

aboni

HydroTracer HT3

Operation Manual

Version HT3 STD

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Declaration of Conformity

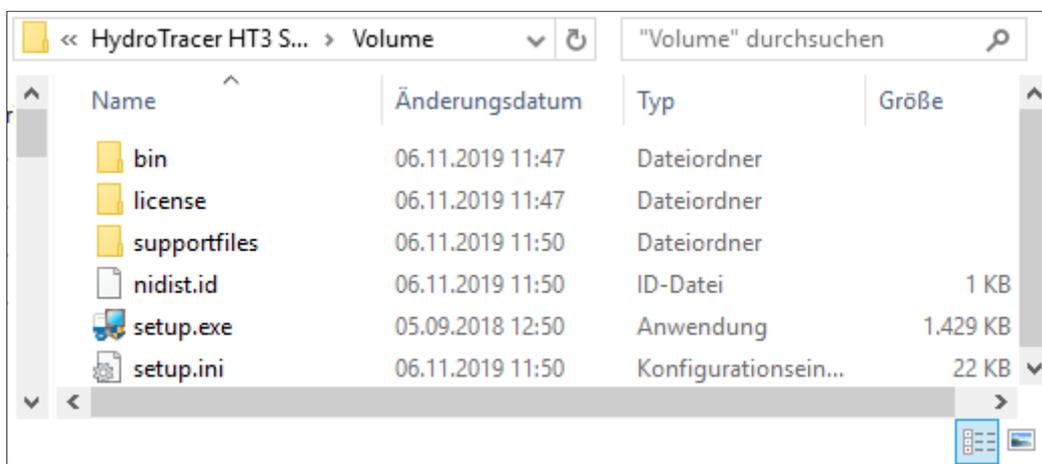
Safety Data Sheet Calcium Hydride

1. Initial Operation

The HydroTracer is controlled by a PC and the signals from the instrument are analysed by the PC software. The data transmission occurs via USB-Port. Before first operation, the control program and the driver must be installed.

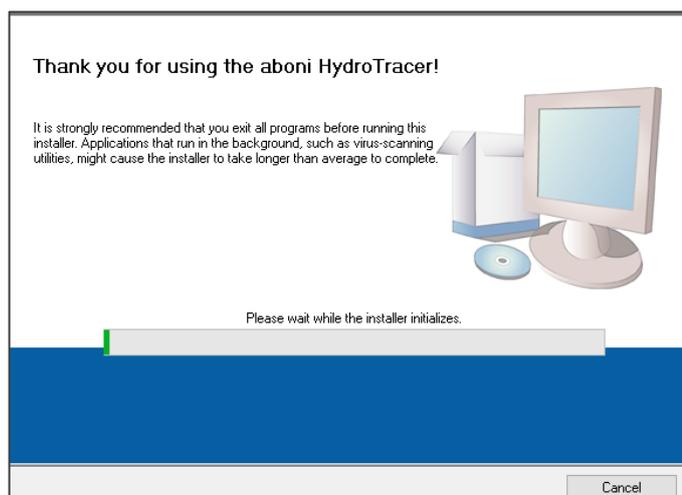
1.1 Installation of the Control Software HT3 STD

Insert the DVD or plug in the USB-storage at a free USB port of your computer and start the installation by running the **setup.exe** within the directory **[CD/DVD/USB]: \HydroTracer HT3 STD Installer\Volume**

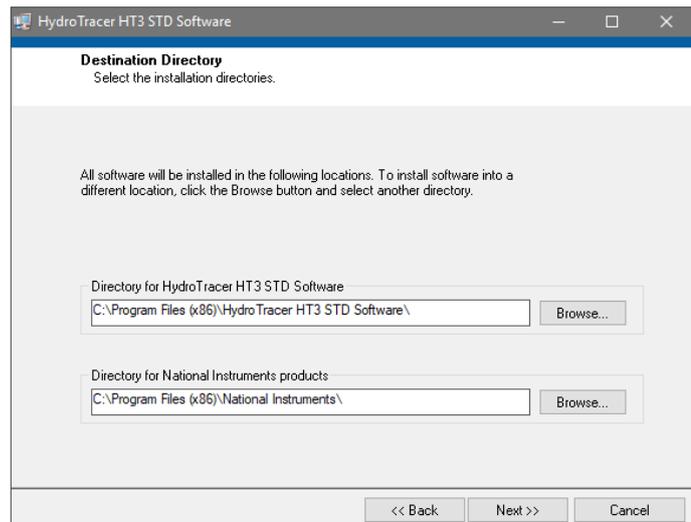


Please follow the instructions on the screen.

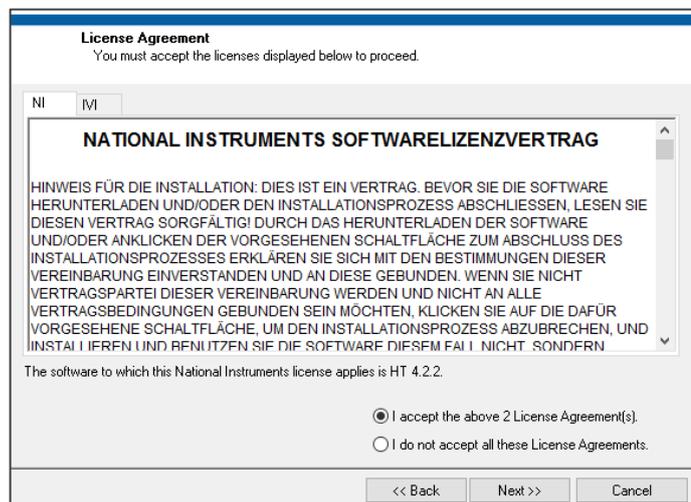
This mask appears and the installation program is initialized



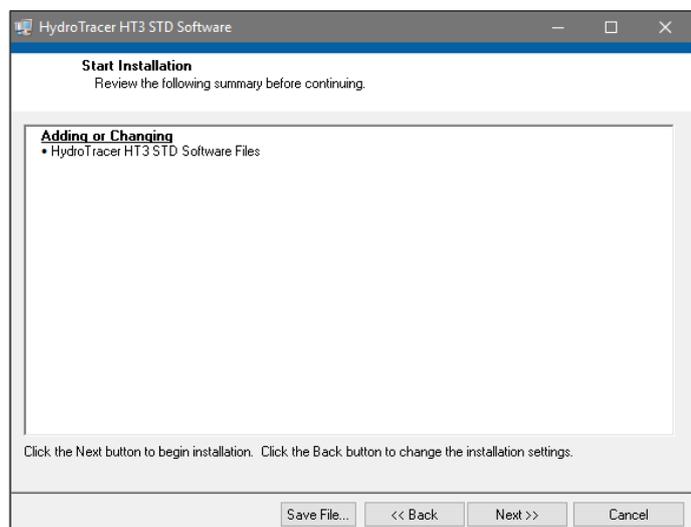
This mask appears. It is recommended not to change the settings. Click "Next >>"



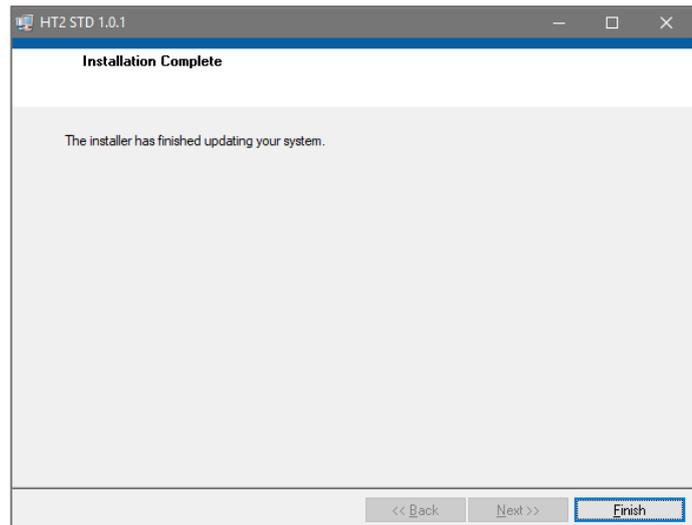
Now click on the field "I accept the license agreements", then on the field "Next >>"



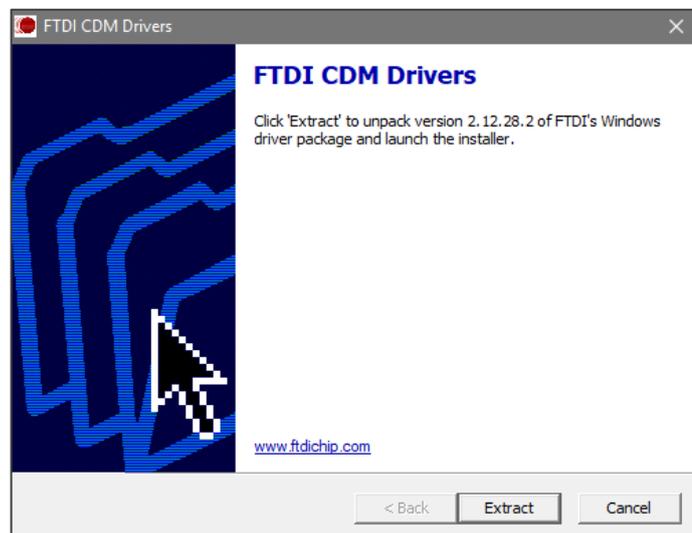
This mask appears. Click "Next >>"



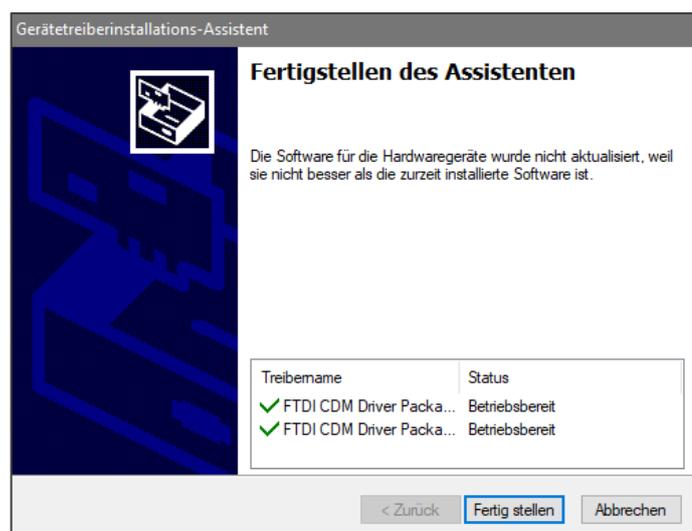
This mask appears. Click "Next >>"



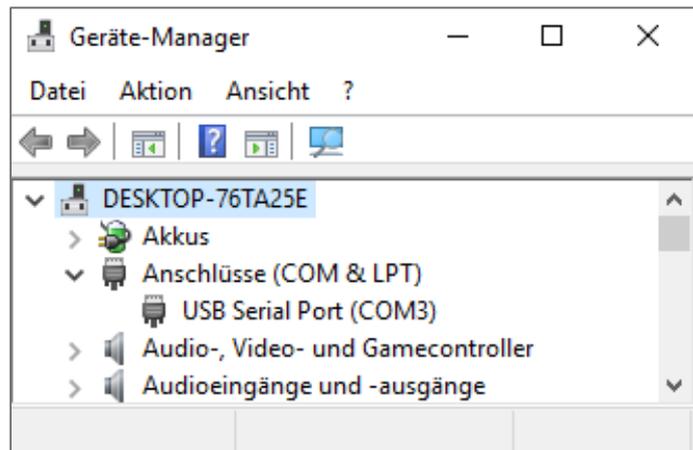
Then the USB driver has to be installed. This mask opens. Click on "Extract" and follow the instructions



At the end of the installation of the USB driver, this mask appears. Click "Finish"



In the Windows® Device Manager, a new entry "USB serial port" appears under the "Ports (COM & LPT)" section when the HydroTracer is connected to the computer via USB cable.



1.2 Connecting the HydroTracer

Switch on your PC (if not done already).

