
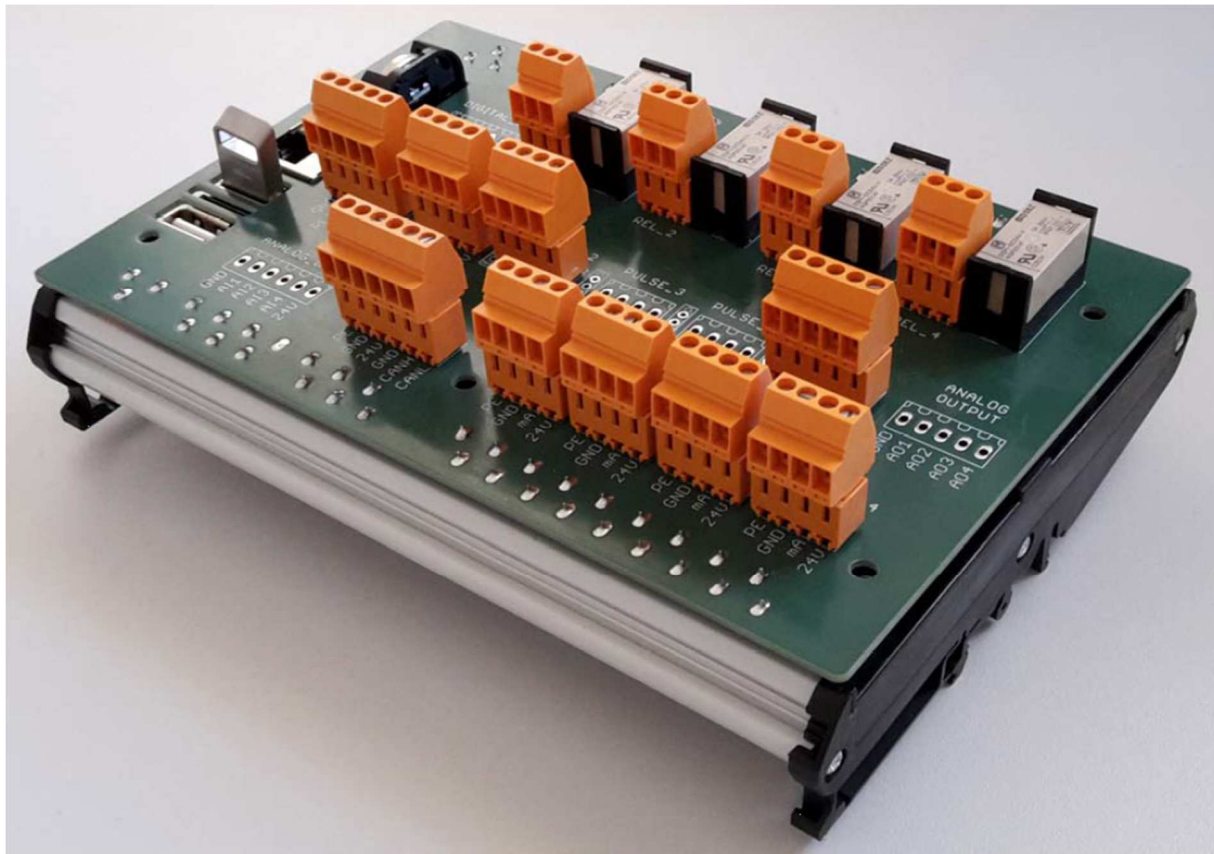



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DPGUARD®

silver



Filtration manager for automatic calculation of corrected differential pressure measurement in refuelling applications + control of associated additional devices like AFGUARD® free water sensor and Drainguard sump

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The DPGUARD® silver has been designed to give out corrected differential pressure values for all type of filter used in aviation refueling, bringing more safety aspects into refueling operations worldwide.

