



Automatic Control for Pressure Chamber 8700/8710

GROUP 8

TEST & CALIBRATION

NO.

V1.1.1 / ISSUE 1

VERSION / DATE / NAME

06 / 01.2018 / Zi



Upgrade of Table Top Housing 8777.0000

APPLICATION

This table top housing will be used for the automatic operation of a pressure chamber. It serves to house the data logger COMBILOG 1022 as well as all valves for the control of the pressure inside the chamber. These valves are connected with the pressure chamber by means of two rubber tubes.

The reference sensor and a temperature sensor are located inside the chamber to allow the correct measurement of the chamber inside conditions.

For the measurement of the room conditions a temperature/humidity sensor is integrated in the table top housing.

The sensors on test will be connected to the data logger via the feed-through terminals at the chamber and using the 4 mm plugs at the front plate of the table top housing.



For automatic operation a PC or Laptop will be used. The relevant plug for the connection of the PC is placed at the back plate.

Additionally to the automatic operation a hand held device for manual operation can be connected at the back plate as well. The hand held device is part of the deliveries.

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TECHNICAL DATA

TABLE TOP HOUSING

Supply voltage:	230 V, 50 Hz other on request
Power supply:	with ON/OFF switch
Pressure tube connections:	Ø 5 mm
Plugs at the back plate:	USB, Ethernet, RS232, PT100, Manual Control Unit, Pressure Chamber t/r.h. Ambient, Pressure Pump, Vacuum Pump Pump, 2 nd Module, Power Supply Line
Dimensions:	530 x 190 x 350 mm (Width x Height x Depth)

The 12/24 VDC power supply units are self-secured, no fuses are necessary.

For further details refer to the manual of the data logger: 1022.2000

REFERENCE SENSOR

Barometric pressure range 500 ... 1100 hPa

Linearity*	±0.05 hPa
Hysteresis*	±0.03 hPa
Repeatability*	±0.03 hPa
Calibration uncertainty**	±0.07 hPa
Accuracy at +20 °C (+68 °F) ***	±0.10 hPa

Temperature dependence****

500 ... 1100 hPa	±0.1 hPa
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Total accuracy -40 ... +60 °C (-40 ... +140 °F)

500 ... 1100 hPa	±0.15 hPa
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Long-term stability

500 ... 1100 hPa	±0.1 hPa/year
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- * Defined as ±2 standard deviation limits of endpoint non-linearity, hysteresis or repeatability error.
- ** Defined as ±2 standard deviation limits of inaccuracy of the working standard including traceability to NIST.
- *** Defined as the root sum of the squares (RSS) of endpoint non-linearity, hysteresis error, repeatability error and calibration uncertainty at room temperature.
- **** Defined as ±2 standard deviation limits of temperature dependence over the operating temperature range.

**OTHER REFERENCE SENSORS
ON REQUEST**

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Sensor Calibration Program Calibration Software for Pressure Chamber 8700/8710

Author: Arman
V1.1.1
Issue 1
April 2017

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INTRODUCTION

The Sensor Calibration Program has been developed for automatic calibration of pressure sensors in Pressure Chamber, types 8700 or 8710.

Components of the system are declared as following:

1. **Pressure Chamber.**
2. **Table top housing** to connect test sensors at the front, to adjust the desired chamber pressure with magnetic valves and a vacuum pump and to connect an additional table top housing (optionally).
3. **Barometric sensor** as reference device build in Pressure Chamber; air pressure range 500...1100 hPa.
4. **Sensor for air temperature** (inside the Pressure Chamber) and **ambient air pressure sensor** (inside the table top housing).
5. Data logger **COMBILOG 1022** to measure all sensor values, build in Table top housing, connected to a computer via WLAN or LAN.
6. **Manual Control Unit** to adjust the chamber pressure manually.
7. Windows 7, Windows 8 or Windows 10 based **computer system**, including this **Sensor Calibration Software** and **ink jet printer** (option) for printing Sensor calibration certificates.

The program registers the following measuring data from the data logger COMBILOG 1022 via WLAN or LAN:

1. **Chamber pressure** from the reference sensor.
2. **Chamber temperature** (= Air temperature inside the Pressure Chamber).
3. **Ambient air pressure** called in shortened form as **Ambient pressure** or **Air Pressure**.
4. **Ambient air temperature** called in shortened form as **Ambient temperature**.
5. **Ambient relative humidity**.
6. **Sensors on test** with frequency, voltage or current output.

Depending on the sensor type that should be calibrated, the user can enter the range of the sensor to convert the physical sensor output (Hz, V or mA) to pressure values (hPa) at the beginning of the calibration process. Also you can select predefined favourite sensors.

The measurements are available as well in **Automated Test Series** mode as in **One-Point-Measurement** mode.



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You can measure up to 2 Sensors at the same time. Or even 6 Sensors are possible, with an additional Table top housing.

The results will be displayed in alphanumerical form and can be saved as a file and printed out as a Certificate too. Each sensor has it's own calibration certificate.

At the starting of the Sensor Calibration Software automatically the last configuration will loaded. This is including the following settings:

- Combilog communication
- Operator
- Sensors
- Chart

Optionally another configuration can be loaded which was saved before. Thus new measurements can be started quick and comfortable.



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1 OPERATION

Before starting the operation of the Pressure Chamber system: The operator should be acquainted with the technical descriptions of the different parts of the system.

1.1 PREPARATION OF MEASUREMENT

Before you start with measurement, please go through the following steps:

1. Be sure, that no wires are connected at the **front** of the **Table top housing**.
2. Turn on the **Table top housing** using the power switch.
3. Switch on the **computer system**. If the Windows 7, Windows 8 or Windows 10 operating system is configured for user login, then enter the right identification and password. Run the **PressureChamber** program on the computer by clicking the program icon on the desktop or from start menu. Alternatively start from All Apps menu (Theodor Friedrichs | Pressure Chamber | PressureChamber).