Connect the power supply cable on the rear side of the HydroTracer. Connect the HydroTracer with the data cable (USB) to your PC. Switch on the power. If the HydroTracer is properly connected to the power supply, the system fan runs and the blue LED glows.

The HydroTracer is now ready for operation.

1.3 Measuring Principle

The patented method of the HydroTracer determines the absolute water content. The mass of the water is measured within the reactor. The percentage of moisture of the sample is calculated by division with the sample weight.

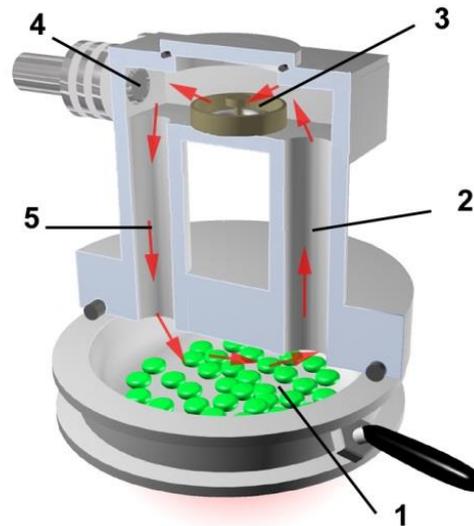
1 The test material is heated in the sample tray; water evaporates

2 The hot humid gas ascends

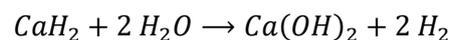
3 The Reagent exchanges water by hydrogen

4 The sensor measures the concentration of hydrogen

5 The cooled gas descends and can absorb water again



The sample is weighed and filled into the sample tray. The sample tray is shifted into the HydroTracer, being a part of the reactor. A heater warms the sample to a temperature chosen by the operator. The water within the sample material evaporates. The volatile water rises to the upper part of the reactor. Two pipes connecting the heated sample tray with the cooled upper part where the reagent is placed. The reagent tray is a small flat tray filled with approximately 0.1 g calcium hydride. When the humid air flows over the reagent, gaseous water reacts with calcium hydride according the following equation:



So water vapor is exchanged against hydrogen and calcium hydride converts to calcium hydroxide (chalk lime).

The cooled, dried gas enters again the lower part of the reactor. The gas circulation is supported by natural convection, created by a special configuration of the vertical pipes. By this method even hygroscopic materials are completely dried. The final concentration of hydrogen in the reactor is proportional to the water content of the sample before the measurement.

The ambient air also contributes water to the reactor atmosphere. To achieve accurate results it is necessary to determine the air humidity and the air density. Integrated sensors measure the humidity of the ambient air, the temperature and the air pressure. With this data the software determines the water of the air humidity which is deduced off the final result.

The concentration of hydrogen is measured by a sensor detecting the thermal conductivity of the gas.

Note: *The air-hydrogen atmosphere does not react chemically, because the temperature is much lower than needed to supply the activation energy of the oxyhydrogen gas reaction. Even if it would react, the theoretic maximum of the reaction enthalpy (the amount of energy which would be set free by the reaction of hydrogen with the oxygen of the air) is about 0.1 kJ and therefore harmless.*

1.4 The Reagent

Calcium hydride reacts with water to calcium hydroxide (hydrated lime, agricultural hydrate), which is a weak base and quite harmless. Nonetheless, take care calcium hydride does not get into contact directly with (liquid) water. The reaction heat together with the oxygen of the air could ignite the developing gas. The small amount of reagent which is needed per measurement averts this danger. Always close the reagent bottle directly after use. Because the reagent is always added in surplus, it will be still reactive after the measurement. Avoid the contact with inflammable, especially wet materials and leave the used reagent exposed to the air, where it can react slowly with the air humidity. An ideal container is an open tin can. After a few hours calcium hydride is completely transformed to calcium hydroxide. If left even longer exposed to the air, calcium hydroxide reacts to calcium carbonate (CaCO_3 , chalk) with the carbon dioxide of the air and can be disposed without any problems.

2. Performing a Test

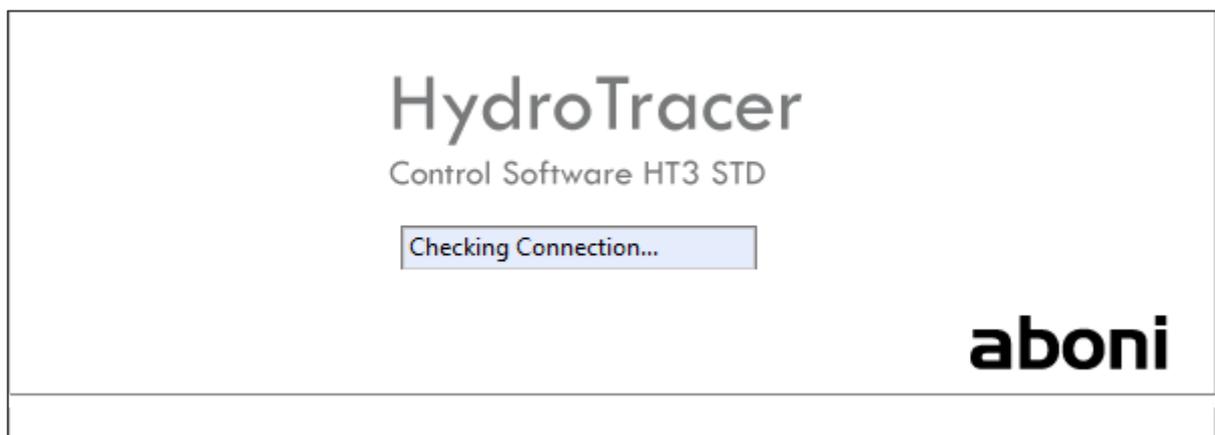
Take care the accessories are within reach. Do not leave your sample material exposed to the ambient air over a longer period, especially if it is hydroscopic.

Note: *It is recommended to acquaint oneself with the operation before doing a „serious“ test. Therefore run the program and follow the menu until you have reached the step START / F10. Then stop the program by clicking on the STOP–button. Repeat these steps until you are familiar with the procedure.*

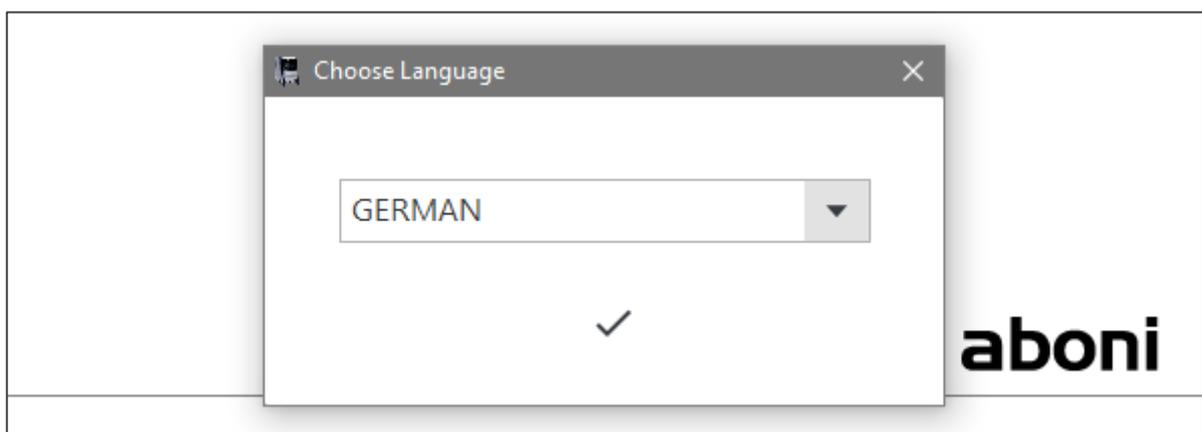
2.1 The procedure step by step

Please make sure that the HydroTracer (optional, the serial scale) is connected to the computer and powered on.

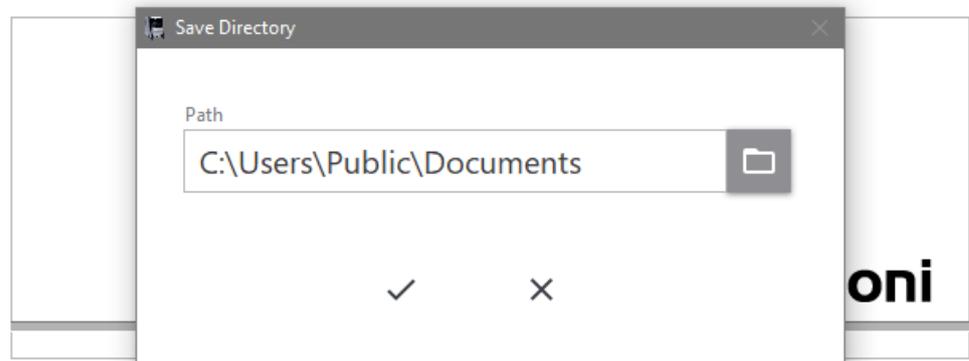
Start the program HT3 STD. A program window will open, which will initialize the software.



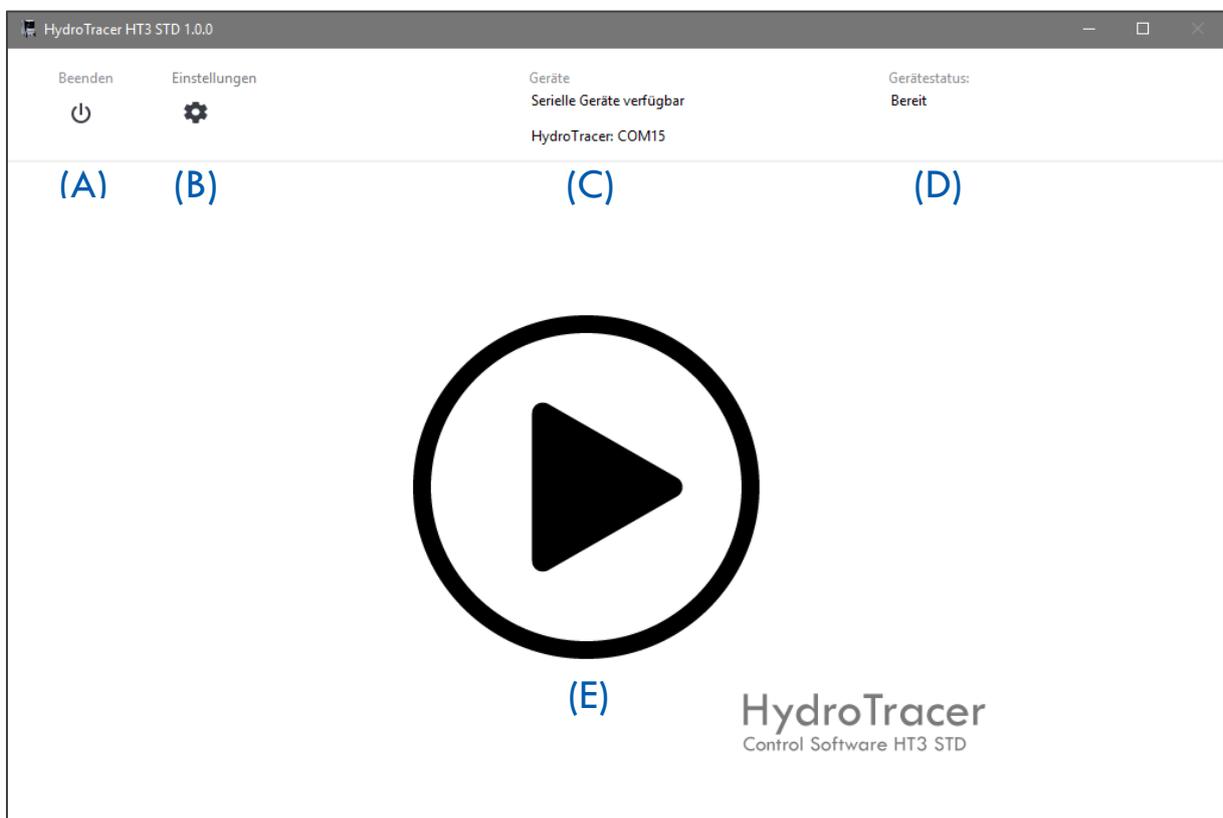
Select a language first.



