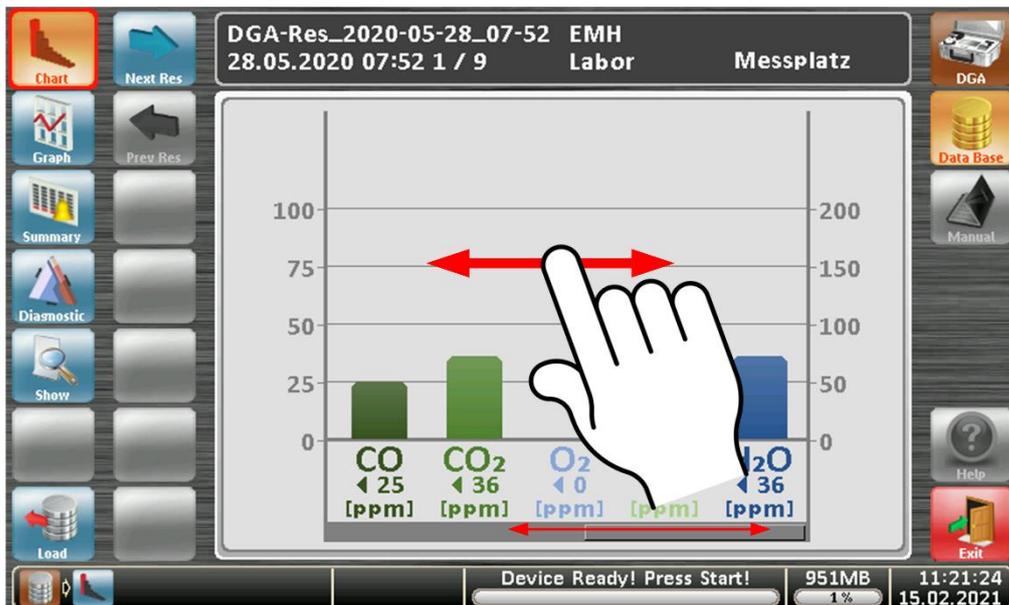
The following information is provided in the results field of the screen:

- Scaling left in ppm 0, 25, 50, 75, 100
- Scaling right in ppm 0, 50, 100, 150, 200
- Gas H<sub>2</sub>, C<sub>2</sub>H<sub>2</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>6</sub>, CH<sub>4</sub>
- Assignment to scaling/  
Concentrations in ppm ◀86, ◀10, ◀63, 113▶, ◀4
- Unit [ppm]

The amount of test results is displayed in the header by the designation 1/9.



To see all test results, simply touch the screen and swipe left/right or use the horizontal scroll bar.

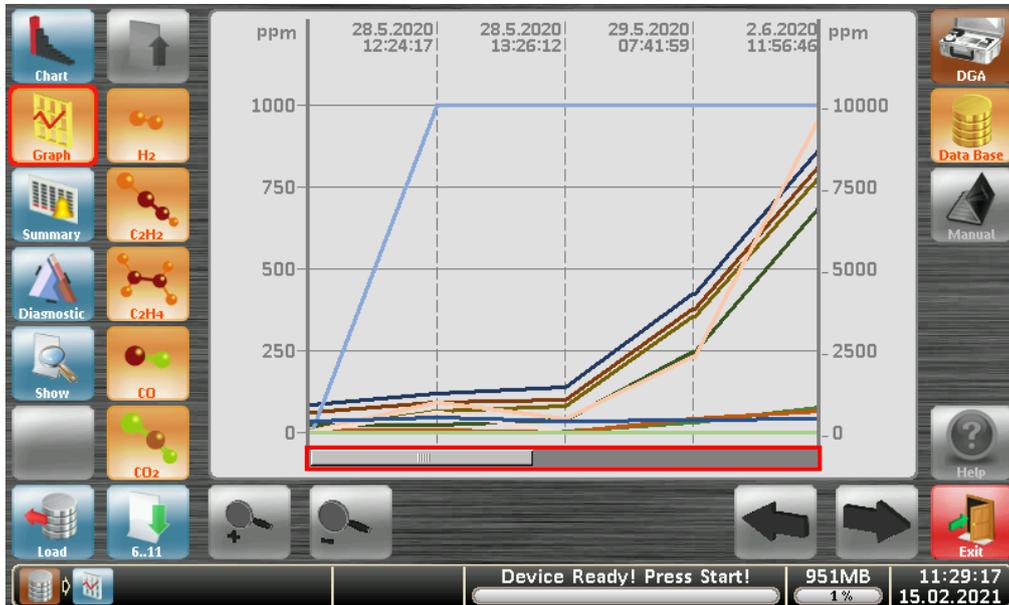


The arrow keys can be used to retrieve further measurements (in the example 2...9) of this test result file.

#### 4.4.2.2 Database - Results - Graph / Line graph

The previously selected test result file [4.4.2] consists of 9 measurements. In the following images, the test results are displayed in the line graph in chronological order.

**Note:** In the result field, as in the bar graph, there are two different scales on the left and right side. Therefore, a direct comparison of the lines of different gases can lead to misjudgements. Instead, the individual lines should be viewed in the context of the overall sequence!



The horizontal scroll bar indicates that there are more results than visible. To see all results, touch the screen and swipe left/right or use the scroll bar.



By pressing the control fields of the gases, gases can be hidden and shown again. This offers the possibility to show only those gases in the line graph that are important for the respective observation.

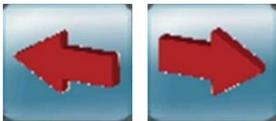
Buttons with a yellow background indicate gases shown on the screen, whereas a blue background indicates hidden gases.



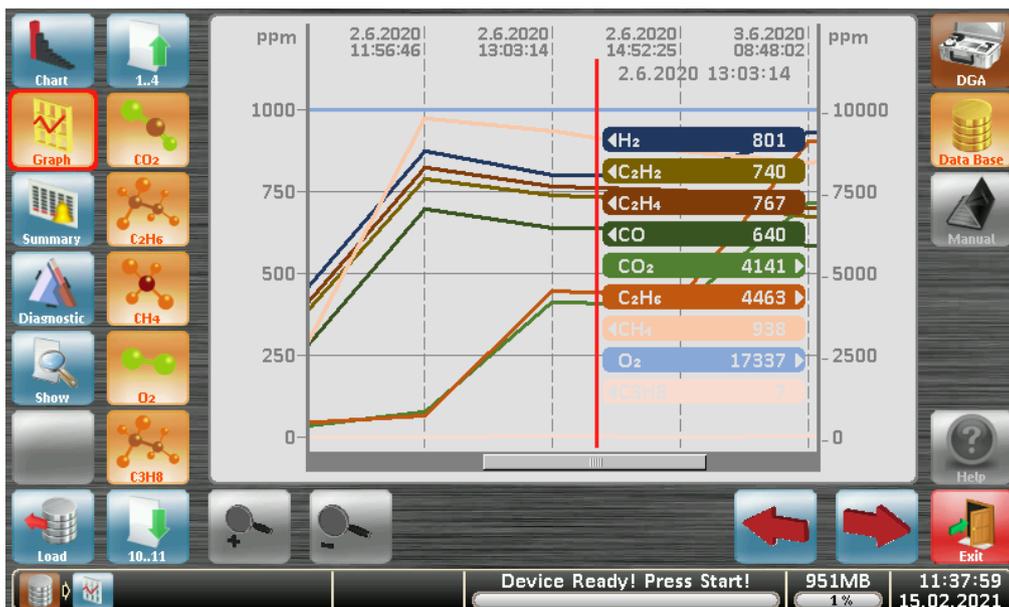
To make hidden gases visible, use the up/down buttons.

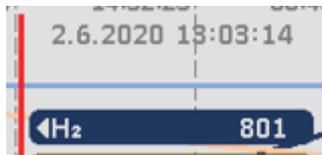
After tapping on a specific point in the line graph, the measurement results determined for this point become visible.

**Note:** If a specific point on the line chart is touched, the corresponding values for this point in time are displayed to the right of it.



By tapping the fields with the red arrows, you can switch between the different measuring points. Right arrow for the next, left arrow for the previous measuring point.





The result field contains the following information in detail:

- Measurement date/time 02.06.2020 13:03:14
- Line colour
- Allocation to the scaling
- Gas H<sub>2</sub>
- Concentrations in ppm 801
- The vertical red line indicates the exact location in the timeline

#### 4.4.2.3 Database - Results - Summary Table

The amount of test results is displayed in the header by the designation 1/9. The following image shows the first of these 9 measurements.

Day	Time	Gas	Level	Limit1	Limit2	Status
28.05.20	07:52	H <sub>2</sub>	86	50	150	
28.05.20	07:52	C <sub>2</sub> H <sub>2</sub>	10	---	---	
28.05.20	07:52	C <sub>2</sub> H <sub>4</sub>	63	---	---	
28.05.20	07:52	CO	36	---	---	
28.05.20	07:52	CO <sub>2</sub>	113	---	---	
28.05.20	07:52	C <sub>2</sub> H <sub>6</sub>	25	---	---	
28.05.20	07:52	CH <sub>4</sub>	4	50	600	
28.05.20	07:52	O <sub>2</sub>	0	---	---	
28.05.20	07:52	C <sub>3</sub> H <sub>8</sub>	5	1	999	
28.05.20	07:52	N <sub>2</sub>	0	---	---	
28.05.20	07:52	H <sub>2</sub> O	36	---	---	



The arrow keys can be used to retrieve further measurements (in the example 2...9) of this test result file.

The arrow keys can be used to retrieve further measurements (in the example 2...9) of this test result file.

DGA-Res\_2020-05-28\_07-52 EMH  
 28.05.2020 07:52 1 / 9 Labor Messplatz

The following information is contained in the screen header:

- File name DGA-Res\_2020-05-28\_07-52
- Storage date/time 28.05.2020 07:52
- Number of the measurement/of 1 / 9
- Company EMH
- Station Labor
- Transformer Messplatz

Day	Time	Gas	Level	Limit1	Limit2	Status
28.05.20	07:52	H <sub>2</sub>	86	50	150	
28.05.20	07:52	C <sub>2</sub> H <sub>2</sub>	10	---	---	

The following information is provided in the results field of the screen:

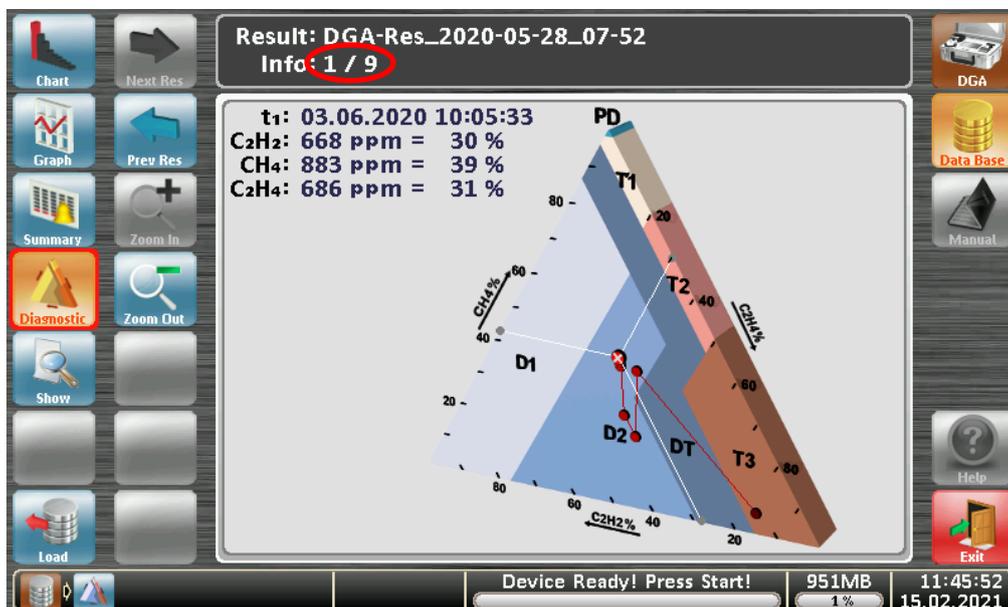
- Day of 28.05.20
- **Time** of the measurement 07:52
- **Gas** H<sub>2</sub>, C<sub>2</sub>H<sub>2</sub>, ...
- **Level** / concentration in ppm 86, 10, ...
- **Limit 1** / Hi-Alarm [4.3.4.1] 50, ---, ...
- **Limit 2** / HiHi-Alarm [4.3.4.2] 150, ---, ...
- Alarm-**Status** [4.3.4] ,

The alarm status in the last column of the table gives a quick overview of the alarm thresholds that may have been reached, see also [4.3.4]:

- Alarm configured and active, everything OK (acknowledged alarms are also shown like this)
- High Alarm triggered (trigger threshold has been exceeded).
- High-High Alarm triggered (trigger threshold has been exceeded)
- Alarm not configured, settings have to be made.

#### 4.4.2.4 Database - Results - Diagnosis / Duval triangle

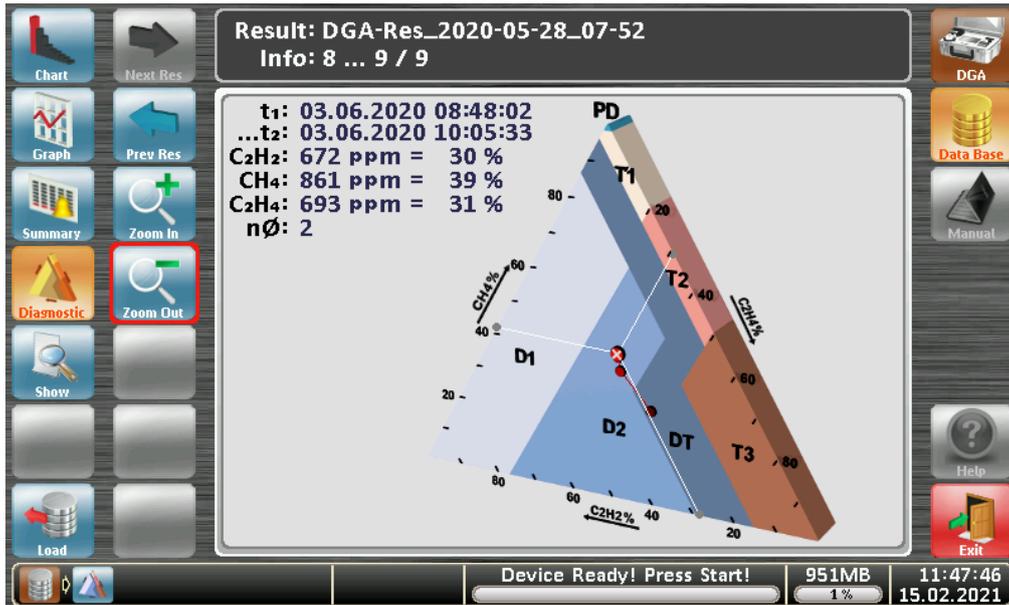
The amount of test results is displayed in the header by the designation 1/9. The following image shows the first of these 9 measurements.



The arrow fields are used to select the measurement results 1/9 .....9/9. The point in the Duval triangle is shown in red with a white x.



The zoom fields can be used to include a range, i.e. several measurement results, in the Duval diagnosis. In the example below, two measurement results (8...9 / 9). With Zoom + the range becomes smaller, with Zoom - the range to be viewed is extended



#### 4.4.2.5 Database - Results - Display / Printout

It is also possible to show test results as text. The data displayed in this view can thus be printed out with the integrated printer.

The text contains the data of the entire data set (in this example, the test result file consists of 9 measurements).

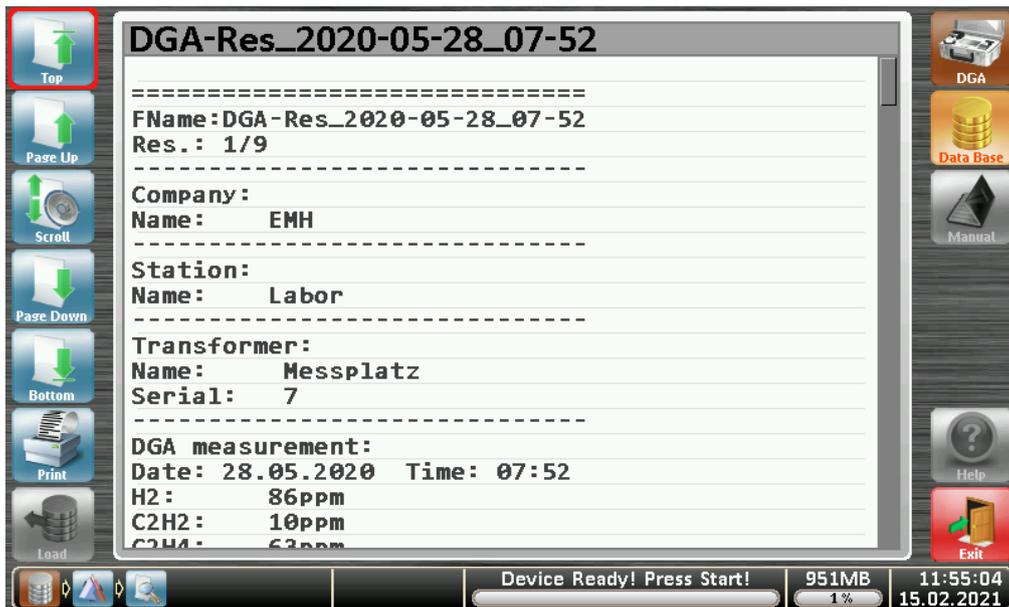
<b>File name:</b>	DGA-Res_2020-05-28_07-52
<b>Result:</b>	1 / 9
<b>Company:</b>	
<b>Name:</b>	EMH
<b>Station:</b>	
<b>Name:</b>	Labor
<b>Transformer:</b>	
<b>Name:</b>	Messplatz
<b>SerNo.:</b>	7
<b>DGA measurement:</b>	
<b>Date:</b>	28.05.2020
<b>Time:</b>	07:52
<b>H2:</b>	86ppm
<b>C2H2:</b>	10ppm
<b>C2H4:</b>	63ppm
<b>C2H6:</b>	25ppm
<b>CO:</b>	36ppm
<b>CO2:</b>	113ppm
<b>CH4:</b>	4ppm
<b>O2:</b>	0ppm
<b>C3H8:</b>	5ppm
<b>N2:</b>	0ppm
<b>H2O:</b>	36ppm
<b>T1:</b>	+39.8°C
<b>T2:</b>	+28.8°C
<b>T3:</b>	+40.1°C