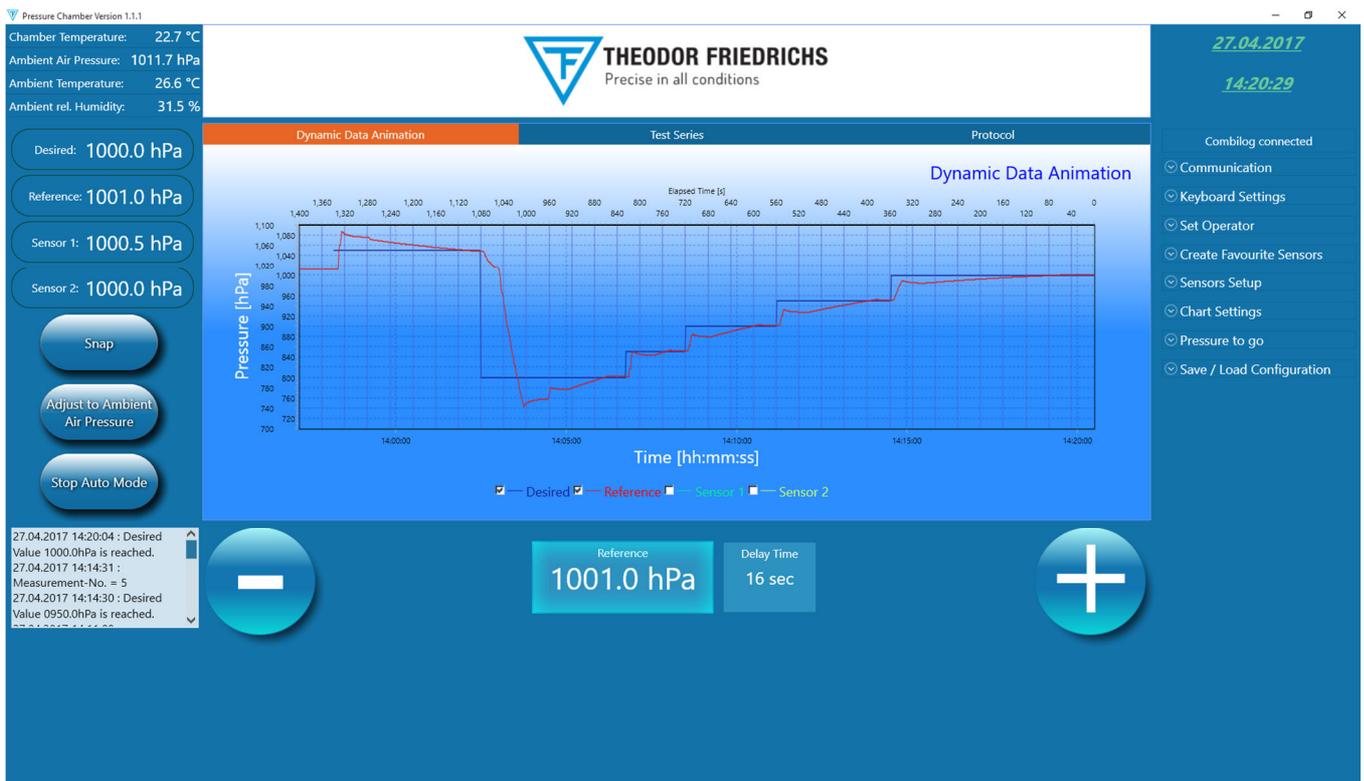


Figure 1: Main Screen

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4. Make sure that the **Chamber pressure** is equal to the **Ambient air pressure**, because you need to open the shutter of the Pressure Chamber for *mounting the Sensors under test!*
If not there are 3 possibilities to equalize the *Chamber pressure* with the *Ambient pressure*:
 - a.) At the condition, that all valves are closed and the program works well, then hit the button on the left side of the Main Screen (see Figure 1) and wait until the Chamber Pressure which is displayed in the lower middle will be brighten. At this time the “Ambient Pressure” and the “Reference” which are displayed on the upper left side of the Main screen, should both have almost the same value (difference less than 3 hPa).
 - b.) At the condition, that all valves are closed and the program works well, then hit the button and use the Manual controller. Push the middle button of the Manual Controller until the “Ambient Pressure” and the “Reference” which are displayed on the upper left side of the Main screen (see Figure 1), should both have almost the same value (difference less than 3 hPa).
 - c.) If you don't use the Calibration software for pressure chamber, then *open manually the valves* at the Recipient and wait until the Chamber pressure is equal to the Ambient air pressure (difference less than 3 hPa). The actual Chamber pressure and the Ambient air pressure are shown on the display of the Combilog 1022 too which is in the Table top housing. You can navigate to the desired measurements by turning the knob at the Combilog 1022.
5. Connect outgoing wires from **outside** the Pressure chamber for **signal output** of each sensor on test to the appropriate connector at the front of the Table top housing. Be aware not to connect the signal outputs to the power supply connectors! Otherwise the sensors on test can be damaged.
6. Connect outgoing wires from **outside** the Pressure chamber for **power supply** of each sensor on test to the appropriate connector at the front of the Table top housing.
7. **Inside** the Pressure chamber connect each **signal output** of each sensor on test to the appropriate connector with caution. Be aware not to connect the signal outputs to the power supply connectors! Otherwise the sensors on test can be damaged.
8. **Inside** the Pressure chamber connect each **power supply** connectors of each sensor on test to the appropriate connector with caution.
9. After the Sensors under test are mounted, **close the shutter** and be sure that the **valves are closed well**. Otherwise the Chamber pressure will permanently equalize to the Ambient air Pressure.