Then select a location on your PC where you want to store the measurement results and reports.



Then the software is ready for operation and the following main menu appears:



- (A) „Quit“-Button closes the application
- (B) „Settings“-Button opens the menu" Settings "(see „4.1 Menu: Settings & Company logo“)
- (C) Information display of available or connected serial devices
- (D) Status indicator for the HydroTracer (see „4.4 Status Display & Information field“)
- (E) "Start"-Button starts a measurement. **Note:** If no HydroTracer was detected during initialization, the "Connect" button will appear instead of "Start" and you can reconnect to the HydroTracer.

After pressing the "Start" button, these input masks 1 appears:

The screenshot shows a software window with two main sections:

- Prüferliste (A):** A list box containing 'Operator 1' (highlighted) and 'Operator 2'. Below it are icons for adding (+) and deleting (trash) operators, and a radio button labeled 'Standardnutzer verwenden?' (C).
- Materialliste (B):** A table with columns 'Material', 'Dichte', and 'Heiztemperatur'. It lists materials like ABS, EVA, PA 6, PA 6 GF 30, PA 6.6, PA12, and PAEK with their respective density and heating temperature values.

Below the lists are icons for adding (+) and deleting (trash) materials, and a text input field labeled 'Kommentar' (D). At the bottom are navigation buttons: a left arrow (←) and a right arrow (→).

- (A) Selection field of existing operators
- (B) Selection field of existing materials
- (C) The checkbox "Use Standard operator?" is described in „4.2 Menu: Operator List“
- (D) Comment field for entering additional notes on the current measurement

-Button: Add a new operator or material

-Button: Opens the Menu "Operator List" or "List of materials"

-Button: Change to previous menu

-Button: Change to next menu (Next)

-Button: Disabled "Next" button, unless all required entries have been made

After selecting an operator and a material, a second input mask 2 appears:

The screenshot shows a software window with the following elements:

- Name des Prüfers:** A text input field containing "Operator 2".
- Material:** A text input field containing "ABS Acrylnitril-Butadien-Styrol".
- Dichte:** A numeric input field containing "1,05".
- Heiztemperatur:** A numeric input field containing "160".
- Kommentar (B):** A large empty text area.
- Serielle Waage (C):** An unchecked radio button.
- Test Report anzeigen? (D):** A checked radio button.
- Probengewicht (E) ?**: A button with a question mark icon.
- Navigation:** A back arrow button on the left and a "Start" button on the right.

- (A) Display of the set parameters for the measurement
- (B) Comment field
- (C) Checkbox for connecting a serial scale (if a scale is connected)
- (D) If a hook is set here, the program automatically opens an HTML report after the measurement has been completed
- (E) Pressing  opens a tool for determining the sample weight (see section „2.3 Selection of Sample Weight“)

If all the settings have been made, you can press  to start the measurement process.

If you need to change the setting, you can access with  the previous menu

2.2 Selection of Temperature

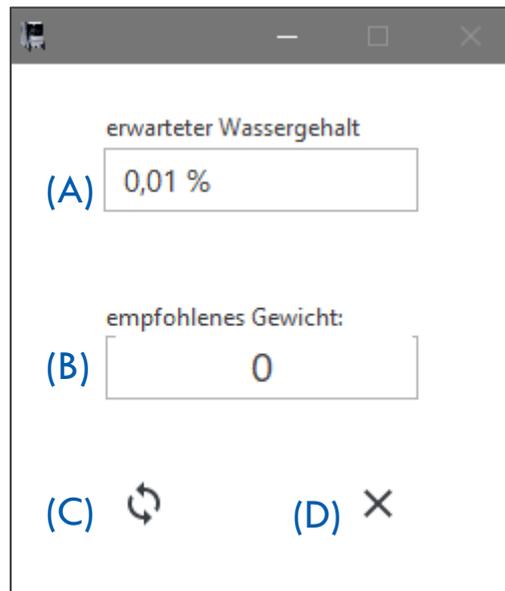
The temperatures given in the materials table are proposals, which might not fit always for each member of a group of materials. Generally a temperature is chosen which is as high as possible to accelerate the evaporation of water but low enough to avoid thermal decomposing. Usually the melting of the sample should be avoided to allow easier cleaning of the sample tray. If you are not sure which temperature is appropriate, try lower temperatures first. In some cases the melting of the sample might be necessary (e.g. to investigate the behavior of compound fillers), then a (dry!) aluminum film can be inserted into the tray before the measurement.

If the heating temperature and the density of a single sample deviates from the usual characteristic, it can be added in the input mask 2 without changing the material table.

2.3 Selection of Sample Weight

The selection of the sample weight has to consider the expected moisture content: Samples with a high moisture content have to be smaller than samples with a low moisture content. A water content of more than 25 mg per sample has to be avoided. The software stops a test when a water content of 25 mg is exceeded.

After pressing  in input mask 2 the following window opens:



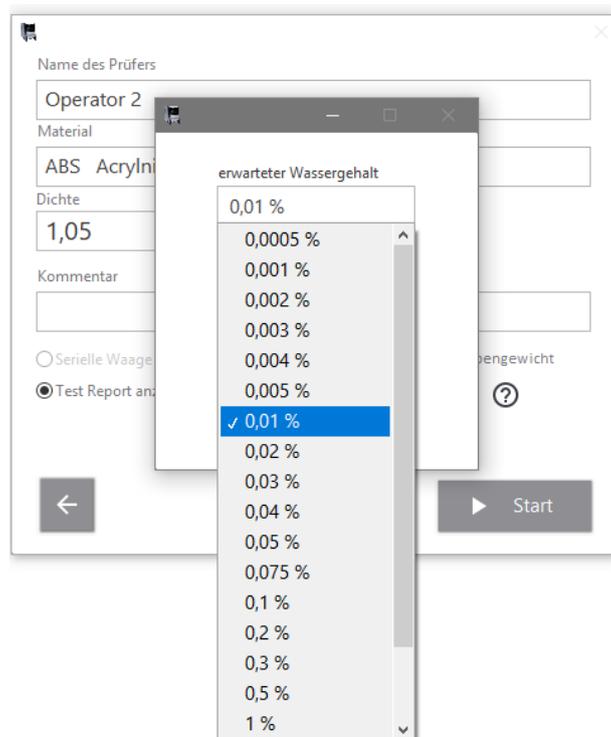
The screenshot shows a software window with the following elements:

- Label: erwarteter Wassergehalt
- Input field (A): 0,01 %
- Label: empfohlenes Gewicht:
- Input field (B): 0
- Button (C): Refresh icon
- Button (D): Close icon (X)

- (A) Selection field for the expected water content of the sample
- (B) Display field for recommended sample weight
- (C) Pressing the button starts the calculation of the sample quantity
- (D) Pressing the button closes the application

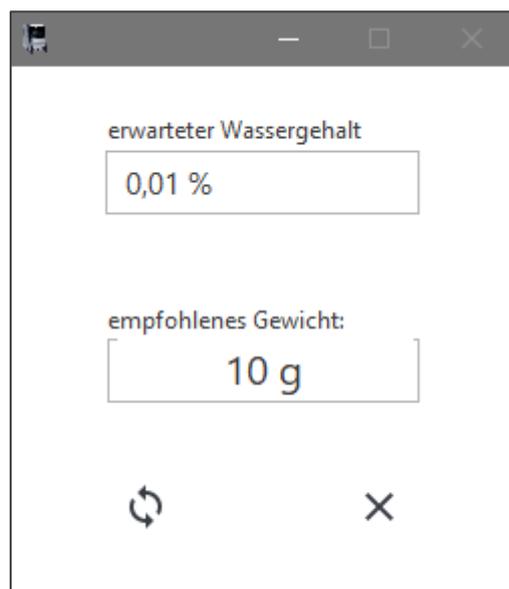
For an explanation, an example:

Selecting the selection field (A) opens a list of relative water contents according to the following figure:



An expected water content of 0.01% is selected. When pressing button (C) the recommended sample weight will be calculated.

The result of the calculation is shown in the following figure:



The recommended weight should be about 10 grams in this case.

2.4 Using the serial balance

The connection of the serial scale with the software can be done in several ways:

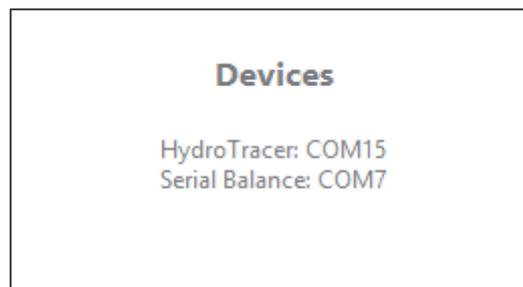
- A) Before starting the software HT3 STD connect the PC and the scale with the serial cable and switch on the scale.

Start the software HT3 STD. The software automatically detects the connected scale.

- B) The software HT3 STD is already started and you are in the main menu. Connect the PC and the scale to the serial cable and switch on the scale.

In the main menu, press the button "settings" and put a checkmark in the checkbox "Serial scale". To connect, press the "Connect" button. The scale is now connected to the software (for more information on the "Settings" menu, see „4.1 Menu: Settings & Company logo“).

If the balance is connected according to (B), you will receive the following info window as confirmation for the successful connection:



Note: The number of the COM port may differ from the picture above!

2.5 Operation menu with manual input: Loading the HydroTracer

This chapter describes the steps of the manual operation as shown on the screen.

The images in the instructions window clarify the activity to be performed. Under the current picture, the respective step is briefly described. The indicator to the right above the image indicates the amount of time, in seconds, that has passed to complete the entire fill operation. Press "X" to abort the test.

Note: The opening time should be at least 15 seconds but not more than 180 seconds.

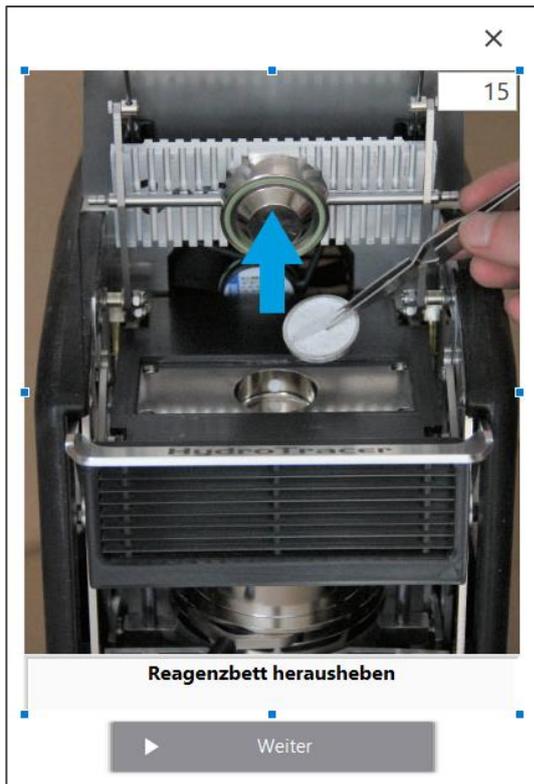
Note: If you use the test pads instead of the powdered reagent, the procedure and the number of instructions and their sequence are not exactly identical to the following instructions. In principle, however, the performance of the filling process is comparable.



Open the test chamber by pulling the one-hand lever up to the stop. The system fan is switched off.



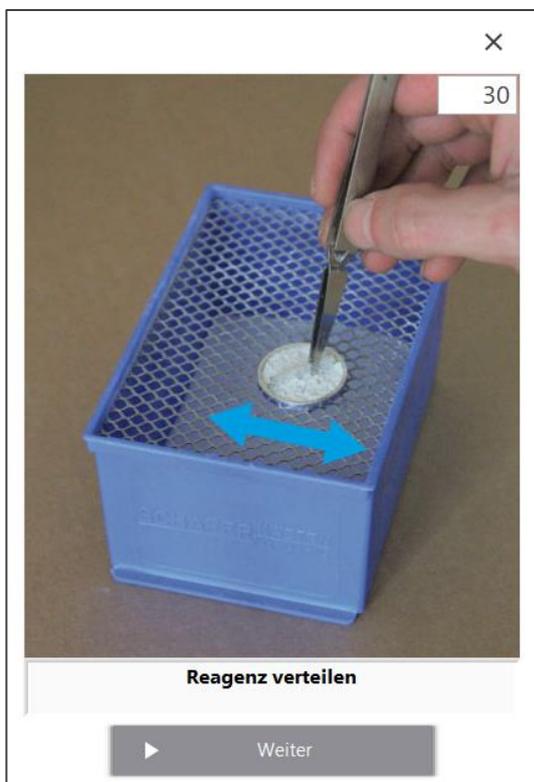
Remove the sample tray. Remove old sample material. Place the sample tray on the scale and tare it.