Result: 2....9 / 9

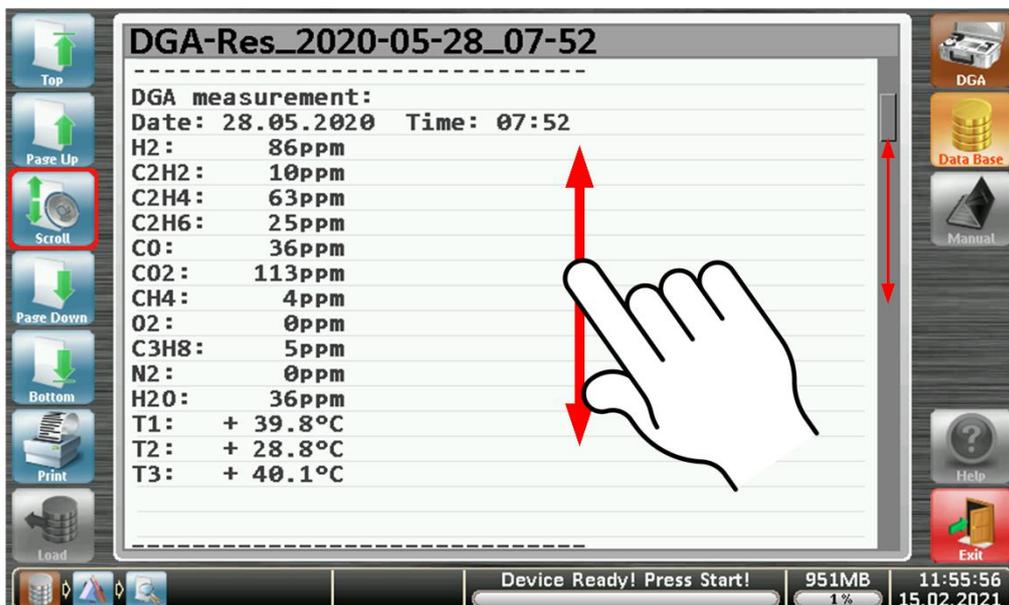
**Gas in Oil Analysis:**

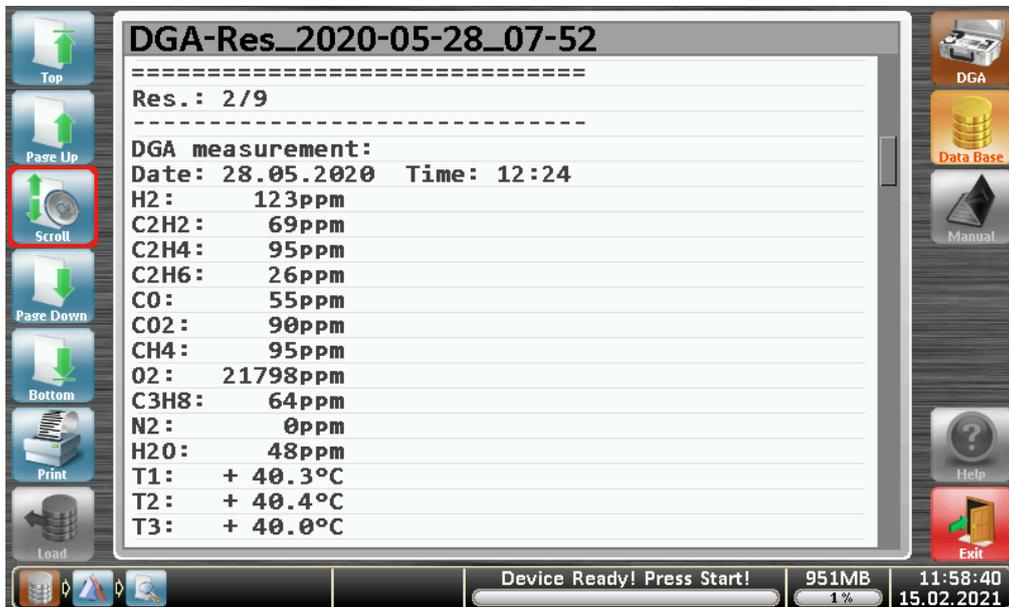
Date: 28.05.2020 Time: 12:24

H2	123ppm
C2H2:	69ppm
C2H4:	95ppm
C2H6:	26ppm
CO:	55ppm
CO2:	90ppm
CH4:	95ppm
....:	....ppm
...:	..
..:	.



In case there are more entries than visible, you can use the scroll bar on the right to see all results or by swiping up/down directly on the screen.





The control fields on the left can be used to carry out additional actions:



Jump to the top of the list



Jump up one page



Jump down one page



Jump to the end of the list

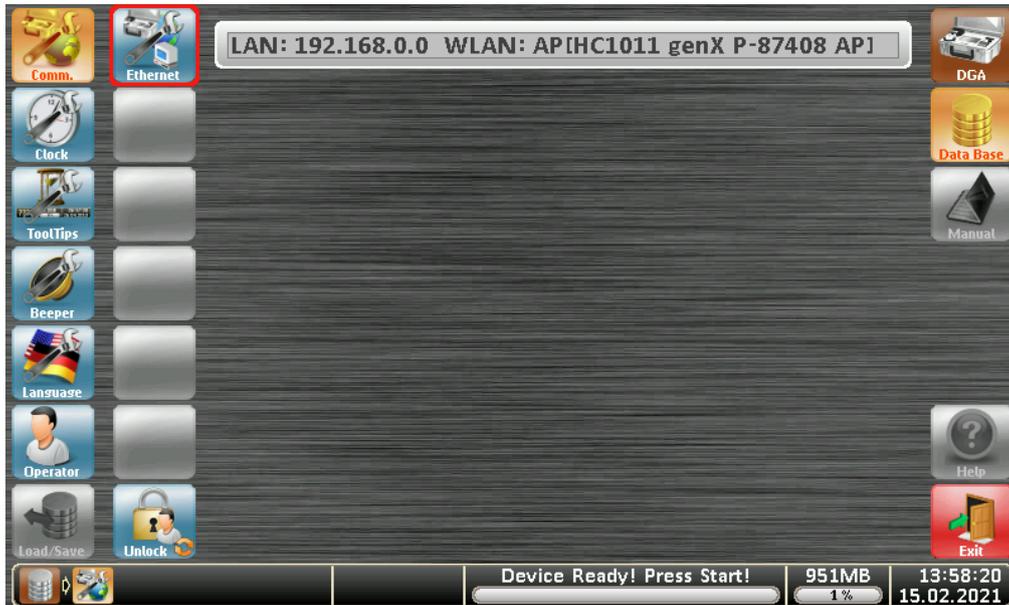


Print the list

**Note:** After pressing the field “Print”, the printout is started immediately. By pressing “Print” again, the printout can be cancelled.

#### 4.4.3 Database - Setup / Device settings

In the parameter menu of the database, the basic device settings of the HYDROCAL 1011 *genX* P can be defined. These include communication settings, time, menu language and operator data.

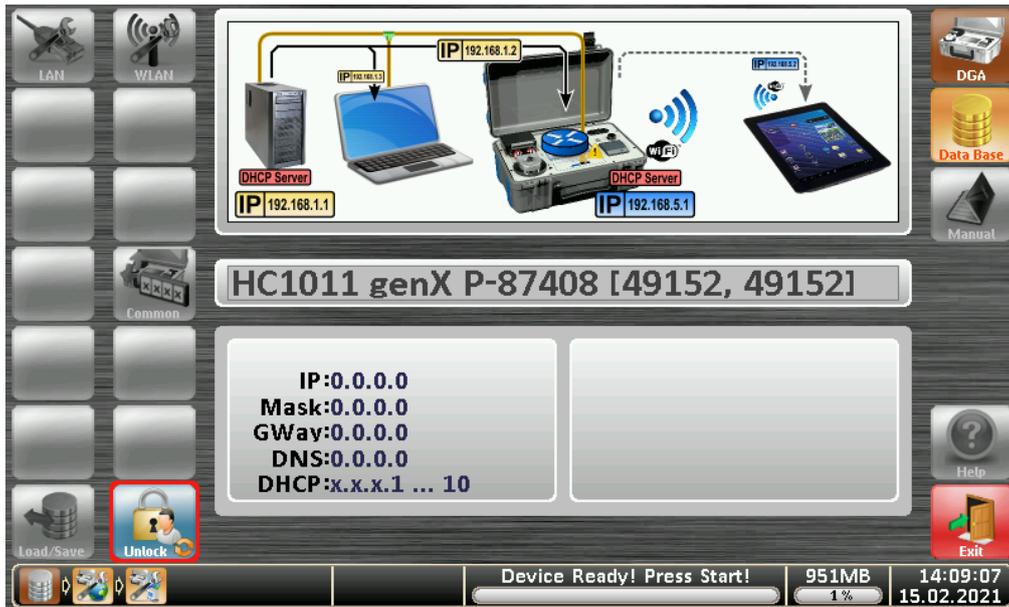


LAN: 192.168.0.0 WLAN: AP[HC1011 genX P-87408 AP]

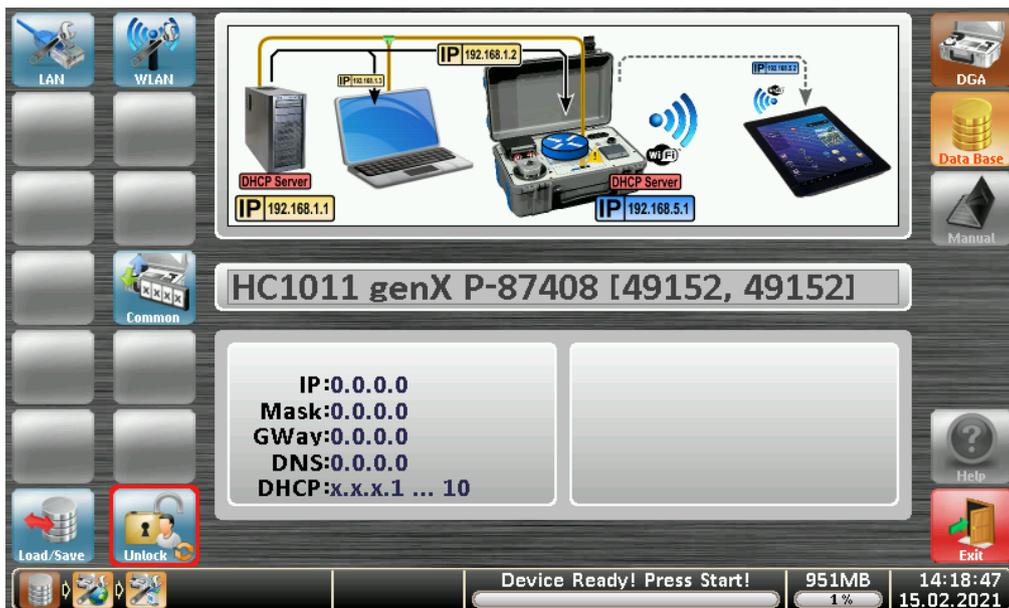
The status bar shows the Lan IP address and the WLAN access point name.

The setup menu offers the following menu items to setup the HYDROCAL 1011 *genX* P:

	Communication	(Ethernet)
	Clock	(time, date)
	Help	(time setting of the key help text)
	Beeper	(key beeper on/off)
	Language	(menu language)
	Operator	(identification of the operator of the HYDROCAL 1011 <i>genX</i> P in the start screen)



In order to be able to make settings in this menu, the following must be enabled [4.3.3]



After releasing [4.3.3], the following settings can be done:



LAN



WLAN



Common

The LAN setting -> DHCP determines how the configuration files are assigned in the LAN network.

The field "DHCP mode" offers the following setting options:



- DHCP off: No automatic IP address assignment
- DHCP Client: The HYDROCAL 1011 *genX* P obtains its IP address from another address server
- DHCP server: The HYDROCAL 1011 *genX* P works as an address server and can assign an IP address to other devices

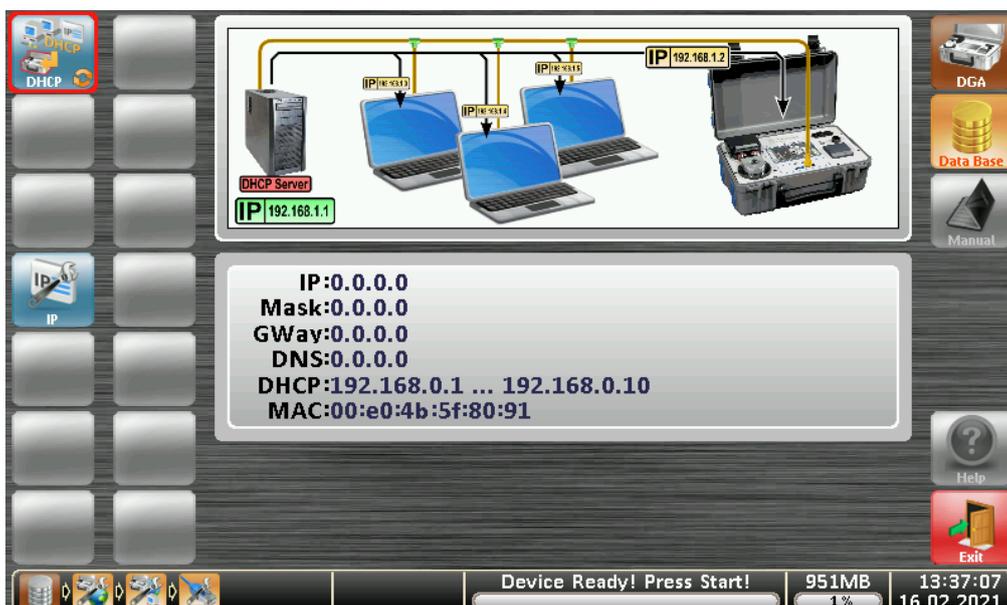
The DHCP settings can be changed by repeatedly pressing the DHCP field. It is also possible to change the setting by tapping in the large field.

DHCP Off:

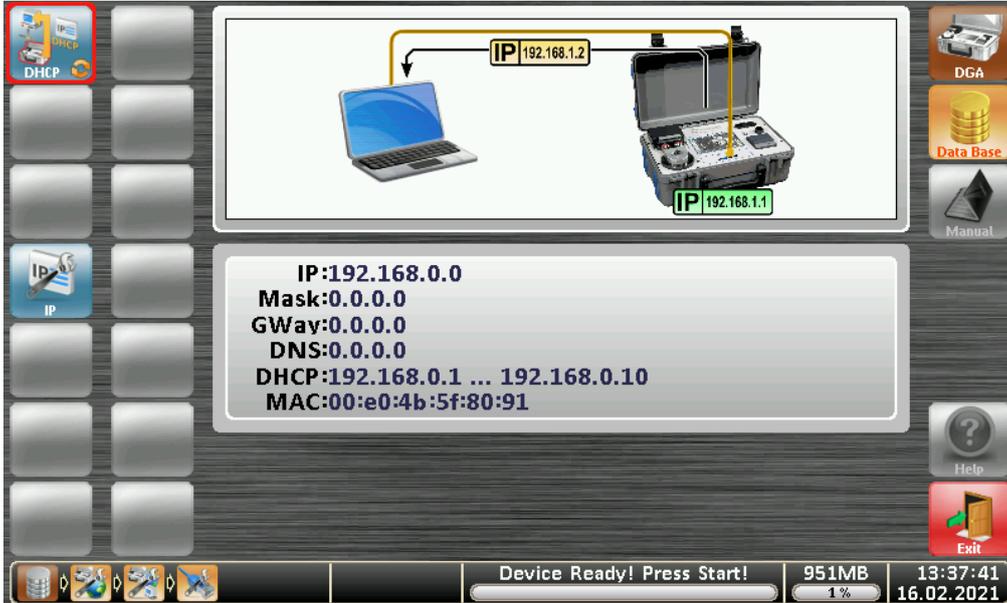


The configuration scheme is shown in the upper middle field. The lower middle field shows the assigned configuration data.

DHCP client:



DHCP server:



The IP field opens a menu in which IP settings can be made.



**IP address:** IP address of HYDROCAL 1011 *genX* P



**Subnet:** Subnet screen



**Gateway:** Standard gateway



**DNS Domain Name Server:** DNS server



**DHCP IP:** Base address of the DHCP address pools



**DHCP N:** Number of addresses in the DHCP pool

4.4.3.1.2 Database - Setup - Communication - Ethernet - WLAN

The WLAN setting -> DHCP determines how the configuration files are assigned in the WLAN network.

The field "DHCP mode" offers the following setting options:



- DHCP off: No automatic IP address assignment
- DHCP Client: The HYDROCAL 1011 *genX* P obtains its IP address from another address server
- DHCP server: The HYDROCAL 1011 *genX* P works as an address server and can assign an IP address to other devices

The DHCP settings can be changed by repeatedly pressing the DHCP field. The WLAN mode can be set via the WLAN field.

DHCP Off:



The configuration scheme is shown in the upper middle field. The lower middle fields show the assigned configuration data.

DHCP client:



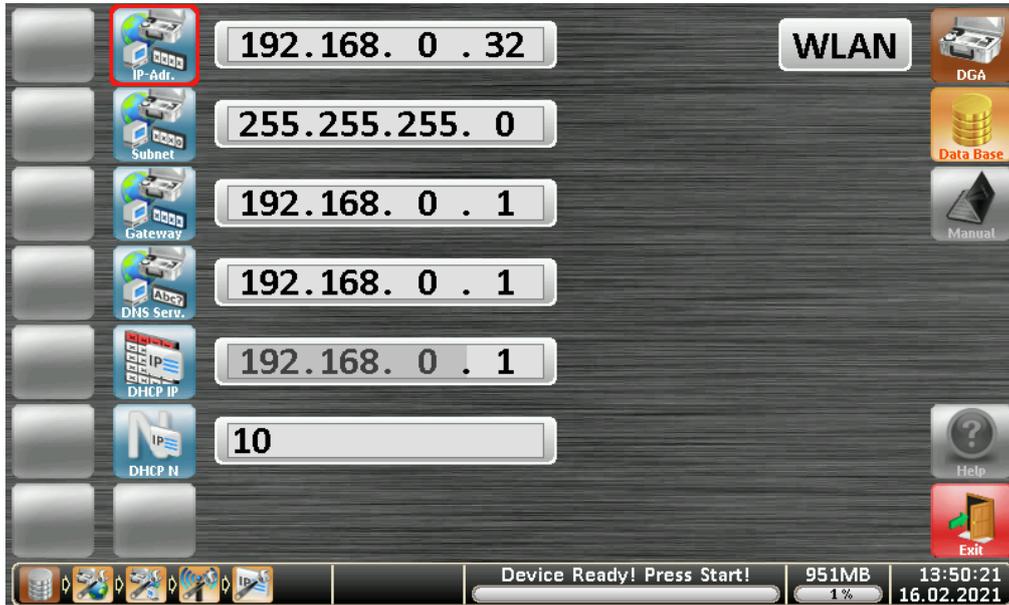
DHCP server:





The IP field opens a menu in which IP settings can be made.

For more details, see [4.4.3.1.1].