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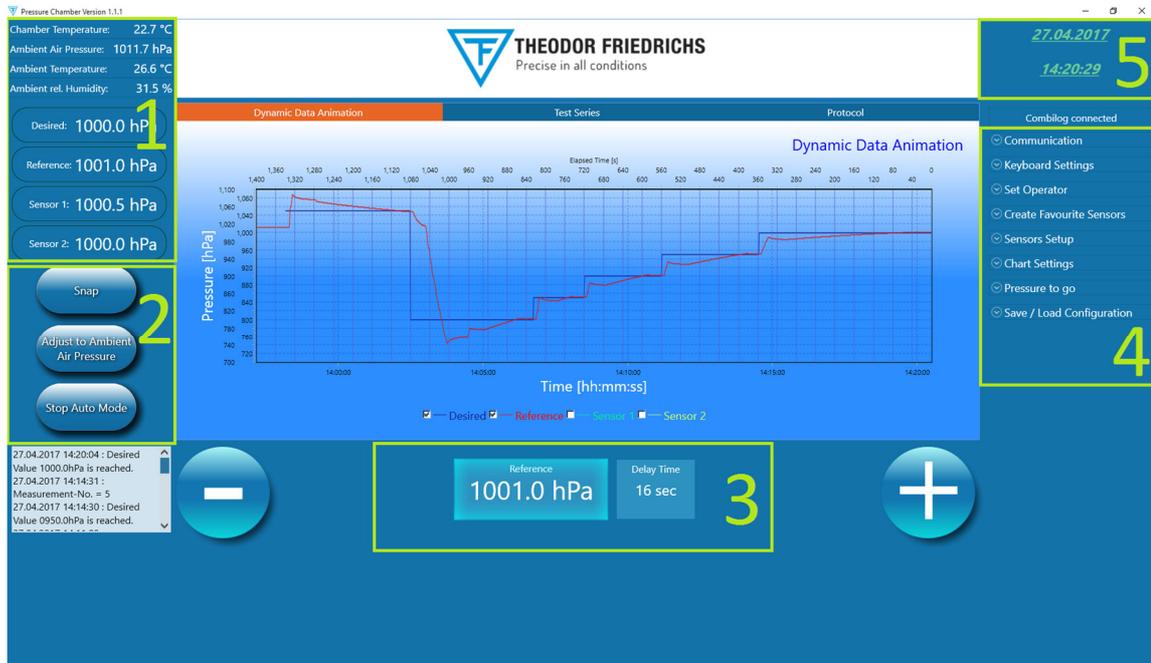
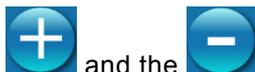


Figure 2

1.2 BECOMING FAMILIAR WITH THE DISPLAYED SCREEN

1.2.1 PLUS AND MINUS BUTTONS



On the lower side the  and the  buttons are displayed. With these buttons you can adjust the chamber pressure **manually**. Once hit on one of these 2 buttons, the button will stay pressed until you hit it again.

1.2.2 DATE AND TIME DISPLAY

The **date** and **time** are displayed permanently on the upper right corner (please look at the sector marked with 5 of figure 2).

1.2.3 INSTANT VALUE PANELS OF ALL SENSORS

The program takes the values of the **Ambient air pressure**, the **Chamber temperature** and the **Chamber pressure** via the data logger automatically.

These values are shown at the upper left side (please look at the sector marked with 1 of figure 2) of the screen permanently. The measured pressure for each **sensor under test** is even displayed on the left side.

The most important value, that is the chamber pressure and is shown at the middle lower side (please look at the sector marked with 3 of figure 2) of the screen permanently too. Right of this value a Delay time is displayed.

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1.2.4 SNAP, ADJUST TO AMBIENT AIR PRESSURE AND STOP AUTO MODE BUTTONS

On the left side (please look at the sector marked with 2 of figure 2) the **Snap**, **Adjust to Ambient Air Pressure** and the **Stop Auto Mode** buttons are displayed. These Buttons have the following functions:

- By hitting the  button you can **immediately make a single One point measurement** which will be added to the certification protocol as one dataset.
- By hitting the  button the Chamber pressure will **equalize** to the Ambient air pressure.
- By hitting the  button the Automated mode will be stopped. In this case you will be able to adjust the Chamber pressure **manually**.

1.2.5 EXPANDABLE PANELS

At the right side (please look at the sector marked with 4 of figure 2) there are **expandable panels** which will expand or collapse by tipping or clicking on them. These panels are the following subchapters:

1.2.5.1 Communication:

With this panel you can establish the communication between the Combilog 1022 and your computer (please look at figure 3). The Parameters are the following:

- a.) Static-IP No.:
This is the *IP address* of the Combilog 1022, e.g. 128.102.0.101.
- b.) Timeout in seconds:
This is the maximum of time the program waits for a response of the Combilog 1022, when connecting, e.g. 3 seconds. After this time without a response, the program knows, that a communication is not established.
The *default value* is 5 seconds.

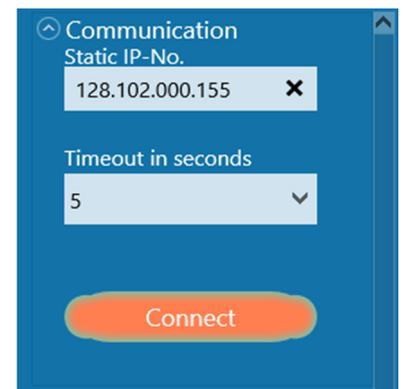


Figure 3

By pressing the  button the communication will be established. At the program start this communication will be established automatically. Normally, the communication panel is collapsed, because there isn't any need to use it.



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1.2.5.2 Keyboard Settings:

At this panel you can select if you want to use a virtual keyboard. Checkmark the check box **Enable Virtual Keyboard**, if you want to use a virtual keyboard. Then choose one of the following virtual keyboard types you want to use:

OSK or **Tabtip**.

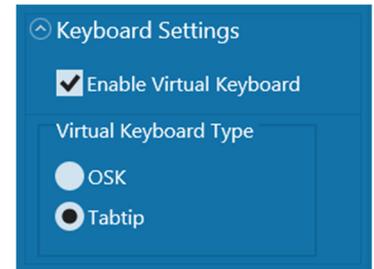


Figure 4

1.2.5.3 Set Operator:

At this panel you can input the name of the Operator. Once added an Operator to the favourite Operators, you will be able to choose the Operator from this list. You can add or delete Operators from the favourite Operators by hitting the add button or the delete button.



Figure 5

1.2.5.4 Create Favourite Sensors:

At this panel you can predefine your *favourite sensors* by inputting the model of the Sensor. The kind of signal output can be set to Voltage, Current or Frequency.