The DPGUARD® is a self-learning system, consisting of a fully automated touch minicomputer, integrated in a hard disk IP 65 Box (for wall mounting). It catches electronic signals from differential pressure sensors and related electronic flow signals to mathematically correct and calculate the related differential pressure functionality and give out corrected differential pressure values related to maximal / rated flow. There is no need of pre-configuration to special types of elements like Monitors, Coalescers, Micro filters, Clay – canisters etc.

It fully automatically detects the differential pressure behavior of the elements in use and gives out the most exact corrected differential pressure curve ever, closest to reality without test at test rig.

The differential pressure curve is always related to the actual differential pressure behavior of the elements in use. The mathematical functionality is independent of manufacturer or type of element. There is no need for calibration or adjustment to special type of filter element, based by the fully automated detection algorithm behind the DPGUARD®.

The DPGUARD® only needs to be configured to handle incoming signals from differential pressure sensors across the elements and related flow signals.

Additional hereto the user is asked to adjust warning and alarm levels to be informed if corrected differential pressure values are going to exceed predefined levels.

These warnings or alarms could be used to address digital output or Relays to automatically initiate relevant actions.

Due to the functionality of in built data logger the DPGUARD® is able to identify pressure increase or losses in differential pressure across the filter elements (e.g. pressure loss caused by ruptured filter elements) to automatically address digital output or relays to stop the fuelling process instantly without necessary human interference. All stored real as well as calculated differential pressure values together with status (ready, warning, alarm level) gives the highest level of documentation ever.

Beside DPGUARD®'s main function to calculate corrected differential pressure values – the DPGUARD® can also be used to remind about time or throughput related end criteria of filter elements. This could be helpful if lifetime related filter exchange should be done e.g. for Monitor filters (1 year lifetime). It also fulfills the ATA 103 requirement of recorded throughput of elements at time of inspection or change out.

For instant overview about the filter behavior - it gives out the stored corrected differential pressure curve as a graph to get an idea about the behavior of installed filter elements.

In addition to this main functionality the DPGUARD could be connected to the AFGUARD® free water sensor to receive inline measurement signals about actual content of free water and to give out actual and average water quantity in relation to the actual fuelling step.

DPGUARD® has a very wide range of connectivity to be integrated in every known system via current (0 /4 ... 20 mA), voltage (0 to 10 V), LAN, WLAN, Ethernet, CAN-BUS or other types of bus systems.


DPGUARD silver should be installed in a hard box for safe area or hazardous area location.

Contact address of manufacturer: FAUDI Aviation Sensor GmbH Scharnhorststrasse 7 B D- 35260 Stadtallendorf Germany	Telefon: +49 6428 4465 - 275 Fax: +49 6428 4465 - 221 Mail: Sensor@faudi-aviation.com Web: www.faudi-aviation.com
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Safety instructions

This manual provides operation and routine maintenance instructions for the FAUDI Aviation DPGUARD® Filtration managing system.

Read this manual and ensure that you fully understand its content before you attempt to install, use or maintain the DPGUARD®.

Important safety information is highlighted in this manual as WARNINGS and CAUTIONS.

The DPGUARD® is a fully automated computerized device to catch up measured signals from differential pressure measurement across filter elements and related flow signals. It's intention is to give out most exact calculated corrected differential pressure values together with related warning or alarm status or output signals for safe operation during refuelling or filtering steps in Aviation industry.

Work on electrical equipment is to be conducted by trained specialists only, according to valid regulations.

Attention must be paid to the requirements of VDE 0100 when setting up high-power electrical units with nominal voltages of up to 1000V, including associated standards and stipulations.

Check the details on the type plate to ensure that the equipment is connected to the correct mains voltage.

Protect against touching dangerously high electrical voltages. Before opening the equipment, it must be switched off and hold no voltages. This also applies to any external control circuits that are connected.


The equipment is only to be used within the permitted temperature and operation ranges.

Check that the location is weather-protected. It is recommended that the DPGUARD® should not be exposed to either direct rain or moisture.

Installation, maintenance, monitoring and any repairs may only be conducted by authorised personnel with respect to the relevant stipulations.