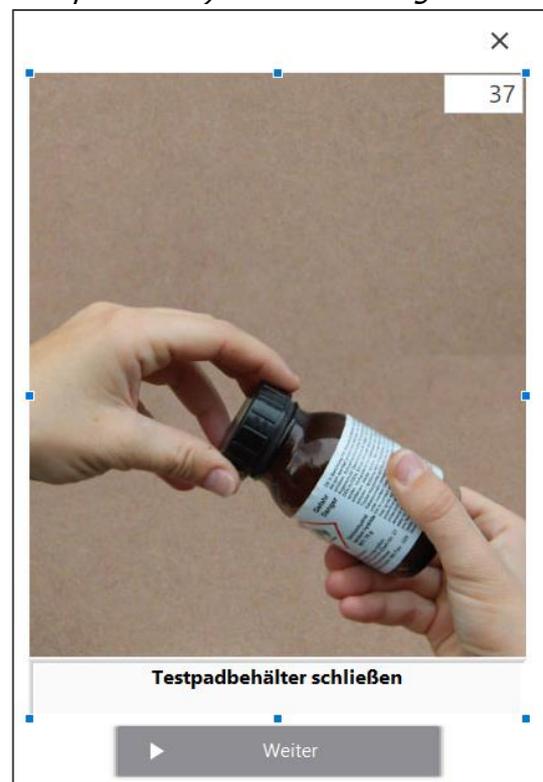
Remove the reagent tray with the pincer and remove the used reagent.



Using the spoon-shaped end of the spatula, take the reagent (about 1/3 of the spoon area) and fill the reagent bed.



Distribute the reagent on the reagent bed.



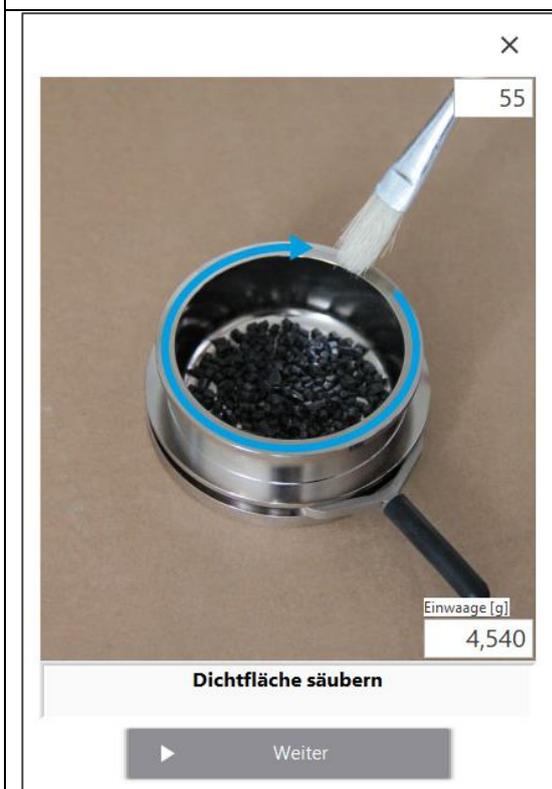
Close the reagent container carefully.



Fill the sample into the sample tray.



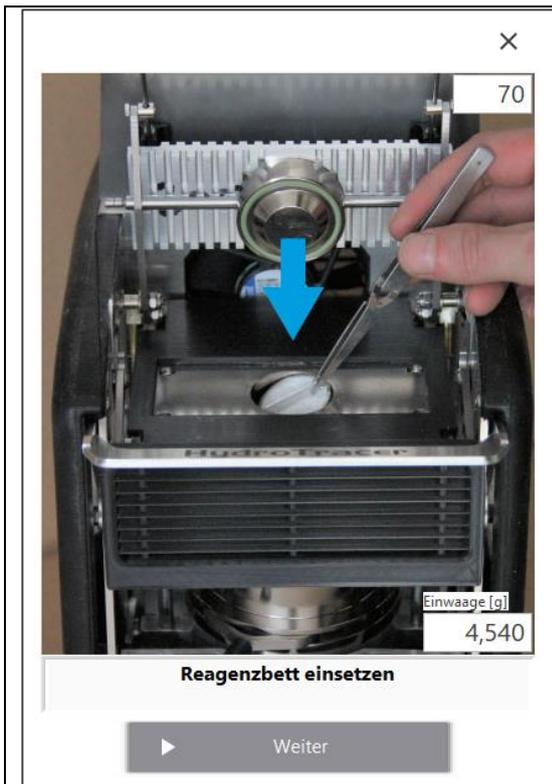
Enter the weight in the input field. Confirm with "✓".



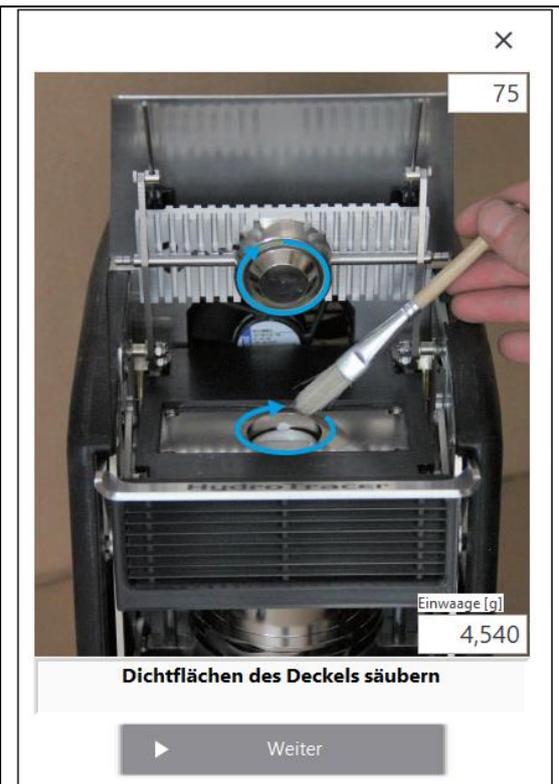
Clean the edge of the sample tray with a brush.



Insert the sample tray. Make sure the bottom edge of the tray is over the heater plate



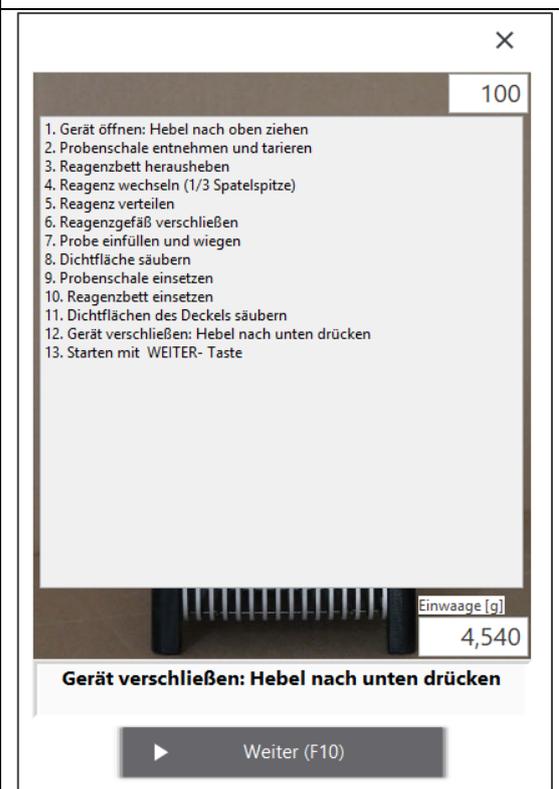
Carefully insert the reagent with the pincer.



Clean the sealing surfaces with a brush.



Close the device by pressing down the one-hand lever. The system fan must now start again. You can start the measurement with "Continue (F10)".



After 99 seconds, all operations are listed again - in case the operator could not follow

2.6 Operation menu with automatic weight input: Loading the HydroTracer

The menu with a connected balance is quite similar to the manual weight input menu. Below are shown the deviations to the manual input of the weight.



Place the sample pan on the balance and tare it. Fill in the sample material and spread it until the bottom of the sample cup is evenly covered.



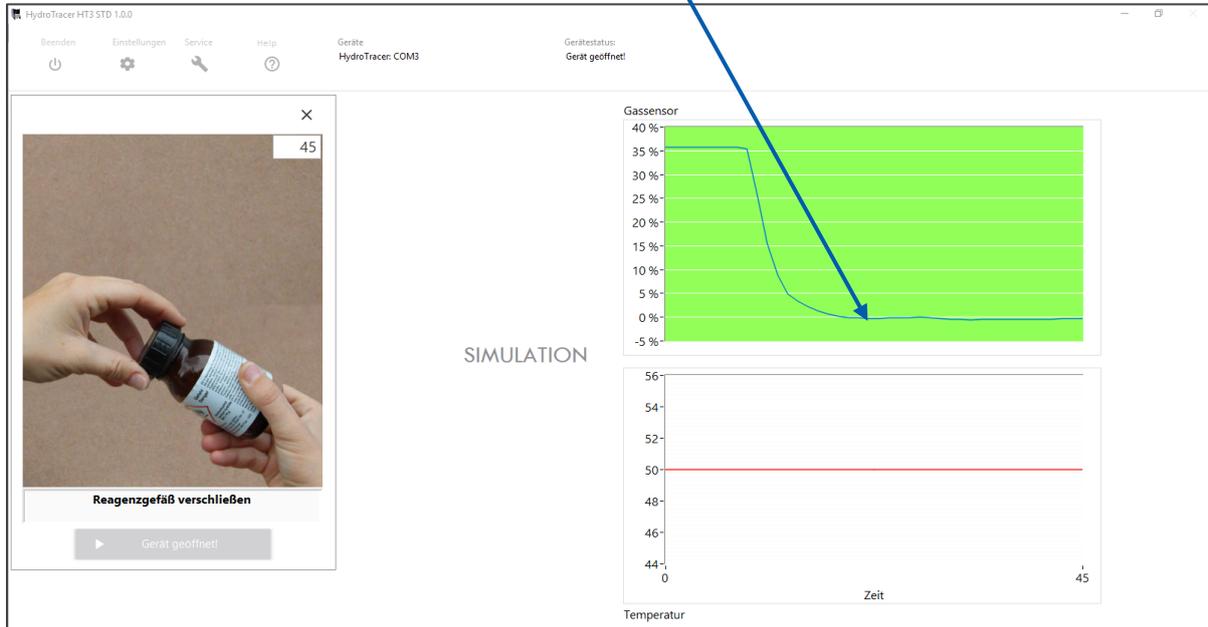
Send the balance data by pressing the "Print" button. The transmitted weight appears in the "Sample Weight [g]" field.

Wenn innerhalb von 30 Sekunden kein Datentransfer erfolgt, erscheint das Eingabemenü zur manuellen Gewichtseingabe.



2.7 Influence of the filling procedure on the accuracy of the test

During the opening phase, the minimum voltage ("zero value") of the sensor is determined via the drop in the hydrogen concentration (arrow).



This zero value should always reach $\pm 5\%$ as soon as you have opened the instrument and removed the sample tray and the reagent tray or test pad.

The concentration curve usually has a specific behavior (first strongly sloping and then flat out). To give the user an indication that the curve is showing the correct behavior, the background of the diagram changes from red to green. Otherwise, the background will remain red.