Then the signal output range as the units V, mA or Hz and the corresponding range as the unit hPa can be set.

E.g.:

You want to create a favourite sensor which type number is "5002.0000" and has a signal output range of 0..20 mA equal to its measuring range 600..1060 hPa. Then at model inputting "5002.0000", at signal output selecting "Current", at the row with "mA" inputting "0" at left side and "20" at the right side, at the row with "hPa" inputting "600" at left side and "1060" at the right side defines this sensor.

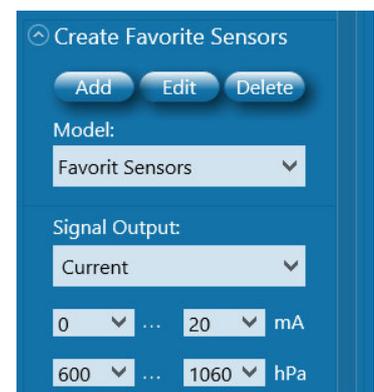


Figure 6

The factor and offset will be calculated automatically and displayed in the protocol.

Once added a Sensor to the favourite Sensors, you will be able to choose the Sensor from this list.

Hitting the add button, the edit button or the delete button adds, edits or deletes Sensors from the favourite sensors.



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1.2.5.5 Sensors Setup:

At this panel you can select your predefined *favourite sensors* by selecting the model of the Sensor at the model combo box. Then the serial number of the sensor under test can be inserted at the S/N combo box. All characteristics of the signal output will be taken automatically from *favourite sensors list*.

Alternatively all the sensor characteristics can be inputted or changed without using the favourite sensors list.

Last but not least checkmark at the check box “**Available**”, if the Sensor under test is available and measurements to the Protocol can be added. Otherwise the Sensor will be ignored.

Each Sensor under test has a different Sensor number named “**Sensor No.**”. Changing this Sensor number shows you if the Sensor under test is available and all other data set up.

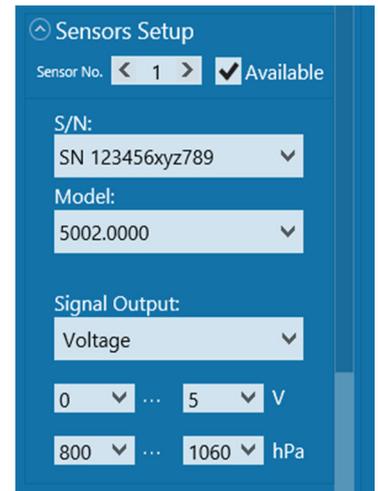


Figure 7

1.2.5.6 Chart Settings:

With this panel you can adjust the *x-scale* and the *y-scale* of the Dynamic Data Animation chart. Every minimum or maximum of the axes can be selected automatically by check marking or by typing in the value.

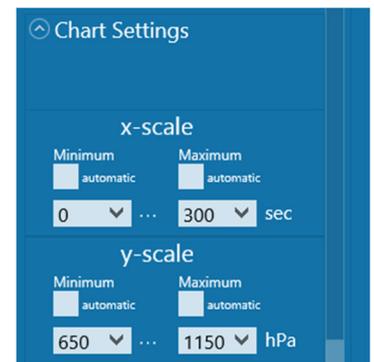


Figure 8

1.2.5.7 Pressure to go:

This Panel displays the desired value of the chamber pressure in the unit hPa.

The *desired pressure* can be chosen by typing in the value in the combo box or alternatively by adding or subtracting pressure values to the actual value by tapping on the +100, +10, +1, -100, -10 or -1 buttons.

Once selected, the actual chamber pressure will be adjusted according to this desired value and when the desired pressure is reached the actual pressure chamber will light (please look at the sector marked with 3 of figure 2).

In the *Automated Test Series Mode* the Desired pressure of the chamber will be chosen automatically.

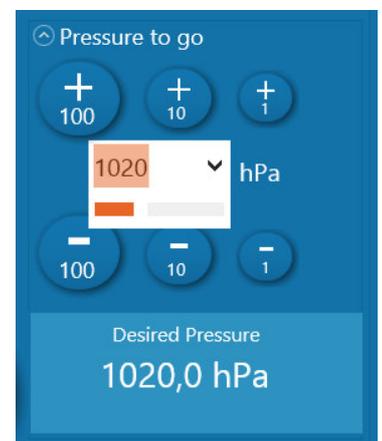


Figure 9



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1.2.5.8 Save / Load Configuration:

At this panel you can save and load configuration files which have all the extension "kfg". When closing the program the actual configuration will be saved automatically to the file "default.kfg". This file will be loaded again automatically, when the program starts. The configuration includes all settings, that have be done with the settings of Combilog 1022, Operators, Sensors and Charts.



Figure 10

1.2.6 INFO BOX

There is an *Info box* on the lower left side of the screen. In this Info box are various information, remarks and events during the calibration software operation.

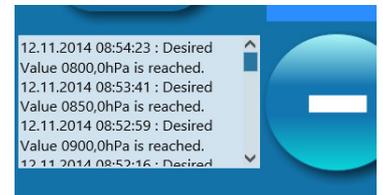


Figure 11



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1.2.7 INDEX TABS ON THE MAIN SCREEN

There are **Index tabs** in the middle of the screen with information and editing capabilities for the Calibration protocol and the Automated Test Series Measurements. These Index tabs will be described in the following subchapters.

1.2.7.1 Dynamic Data Animation

The following figure shows the index tab which is named “*Dynamic Data Animation*”.