All changes of the standard DPGUARD® with parts which are not specified or approved by FAUDI Aviation Sensor GmbH, as well as repair and service with unspecified parts will result in loss of the CE conformity and guarantee.

In case of doubt, please turn directly to FAUDI Aviation Sensor GmbH, respectively to your FAUDI Aviation Distributor or Service organisation.

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1.1 Designated use

The DPGUARD® is suitable for continuous operation during refuelling or filtering steps in the aviation industry. It's intention is to catch up electrical signals coming from electrical sensors to detect pressure flow and water content values. These signals are evaluated and recalculated to give out corrected differential pressure values related to filter elements in use and their actual filtering behaviour together with actual and averaged free water level. If the filter elements are exposed to higher levels of differential pressure / flow velocity and/or related corrected differential pressure than intended, Relays for alarm or warning could be addressed. The integrated data logger stores all measured data along the whole life of filter elements installed. Additionally hereto it provides the functionality to detect and give out warning or alarm status if drops in corrected differential pressure values are detected.

The manufacturer is not liable for damages caused by improper or non-designated use.

1.2 Installation, commissioning and operation

Please refer to installation manual for cabling and mechanical setup of DPGUARD®
Note:

Installation, electrical connection, commissioning, operation and maintenance of the measuring system must only be carried out by trained technical personnel.

The technical personnel must be authorised by the system operator to conduct the specified activities.

Technical personnel must have read and understood these Operating Instructions and must adhere to them.

Before commissioning the entire measuring point, check all the connections for correctness. Ensure that electrical cables are not damaged.

Do not operate damaged products and secure them against unintentional commissioning. Mark the damaged product as being defective.

Measuring point faults may only be rectified by authorised and specially trained personnel. If faults cannot be rectified, the products must be taken out of service and secured against unintentional commissioning.

Repairs not described in these Operating Instructions may only be carried out by manufacturer or by a designated service organisation.

1.3 Operational safety

The DPGUARD® has been designed and tested according to the state of the art and left the factory in perfect functioning order.

Relevant regulations and European standards have been met.

As the user, you are responsible for complying with the following safety conditions:

Installation instructions

Local prevailing standards and regulations.

1.4 Return

If the device requires repair, please send it in cleaned condition to the appropriate sales centre. Please use the original packaging, if possible.

! Note!

When sending for repair, please enclose a note with a description of the error and the application.

1.5 Notes on safety icons and symbols



Warning!

This symbol alerts you to hazards. They can cause serious damage to the instrument or to persons if ignored.



Caution!

This symbol alerts you to possible faults which could arise from incorrect operation. They could cause damage to the instrument if ignored.