The WLAN mode can be set by repeatedly pressing the WLAN field

WLAN off:



WLAN AP (access point):

**IP:192.168.0.32**  
**Mask:255.255.255.0**  
**GWay:0.0.0.0**  
**DNS:0.0.0.0**  
**DHCP:x.x.x.1 ... 10**  
**MAC:80:86:f2:d6:29:a5**

**Name:HC1011 genX P-87408**  
**Status:0 Clients**

Device Ready! Press Start!    951MB    1%    14:00:23  
 16.02.2021

WLAN Point-to-Point:

**IP:192.168.0.32**  
**Mask:255.255.255.0**  
**GWay:0.0.0.0**  
**DNS:0.0.0.0**  
**DHCP:x.x.x.1 ... 10**  
**MAC:80:86:f2:d6:29:a5**

**Con: X**  
**Avail:0 WLANs**

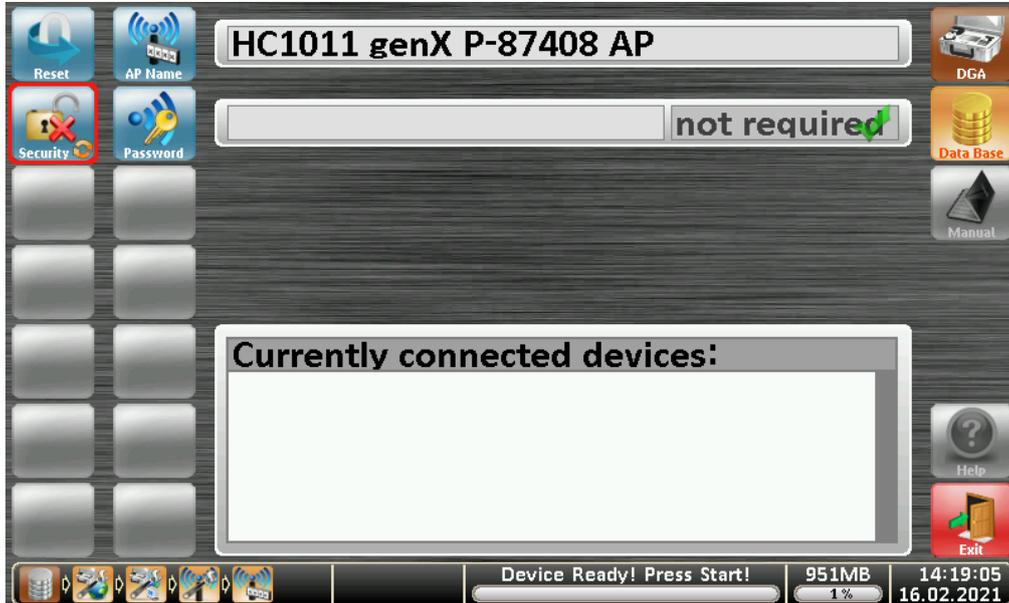
Device Ready! Press Start!    951MB    1%    14:01:28  
 16.02.2021

Further setting options in the WLAN menu are as follows:



WLAN AP (Access Point)

The settings are made here if the HYDROCAL 1011 *genX* P is used as an access point. Name, password and the respective encryption type can be set here.



### Reset

The "AP name" is set to the default value here.



### AP name

This is the WLAN name of the HYDROCAL 1011 *genX* P. The name is displayed to the right of the "AP Name" field and is visible in the WLAN list of a PC, for example. In the example shown above, "HC1004genX AP" is entered. This name can be modified as required. To do this, touch the field and then make the required entries using the input field that opens, then confirm by touching the enter key.



### Safety

The type of encryption is selected here. Touching this field makes the following possibilities available for selection:



None: 0 characters

WEP64: 5 characters

WEP128: 13 characters

WPA: 8...63 characters

WPA2: 8...63 characters

A password made up of the given number of characters must be allocated for the respective selection.



### Password

The password is entered here.

A password is not mandatory.

In this case, "None" is selected on the left-hand side .

The allocation of a password is urgently recommended, however, to protect wireless access to the device. WPA2 is the most secure standard and should be used if possible. The password is requested after initial login at this access point.

Compliance with the requirements (number of characters, see "Security") is confirmed with a green tick.



If the requirements are not met, a yellow triangle with an exclamation mark appears.



### WLAN Direct Connection/Point-to-Point Settings

#### WLAN Direct Connection/Point-to-Point Settings



Updates the networks nearby

The WIFI networks nearby appear in the upper field. The following data are listed for the displayed networks:

- Name
- MAC address
- Type of encryption
- Channel
- Signal strength

For hidden networks, it is possible to touch the following field to open an input window where the name of the WIFI network can then be entered.



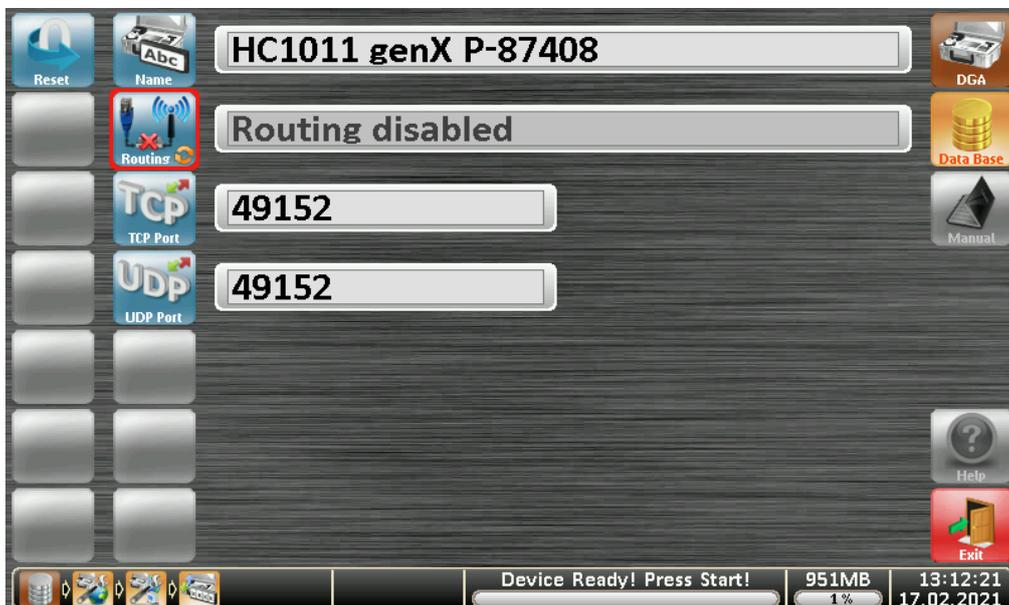
Entry for hidden networks

The “Security” and “Password” settings in this menu are analogous to the previous section.

#### 4.4.3.1.3 Database - Setup - Communication - Ethernet - Global

The global network settings of the device are made here

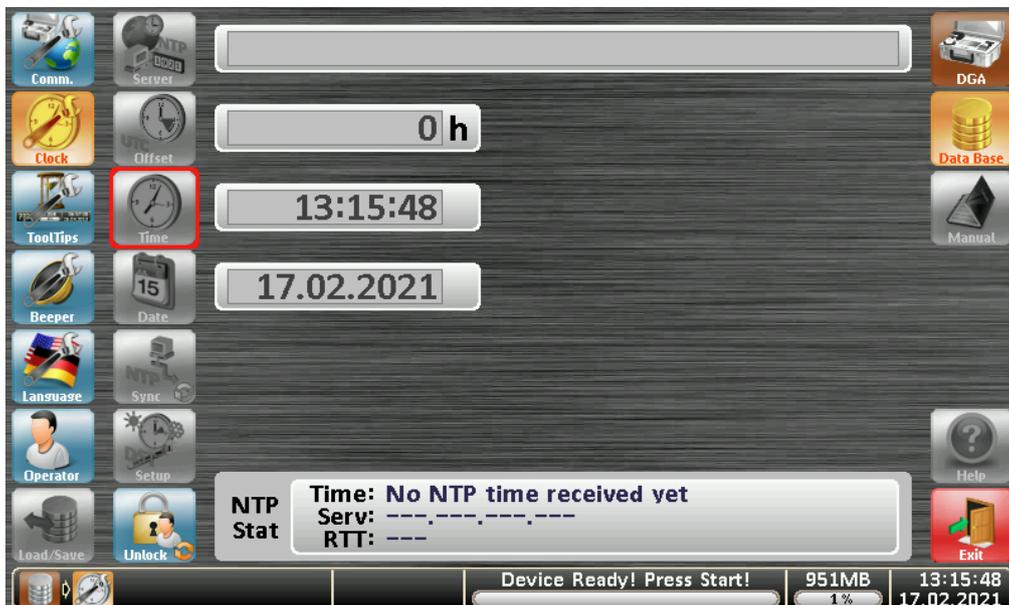
- Hostname-Network name of the device
- Switching on and off Routing
- Setting TCP Port
- Setting UDP Port



#### 4.4.3.2 Database - Setup - Communication - Clock

The time and date are shown in the bottom right-hand corner of the display. This time is used as a time stamp for measurement recordings.

**Note:** If the device is not operated at the mains for a longer period, the time may have to be reset. In the following image, no settings are possible yet, as indicated by the greyed-out fields. Before settings can be made, a release [4.3.3] must be done.



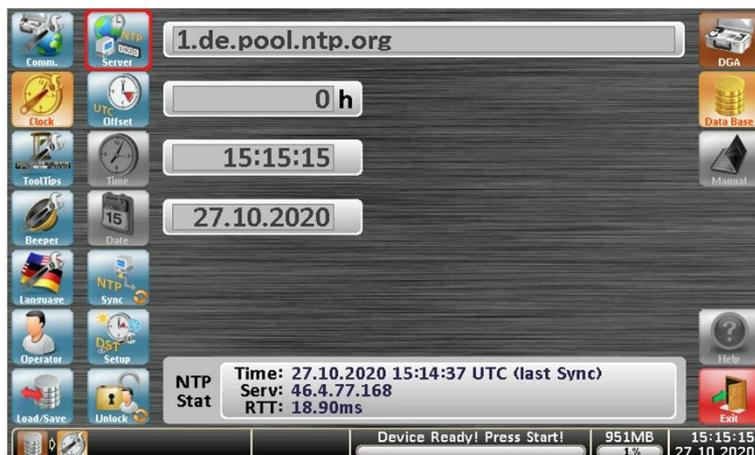
There is essentially the possibility of external time synchronisation via Ethernet -> NTP [4.4.3.2.5].

By pressing the “Sync” field, it can be selected as to whether manual time or network time synchronisation is to be used.



Manual time setting

Network synchronous time



If network synchronisation is selected, the fields for manually entering the time and date are greyed out.

The following settings can be done in the clock menu:



NTP Server / Enter the NTP server address



UTC Offset / Setting the offset between UTC time and local time



Time / Manual setting of the time



Date / Manual setting of the date



NTP Sync. / Selection of whether network synchronisation is to be selected



DST Summer / Settings for Daylight Saving Time

4.4.3.2.1  Database -  Setup -  Communication -  Clock -  NTP Server



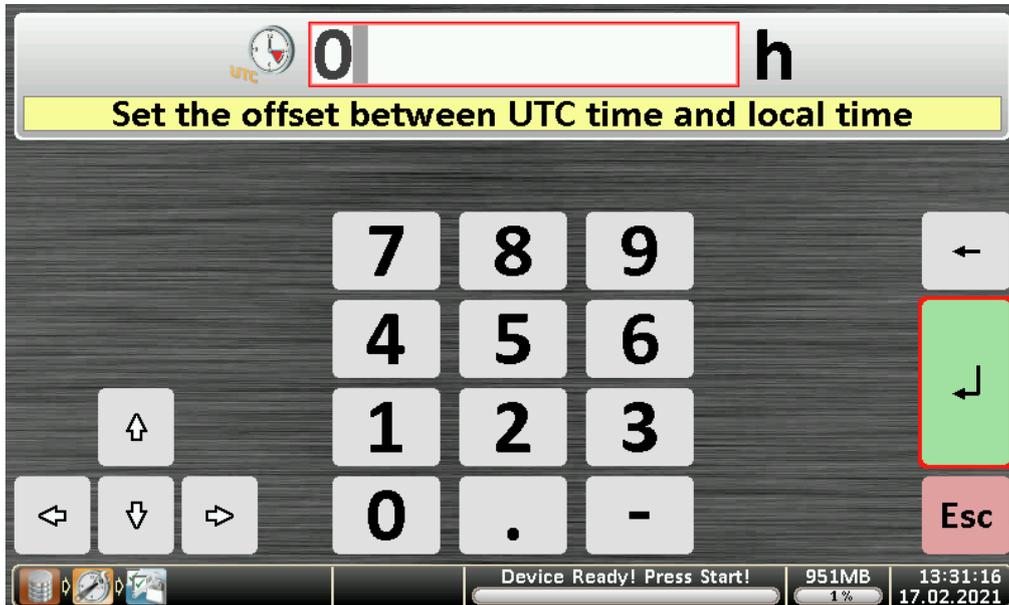
After activating the field “NTP Server”, an input mask opens in which the address of the NTP server is entered. The image shows an example address. Further addresses at [www.ntppool.org](http://www.ntppool.org)



After entering the address, confirm with the green “Enter” key and exit the input mask.



After activating the field “UTC Offset”, the offset from the UTC to the respective country can be entered in the opening input field.



After entering the address, confirm with the green “Enter” key and exit the input mask.



After activating the field “Time”, the current time can be entered manually in the opening input field.



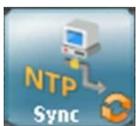
After entering the address, confirm with the green “Enter” key and exit the input mask.



After activating the field “Date”, the current date can be entered manually in the opening input field.



After entering the address, confirm with the green “Enter” key and exit the input mask.



By pressing the field “NTP Sync”, it can be selected as to whether the manual time or the network time synchronisation is to be used.



Manual time setting

Network synchronous time



By pressing the field “DST Summer”, settings for daylight saving time can be made in the opening input field.



First, one of the selection fields on the left is activated. After the individual fields in the central area have been touched, an input window opens where the respective settings can be made.

- DST Start:** Start of summertime (daylight saving time)
- DST End:** End of summertime
- DST offset:** Difference in time between summertime and standard time

After the entry has been made, confirm with the “End” field and exit the input mask.

#### 4.4.3.3 Database - Setup - Communication - Help

In this menu, settings can be made for the help text key on the HYDROCAL 1001 *genX* P.



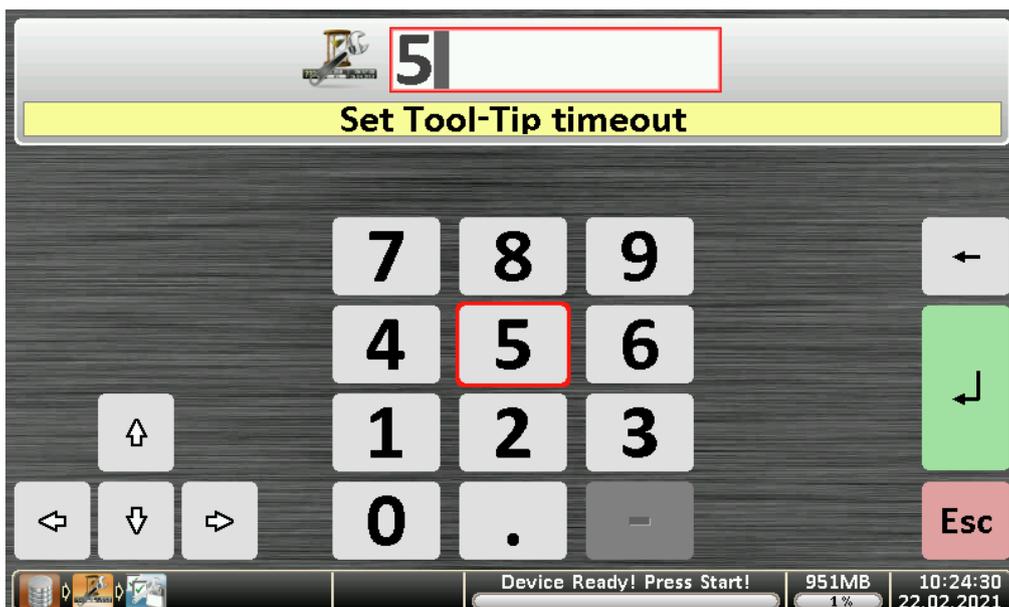
After pressing the “Help” field, the menu for activating the function “Tool Tips” opens. After pressing the time field (or the right “Help” field), the time for which the help text is to be displayed can be set in the menu that now opens. If “0” (zero) is entered, no help text appears.



In the following image, no settings are possible yet, as can be seen from the greyed-out fields. Before settings can be made, a release [4.3.3] must be done.



The time is given in seconds. If "0" (zero) is entered, no help text is displayed. The entry is confirmed by the green enter key.



Now a help text is displayed in the lower left corner of the screen each time a field is pressed.



#### 4.4.3.4 Database - Setup - Communication - Beeper

In this menu, the beeper can be switched on or off when the touch screen of the HYDROCAL 1011 *genX* P is touched.



When the field “Beeper” is touched, the menu for activating the function “Beep when touched” is opened.



In the following image, no settings are possible yet, as can be seen from the greyed-out fields. Before settings can be made, a release [4.3.3] must be done.



The selection is made by repeatedly touching the “Touch” button.



Beeper on



Beeper off

#### 4.4.3.5 Database - Setup - Communication - Language

In this menu, the menu language used by the HYDROCAL 1001 *genX* P can be set.



After selecting the “Language” field, the menu for selecting the language opens.



In the following image, no settings are possible yet, as can be seen from the greyed-out fields. Before settings can be made, a release [4.3.3] must be done.



After selecting the “Language” field, the menu opens in which the respective national language can be selected.

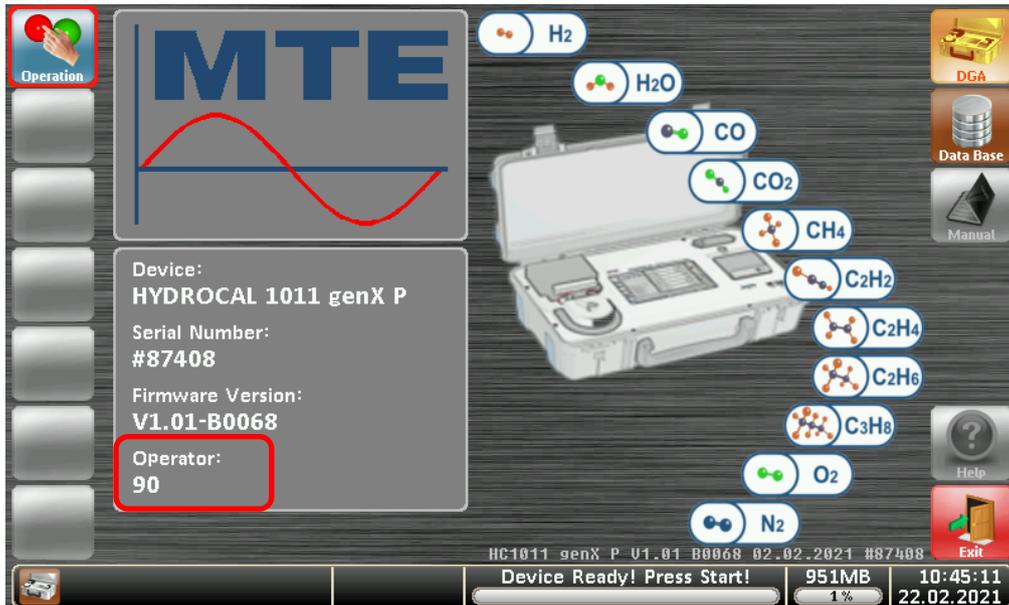
To select a language, tap on corresponding entry. The menu will close automatically.



To scroll to your preferable language, use the scroll bar on the right or swipe up/down directly on the screen

#### 4.4.3.6 Database - Setup - Communication - Operator

In this menu, the operator identification for the HYDROCAL 1011 *genX* P can be set. In addition, the default password (999) to enable submenus can be changed. The operator identification appears on the start screen.



After selecting the “Operator” field, the menu for selecting the operator identification and for adjusting the password opens.