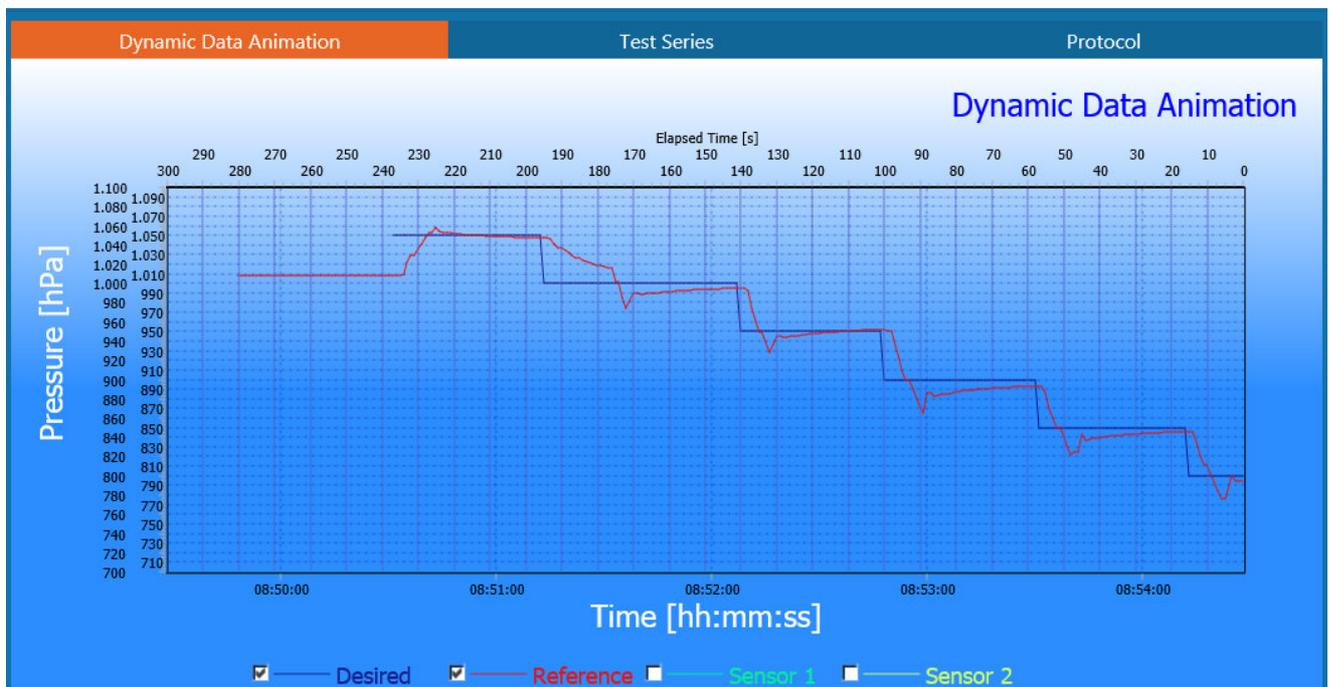


Figure 12

This is a diagram with two x-axes (horizontal axes) and one y-axis (vertical axis). The upper x-axis indicates the elapsed time from the current time in the unit seconds. The lower x-axis indicates the time, when the measuring happened. This time format is displayed as hours, minutes and seconds, e.g.: **08:53:00** has the following time components:

hh = 08 , that are 8 hours,
mm = 53 , that are 53 minutes and
ss = 00 , that are 0 seconds.

The y-axis indicates the measured pressure in the unit hPa. The axes range can be scaled by the expandable panel “**Charts settings**” (please see chapter 1.2.5.6). This diagram shows graphs of the Desired chamber pressure (named “Desired”), the Chamber pressure measured with the reference sensor (named “Reference”) and all available Sensors under test (named with “Sensor 1”, “Sensor 2” etc.). It is also possible to checkmark the graphs, that you want to see.

E.g.: In figure 12 only the check marked graphs of “Desired” and “Reference” are shown.



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1.2.7.2 Test Series

The following figure shows the index tab which is named “Test Series”.

With this index tab you can create, edit, save and load Test series. Test series are used in the **Automated Test Series Mode** and specifies which measuring points shall be driven.

At the left side you can see the Test series editor. The Test series consists of several rows. Each row consist of a dataset with a row number, a desired chamber pressure in hPa and a Delay time in seconds. The user can edit only the desired pressure and the Delay time. The row number is given automatically.

The **Delay time** is the time which elapses after the desired chamber pressure is reached. After the Delay time counted down to zero, a measurement for the Certification protocol will be made. During the Automated Test Series Measurements the Delay time is displayed permanently on a panel as described in chapter 1.2.3.

No.	Desired Pressure [hPa]	Delaytime [s]
1	1050.0	30
2	1000.0	30
3	950.0	30
4	900.0	30
5	850.0	30
6	800.0	30
7	750.0	30

Buttons: Apply Test Series, Save, Load, Course, Add, Delete, Delete All

Course Configuration:
 Course:
 Pressure [hPa]: Start 1050, End 750
 Delaytime [s]: 30
 Steps: 7
 Loop Test Series:

Figure 13

The following chapter describes how to predefine Test series and the used buttons.

1.2.7.2.1 Predefining Test series

With predefined *Test series* there is the ability given to perform the measuring of multiple pressures without manually adjusting the Chamber pressure for each measurement-point. The taken measurements will be added to the protocol (please see chapter 1.2.7.3).

Predefined Test series measurements of air pressure can be performed in any order and as many as you like.



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Use the following buttons for adding or deleting new measurement points in the Test series:

- a.) The  button adds multiple measuring points to the Test series which was defined in the expandable panel “Course” before.
E.g.: You want add measuring points in steps of 50 hPa beginning from 1050 hPa and ending at 750 hPa. The desired Delay time is 30 seconds for each measuring point. In this case expand the “Course” panel and type in at Start 1050, at End 750, at Steps 7 and at Delay time 30. Then hit the Course button to add these 7 measurement points to the Test series. If you want to edit some values, then just tip in the field of the value and edit it.

- b.) The  button adds 1 measuring point to the Test series.

- c.) The  button deletes 1 measuring point from the Test series.

- d.) The  button deletes all measuring points from the Test series.

Use the following buttons for saving or loading the Test series:

- e.) The  button saves the Test series as a TSF file.

- f.) The  button loads a Test series file which has a file with a TSF extension.