To obtain a proper test result it is therefore necessary that

- 1) the reactor will not be opened before the pictures of the filling procedure are shown on the screen*
- 2) the period when the reactor is open is not less than 15 seconds (this allows the hydrogen to evaporate completely)*

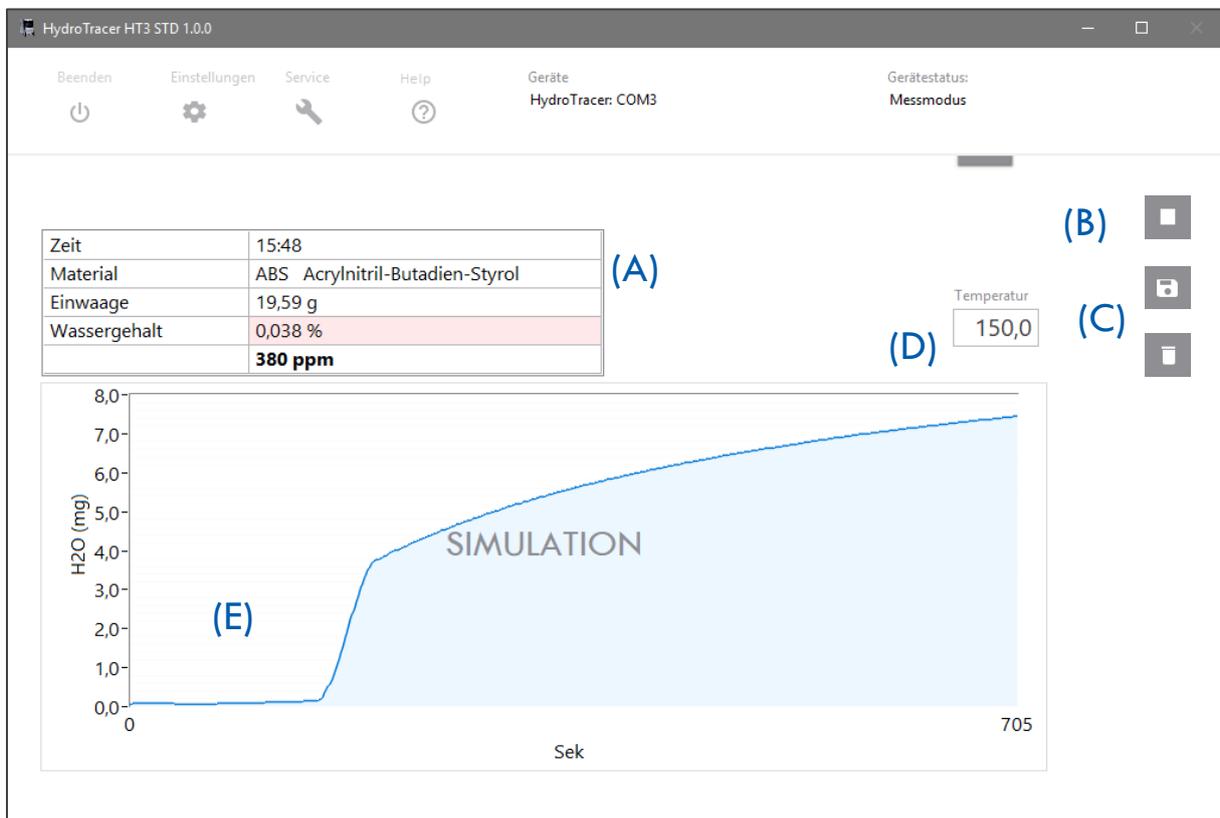
2.8 Measuring period

Now the sample is heated to the selected temperature. The current heating temperature is shown in the digital display (D).

In the diagram (E) the current total amount of water is shown in [mg]. That means both the amount of water from the sample and the amount of water from the ambient air introduced during the filling procedure are displayed.

The measuring time depends on the type of sample and the amount of water contained and is between 12 - 40 minutes. The display field (A) shows: the time of the beginning of the measurement, the description of the material sample, the initial weight and - after approx. 500 seconds - the water content* of the material sample in % and ppm.

** Until the end of the measurement, this is a prognosis that interpolates the function of water increase over time. Only when the HydroTracer has finished the measurement, the result is displayed correctly.*

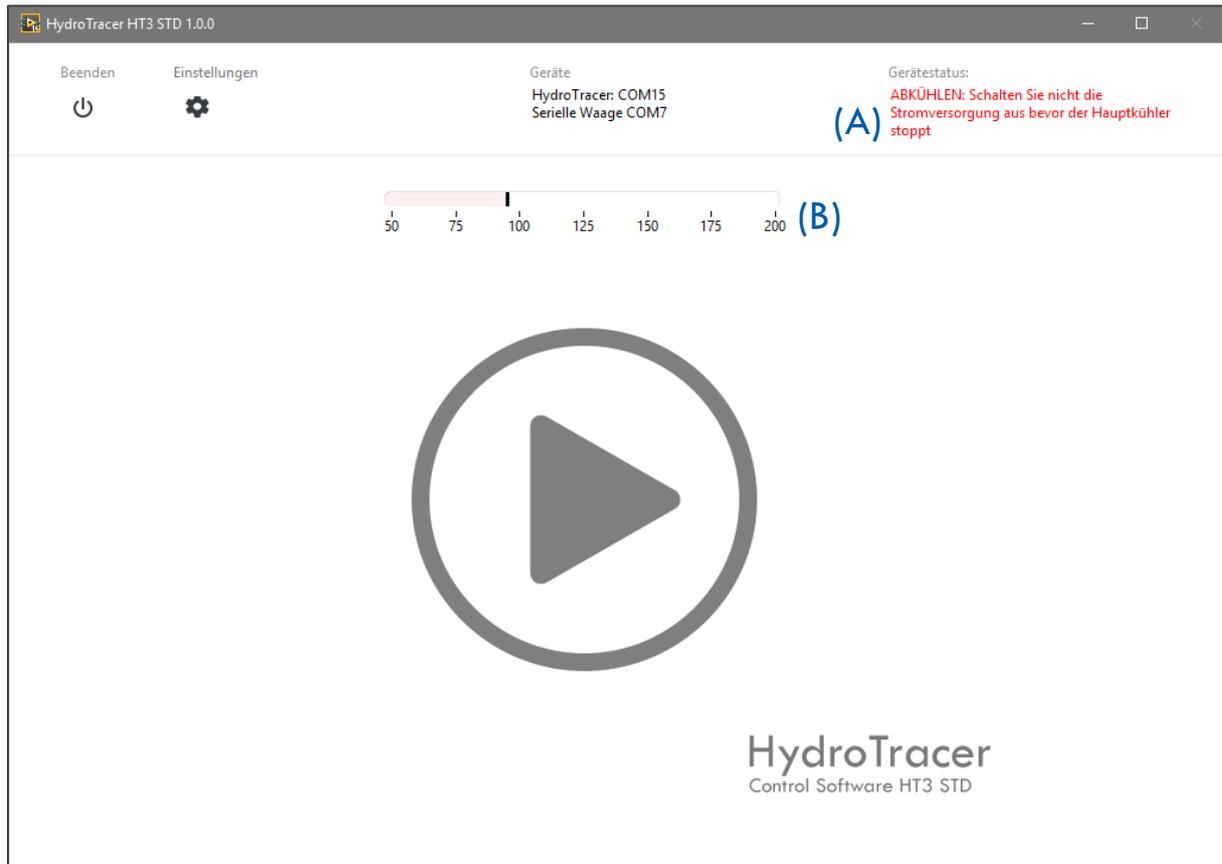


Also shown are the button (B) to prematurely end the current measurement as well as the selection menu (C), which is only displayed after the end of the measurement.

2.9 End of the test

At the end of the measurement, a selection menu appears (see (C) „2.8 Measuring period“), whether the measurement should be saved or discarded. If no selection is made within 10 seconds, the measurement is saved automatically.

After saving, the measurement results are displayed as HTML-Report according to “3.1 HTML-Report”. Then the heater is switched off and the main cooler is adjusted to cool the HydroTracer to 50 °C stand-by temperature.



To indicate that the HydroTracer is in the cooling phase, a warning field (A) and a temperature scale (B) are displayed. Using the temperature scale, you can see at what temperature the HydroTracer is currently in the cooling phase.

Note: Never turn off the power supply of the HydroTracer before the device reaches the default temperature of 50 °c and the main fan turns off.

3. Output of the results and storage

The measurement results of a measurement are stored twice and (optionally) displayed immediately after measuring.

In the file "HT-TAB. txt" all parameters of the measurements performed in the test report are stored line by row. You can find this file at the following location:

*|*Your chosen directory*|HydroTracer Test Data|HT-Table*

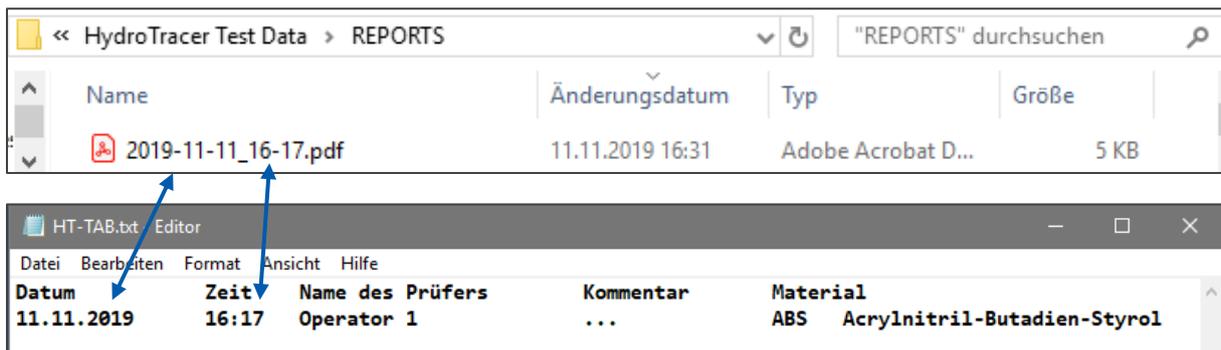


Name	Änderungsdatum	Typ	Größe
HT-TAB.txt	23.11.2017 16:15	Textdokument	3 KB

The purpose of this file is to provide the measurement data for further processing systems such as Microsoft © Excel.

A ".pdf"-file is created for each stored measurement and stored in the following storage path:

*|*Your chosen directory *|HydroTracer Test Data|REPORTS*

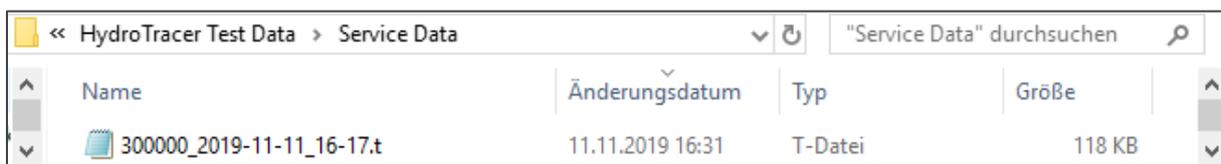


Name	Änderungsdatum	Typ	Größe
2019-11-11_16-17.pdf	11.11.2019 16:31	Adobe Acrobat D...	5 KB

Datum	Zeit	Name des Prüfers	Kommentar	Material
11.11.2019	16:17	Operator 1	...	ABS Acrylnitril-Butadien-Styrol

The name of the ".pdf" file follows the convention "Year-Month-Day_Hour-Minute.zip". In connection with the "HT-TAB. txt", each report can be assigned in the table.