In the following image, no settings are possible yet, as can be seen from the greyed-out fields. Before settings can be made, a release [4.3.3] must be done.



After selecting the field “Operator”, the setting mask opens, in which the operator identification can be entered.



After entering the operator identification, this is confirmed by pressing the green “Enter” field.



After selecting the “Password” field, the setting screen opens in which the password can be changed.



Confirmation is made by pressing the green “Enter” button.

**NOTE:** When changing the password, please remember the new settings. After changing the password and confirming it with the green “Enter” field, the password you entered must be used for release see [4.3.3]

## 4.5 Measuring procedure

### 4.5.1 Safety instructions for the measuring procedure



**Attention:** Always tighten the oil container until only hand-tight without the use of tools.



**Note:** When assembling, as well as inserting, the oil container, pay attention to the instructions see [4.5.6.2].



**Note:** During all work, ensure that the oil container is stored upright.



**Note:** Ensure that oil and oil-contaminated tools are disposed of in an environmentally friendly manner.

### 4.5.2 Preparing the device for measurement

Before taking a measurement, the following steps must be carried out in sequence:

- Set up the device safely [3.1.2].
- Open [3.1.1] and connect the HYDROCAL 1011 *genX* P to a suitable power supply [3.2.6].
- Switch on



- Press “Operation” to select the DGA measuring and analysis mode.



- Wait until initialisation/heating is complete [4.3.1].



- Press “Start”



You are now prompted to clean the extraction device.



An advisory tone supports the request to clean the extraction device.

#### 4.5.2.1 Abort

It is possible to abort by pressing “Stop”.

**Note:** The Stop key must be pressed for at least 3 seconds to cancel the operation.



After that, an expiring clock and a hint appear in the status bar.



Nach erfolgreichem Abbruch erscheint ein grüner Punkt im Bedienfeld.

### 4.5.3 Removing, cleaning and reinserting the oil container



**Note:** Observe the instructions chapter [4.5.6.2].



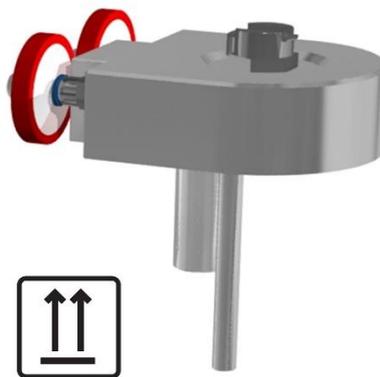
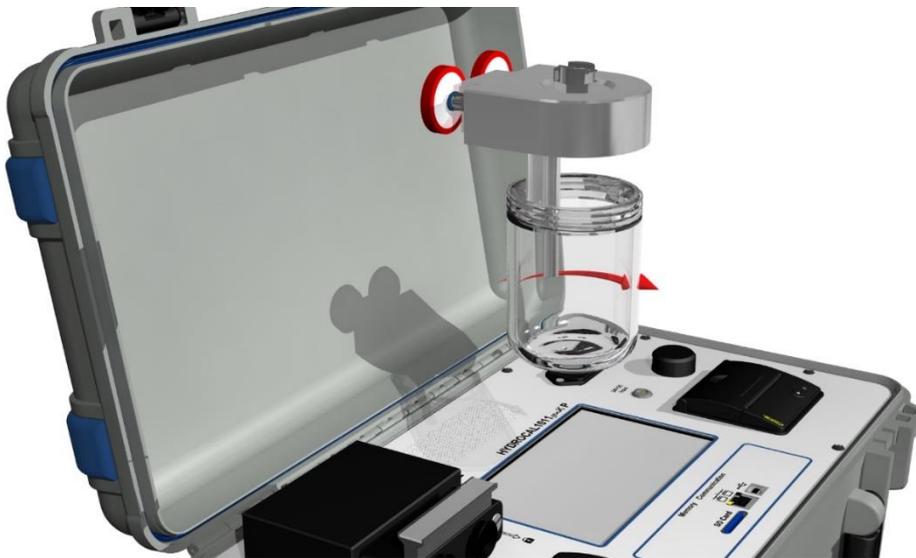
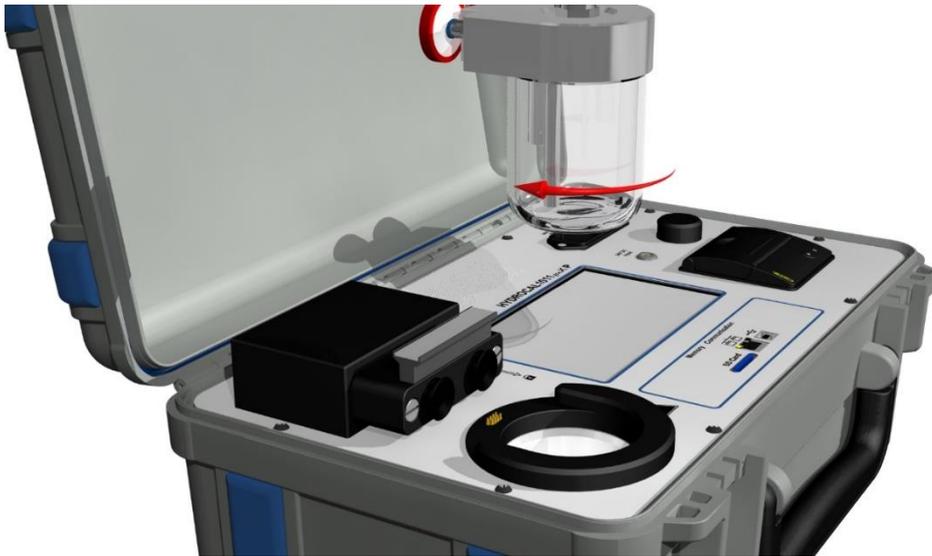
Push the sliding block of the connection unit back as far as it will go and hold it.



With the sliding block pushed back, pull the oil container out of the HYDROCAL 1011 *genX* P.



Unscrew the oil container in the direction of the arrow



**Note:** When cleaning the lower part of the oil reservoir, the upper part of the oil reservoir must be stored upright.

Clean the oil container with a lint-free, dry cloth.



Close the oil container in the direction of the arrow.



**Note:** Carefully position the thread and tighten the container by hand without using tools.



Push back the sliding block of the connection device and hold it.



With the sliding block pushed back, position the oil container in the HYDROCAL 1011 *genX* P.



After it is released, the sliding block of the connection device is automatically brought into the starting position by spring pressure.

**Note:** Make sure that the seals of the sliding block are seated correctly [4.5.6.2].



The HYDROCAL 1011 *genX* P recognises the insertion of the oil container. The following screen content is displayed:



An advisory tone signals the request to select “Next”.



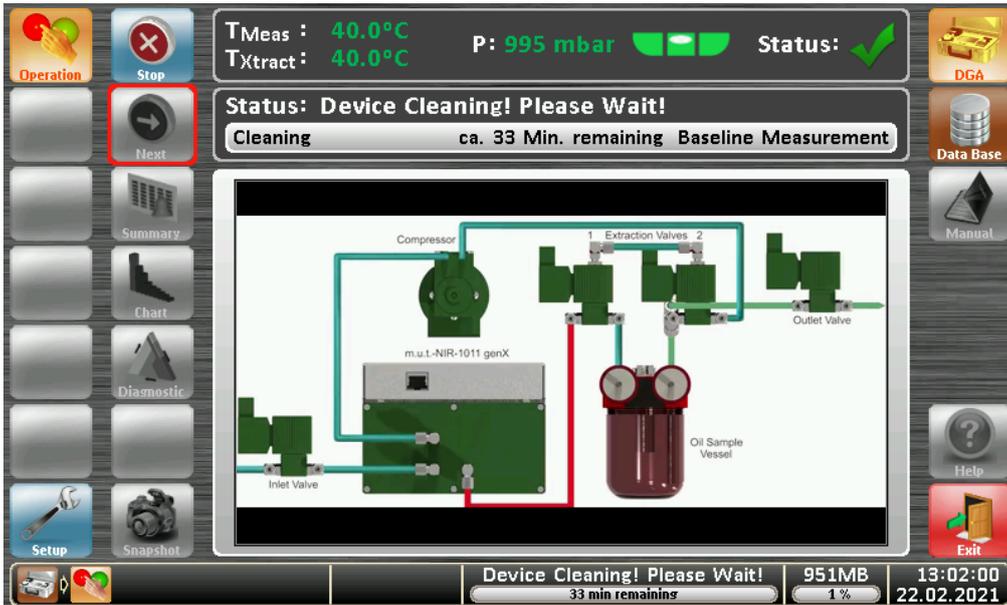
Pressing “Next” starts the zero measurement of the device.

**Note:** There is currently no oil in the oil container.

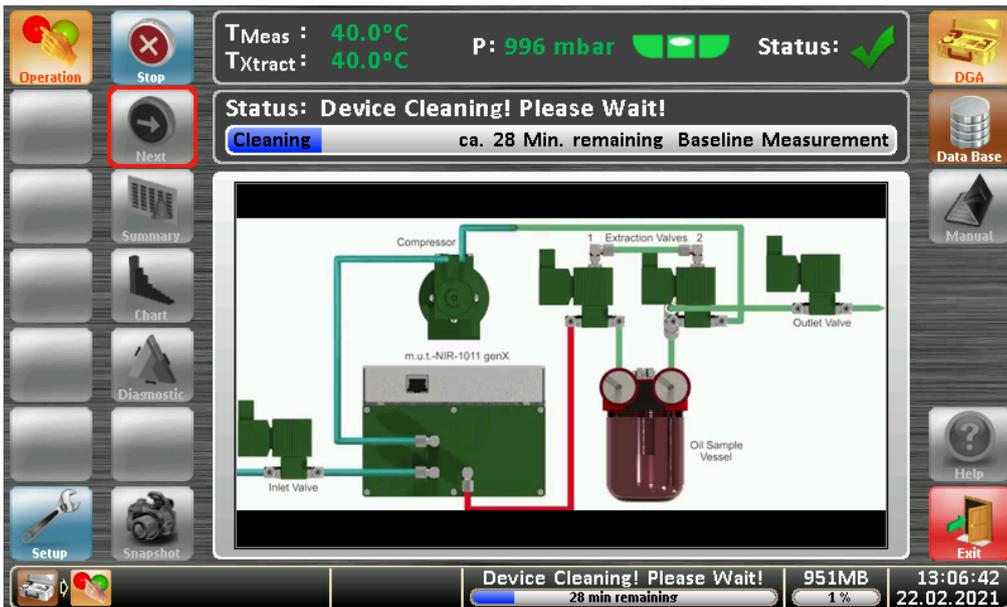
**Note:** Before the zero measurement, a memory card must be inserted into the HYDROCAL 1011 *genX* P see [3.2.5].

### 4.5.3.1 Zero measurement

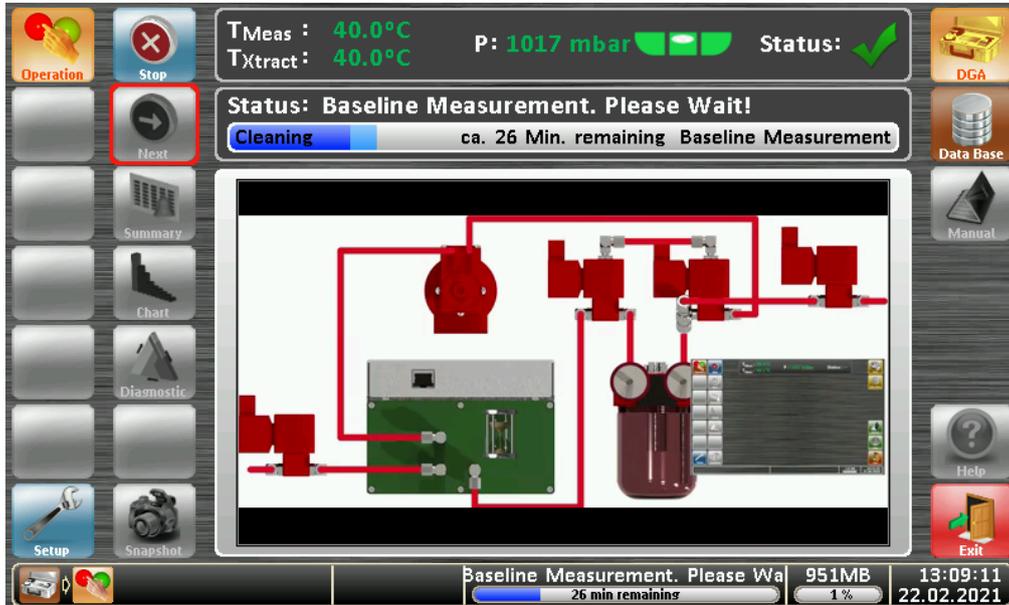
The device now automatically carries out a cleaning process followed by a zero measurement. This process takes about 30 minutes. The progress of this process is indicated by a blue bar and the remaining time in minutes on the display. The contents of the following images are displayed one after the other:



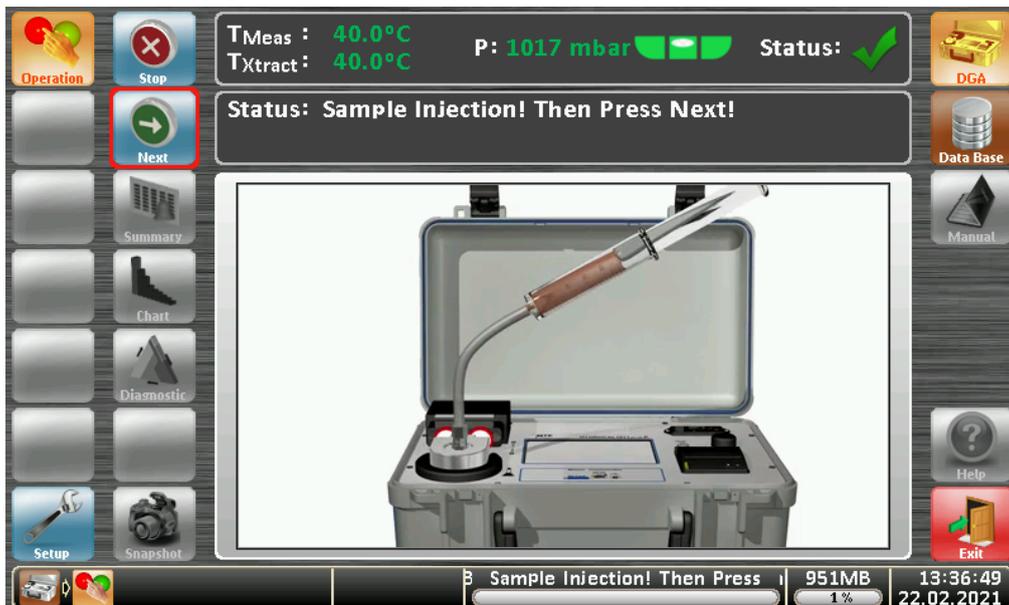
### Cleaning



## Zero measurement



When the cleaning and zero measurement have been completed, the following screen appears with the request to inject the oil sample.



A beep indicates the request to inject the sample.

Now the oil sample must be injected by the user as described below.

#### 4.5.4 Injecting an oil sample

A qualitative and representative oil sample is crucial for a reliable diagnosis with the HYDROCAL 1011 *genX* P. Even the most sophisticated extraction or diagnostic method cannot compensate for a faulty sample collection. Oil sampling must be carried out in accordance with IEC 60567.

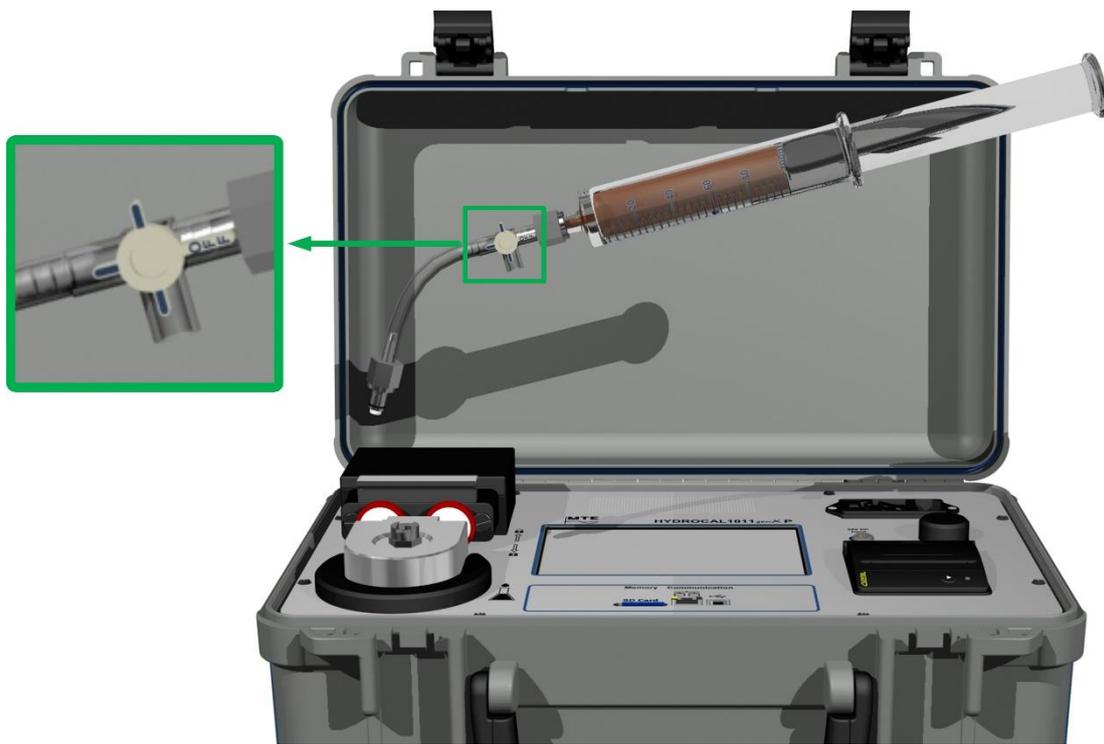


Fill the supplied oil sample syringe with 100 ml of the oil sample.

**Note:** The sample quantity must be exactly 100ml, otherwise, deviations in the measurement results of the HYDROCAL 1011 *genX* P may occur.