1.2.7.2.2 Loop Test Series

The expandable panel “Loop Test Series” give the possibility to loop the Test series as often as you like. To do this just set the *Loop enable* checkmark. The Loop counter at the left at Figure 14 counts the loops. At the right you can adjust the desired number of loops. If the number is zero, the loop will never end, before you stop it with the “Stop Auto Mode” button (please see chapter 1.2.2).

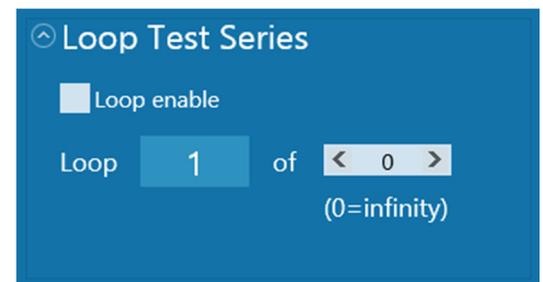


Figure 14

1.2.7.2.3 Apply Test Series

Hitting the  button starts the current *Test series*. The *Manual Mode* is simultaneously left. To leave this *Automated Test Series Mode* just hit the “Stop Auto Mode” button (see chapter 1.2.4) or wait until the Test Series ends.



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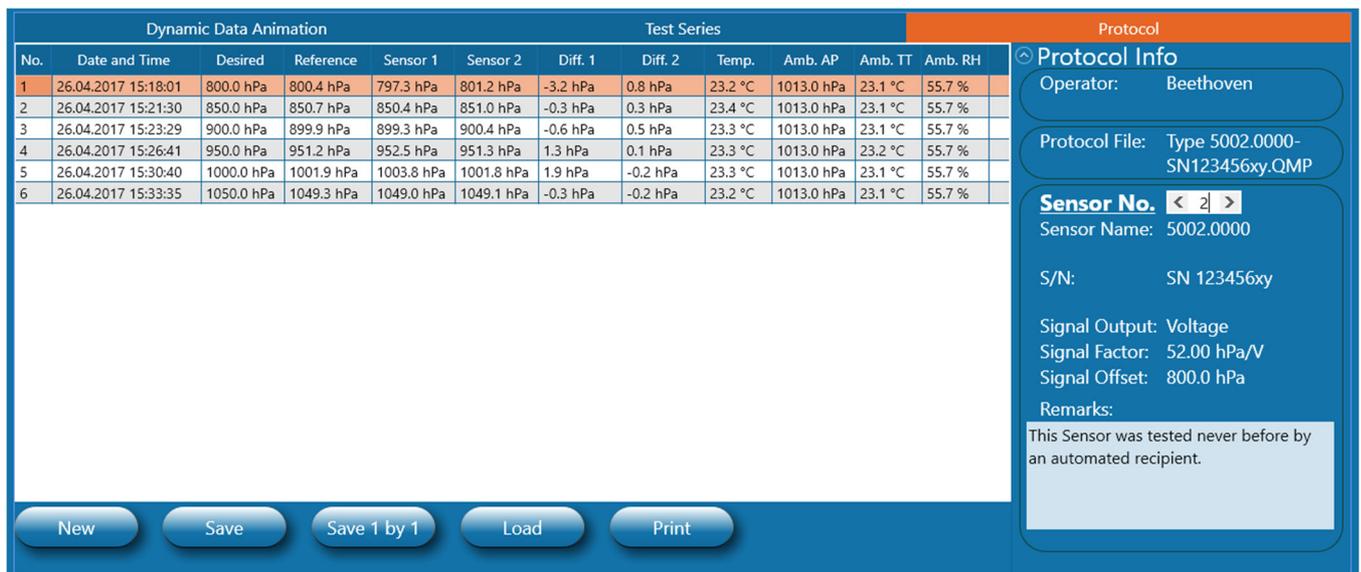
1.2.7.3 Protocol

The following figure shows the index tab which is named “*Protocol*”.
 With this index tab you can see the recorded measurements for the *Sensor Calibration Certificate*.

Each row consist of a dataset with the following elements:

- 1.) A row number, named “**No.**”.
- 2.) A date and time stamp, named “**Date and Time**”.
- 3.) A desired chamber pressure in hPa, named “**Desired**”.
- 4.) An actual chamber pressure in hPa, named “**Reference**”.
- 5.) For each available Sensor under test a Sensor under tests signal output in hPa, named “**Sensor 1**”, “**Sensor 2**” etc..
- 6.) For each available Sensor under test a difference between the Reference and the Sensor under test in hPa, named “**Diff. 1**”, “**Diff. 2**” etc..
- 7.) The Chamber temperature in °C, named “**Temp.**”.
- 8.) The Ambient air pressure in hPa, named “**Amb. AP**”
- 9.) The Ambient air temperature in °C, named “**Amb. TT**”
- 10.) The Ambient relative humidity in %, named “**Amb. RH**”

Remark: *The user cannot edit or delete recorded datasets, but just add the new ones.*



Dynamic Data Animation			Test Series								Protocol
No.	Date and Time	Desired	Reference	Sensor 1	Sensor 2	Diff. 1	Diff. 2	Temp.	Amb. AP	Amb. TT	Amb. RH
1	26.04.2017 15:18:01	800.0 hPa	800.4 hPa	797.3 hPa	801.2 hPa	-3.2 hPa	0.8 hPa	23.2 °C	1013.0 hPa	23.1 °C	55.7 %
2	26.04.2017 15:21:30	850.0 hPa	850.7 hPa	850.4 hPa	851.0 hPa	-0.3 hPa	0.3 hPa	23.4 °C	1013.0 hPa	23.1 °C	55.7 %
3	26.04.2017 15:23:29	900.0 hPa	899.9 hPa	899.3 hPa	900.4 hPa	-0.6 hPa	0.5 hPa	23.3 °C	1013.0 hPa	23.1 °C	55.7 %
4	26.04.2017 15:26:41	950.0 hPa	951.2 hPa	952.5 hPa	951.3 hPa	1.3 hPa	0.1 hPa	23.3 °C	1013.0 hPa	23.2 °C	55.7 %
5	26.04.2017 15:30:40	1000.0 hPa	1001.9 hPa	1003.8 hPa	1001.8 hPa	1.9 hPa	-0.2 hPa	23.3 °C	1013.0 hPa	23.1 °C	55.7 %
6	26.04.2017 15:33:35	1050.0 hPa	1049.3 hPa	1049.0 hPa	1049.1 hPa	-0.3 hPa	-0.2 hPa	23.2 °C	1013.0 hPa	23.1 °C	55.7 %

Protocol Info

Operator: Beethoven

Protocol File: Type 5002.0000-SN123456xy.QMP

Sensor No. < 2 >

Sensor Name: 5002.0000

S/N: SN 123456xy

Signal Output: Voltage

Signal Factor: 52.00 hPa/V

Signal Offset: 800.0 hPa

Remarks:

This Sensor was tested never before by an automated recipient.