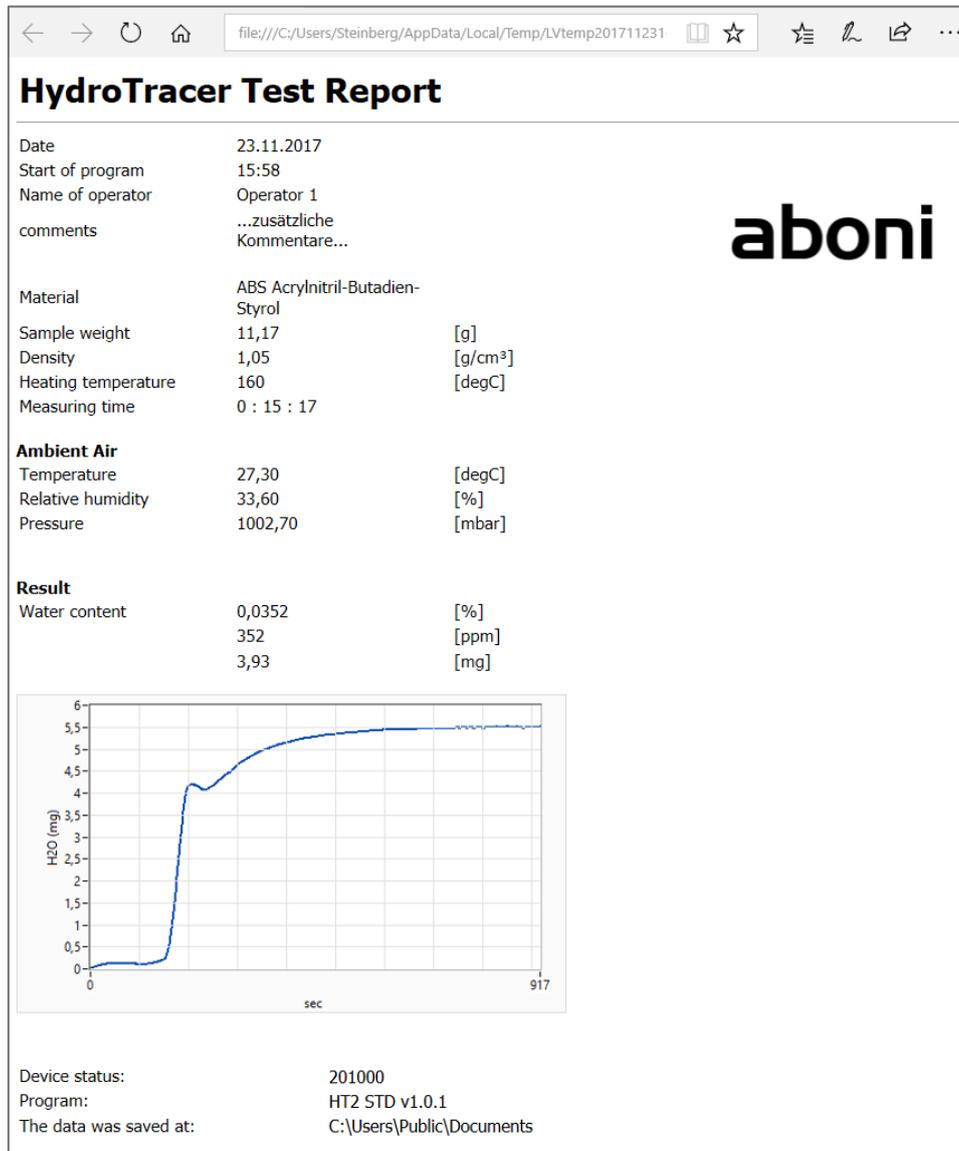
In another folder *|*your chosen storage path*|HydroTracer Test Data|Service Data*, there is a binary data file with the extension ".t". This is created for each test that lasts longer than 500 seconds and is also saved. These service files provide support and remote fault diagnosis by **aboni** GmbH.



Name	Änderungsdatum	Typ	Größe
300000_2019-11-11_16-17.t	11.11.2019 16:31	T-Datei	118 KB

3.1 HTML-Report

If a checkmark has been set in the CheckBox "Show test Report" in Input mask 2 (see „2.1 The procedure step by step“) a measurement report is opened in the Web browser after a measurement has been completed:

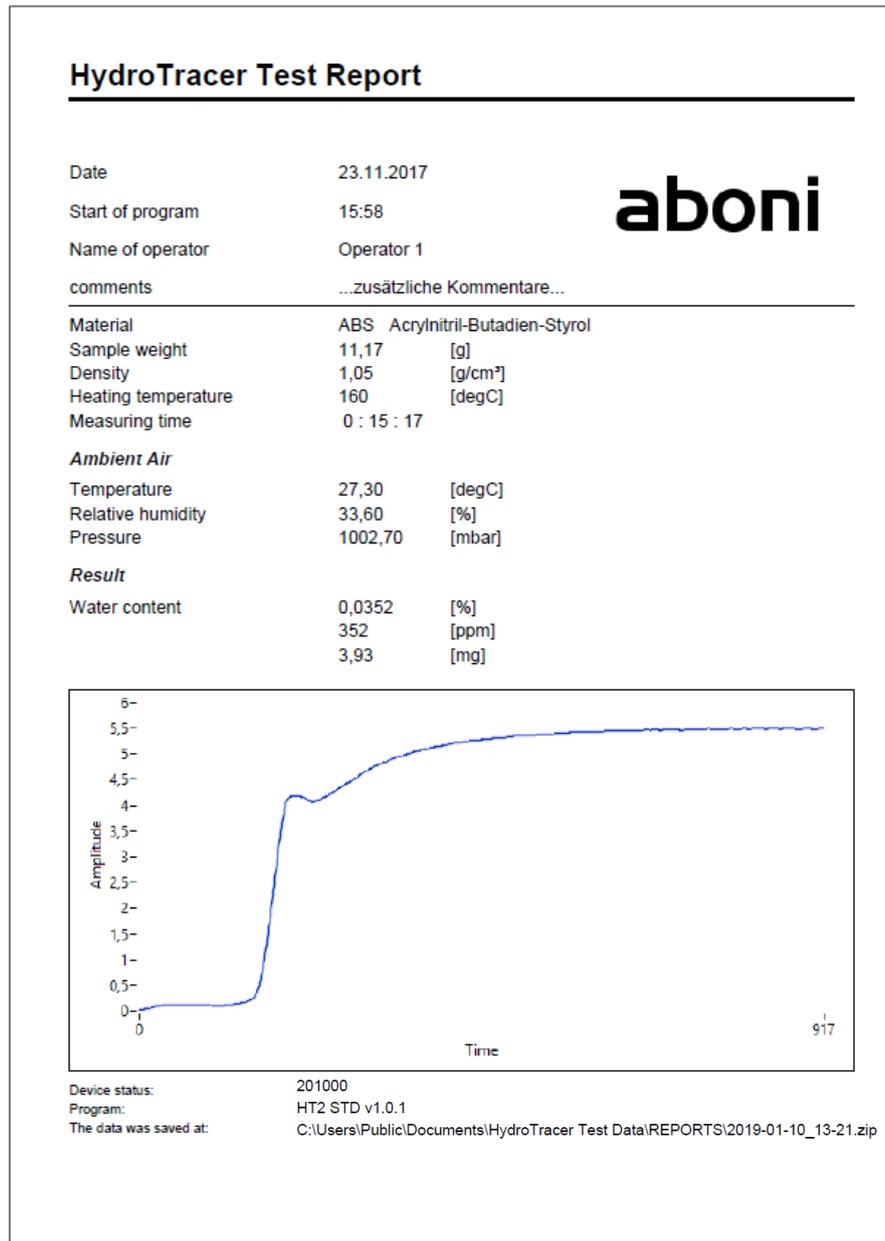


The HTML test report contains all the information provided by the user, the measurement results and information about the location and the software version.

Note: The HTML report is only saved temporarily!

3.2 PDF-Report

The PDF report of a measurement is stored in each case. It contains the same information as the HTML report:



If you have selected the option "test report bilingual?" in the Menu "settings" (see „4.1 Menu: Settings & Company logo“), an additional report is created in the desired language.

Furthermore you have the possibility to insert a company logo into the report (cf. company logo "aboni" in the picture above). The insertion of a company logo is explained in „4.1 Menu: Settings & Company logo“.

4. Selection Menus & Status Display

4.1 Menu: Settings & Company logo

After calling up the menu "settings" from the main screen, this window appears:

The screenshot shows a settings window with the following elements:

- (A) Programmsprache: A dropdown menu currently set to "GERMAN".
- (B) Bericht anzeigen: A radio button that is selected.
- (C) Test Report zweisprachig?: A radio button that is selected.
- (D) Sprache auswählen: A dropdown menu currently set to "ENGLISH".
- (E) Serielle Waage: A radio button that is selected, followed by a refresh icon.
- (F) Testpad: An unselected radio button.
- (G) Materialliste: A pencil icon.
- (H) Prüferliste: A pencil icon.
- Speicherort: A text input field containing "C:\Users\Public\Documents" and a folder icon button.
- Firmenlogo: An empty text input field and a folder icon button.
- (K) A checkmark icon at the bottom center.

- (A) Selection of the program language
- (B) Show HTML-Report after a test
- (C) Create a further Test-Report in a second language
- (D) If (C) is selected, the language can be chosen here
- (E) Put the tick in the checkbox, connect the PC and the balance with the serial cable, and switch on the balance. Then press the "Connect" button and the software connects the balance. You will get the info window as shown in „**Fehler! Verweisquelle konnte nicht gefunden werden.** Using the serial balance“
- (F) Using the test pads instead of the powdered reagent, select this option.

(G) By pressing  the material list appears

(H) By pressing  the operator list appears

(I) The current storage path of the test reports. By pressing the  - Folder icon, a new save path can be selected.

Note: The old storage path including the containing data is retained!

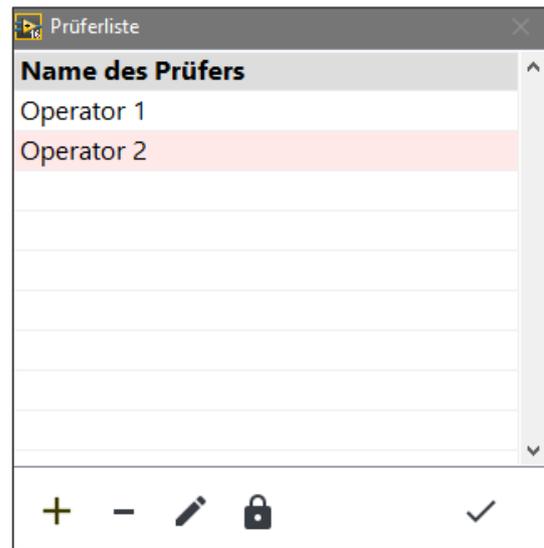
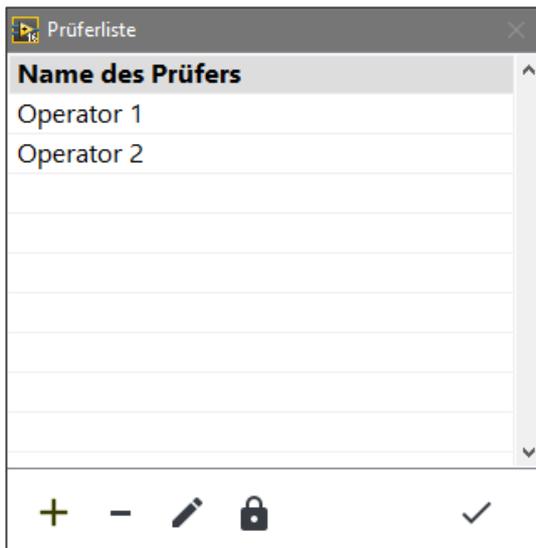
(J) By pressing  - Folder icon to insert the image file.

IMPORTANT: The image must be in ".jpg" format. To achieve an optimal representation of your company logo, the image height should be 0.75 x the image width.

(K) Pressing the button closes the "Settings" window and leads to the main menu

4.2 Menu: Operator List

Explanation of the functions within the "Operator List".



-   -Button: Add or remove an examiner
-  -Button: Sets the selected examiner as standard. With each new measurement this is already selected or preset
-  -Button: the selected examiner can be edited
-  -Button: Closes the operator list

4.3 Menu: List of materials

Explanation of the functions within the "List of materials".

Material	Dichte [g/ccm]	Heiztemperatur [degC]
ABS Acrylnitril-Butadien-Styrol	1,05	160
EVA Ethylen-Vinylacetat	1,15	130
PA 6 Polyamid 6	1,10	150
PA 6 GF 30 Polyamid 6/GF	1,50	150
PA 6.6 Polyamid 6.6	1,10	150
PA12 Polyamid 12	1,04	150
PAEK Polyaryletherketon	1,30	175
PBT Polybutylenterephthalat	1,30	150
PC Polycarbonat	1,25	175
PE Polyethylen	0,95	130
PEI Polyetherimid	1,30	180
PESU Polyethersulfon	1,30	175
PET Polyethylenterephthalat	1,30	180
PETG Polyethylenterephthalat-Glyc.	1,27	125






The material list already contains a variety of materials, indicating the density and recommended heating temperature.