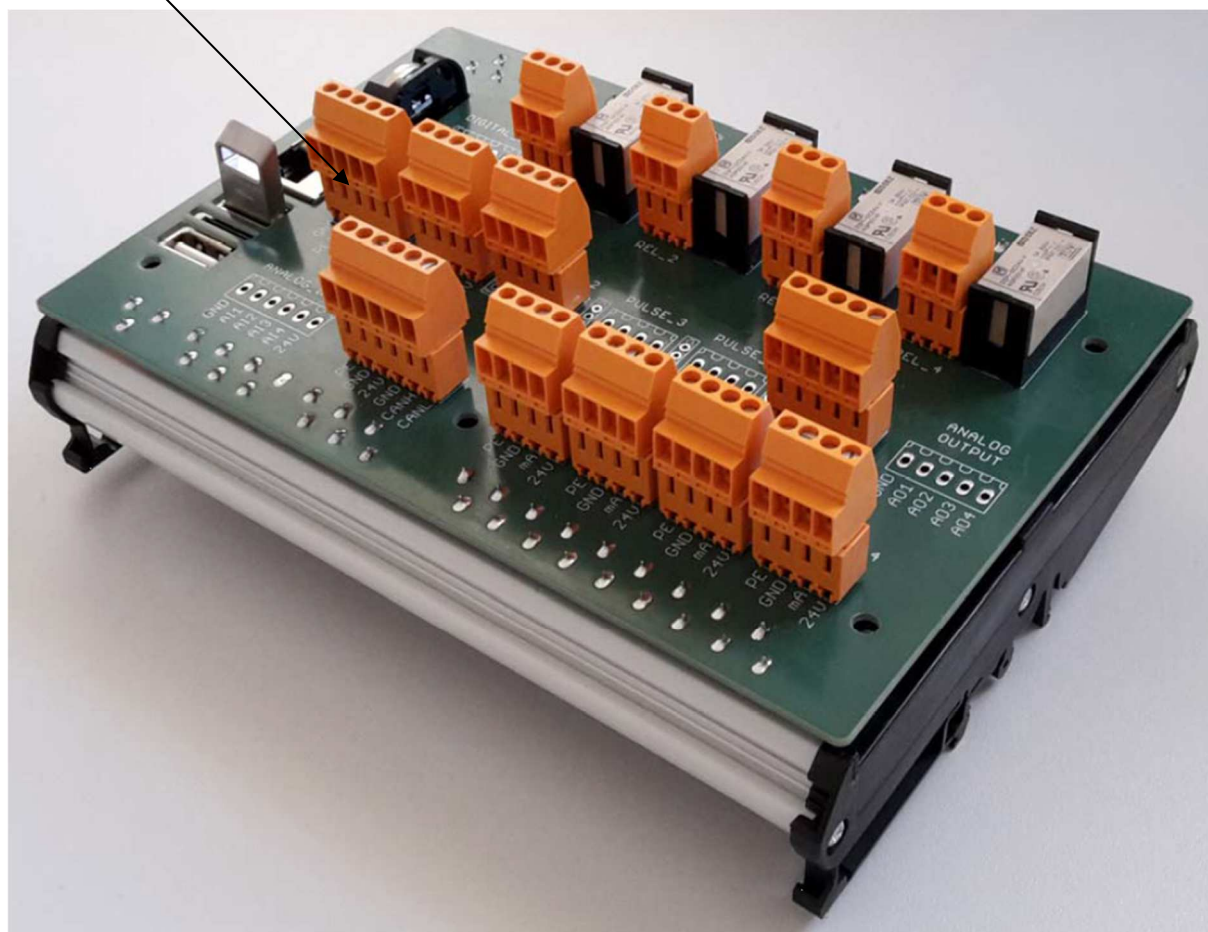
Note!


This symbol indicates important items of information.

2 Identification

The DPGUARD® is marked with the following, permanently identification marking.

DPGUARD®



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3 Operation

The DPGUARD® is a self-learning fully automated minicomputer. Its main function is to

Catch signals coming from

- electronic sensors for differential pressure and flow signal to give out corrected differential pressure, detect sudden drops in differential pressure and indicate when certain alarm or warning levels are reached or increased.
- AFGUARD free water sensor to give out actual content of free water in Fuel and calculate for average free water level by the use of existing flow signal.
- Operate the DRAINGUARD sump assembly to automatically drain water in filter vessels, sumps or other low points

3.1 Start of DPGUARD®

3.1.1 Pre configured version

DPGUARD silver can be preconfigured on request to enable quick installation and fast setup and start of application.

Setup and start using Webvisu

Due to the fact that DPGAURD silver does not have a screen like DPGUARD gold – all menus could only be addressed when connected to a computer device by the use of a cross link cable. You than have to address “webvisu” to go online

3.1.2 Connection of DPGUARD silver to computer devices for installation and setup

- You need to run JAVA software on your computer
- You need to adjust the tCP/IP protocol to connect to the dPGUARD device
- You should connect by the use of Internet Explorer