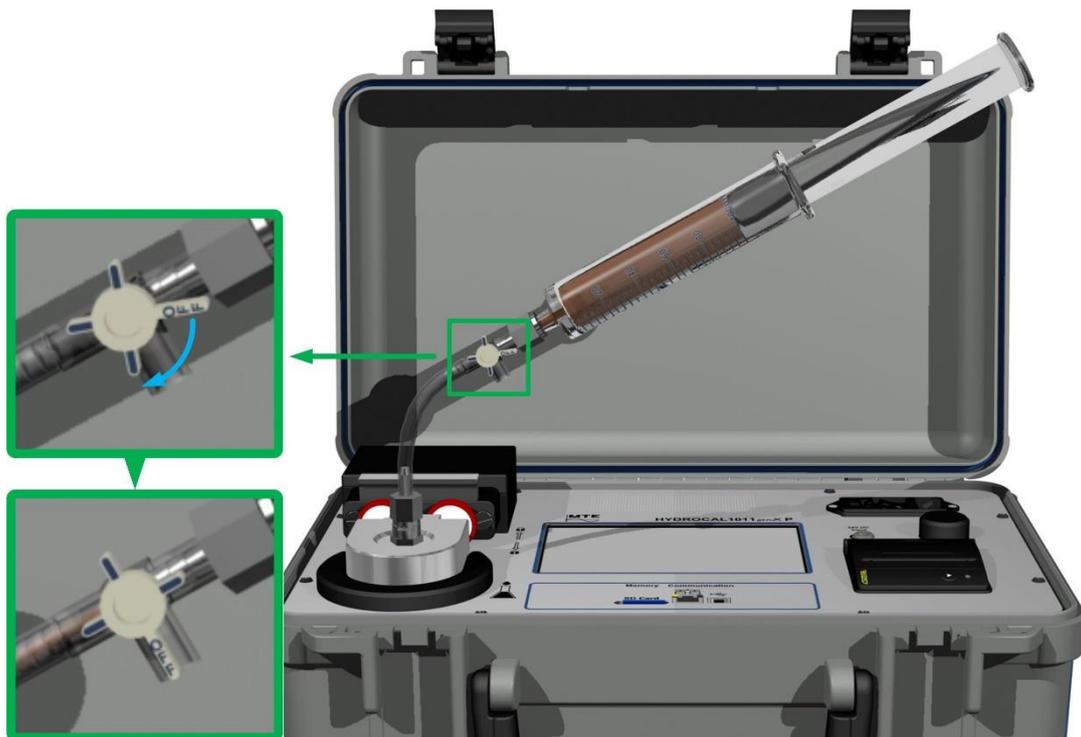
The 3-way shut-off valve is still closed, oil leakage is not possible.



Connection of the syringe by means of quick coupling plug (use quick coupling plug from the scope of delivery).

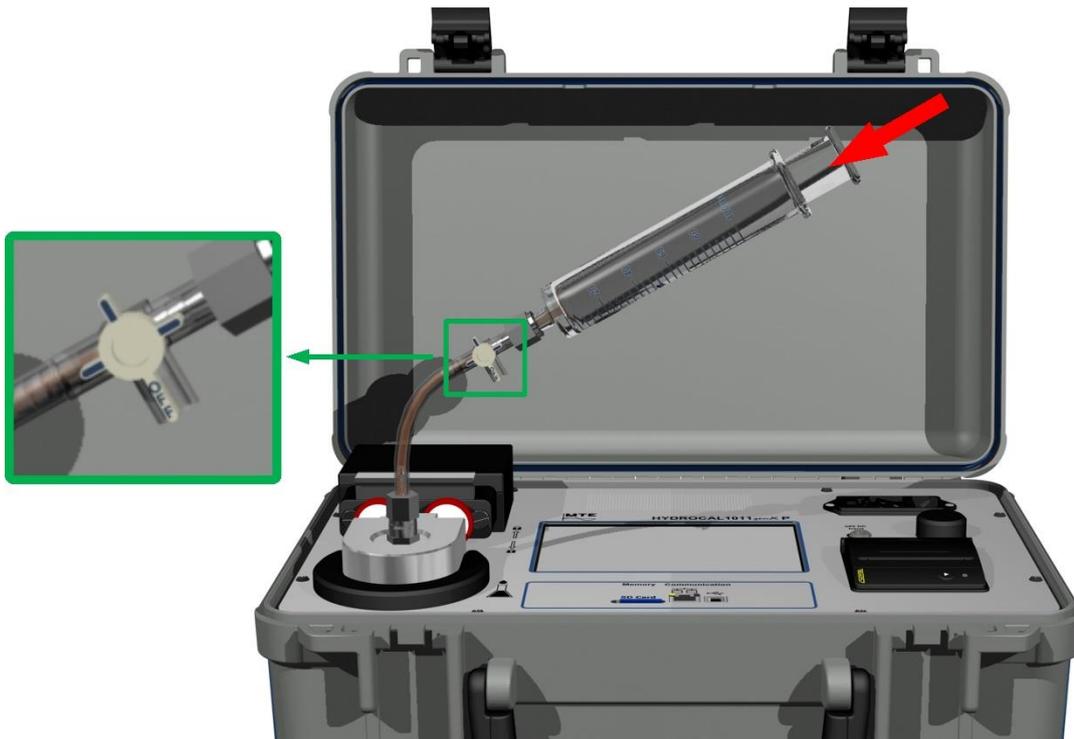


Open the 3-way shut-off valve

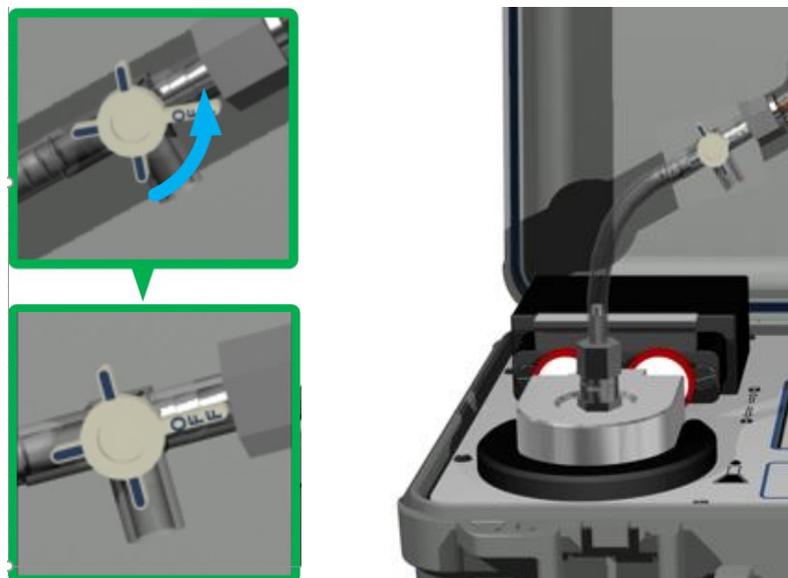


Inject the complete oil sample into the oil container by pressing the glass plunger.

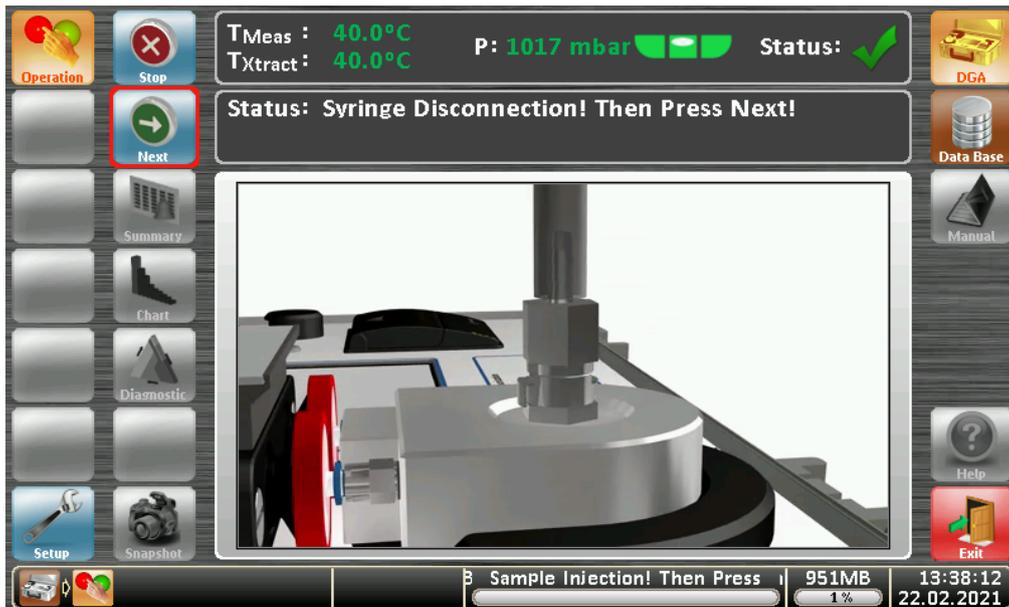
**Note:** Slowly press down the glass plunger of the syringe with moderate pressure. If too much pressure is applied, the syringe may be damaged and there is a risk of injury.



As soon as the oil sample of the syringe is completely empty, the 3-way stopcock is closed again so that the rest of the oil sample can run out of the tube into the oil chamber of the HYDROCAL 1011 *genX* P:

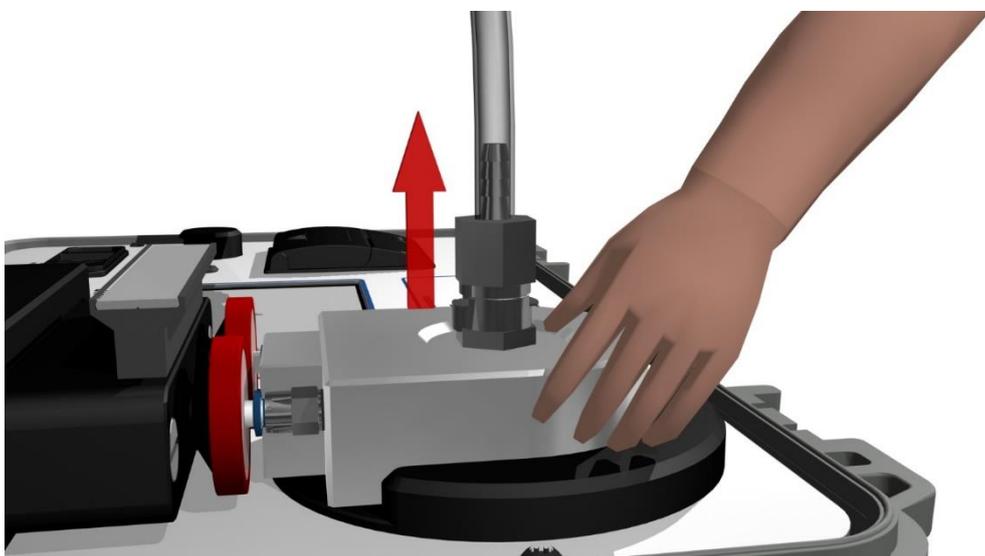
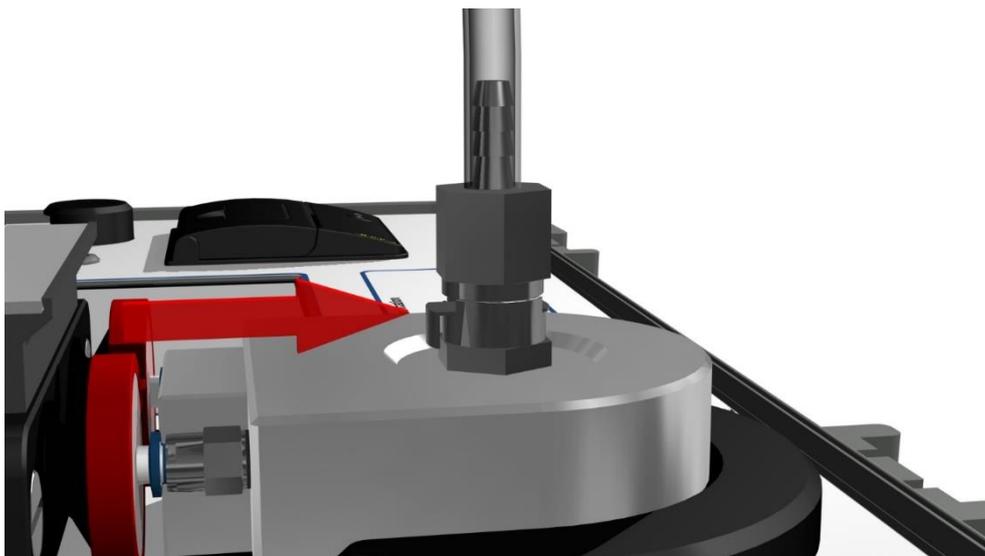


Then press the “Next” button on the HYDROCAL 1011 *genX* P, and the following screen content appears:



To remove the syringe, release the locking mechanism of the quick contact by pressing in the ejector lever.

**Note:** The plug is ejected by spring pressure. Hold the syringe firmly

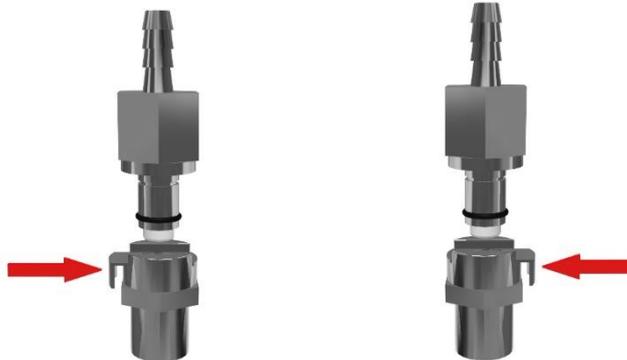


**Note:** The quick contact plug is ejected by spring pressure. Hold the syringe firmly.

To prevent possible lifting of the oil container, the oil container is held in place when the quick contact is pulled out.



**Note:** Due to the manufacturing process, it can happen that the quick contact on the oil container has been mounted by 180° contrary to the previous description. In this case, the eject lever is on the opposite side. In this case, the ejector lever is at the front when standing in front of the device.



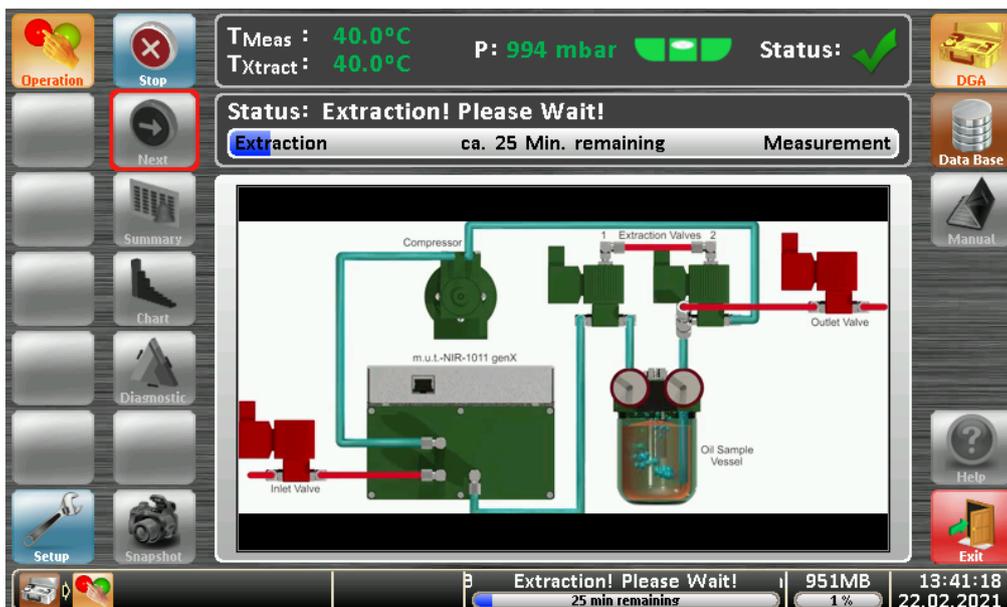
After removing the syringe from the HYDROCAL 1011 *genX* P, press the “Next” button. Then the extraction and measurement of the oil sample begin. This process takes about 30 minutes. The progress is indicated by a blue bar and the remaining time in minutes on the display.



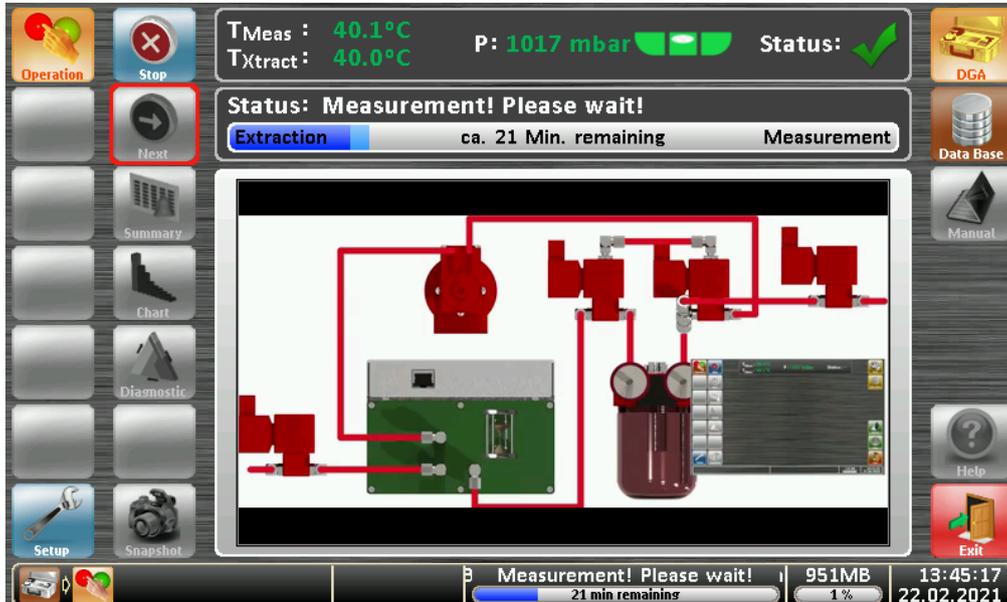
If the user does not press the “Next” button, an acoustic signal sounds.

After the “Next” button has been pressed, the following screen contents appear one after the other:

### Extraction



## Measuring



After the successful completion of the measurement, the following screen content appears. The control fields of the results (table, overview diagram) are now no longer greyed out and can be selected freely. The prompt for cleaning the extraction device appears.



Removal and cleaning of the oil container is now carried out as described in chapter [4.5.6.1].



If the user does not remove and clean the oil container, an acoustic signal sounds.

**Note:** Emptying and cleaning the oil container is mandatory! Observe the instructions as mentioned in chapter [4.5.6.2].

## 4.5.5 Measurement results

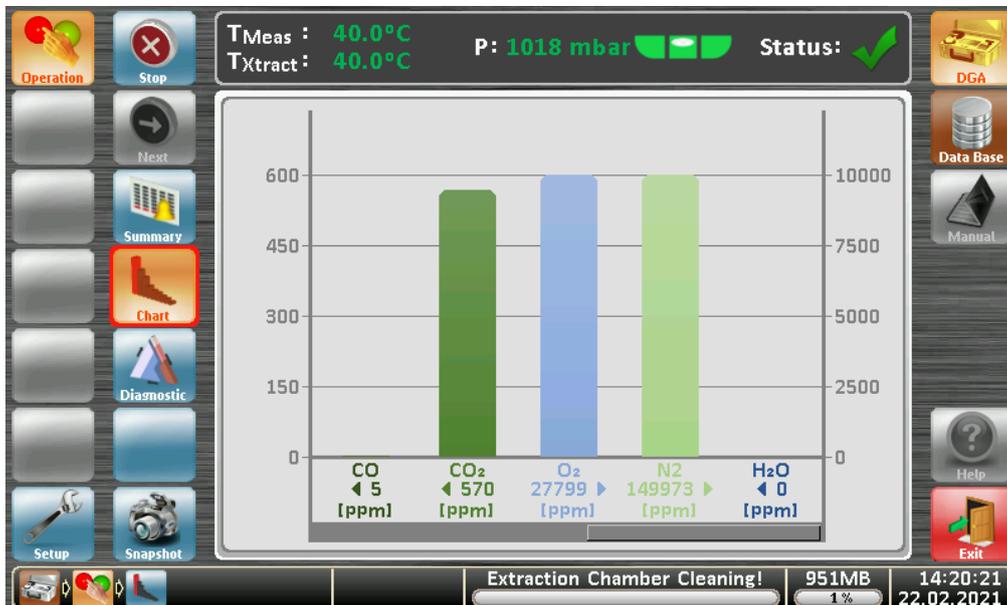
### 4.5.5.1 Viewing the measurement results



By pressing the button “Table”, the measurement results are displayed as a table.