-   -Button: Add or remove a material
-  -Button: the selected material can be edited
-  -Button: Closes the material list

4.4 Status Display & Information field

In the main menu (cf. „2.1 The procedure step by step“ field (C) and (D)) you get information about the connection of the HydroTracer (and the serial scale), as well as a status message about the HydroTracer itself.

If the HydroTracer and a serial balance are connected, you will receive this information in the Information field (C).

```
Geräte
HydroTracer: COM15
Serielle Waage COM7
```

If no scale is connected, only the HydroTracer with the COM port number is displayed.

The field (D) gives you information about the operating status of the HydroTracer.

```
Gerätestatus:
Bereit
```

Three status messages are possible here:

1. "Ready" – the HydroTracer is ready for a measurement
2. "Warm Up" – the HydroTracer is not yet on stand-by temperature and is warmed up
3. "Systemtest" – the HydroTracer performs an internal system test. This happens every time after switching on the instrument.
4. "Cool Down" – the HydroTracer is currently cooling down to the stand-by temperature of 50 °c
5. "Test Mode" – the HydroTracer is currently measuring
6. "Error" – the HydroTracer has detected an error

5. Cleaning the reactor interior

Sometimes volatiles are set free during the measurement, e.g. softeners and waxes. These substances will condense on the cooler inner surfaces of the reactor depending on condensing temperature and heating temperature. It may be necessary to clean the reactor sometimes, if visible layers occur.

Important: Check the O-Ring regularly for deposits!

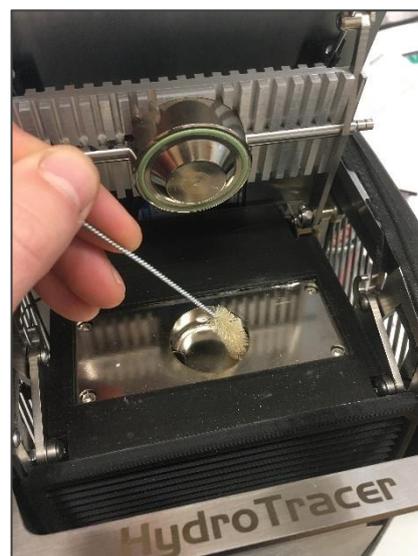


To do this, switch off the power, open the reactor and take out reagent tray and sample tray.

Use a paper tissue, wetted with pure alcohol (moist but not dripping) and wipe over the soiled spots. Especially the reactor- surface opposite to the sample tray can be cleaned this way.



The pipes are cleaned best with a tube brush (see picture). Put in the sample tray to avoid contamination of the heating plate.



Afterwards, check the O-ring. No dirt particles may remain on the sealing.



If the reagent is distributed in the reactor, it is also recommended to clean the reactor. If the powder is only in the area of the reagent bed storage, simply open the reactor, remove the reagent bed and brush the powder through the riser tubes into the sample tray. Even with dry compressed air (minimum distance 15 cm!) the reactor can be cleaned.

After the cleaning a dry run should be performed.

6. Dry Run

A dry run is necessary:

- Before first use,
- after the reactor has been left open for a longer period > 180 sec
- or
- if the water content of a previous measurement exceeded 25 mg

Although very low water contents are to be measured and the device was not in use before, a dry run is recommended. If the HydroTracer is not in use the unit must always be kept closed and be filled with reagent

A dry run is carried out in accordance with section "2 Performing a Test", with the difference:

- no sample material is used
- the heating temperature is set to 210 °C
- for the sample weight is enter 1 g and for the density 1g/cm³

7. Errors

If an error occurs during the communication between Hydrotracer and PC, the HydroTracer sends an error message to the software. In some cases, this will interrupt the measurement.

Following table shows the possible errors:

Code	Error
2	Reactor Heater
4	Door Contact Reactor
16	PT1000 Mainboard (PTC3)
32	BME280 – Temperature
64	BME280 – Humidity
128	BME280 – Pressure
256	Communication Mainboard <-> PC
512	Communication Mainboard <-> Sensorboard
1024	general Sensorboard

If the connection between PC and HydroTracer is interrupted for more than 4 minutes, the measurement is automatically cancelled and the HydroTracer cools down.

8. Remarks concerning calcium hydride

Calcium hydride is reported as dangerous goods in the material safety data sheet.

This classification refers to large amounts, so that the recommended precautions to exposure are valid over any length of time with any great amount (e.g. filling a silo or the like)

About the toxicity of calcium hydrid:

Calcium hydride reacts with **water** immediately to **calcium hydroxide** (slaked lime) and **hydrogen**. In this reaction, heat is released. In minor amounts, which are used in the measurement with the HydroTracer, damage by heat development is virtually impossible.

In an aqueous solution of **calcium hydroxide** reacts alkaline (pH up to about 11). The resulting solution is an irritant and skin contact should be avoided. From the overall experience it is known as calcium lime mortar. In the food industry, calcium lime is added as an acidity regulator for foods and in the EU as a food additive called E 526 approved without maximum limit (quantum satis) generally for food.

The resulting **hydrogen** is produced also as a metabolite in the human body and is non-toxic.

About the explosion capacity of calcium hydride:

Hydrogen is produced by the reaction of calcium hydride with water. In air hydrogen is explosive at concentrations of 4% (detonating gas reaction). Since only small amounts of the reagent used (maximum of 75g per bottle) it is practically impossible to create a flammable mixture with air in a room. The very high volatility of the hydrogen gas prevents locally higher concentrations formed in the air.

Disposal of the used reagent:

The reagent used in the HydroTracer is still largely reactive after the measurement. By exposure to air, it can react slowly with atmospheric moisture to calcium hydroxide (approximately 1-2 hours). Subsequently calcium hydroxide reacts with the carbon dioxide of the air to calcium carbonate (limestone) and can then be disposed of with household waste.

Conclusion:

When dealing with calcium, it is crucial that the amount used is minimized. Ingestion inhalation and contact with the mucous membranes should be avoided to prevent irritation. The minor potential of harm is also caused by the small amounts (about 0.1 g) which are advised in the manual. The chemical hazard corresponds to that of slaked lime.

In normal use no risk of explosion due to hydrogen gas.

CE- Konformitätserklärung / CE Declaration of Conformity**Die Firma / The manufacturer**

aboni GmbH für Mess- und Automatisierungstechnik

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Web: www.aboni.de E-Mail: info@aboni.de

erklärt hiermit, dass die Produkte / hereby declares that the following products

Produktkennzeichnung / Product name

HydroTracer type HT3

Feuchtemessgerät für Feststoffe, moisture analyser for solids

**mit den Bestimmungen der nachstehenden EU-Richtlinien übereinstimmen /
are in accordance with the following European directives**

Referenz-Nummer / Reference no.	Titel / Title
2006/42/EG / 2006/42/EC	Maschinenrichtlinie / Machinery Directive
2004/108/EG / 2004/108/	EC Elektromagnetische Verträglichkeit / Electromagnetic Compatibility
2006/95/EG / 2006/95/	EC Niederspannungsrichtlinie / Low Voltage Electrical Equipment
2006/95/CE	CE Kennzeichnung / CE marking

**und dass die nachstehenden Europäischen Normen zur Anwendung gelangt sind. /
and comply with the following european standards.**

Norm / Standard	Titel / Title
EN 61326	Electrical equipment for measurement, control and laboratory use-EMC requirements
EN 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use
EN 14121:2007	Safety of machinery

Das Gerät wurde überprüft bezüglich seiner Funktionsfähigkeit der Genauigkeit der Messergebnisse. Die Funktionen des Gerätes sind in der Betriebsanleitung dokumentiert.

The instrument was validated with respect to functionality, analytical performance and accuracy of the results. The instrument functions are documented in the instruction manual.

Schwielowsee , 01.10.2019

Holger Hofmann, Geschäftsführer / Managing Director

aboni GmbH

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SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Trade name : Calcium Hydride Powder K
REACH Registration Number : 01-2120774384-47-0000
Substance name : Calcium hydride
CAS-No. : 7789-78-8

1.2 Relevant identified uses of the substance or mixture and uses advised against

Use of the Sub-stance/Mixture : Pyrotechnics., Reducing agents, Alloy component.
Recommended restrictions on use : None known.

1.3 Details of the supplier of the safety data sheet

Company : Albemarle Germany GmbH
Industriepark Höchst, Gebäude G 879
65926 , Frankfurt a.M.
Germany
Telephone : +49 69 40 12 6-0
Telefax : +49 69 40 12 6-7 2000
Contact person product safety : DEPARTMENT OF PRODUCT SAFETY
E-mail address : PRODUCTSAFETY@ALBEMARLE.COM

1.4 Emergency telephone number

Emergency telephone number : +32 (0) 70-233-201 (EUROPE)
(+1)225-344-7147 (US and WORLDWIDE)
+65-6733-1661 (ASIA PACIFIC)
+86-532-8388-9090 (CHINA)
+61 2 8014 4558 or 18000 74234 (Australia)
NHS Direct
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SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification (REGULATION (EC) No 1272/2008)

Substances and mixtures, which in contact with water, emit flammable gases, Category 1

H260: In contact with water releases flammable gases which may ignite spontaneously.

Skin irritation, Category 2

H315: Causes skin irritation.

Eye irritation, Category 2

H319: Causes serious eye irritation.

2.2 Label elements

Labelling (REGULATION (EC) No 1272/2008)

Hazard pictograms :



Signal word : Danger

Hazard statements : H260 In contact with water releases flammable gases which may ignite spontaneously.
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Supplemental Hazard Statements : EUH014 Reacts violently with water.

Precautionary statements :

Prevention:

P231 + P232 Handle and store contents under inert gas. Protect from moisture.

P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.

Response:

P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.

P308 IF exposed or concerned:

P310 Immediately call a POISON CENTER or doctor/ physician.

P378 In case of fire, use extinguish media on basis of NaCl or pulverized limestone. Never use water.

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2.3 Other hazards

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

The information required is contained in this Material Safety Data Sheet.

SECTION 3: Composition/information on ingredients

3.1 Substances

Substance name : Calcium hydride
CAS-No. : 7789-78-8
Chemical nature : Inorganic compound

Hazardous components

Chemical name	CAS-No. EC-No. Index-No. Registration number	Classification	Concentration (% w/w)
calcium hydride	7789-78-8 232-189-2 001-004-00-5 01-2120774384-47-0000	Water-react. 1; H260 Skin Irrit. 2; H315 Eye Irrit. 2; H319	>= 90 - <= 100

For explanation of abbreviations see section 16.

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice : First Aid responders should pay attention to self-protection and use the recommended protective clothing
Take off contaminated clothing and shoes immediately.
Move out of dangerous area.
Keep warm and in a quiet place.

If inhaled : Move to fresh air.
If not breathing, give artificial respiration.
Keep the victim calm and in a semi-upright position.
Call a physician immediately.

In case of skin contact : Wash off immediately with plenty of water for at least 15 minutes.
Call a physician immediately.

In case of eye contact : Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Call a physician immediately.

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If swallowed : Clean mouth with water and drink afterwards plenty of water.
Do NOT induce vomiting.
Never give anything by mouth to an unconscious person.
Call a physician immediately.

4.2 Most important symptoms and effects, both acute and delayed

Symptoms : Irritation
Erythema

4.3 Indication of any immediate medical attention and special treatment needed

Treatment : Treat symptomatically.
For specialist advice physicians should contact the Poisons Information Service.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media : Dry extinguishing media based on NaCl or pulverized limestone.

Unsuitable extinguishing media : Water
Carbon dioxide (CO₂)
Foam

5.2 Special hazards arising from the substance or mixture

Specific hazards during fire-fighting : In contact with water releases flammable gases which may ignite spontaneously.
Dust can form an explosive mixture in air.
Hazardous decomposition products formed under fire conditions.