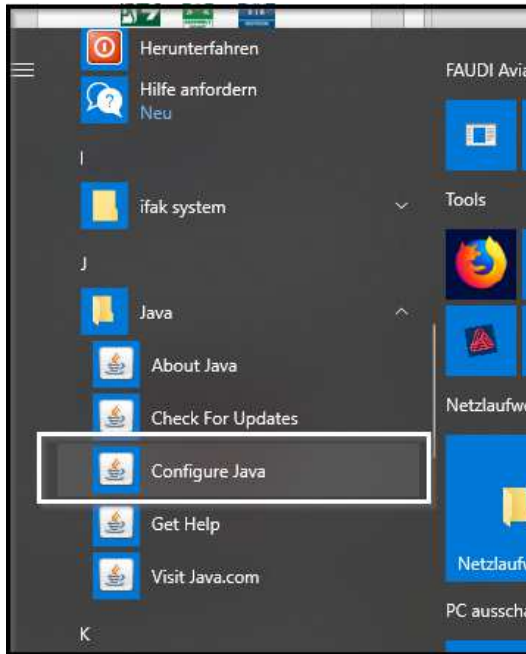
3.1.2.1 Download software

First ensure to have **Internet Explorer** running on your computer – Firefox does not work properly.

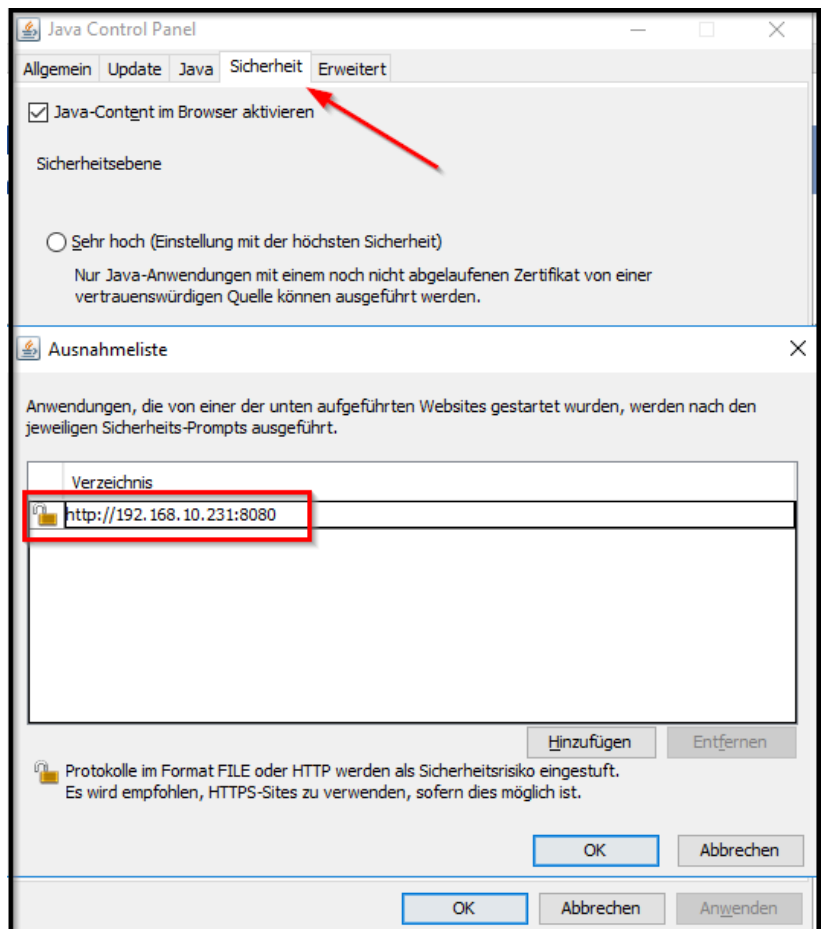
Download and install **JAVA** for internet Explorer