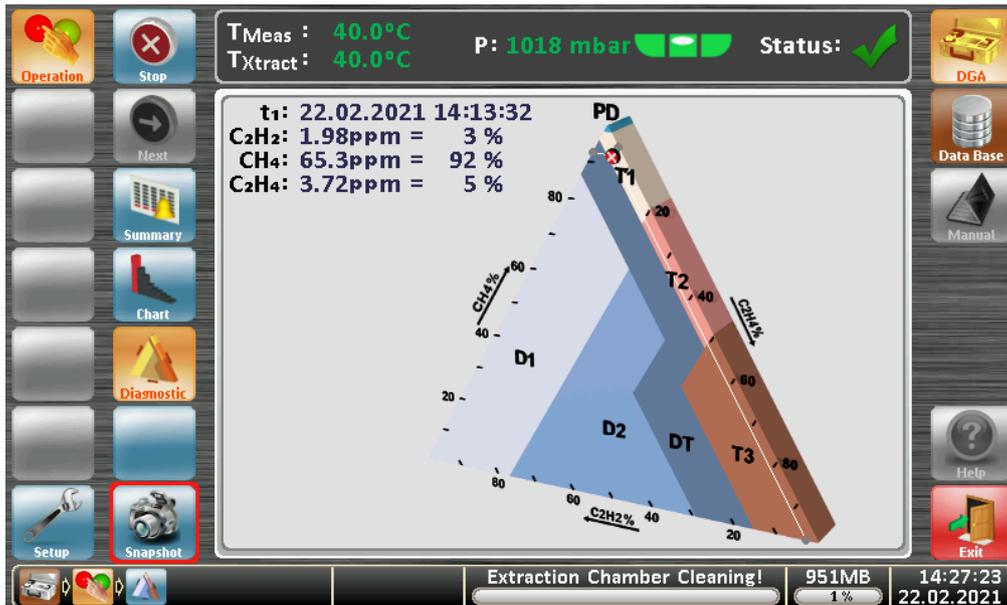


By pressing the button “Overview”, the measurement results are displayed as a bar graph.





By pressing the button “Diagnosis”, the measurement results are displayed in the Duval triangle.



**Note:** See also Database menu – Results chapter [4.4.2]

#### 4.5.5.2 Printing and saving the measurement results



After pressing the button “Save”, the measurement results can be printed and saved as displayed. The following options are available



Print the current result as a list via the integrated printer. After selecting the control field “Print”, the printer immediately starts printing



Display the current result as a list



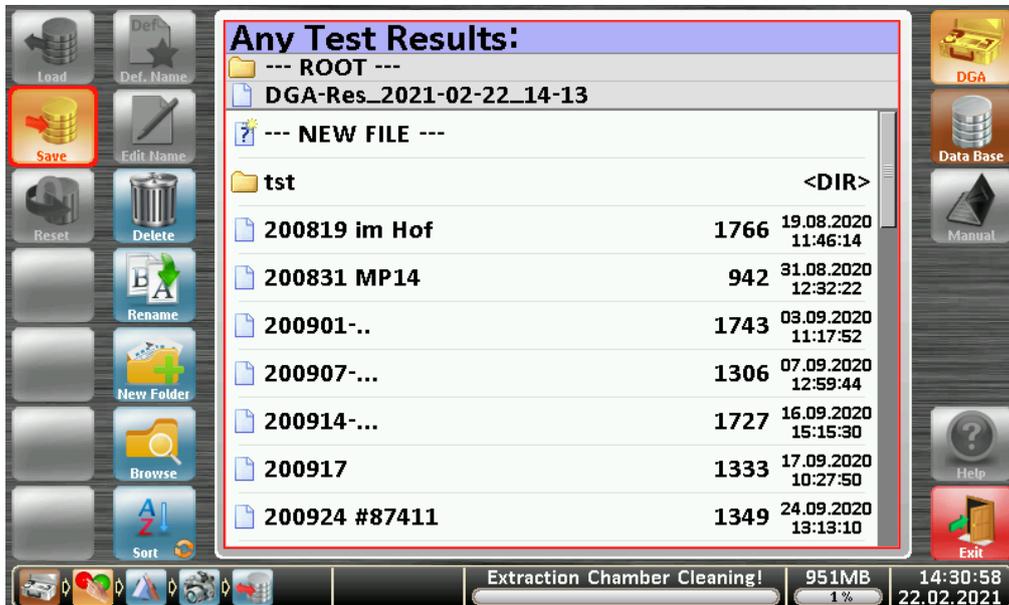
Save the measurement result

Customer data can be entered in advance or retrieved as described in chapter [4.4.2].

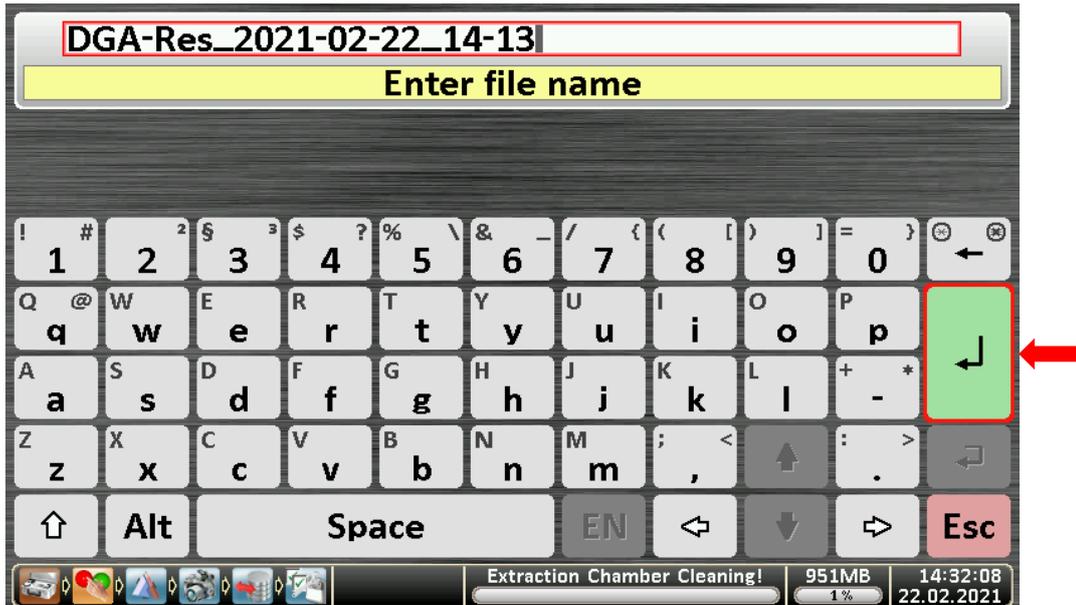


After pressing the control field "Save", the data manager opens, which has already been explained in detail in chapter [4.4.2]

Now press  --- NEW FILE --- .



After pressing **?** --- **NEW FILE** --- , the input field for the file name opens. Here you can accept the suggested name (*DGA-Res\_YYYY-MM-DD\_HH-MM* / date and time of the measurement result file) or enter an individual name via the keypad.



To confirm the entered data, touch the green “Enter” button.

### Merging measurement results

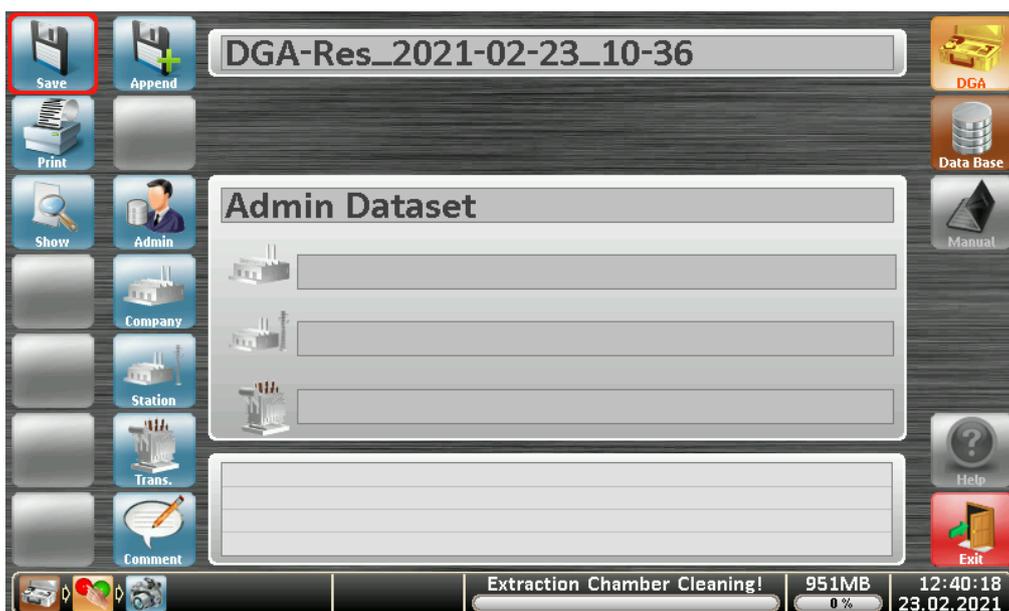
Another possibility to store measurement results is to merge measurement results, in order to read a trend in the results over the course of several measurements; see also the example in [4.4.2.2].

To append measurement results to an existing measurement, two options are available:

- On the one hand, it is possible to append the current measurement to a measurement previously carried out with the HYDROCAL 1011 *genX* P. This can be done if the “Append” control panel is enabled for selection (not greyed out).



The measurement is added to an existing measurement via the “Append” control panel. This makes it possible to merge measurement results into one file

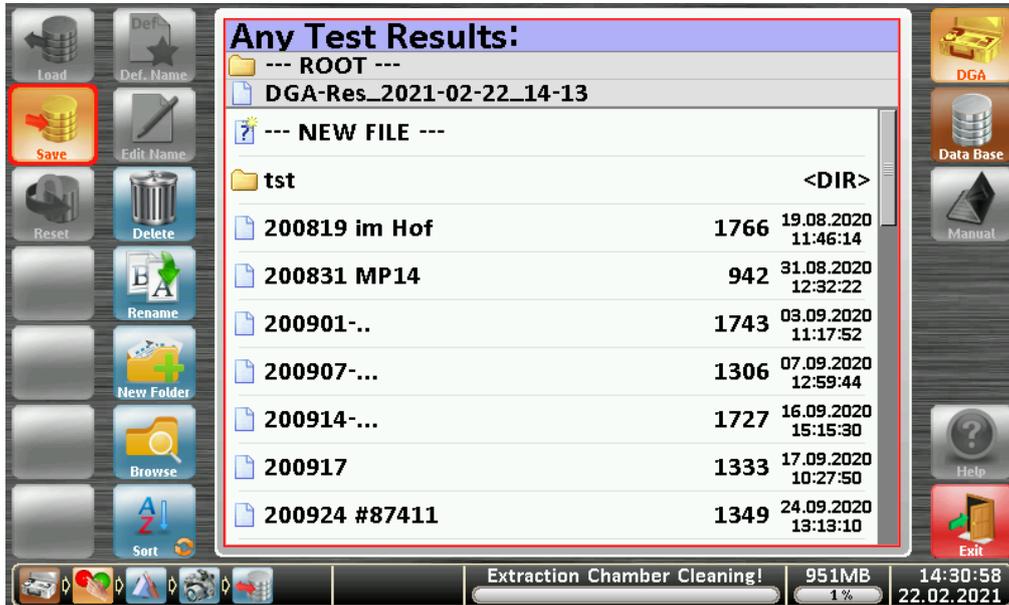


After selecting “Append”, the last measurement of the measurement previously taken with the HYDROCAL 1011 *genX* P is appended.

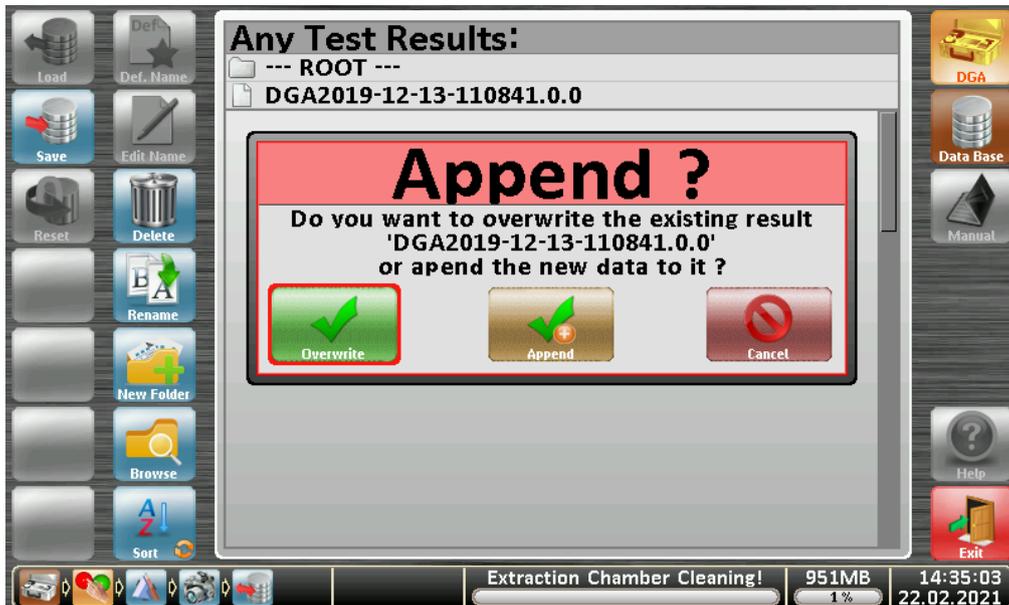


Another variant for appending is to append the measurement result to an already existing measurement result file. To do this, first select "Save".

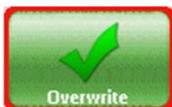
After pressing the control field "Save", the data manager opens. Here, an existing file is selected to which the new measurement result is to be attached.



After a measurement result file is selected, a confirmation is required to append.



Choose the wanted option:



To **replace** the selected measurement result file with the new file.  
**Note:** The selected file is overwritten and is no longer available.



To **attach** the new measurement result file to the selected file.



To **abort** the operation.

#### 4.5.6 Remove, empty, clean and reinsert the filled oil container.



**Note:** Observe the instructions chapter [4.5.6.2].

##### 4.5.6.1 Removing, emptying and cleaning the oil reservoir



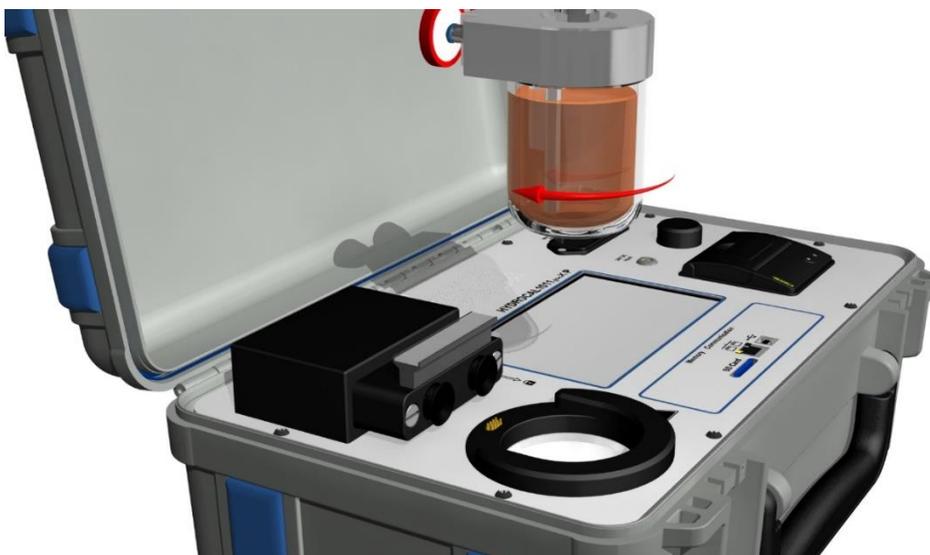
Push the sliding block of the connection unit backwards as far as it will go and hold it.

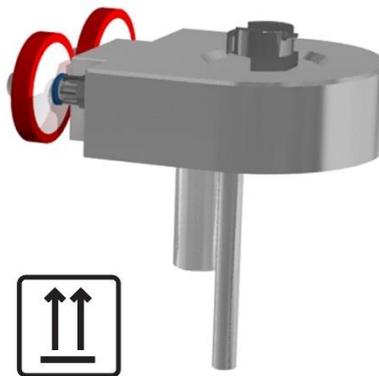
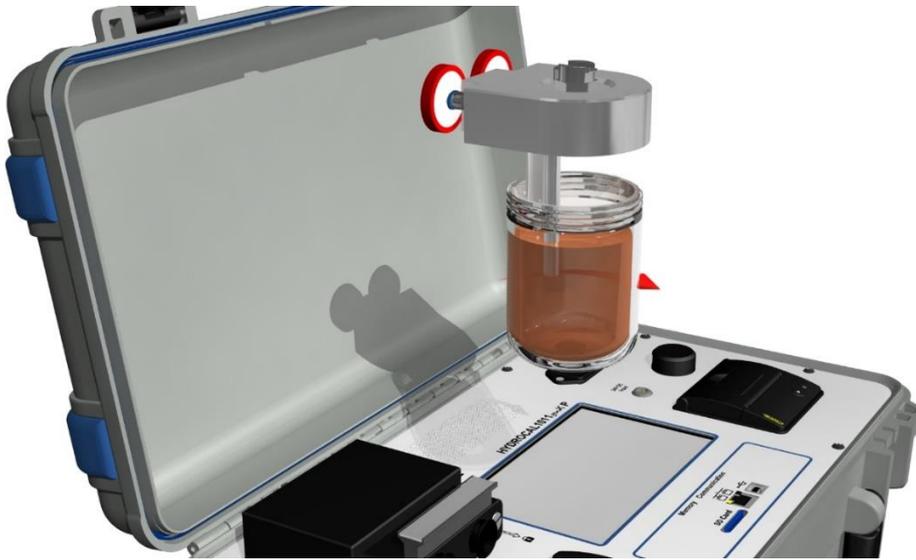


With the sliding block pushed back, pull the oil reservoir upwards out of the HYDROCAL 1011 *genX* P.