Figure 15

At the right side of the tab index “*Protocol*” is an expandable panel, named “**Protocol Info**”.
 The following subchapter describes this panel in detail.



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1.2.7.3.1 Protocol Info

At this panel you are able to look at the information about the Protocol.

As you can see at Figure 15 the Protocol info is separated into the following 3 groups:

a.) Operator:

If selected at the expandable panel “**Set Operator**” (see chapter 1.2.5.3), the operator will be displayed.

b.) Protocol File:

If a Protocol file is loaded or saved, then the Protocol file name will be displayed.

c.) Sensor No.:

At the right side of the text “**Sensor No.**” is the *selector*.

With this selector you can select the sensor number of each Sensor under test.

If the sensor is *available* then you will see the following data:

- Sensor name
- S/N
- Signal output
- Signal factor
- Signal offset
- Remarks

Besides *Remarks* all data is taken from the expandable panel

“**Sensors Setup**” (see chapter 1.2.5.5).

In the editable field “*Remarks*” you can add any text you want.

The *Signal factor* and *Signal offset* is calculated, because with this parameters it's easy to recalculate the signal output in its physical unit, e.g.:

At the protocol you see the value 1048.3 hPa of “Sensor 1” and now want to know the value of the signal output in Volts. Looking at the panel you know, that the Signal factor is 52 hPa / V and the Signal offset is 800 hPa. With the following formula you can calculate the Signal output in it's physical unit:

$$\begin{aligned} \text{PhysicalSignalOutput} &= \frac{\text{SensorValue} - \text{SignalOffset}}{\text{SignalFactor}} = \frac{1048.3 \text{ [hPa]} - 800 \text{ [hPa]}}{52 \left[\frac{\text{hPa}}{\text{V}} \right]} \\ &= 4.79 \text{ [V]} \end{aligned}$$

All data about the Protocol Info can be printed out with the Sensor Calibration Certificate and saved with the Protocol file.



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1.2.7.3.2 The Protocol buttons: New, Save, Save 1 by 1, Load and Print

Use the following buttons to handle the Protocols:

- a.) The  button deletes the actual Protocol and establishes a new Protocol.
- b.) The  button saves the actual Protocol with all available Sensors under test as a file with a QMP extension or optionally with a CSV extension (spreadsheet file type).
- c.) The  button saves the actual Protocol with all available Sensors under test 1 by 1, so each Sensor under test will be saved as a own file with a QMP extension or optionally with a CSV extension (spreadsheet file type).
- d.) The  button loads a saved Protocol file with a QMP extension and shows all data at the tab index Protocol. By loading a Protocol file the actual sensor settings will be changed to the loaded ones. To disable certificate manipulation, protocol files with a CSV extension (spreadsheet file type) can not be loaded.
- e.) The  button prints the actual Protocol with all available Sensors under test 1 by 1, so each Sensor under test will have its own **Pressure Chamber Calibration Certificate**.

Pressure Chamber Calibration Certificate

File: Type 5002.0000-SN123456xy.QMP Operator: Beethoven Sensor Name: TestBox-4122 S/N: SN 212/98 Signal Output: Current Signal Factor: 25.00 hPa/mA Signal Offset: 600.0 hPa	Initial Ambient Conditions: Ambient Air Pressure: 1001.5 hPa Ambient Temperature: 23.1 °C Ambient Relative Humidity: 55.7 % Initial Chamber Conditions: Chamber Pressure: 1013.0 hPa Temperature: 23.2 °C
--	---

Remarks:
 This Sensor was tested never before by an automated recipient.

No.	Date and Time	Desired	Reference	Sensor	Difference	Temperature	Ambient Air Pressure	Ambient Temperature	Ambient Rel. Humidity
1	26.04.2017 15:18:01	800.0 hPa	800.4 hPa	797.3 hPa	-3.2 hPa	23.2 °C	1013.0 hPa	23.1 °C	55.7 %
2	26.04.2017 15:21:30	850.0 hPa	850.7 hPa	850.4 hPa	-0.3 hPa	23.4 °C	1013.0 hPa	23.1 °C	55.7 %
3	26.04.2017 15:23:29	900.0 hPa	899.9 hPa	899.3 hPa	-0.6 hPa	23.3 °C	1013.0 hPa	23.1 °C	55.7 %
4	26.04.2017 15:26:41	950.0 hPa	951.2 hPa	952.5 hPa	1.3 hPa	23.3 °C	1013.0 hPa	23.2 °C	55.7 %
5	26.04.2017 15:30:40	1000.0 hPa	1001.9 hPa	1003.8 hPa	1.9 hPa	23.3 °C	1013.0 hPa	23.1 °C	55.7 %
6	26.04.2017 15:33:35	1050.0 hPa	1049.3 hPa	1049.0 hPa	-0.3 hPa	23.2 °C	1013.0 hPa	23.1 °C	55.7 %

Date of printing: 27.04.2017
 Time of printing: 14:57:20

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Figure 16

Technical data are subject to change!



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1.3 MEASURING PROCEDURE

The **Measuring procedure** can be performed in **3 modes** of the Chamber pressure control.

The target is always to get measurements for a Protocol.

After saving the Protocol, then you can finally print out the Pressure Chamber Calibration Certificate for each Sensor under Test.