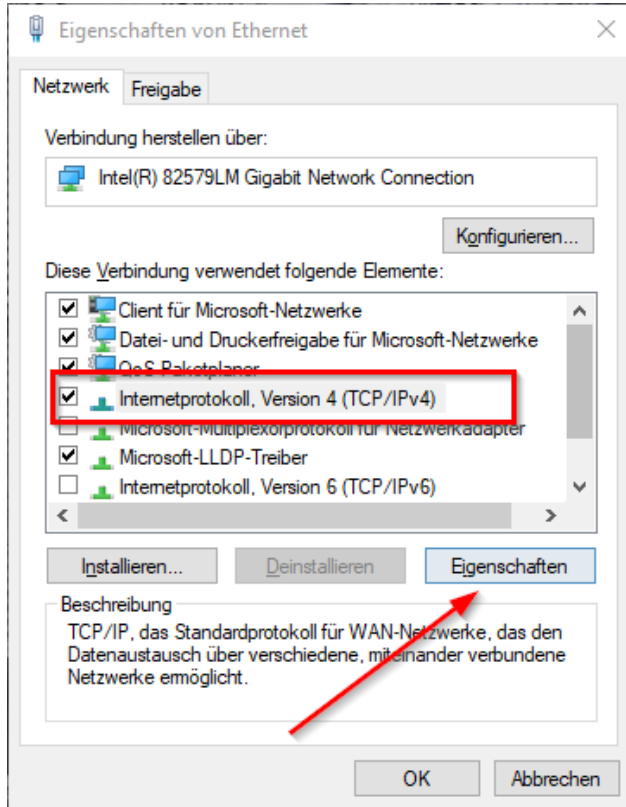
Configure Java open Applications / Programms:



- Open "Security"
- Click on Adjust Sidelist
- Click on "Add"
- Type in <http://192.168.10.231:8080> and click "ok"
- Close JAVA with OK