Unscrew the oil reservoir in the direction of the arrow





**Note:** When cleaning the oil reservoir, the upper part must be stored upright.

Empty the oil reservoir



**Note:** Ensure that the oil is disposed of in an environmentally friendly manner

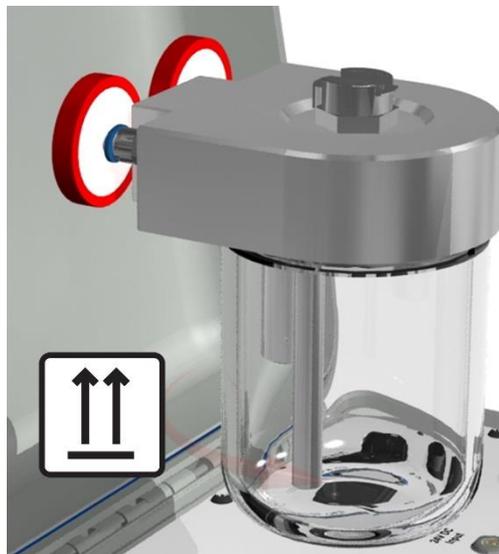
Clean the oil reservoir of the oil container with a suitable cloth.



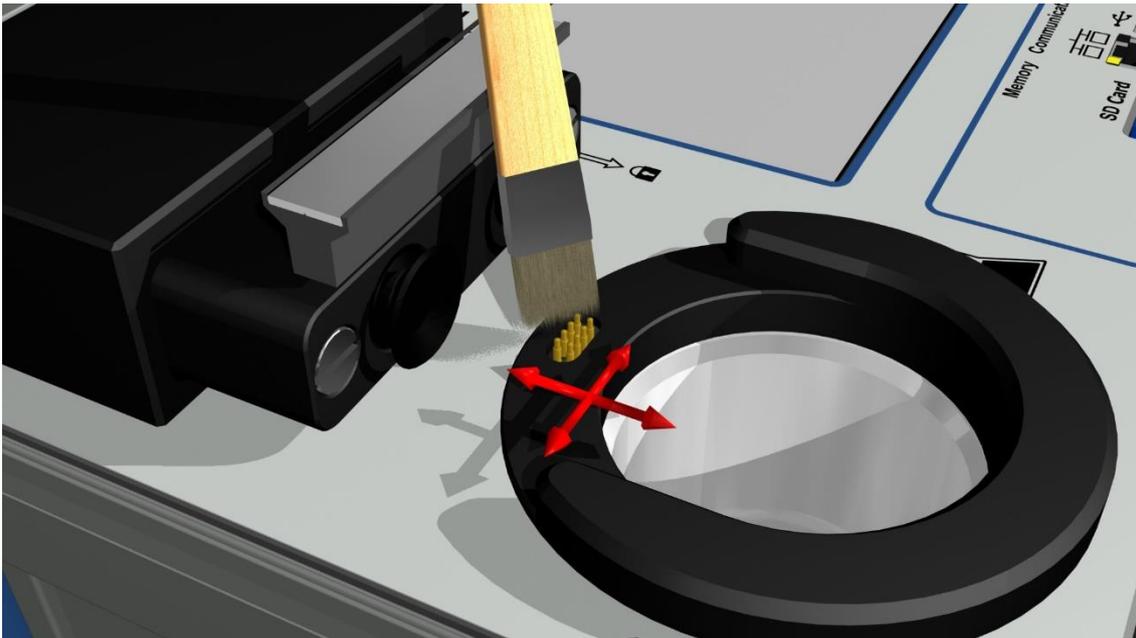
**Note:** Ensure that oil-soaked cloths are disposed of in an environmentally friendly manner.

#### 4.5.6.2 Additional cleaning of contacts, checking of seals and filters.

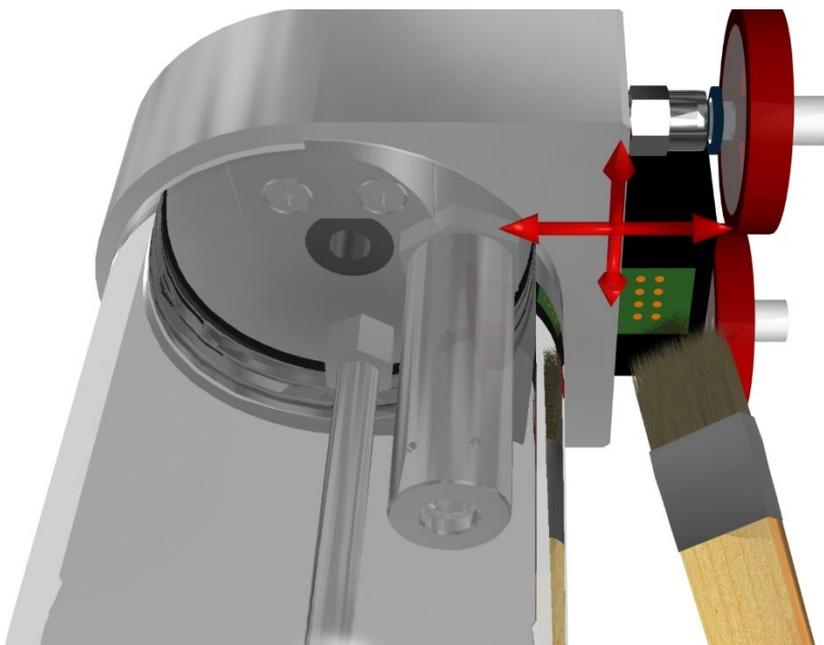
**Note:** Do not turn the oil container upside down, as otherwise oil sample residues may get into the filters and thus impair the measurements.



Clean the contacts of the oil moisture measurement with a suitable cleaning tool (cloth, brush) to remove oil film and foreign bodies. Check the contacts for possible damage.

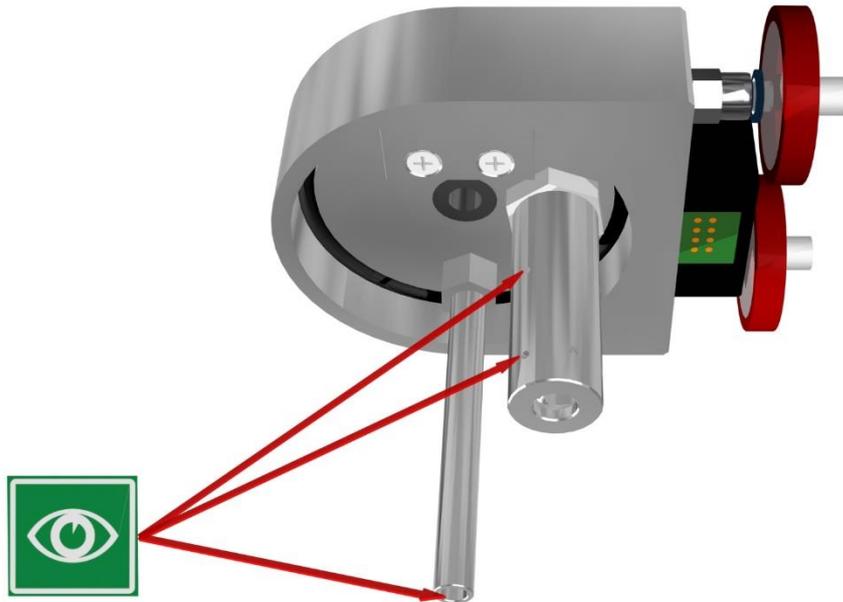


Remove oil film and foreign bodies from contacts of the upper part with a suitable cleaning tool (cloth, brush). Check the contacts for possible damage.



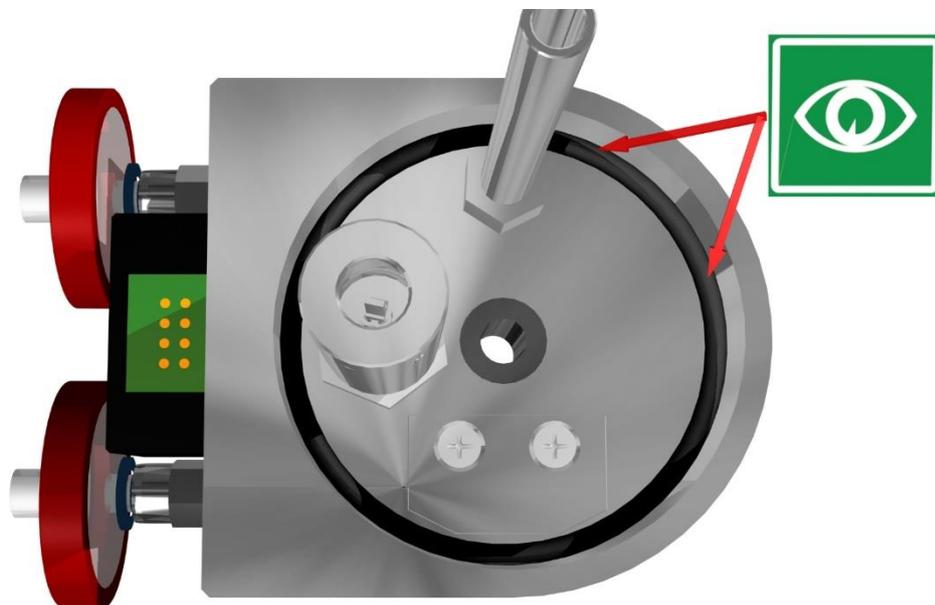
**Note:** Do not turn the oil container upside down, as otherwise, oil sample residues may get into the filters and thus impair the measurements.

Check all openings for pervasiveness, carefully remove possible foreign bodies with suitable cleaning tools (cloth, brush).



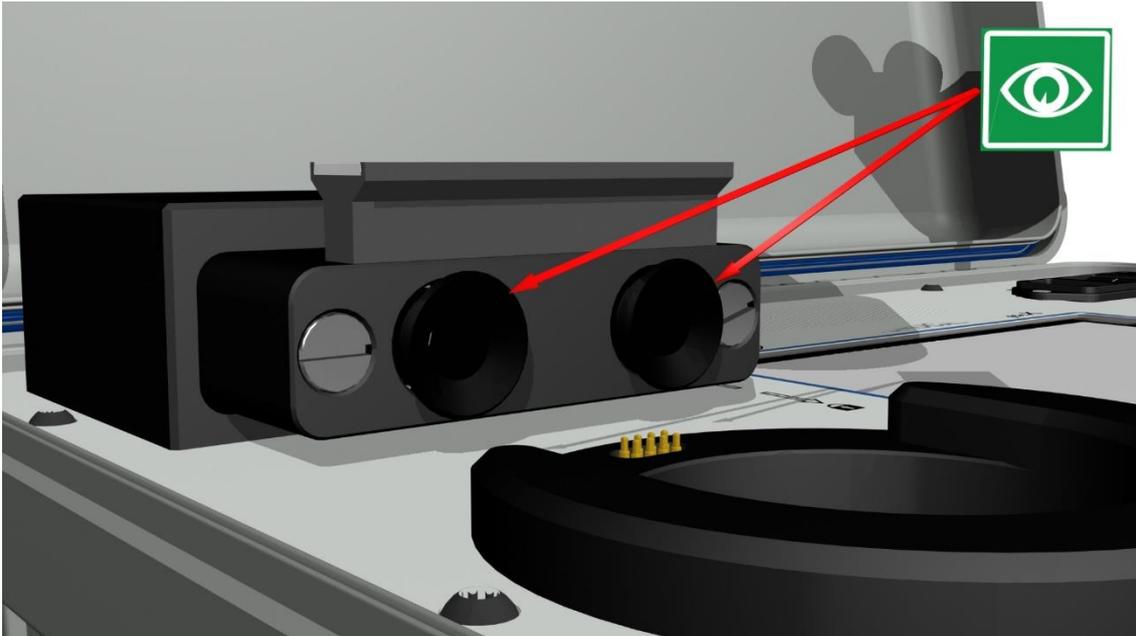
**Note:** Do not turn the oil container upside down, as otherwise, oil sample residues may get into the filters and thus impair the measurements.

Check the oil container seal. Both the seal in the upper part of the oil container (aluminium) and the opposite contact surface on the oil reservoir (acrylic) must be free of dust, undamaged and free of foreign bodies.

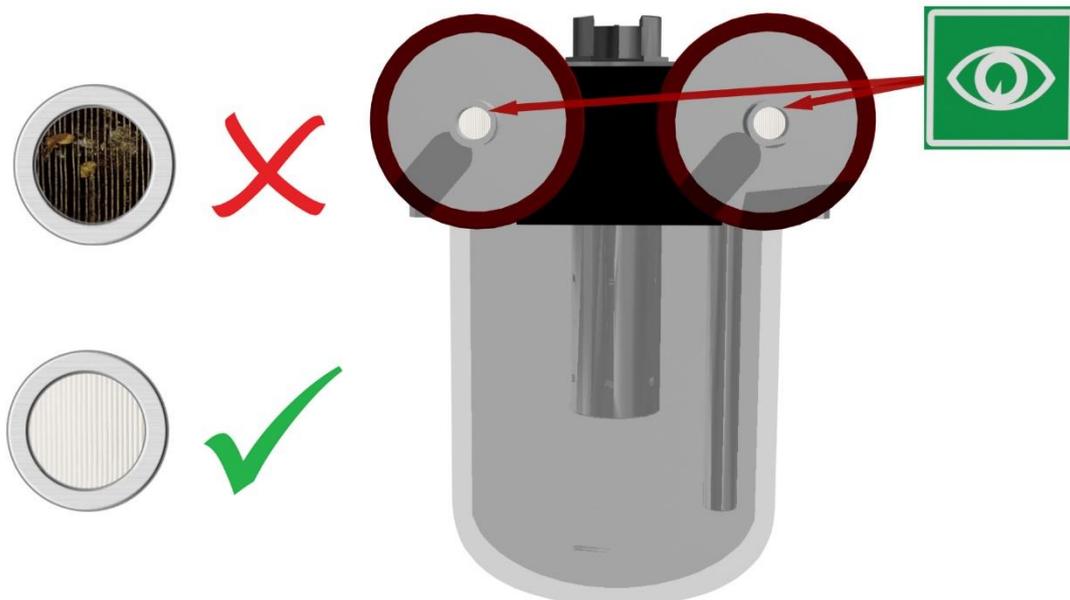


**Note:** Do not turn the oil container upside down, as otherwise, oil sample residues may get into the filters and thus impair the measurements.

Check the 2 seals of the sliding block. Both the seal on the sliding block and the opposite contact surfaces on the filters must be free of dust, undamaged and free of foreign bodies.



Check the filters: The filters must be free of oil, dust and foreign bodies. The filter housings must also be undamaged and clean.



If dirty filters are found, they must be replaced with new filters. See scope of delivery [6.1].

**Note:** It is recommended to replace the oil filters after 5 measurements.



**Note:** Ensure that filters are disposed of in an environmentally friendly manner.

#### 4.5.6.3 Assembling the oil container and inserting it into the appliance



Close the oil container in the direction of the arrow.





**Note:** Carefully position the thread and tighten the container by hand without using tools.

Push back the sliding block of the connection device and hold it.



With the sliding block pushed back, put the oil container into the HYDROCAL 1011 *genX* P.

**Note:** Make sure that the seals of the sliding block are correctly seated [4.5.6.2].

The sliding block of the connection device is automatically brought into the starting position by spring pressure after it is released.



After the oil container is cleaned and reinserted, the following screen content appears:



Furthermore, the control fields of the results (table, overview diagram) are free for selection.

The measurement process is completed when the measurement results are saved.

**Note:** After starting a new measurement, the results are only available in the database when they were saved, see chapter [4.5.5.2].

A prompt for a new measurement appears below.



An advisory tone signals the request to select “Next”.



Pressing “Next” starts the cleaning of the device.

**Note:** There is currently no oil in the oil container.

After cleaning is complete, “Start” will be released and a new measurement can be started.

## 5. Troubleshooting / Errors

### 5.1 General points

Unexpected failure of the device may still occur despite high quality standards. Many problems can be solved by working through the following steps of the on-site analysis. If this is not successful, remote diagnosis is possible by contacting our service department at [support@emh.de](mailto:support@emh.de).

### 5.2 On-site fault analysis

#### 5.2.1 Display is dark

The display of the HYDROCAL 1011 *genX* P is permanently in operation after it has been connected to the mains supply and switched on.

**Note:** When the HYDROCAL 1011 *genX* P is connected via the auxiliary power supply [3.2.6.2], the device is permanently switched on. The mains switch and the fuses are only relevant for the supply via the mains connection line and have no influence on the auxiliary power supply.

This means that a fault has occurred if the display is dark. The following points can be helpful in eliminating the fault.

##### 5.2.1.1 Check the power supply

Check the power supply or optional auxiliary power supply of the HYDROCAL 1011 *genX* P with a suitable measuring device. Check the mains connection cable or optional auxiliary power supply for possible damage.

##### 5.2.1.2 Check and replace the fuse of the mains power supply.

**Warning:** To avoid electric shock, switch off the power supply to the device and remove the mains connection cable [6.1.1] from the device before opening the fuse holder. To avoid personal injury or damage to the appliance, use ONLY the specified fuses:

- Mains input fuse: 2 x T 3.15 A size 5 x 20 mm

Before replacing the fuse, check it using a suitable measuring device.

If the device still does not work, the measuring and controller card may be faulty.

#### 5.2.2 Problems with the printer

- Printer produces imperfect prints: Cleaning, see [3.2.7.3].
- Printer does not print: Printer self-test and replace paper roll, see [3.2.7].

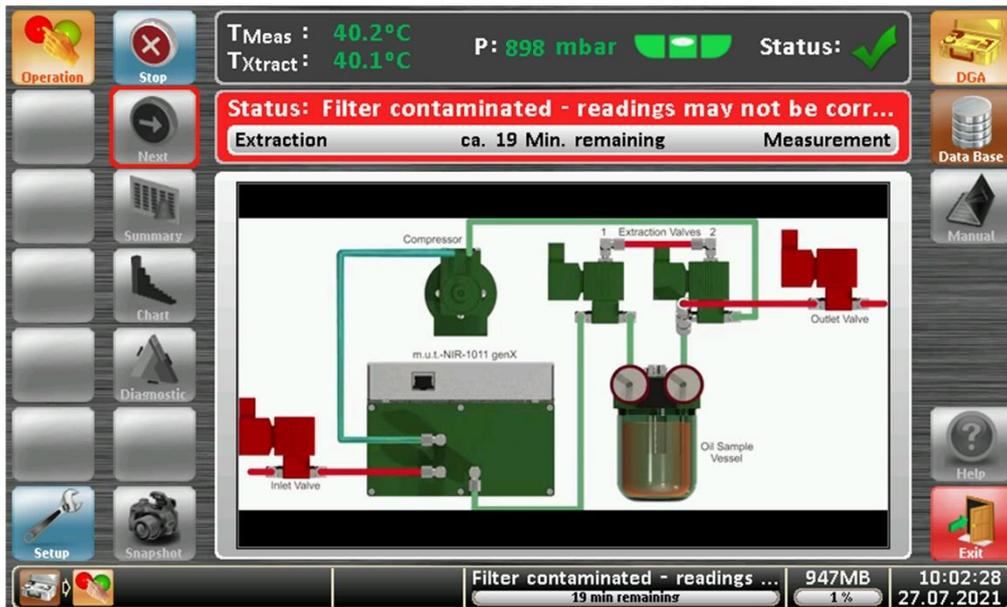
#### 5.2.3 Measured values deviate strongly

If the 1011 *genX* P gives readings that differ greatly from the expected value (for example, when measuring the same oil in succession), the cause may be that the contacts or filters are dirty, see [4.5.6.2].

**Note:** To be able to make precise statements, it is recommended to analyse more than one oil sample.

## 5.2.4 Filter contaminated

If the filters are heavily contaminated, this is detected by the Hydrocal 1011 genX P during extraction- and shown as a message on the display. In this case, both filters must be replaced.