The following chapter first describes the creation procedure of a new Protocol, then other 3 chapters are describing the measuring procedure with the different 3 modes which are the following:

1. **Manual Mode**
2. **Automated Mode**
3. **Automated Test Series Mode**

1.3.1 CREATING A NEW PROTOCOL

Before you perform any measurements in any mode, please make the following settings:

1. **Set up the Operator.**
Please look at chapter 1.2.5.3 for a detailed description.
2. **Set up Sensors under test** and checkmark which are available.
Please look at chapters 1.2.5.4 and 1.2.5.5 for detailed descriptions.
3. **Create a new Protocol**

by opening the index tab which is named "**Protocol**" and then by hitting the  button.

All the Protocol information will be shown in the expandable panel "**Protocol Info**" (Please look at chapter 1.2.7.3 for a detailed description).

Now you are ready for take measurements and add them to the Protocol.

1.3.2 MANUAL MODE

In the Manual Mode there are again 2 ways to adjust the Pressure Chamber which are described in the following 2 subchapters.

After Adjusting the Chamber Pressure which is shown on the programs Main Screen, just hit the

 button. With this button you can immediately make a single **One point measurement** which will be added to the Certification protocol as one dataset.



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1.3.2.1 Adjusting the Pressure Chamber by the software

On the lower side of the Main screen the  and  buttons are displayed. With these buttons you can adjust the Chamber pressure **manually**. Once hit on one of these 2 buttons, the button stays pressed until you hit it again.

1.3.2.2 Adjusting the Pressure Chamber by the Manual Control Unit



Please hit the  button before using the **Manual Control Unit**.

The physically existing **Manual Control Unit** let you adjust the Chamber pressure manually by pushing the “UP”, “OPEN” and “DOWN” buttons. Please look at figure 17.

The buttons and their functions are described as following:

a.) UP:

Starts the Motor of the Pressure chamber for pumping air **into** the chamber and the Chamber pressure starts to get higher.

Be aware: Don't use this button, if the Chamber pressure is more than **50 hPa lower than the Ambient air pressure!** In this case use the OPEN button which will let enter the air without the Motor.

b.) OPEN:

Stops the Motor of the Pressure chamber and opens a magnetic valve in the **Table top housing** which equalizes the Chamber pressure to the Ambient air pressure after pushed long enough.

There are 2 cases:

- If the Ambient air pressure is **lower** than the Chamber pressure, then the air will **deflated out** of the chamber.
- If the Ambient air pressure is **higher** than the Chamber pressure, then the air will **enter into** the chamber.

c.) DOWN:

Starts the Motor of the Pressure chamber for pumping air **out of** the chamber and the Chamber pressure starts to get lower.

Be aware: Don't use this button, if the Chamber pressure is more than **50 hPa higher than the Ambient air Pressure!** In this case use the OPEN button which will deflate without the Motor.



Figure 17



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1.3.3 AUTOMATED MODE

The **Automated Mode** starts automatically, if you enter a Desired chamber pressure as described in chapter 1.2.5.7. After the Chamber pressure has been automatically adjusted to the Desired pressure, then the panel of the Actual pressure will brighten.



If you now just hit the **Snap** button, you can immediately make a single **One point measurement** which will be added to the Certification protocol as one dataset.



Figure 18

1.3.4 AUTOMATED TEST SERIES MODE

Before you start the **Automated Test Series Mode** you should first predefine Test series as described in chapters 1.2.7.2 and 1.2.7.2.1. After setting up the Replay properties as described in chapter 1.2.7.2.2 you



can start the **Automated Test Series Mode** by hitting the **Apply Test Series** button.

In this mode all Desired Chamber pressures will be adjusted automatically. After each Chamber pressure has been automatically adjusted to a Desired pressure, then the panel of the Actual pressure will brighten. Then, after the specified Delay time counted down to zero a single **One point measurement** which will be added to the Certification protocol as one dataset. The next Desired Chamber pressure from the list of the Predefined Test series will be adjusted and so on, until the end of the list.

When all automated Test series measurements has been finished, you can save the Protocol or print it out as described in the chapters 1.2.7.3, 1.2.7.3.1 and 1.2.7.3.2.



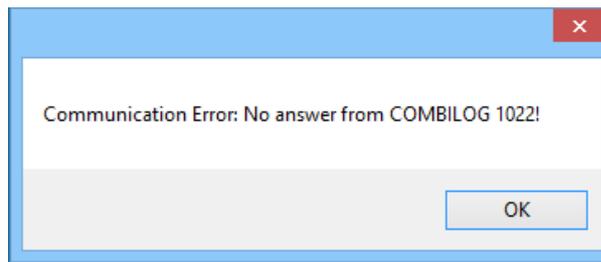
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2 PROBLEM HANDLING

2.1 COMMUNICATION

If the connection could not be established, the message "Communication Error: No answer from COMBILOG 1022"



will appear and the program is in offline mode. In this case you should make sure, that your notebook is not out of the WLAN range and the data logger is working and the communication cable between the WLAN router and the data logger is connected correctly.

In the editing field for "Static-IP No." the IP address of the Combilog should inputted.

You can try to reconnect by pressing the  key on the expanded Communication panel (see Figure 9).

The data will be updated at least one time per second, and the software indicates the communication by highlighting "**Combilog connected**".

In case of implausible or missing data "n.a." will be displayed on each sensors panel.



Figure 19

2.2 1100 hPa (UPPER LIMIT) AND 500 hPa (LOWER LIMIT)

If a value of 1100 hPa is desired, the pressure will rise above 1100 hPa for several times. These values above will not be indicated, as the reference does not send a signal. The air will be released and the pressure will be put in again from below 1100 hPa until the chamber pressure will be built-up again to 1100 hPa.

The same is for the Lower Limit. If a value of 500 hPa is designed, the pressure will fall under 500 hPa for several times. These value above will not be indicated, as the reference does not send a signal. The air will be released and the pressure will be put in again from below 500 hPa until the chamber pressure will be built-up again to 500 hPa.

2.3 CLOSING THE SOFTWARE

Press ESC and close App or just close with "X" (top right).