Open the settings of your Ethernet connection

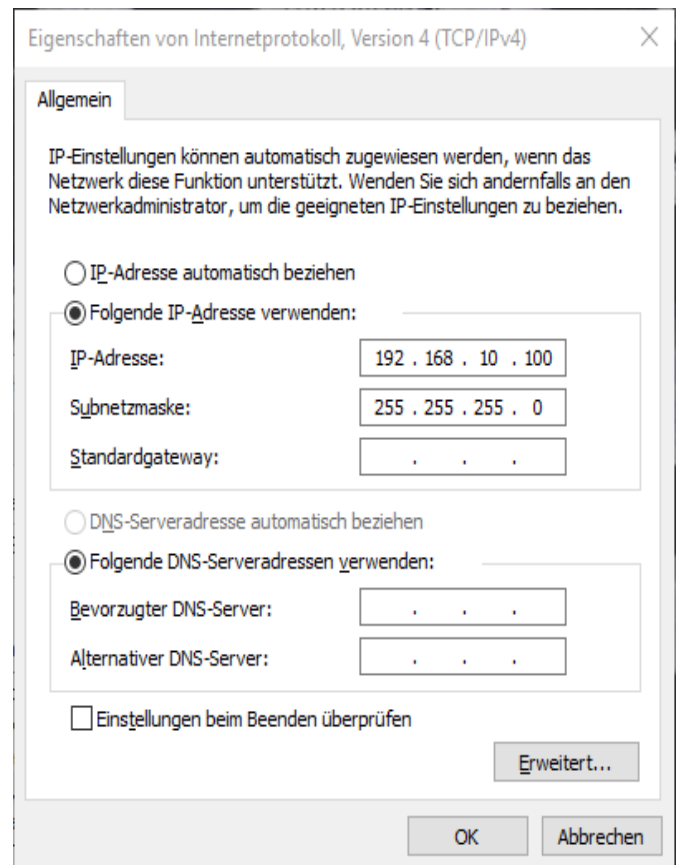


Choose version 4 (TCP/IPv4) Internet protocol

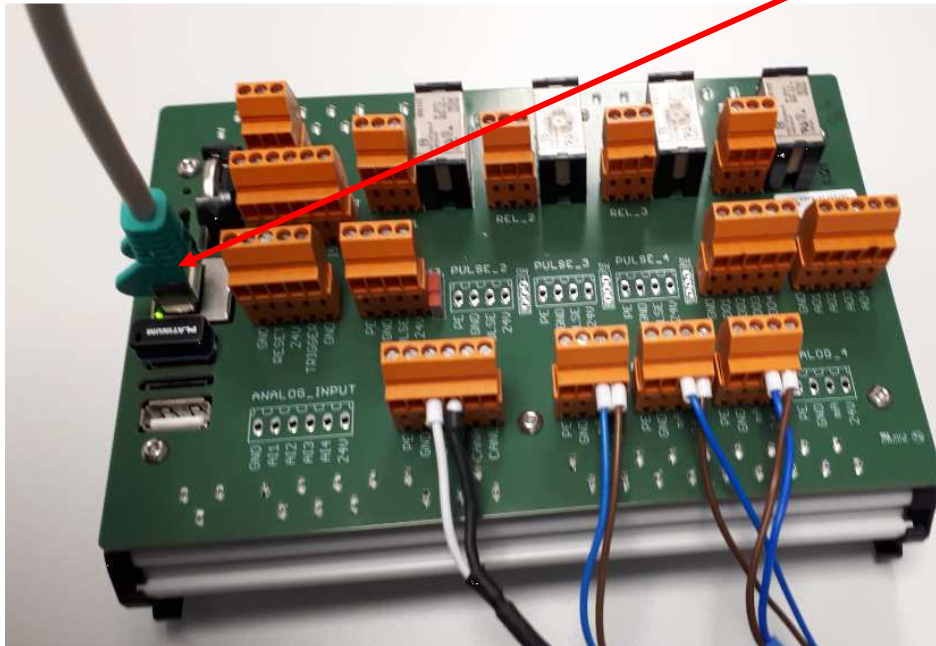
Click on properties

Note the original settings e.g. by screenshot and carefully save the original information to set back your computer when finished with the DPGUARD settings

- Change IP address to 192.168.10.100
- Subnet should be 255.255.255.0
- Delete gateway settings
- Delete DNS settings
- Settings should be in accordance to the right picture
- Press "OK"



Connect your laptop / computer to the controller by the use of a crosslink cable (Ethernet crosslink)



- Start Internet Explorer (please only Internet Explorer (Mozilla does create problems))
- Type in <http://192.168.10.231:8080/webvisu.htm>
- Allow all upcoming questions

Following screen should appear (controller must be powered on!)



3.1.3 Settings of DPGUARD

Set the DPGUARD® under power (24 VDC) and go online (previous chapter)
 After successful booting the main screen should appear.

Status: o.k.		26.01.12 15:04:23	
flow rate	total quantity		Info
629 l/min	31932 l		
pressure monitoring			Setup
measured pressure	corrected pressure		
0.102 bar	0.40 bar		
free water detection			Filterstatus
measured water	average		
8.2 ppm	8.3 ppm		