Hazardous combustion products : Metal oxides
Hydrogen

5.3 Advice for firefighters

Special protective equipment for firefighters : Wear full protective clothing and self-contained breathing apparatus.

Further information : Use water spray to cool unopened containers.
Be aware of a dangerous reaction with water, if the container is ruptured.
Collect contaminated fire extinguishing water separately. This must not be discharged into drains.
Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

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SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Personal precautions : Remove all sources of ignition.
Ensure adequate ventilation.
Wear personal protective equipment.
Avoid contact with skin, eyes and clothing.
Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
Keep people away from and upwind of spill/leak.

6.2 Environmental precautions

Environmental precautions : Do not flush into surface water or sanitary sewer system.
Avoid subsoil penetration.

6.3 Methods and material for containment and cleaning up

Methods for cleaning up : Do not allow contact with water.
Use mechanical handling equipment.
Cover spilled material with limestone powder.
Avoid dust formation.
Pick up and transfer to properly labelled containers.
Non-sparking tools should be used.
Adequate disposal

6.4 Reference to other sections

For personal protection see section 8., For disposal considerations see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling : Handle under inert gas.
Keep from any possible contact with water.
Provide sufficient air exchange and/or exhaust in work rooms.
Wear personal protective equipment.
Avoid creating dust.
Handle in accordance with good industrial hygiene and safety practice.
In general, emissions are controlled and prevented by implementing an appropriate management system, including regular informing and training workers.

Advice on protection against fire and explosion : Keep away from heat and sources of ignition. Dust may form explosive mixture in air. Take measures to prevent the build up of electrostatic charge. Use explosion-proof equipment.

Hygiene measures : Take off contaminated clothing and shoes immediately. Avoid contact with skin, eyes and clothing. Do not breathe dust/ fume/ gas/ mist/ vapours/ spray. Smoking, eating and drinking

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should be prohibited in the application area. Keep away from food, drink and animal feedingstuffs. Wash hands before breaks and at the end of workday.

7.2 Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers : Keep under inert gas. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat. Protect from moisture.

Advice on common storage : Never allow product to get in contact with water during storage.
Keep away from oxidizing agents.
Do not store near acids.

7.3 Specific end use(s)

Specific use(s) : Pyrotechnics.
Reducing agents
Alloy component.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Engineering measures

Provide sufficient air exchange and/or exhaust in work rooms.
Take precautionary measures against static discharge.
Electrical equipment should be protected to the appropriate standard.

Personal protective equipment

Eye protection : Safety glasses with side-shields conforming to EN166

Hand protection

Material : Wear suitable gloves.

Material : Flame retardant gloves

Remarks : Protective gloves complying with EN 374. and Protective gloves complying with EN 659.
The choice of an appropriate glove does not only depend on its material but also on other quality features and is different from one producer to the other. The exact break through time can be obtained from the protective glove producer and this has to be observed. Protective gloves have to be replaced at the first sign of deterioration.

Skin and body protection : Flame retardant antistatic protective clothing.

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Respiratory protection	:	In case of inadequate ventilation wear respiratory protection. Respirator must be worn if exposed to dust.
Filter type	:	Filter type ABEK-P
Protective measures	:	Handle in accordance with good industrial hygiene and safety practice. Ensure that eye flushing systems and safety showers are located close to the working place.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance	:	powder
Colour	:	white, to, grey
Odour	:	odourless
Odour Threshold	:	No data available
pH	:	No data available
Decomposition temperature	:	≥ 600 °C Method: OECD Test Guideline 102
Boiling point/boiling range	:	Decomposes below the boiling point.
Flash point	:	No data available
Evaporation rate	:	No data available
Flammability (solid, gas)	:	does not ignite Method: Regulation (EC) No. 440/2008, Annex, A.10 GLP: yes
Burning number	:	No data available
Upper explosion limit / Upper flammability limit	:	No data available
Lower explosion limit / Lower flammability limit	:	No data available
Vapour pressure	:	No data available
Relative vapour density	:	No data available
Relative density	:	No data available
Density	:	1.90 g/cm ³ (20 °C)

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Method: OPPTS 830.7300

Bulk density : No data available

Solubility(ies)
Water solubility : Substance hydrolyses rapidly. (20 °C)
Method: OECD Test Guideline 111
GLP: yes

Solubility in other solvents : No data available

Partition coefficient: n-
octanol/water : No data available

Auto-ignition temperature : No data available

Decomposition temperature : ≥ 600 °C
To avoid thermal decomposition, do not overheat.

Viscosity, dynamic : No data available

Viscosity, kinematic : No data available

Explosive properties : No data available

Oxidizing properties : No data available

9.2 Other information

Flammability (liquids) : No data available

Sublimation point : No data available

Molecular weight : 42.10 g/mol

SECTION 10: Stability and reactivity

10.1 Reactivity

Risk of violent reaction.

10.2 Chemical stability

Sensitive to air.

Decomposition under influence of moisture is highly accelerated by heating.

10.3 Possibility of hazardous reactions

Hazardous reactions : In contact with water releases flammable gases which may ignite spontaneously.
Dust can form an explosive mixture in air.
Reacts violently with water.

10.4 Conditions to avoid

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Conditions to avoid : Keep away from open flames, hot surfaces and sources of ignition.
Protect from moisture.
Keep away from heat.
Avoid dust formation.
Take action to prevent static discharges.

10.5 Incompatible materials

Materials to avoid : Water
Oxidizing agents
Acids
Halogenated compounds
Alcohols
Ammonia

10.6 Hazardous decomposition products

Decomposes in contact with water.
Hydrogen

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Components:

calcium hydride:

Acute oral toxicity : LD50 (Rat, female): > 2,000 mg/kg
Method: OECD Test Guideline 425
Test substance: Read-across (Analogy)
GLP: yes

Skin corrosion/irritation

Components:

calcium hydride:

Species : Rabbit
Method : OECD Test Guideline 404
Result : Skin irritation
Test substance : Read-across (Analogy)

Serious eye damage/eye irritation

Components:

calcium hydride:

Species : Rabbit
Method : OECD Test Guideline 405

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Result : Eye irritation
Test substance : Read-across (Analogy)

Respiratory or skin sensitisation

Components:

calcium hydride:

Remarks : Study scientifically unjustified

Germ cell mutagenicity

Components:

calcium hydride:

Genotoxicity in vitro : Test Type: reverse mutation assay
Test system: Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative
GLP: yes
Test substance: Read-across (Analogy)

Test Type: reverse mutation assay
Test system: Escherichia coli
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative
GLP: yes
Test substance: Read-across (Analogy)

SECTION 12: Ecological information

12.1 Toxicity

Components:

calcium hydride:

Toxicity to daphnia and other aquatic invertebrates : (Daphnia magna (Water flea)): > 100 mg/l
End point: Immobilization
Exposure time: 48 h
Test Type: static test
Analytical monitoring: yes
Test substance: Read-across (Analogy)
Method: OECD Test Guideline 202
Remarks: Changes in the pH of the substance can have a direct effect on the aquatic

Toxicity to algae : EC50 (Pseudokirchneriella subcapitata (green algae)): 184.75 mg/l

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End point: Growth rate
Exposure time: 72 h
Test Type: static test
Analytical monitoring: yes
Test substance: Read-across (Analogy)
Method: OECD Test Guideline 201
GLP: yes
Remarks: Changes in the pH of the substance can have a direct effect on the aquatic

12.2 Persistence and degradability

Components:

calcium hydride:

Biodegradability : Remarks: The methods for determining biodegradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential

Components:

calcium hydride:

Bioaccumulation : Remarks: Does not bioaccumulate.

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

Product:

Assessment : This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher..

12.6 Other adverse effects

Product:

Additional ecological information : Do not flush into surface water or sanitary sewer system. Avoid subsoil penetration.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product : Dispose of in accordance with local regulations.

Contaminated packaging : Refer to manufacturer/ supplier for information on recovery/ recycling.

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Waste Code : Waste codes should be assigned by the user, preferably in discussion with the waste disposal authorities.

SECTION 14: Transport information

14.1 UN number

ADN : UN 1404
ADR : UN 1404
RID : UN 1404
IMDG : UN 1404
IATA (Cargo) : UN 1404
IATA (Passenger) : UN 1404
Not permitted for transport

14.2 UN proper shipping name

ADN : CALCIUM HYDRIDE
ADR : CALCIUM HYDRIDE
RID : CALCIUM HYDRIDE
IMDG : CALCIUM HYDRIDE
IATA (Cargo) : Calcium hydride
IATA (Passenger) : CALCIUM HYDRIDE
Not permitted for transport

14.3 Transport hazard class(es)

ADN : 4.3
ADR : 4.3
RID : 4.3
IMDG : 4.3
IATA (Cargo) : 4.3
IATA (Passenger) : Not permitted for transport

14.4 Packing group

ADN
Packing group : I
Classification Code : W2
Labels : 4.3
ADR
Packing group : I
Classification Code : W2
Labels : 4.3

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Tunnel restriction code : (E)

RID

Packing group : I
Classification Code : W2
Hazard Identification Number : X423
Labels : 4.3

IMDG

Packing group : I
Labels : 4.3
EmS Code : F-G, S-O
Remarks : Alkalis

IATA (Cargo)

Packing instruction (cargo aircraft) : 487
Packing group : I
Labels : Dangerous When Wet

IATA (Passenger) : Not permitted for transport

14.5 Environmental hazards

ADN

Environmentally hazardous : no

ADR

Environmentally hazardous : no

RID

Environmentally hazardous : no

IMDG

Marine pollutant : no

14.6 Special precautions for user

The transport classification(s) provided herein are for informational purposes only, and solely based upon the properties of the unpackaged material as it is described within this Safety Data Sheet. Transportation classifications may vary by mode of transportation, package sizes, and variations in regional or country regulations.

14.7 Transport in bulk according to Annex II of Marpol and the IBC Code

Not applicable for product as supplied.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

REACH - Candidate List of Substances of Very High Concern for Authorisation (Article 59) : Not applicable

REACH - List of substances subject to authorisation (Annex XIV) : Not applicable

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Regulation (EC) No 1005/2009 on substances that deplete the ozone layer : Not applicable

Regulation (EC) No 850/2004 on persistent organic pollutants : Not applicable

REACH - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, preparations and articles (Annex XVII) : Not applicable

Seveso III: Directive 2012/18/EU of the European Parliament and of the Council on the control of major-accident hazards involving dangerous substances.

		Quantity 1	Quantity 2
O1	OTHER HAZARDS	100 t	500 t
O2	OTHER HAZARDS	100 t	500 t

Volatile organic compounds : Directive 2010/75/EU of 24 November 2010 on industrial emissions (integrated pollution prevention and control)
Not applicable

The components of this product are reported in the following inventories:

- EINECS : On the inventory, or in compliance with the inventory
- DSL : All components of this product are on the Canadian DSL
- AICS : On the inventory, or in compliance with the inventory
- NZIoC : On the inventory, or in compliance with the inventory
- ENCS : On the inventory, or in compliance with the inventory
- ISHL : On the inventory, or in compliance with the inventory
- KECI : On the inventory, or in compliance with the inventory
- PICCS : On the inventory, or in compliance with the inventory
- IECSC : On the inventory, or in compliance with the inventory
- TCSI : On the inventory, or in compliance with the inventory
- TSCA : On TSCA Inventory

15.2 Chemical safety assessment

A Chemical Safety Assessment has been carried out for this substance.

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SECTION 16: Other information

Full text of other abbreviations

ADN - European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways; ADR - European Agreement concerning the International Carriage of Dangerous Goods by Road; AICS - Australian Inventory of Chemical Substances; ASTM - American Society for the Testing of Materials; bw - Body weight; CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECHA - European Chemicals Agency; EC-Number - European Community number; ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RID - Regulations concerning the International Carriage of Dangerous Goods by Rail; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; SVHC - Substance of Very High Concern; TCSI - Taiwan Chemical Substance Inventory; TRGS - Technical Rule for Hazardous Substances; TSCA - Toxic Substances Control Act (United States); UN - United Nations; vPvB - Very Persistent and Very Bioaccumulative

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

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