The filter can be changed after the Hydrocal 1011 genX P has completed its measuring cycle.

**Caution:** In this case, the measurement results may be falsified.

Alternatively, the measuring cycle can be interrupted by the operator via the "Stop" control button [4.5.2.1] in order to carry out a filter change.

**Caution:** Never change the filter while an extraction/measurement is in progress.

When changing the filter, follow the instructions in [4.5.6.2].

### 5.3 Diagnosis with the HYDROCAL Service Tool

If a fault occurs, all the device data should be read out before any further actions are taken. The software *HYDROCAL Service Tool* is available for this purpose. HYDROCAL Service Tool (HCalServTool.exe) is a help software for the devices in the HYDROCAL family.

The software is mainly used for:

- Updating firmware and setting parameters for the HYDROCAL devices
- Reading out service data (configuration, parameter setting, diagnosis and measured data)

The data may contain value information and can be used by the service technician to localise a fault. The HYDROCAL Service Tool is provided by the Service department [support@emh.de](mailto:support@emh.de) and sent as a compressed file (zip-file).

Installation is not necessary. Simply unpack the compressed file to the required directory.

#### 5.3.1 System requirements

The following system requirements must be fulfilled for the HYDROCAL Service Tool:

- Personal computer (PC) with a Microsoft® Windows operating system such as Windows 7, Windows 8 and Windows 10.
- Ethernet or RS485 interface.

#### 5.3.2 Reading out service data

If the HYDROCAL Service Tool is used for troubleshooting, no download of any kind may be carried out in the meantime, since this would also reboot the device.

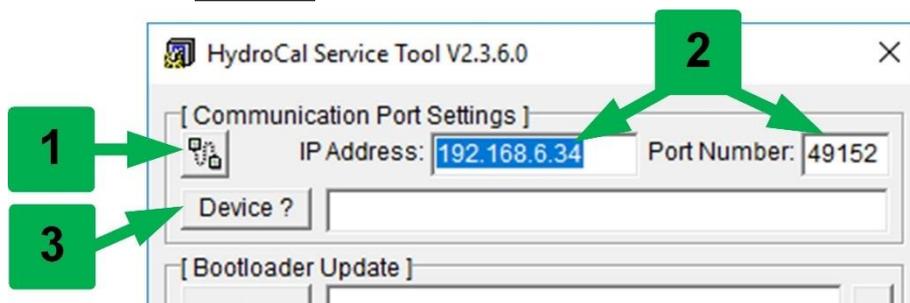
The update query which the HYDROCAL Service Tool suggests during device detection must be aborted. The last DGA analysis data (Service Date Read) are not required for this and can be marked as unknown (date and gases).

The prerequisite is that the HYDROCAL Service Tool (zip-file) has been unpacked to the required directory.

- Connect the HYDROCAL device to the PC (via Ethernet)

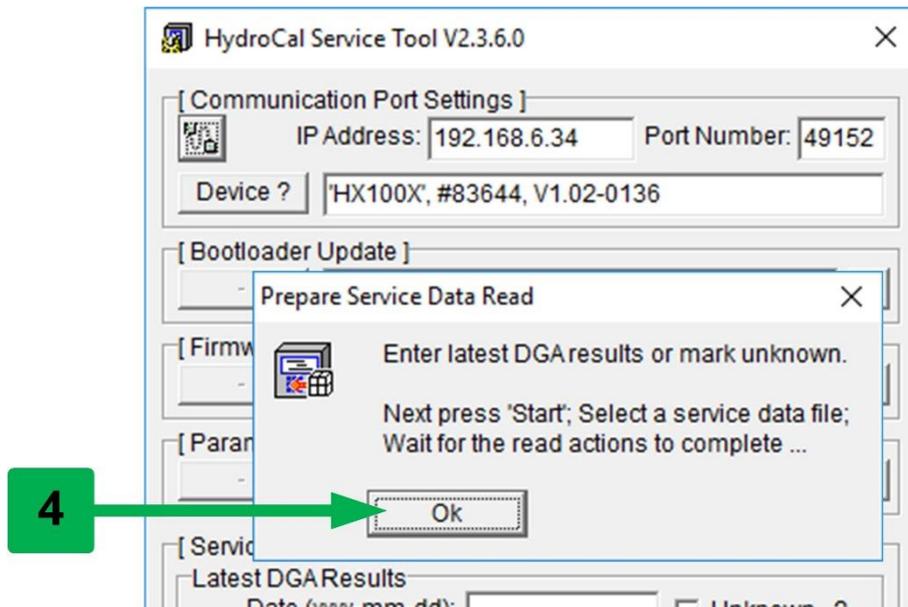
Start the HYDROCAL Service Tool  HCalServTool.exe

1. Select the interface [Communication Port Settings]: Press this field until Ethernet is set. This can be seen on the basis of the following symbol:  .
2. Enter the IP address and port number of the network interface.
3. Touch the field  .

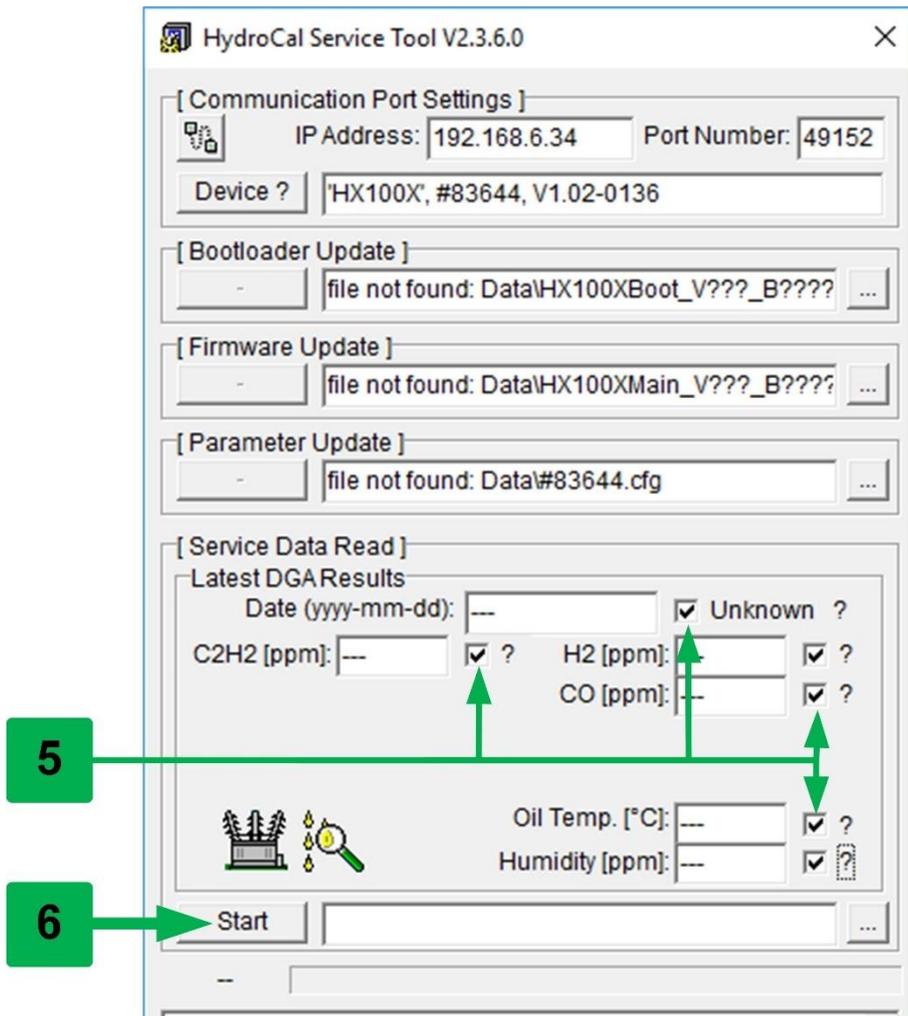


After the field  has been touched, the HYDROCAL ID, serial number and firmware version of the device appear in the field behind it.

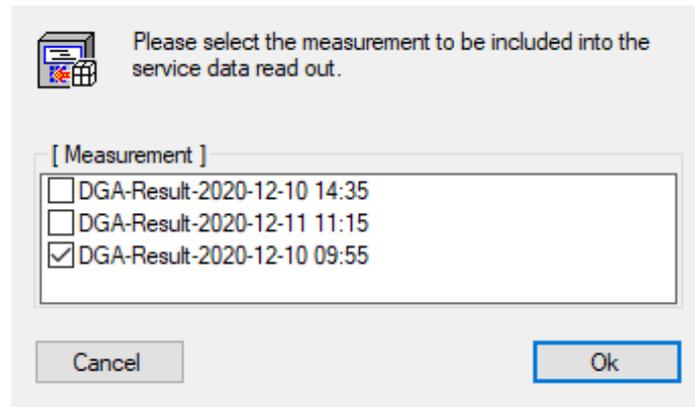
4. Skip message [Prepare Service Data Read] by touching .



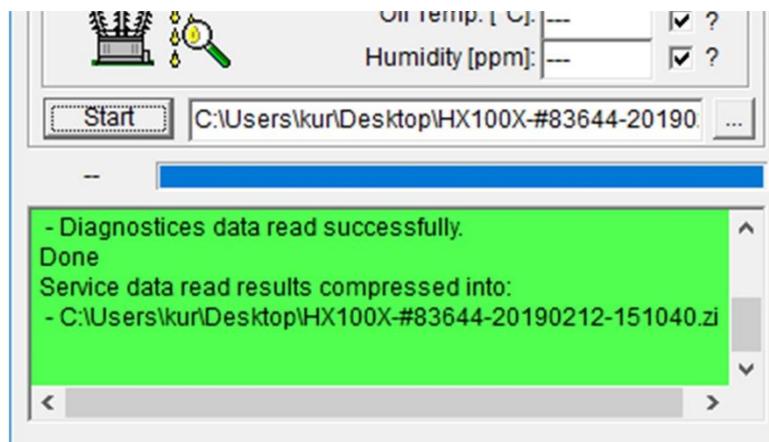
5. Enter the last DGA analysis data or mark as unknown [Unknown].  
**Note:** Either DGA analysis data must be entered or a tick placed next to [Unknown]. Otherwise it is not possible to read out the service data.
6. Touch the field , then a window opens for the storage location of the service data [Select Service Data Read File]. This can be adapted individually. After Save has been touched, reading of the service data begins.



- The list of measurements is loaded from the device. The measurement to be analysed must be selected and the process terminated with OK.



- Reading of the service data is shown in the field highlighted green. The storage location of the service data is also displayed.



- The file read out with the service data (zip file) can now be sent to the Service department ([support@emh.de](mailto:support@emh.de)).

## 6. Accessories HYDROCAL 1011 *genX* P

### 6.1 Scope of delivery

The following accessories are included in the delivery of a HYDROCAL 1011 *genX* P

Position	Quantity in Scope of delivery	Designation	Order number*
1	1	Cold-device connection cord	H0KF43520180000
2	2	Spare thermal paper rolls for printer	H0Z0ROLLPAPER04
3	2	Glass syringe 100 ml	H0HH20605275100
4	20	Syringe filter	H0HH10626085600
5	4	3-way stopcock	H0HH2GZ30600020
6	2	Quick coupling plug hose connection	H0HH2LCD2000401
7	2	Versilon hose 100mm	H07L1TYGOTHANE2
8	2	Versilon hose 200mm	H07L1TYGOTHANE3
9	2	Hose adapter (male) LM41	H07L000000LM410

\*Each order number refers to a single order unit

**Note:** The following illustrations are not to scale.

#### 6.1.1 Cold-device connection cord



#### 6.1.2 Thermal paper rolls



#### 6.1.3 Glass syringe 100 ml



#### 6.1.4 Syringe filter



#### 6.1.5 3-way shut-off valve



#### 6.1.6 Quick coupling plug hose connection



#### 6.1.7 Versilon hose 100mm



#### 6.1.8 Versilon hose 200mm



#### 6.1.9 Hose adapter (male) LM41



## 6.2 Optional accessories

The following accessories can be ordered as an option for the HYDROCAL 1011 *genX* P.

### 6.2.1 HYDROCAL 1011 *genX* P Battery Pack / H20R13120828901

Consists of:

- Battery Pack



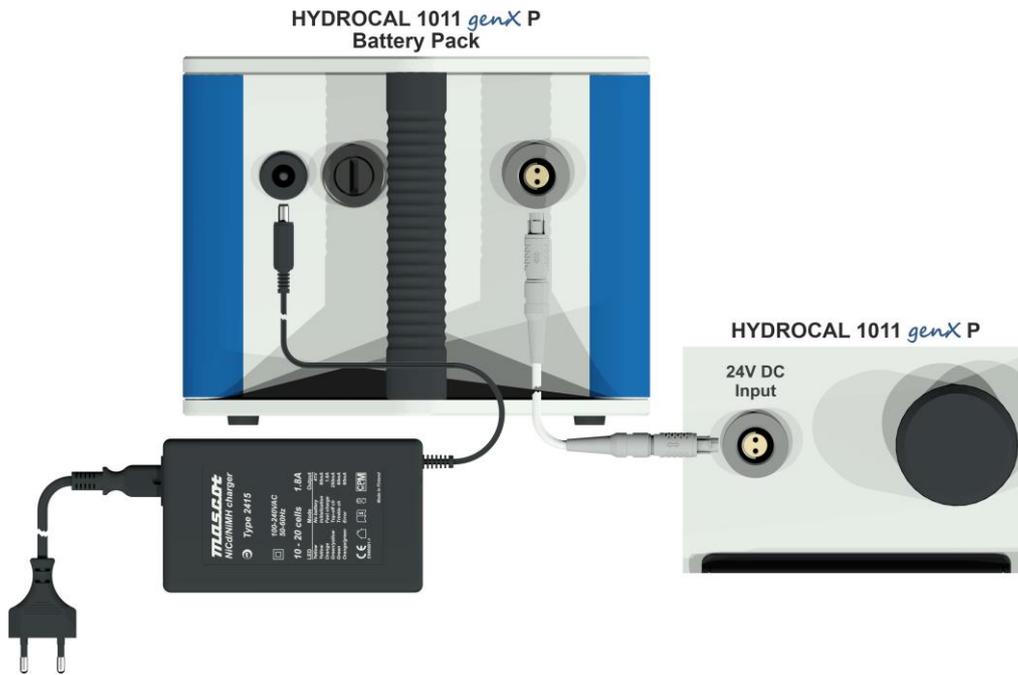
- HYDROCAL 1011 *genX* P AC Charger / H1H2MASCOT24151



- Connecting cable Battery Pack / HC 1011genX P / H1KZ009B4130100



Connection diagram for HYDROCAL 1011 *genX* P supply via Battery Pack (right side) and charging of Battery Pack (left side):



### 6.2.2 HYDROCAL 1011 *genX* P Automotive Supply / H20Q11500828801

Consists of:

- Voltage transformer



- Connecting cable Car Adapter / H1KZ009B4920100



- Connection cable Supply / HC 1011genX P / H1KZ009B4130100



Connection diagram for HYDROCAL 1011 *genX* P supply via Automotive Supply



## 7. Technical data HYDROCAL HYDROCAL 1011 *genX* P

### 7.1 General

Power supply:	88 VAC <sub>min</sub> ... 264 VAC <sub>max</sub> 47 ... 63 Hz
24 VDC supply:	20 VDC <sub>min</sub> ... 28 VDC <sub>max</sub>
Auxiliary voltage:	20...28 VDC
Power consumption:	max. 130 W
Housing:	Hard plastic housing
Dimensions:	W 447 x D 297 x H 187 mm
Weight:	approx. 13.4 kg
Operation temperature: (ambient)	-10°C ... +50°C
Oil temperature: (in the transformer)	-20°C ... +90°C
Storage temperature: (ambient)	-20°C ... +60°C

<b>Safety</b>	CE certified
Insulation protection:	IEC 61010-1
Degree of protection:	IP68 (housing closed) IP40 (housing open)
Overvoltage category (in accordance with EN 61010-1)	II
Protective rating (in accordance with EN 61140)	I (protective earth conductor necessary)

### 7.2 Measurements

Measurement of dissolved gas in oil				
Quantity to be measured		Measuring range	Accuracy Gas extraction	Accuracy Gas measurement <sup>1)</sup>
Hydrogen	H <sub>2</sub>	0 .. 10,000 ppm	≤ ± 8% ± 4ppm	≤ ± 10% ± 20ppm
Carbon monoxide	CO	0 .. 10,000 ppm	≤ ± 8% ± 30ppm	≤ ± 10% ± 5ppm
Carbon dioxide	CO <sub>2</sub>	0 .. 20,000 ppm	≤ ± 8% ± 30ppm	≤ ± 10% ± 5ppm
Acetylene	C <sub>2</sub> H <sub>2</sub>	0 .. 10,000 ppm	≤ ± 8% ± 4ppm	≤ ± 10% ± 5ppm
Methane	CH <sub>4</sub>	0 .. 10,000 ppm	≤ ± 8% ± 4ppm	≤ ± 10% ± 5ppm
Ethylene	C <sub>2</sub> H <sub>4</sub>	0 .. 10,000 ppm	≤ ± 8% ± 4ppm	≤ ± 10% ± 5ppm
Ethane	C <sub>2</sub> H <sub>6</sub>	0 .. 10,000 ppm	≤ ± 8% ± 4ppm	≤ ± 10% ± 5ppm
Propane	C <sub>3</sub> H <sub>8</sub>	0 .. 5,000 ppm	≤ ± 8% ± 4ppm	≤ ± 15% ± 20ppm
Oxygen	O <sub>2</sub>	0 .. 50,000 ppm	≤ ± 8% ± 500ppm	≤ ± 10% ± 500ppm
Nitrogen	N <sub>2</sub>	0 .. 150,000 ppm	≤ ± 8% ± 1500ppm	≤ ± 10% ± 1500ppm

<sup>1)</sup> In relation to ambient temperature +20°C and oil temperature +55°C

Measurement of dissolved moisture in oil		
Quantity to be measured	Measuring range	Accuracy Moisture in oil measurement
Moisture in oil H <sub>2</sub> O	0 .. 100 %	± 3% (absolute)
Moisture in oil in mineral oil	0 .. 150ppm	± 3% ± 3ppm
Moisture in oil in ester <sup>3)</sup>	0 .. 2000ppm	± 3% of MSC <sup>4)</sup>

<sup>3)</sup> Optional | <sup>4)</sup> Moisture Saturation Content

### 7.3 Working principle

- Headspace gas extraction for portable use
- Near-infrared NIR gas sensor device for CO, CO<sub>2</sub>, C<sub>2</sub>H<sub>2</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>6</sub>, CH<sub>4</sub> and C<sub>3</sub>H<sub>8</sub>
- Microelectronic gas sensor for H<sub>2</sub>, O<sub>2</sub> and N<sub>2</sub> measurement
- Thin-film capacitive moisture in oil sensor for determining the absolute (%) and relative (ppm) moisture content in the transformer oil
- Temperature sensors for oil and gas temperature measurement

### 7.4 Communication

- WLAN interface
- ETHERNET 10/100 Mbit/s copper / RJ 45
- USB-interface type B

## 8. Dimensions HYDROCAL 1011 *genX* P