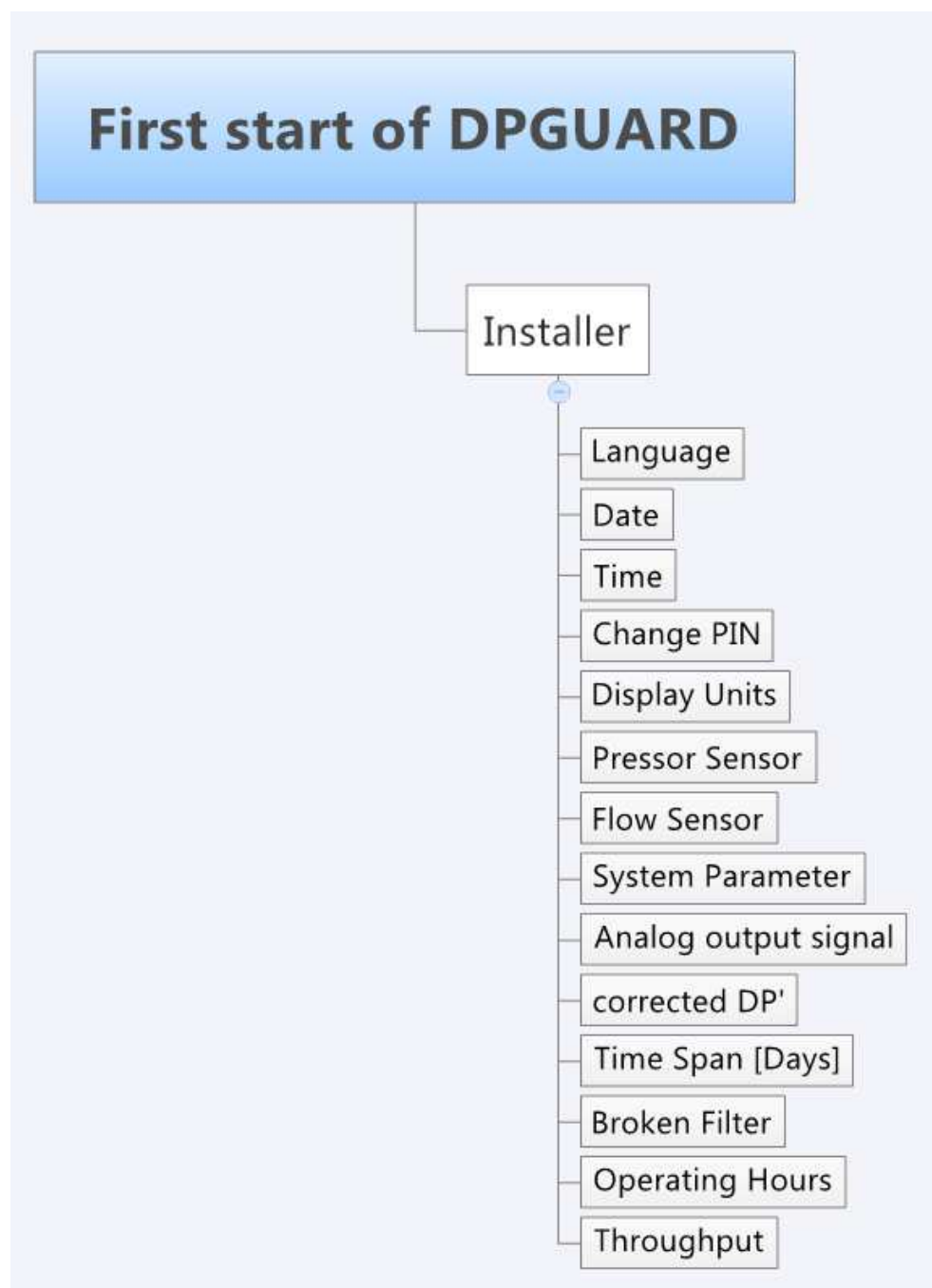
For first Installation of DPGUARD® – a configurator appears that guides you through the configuration menu.

This subroutine could be called when ever you go into the setup menu to enter the Installer (see Chapter 3.2 Installer).

3.2 Installer

It is recommended to go through the configurator (Installer) that appears during first installation of the DPGUARD.

Following sub menus are addressed during this auto configuration routine:



The Installer should be used for first installation of DPGUARD®. The Installer guides you through the setup menu.

The Installer has been created to guide you through first setup of DPGUARD® and associated signal input and output.

3.2.1 Manually start of the Installer

In cases where you want to manually start the Installer – please go on main screen and press the **Setup** button:

Status: o.k.		26.01.12 15:04:23	
flow rate	total quantity		
629 l/min	31932 l		Info
pressure monitoring			Setup
measured pressure	corrected pressure		
0.102 bar	0.40 bar		
free water detection			
measured water	average		Filterstatus
8.2 ppm	8.3 ppm		

You will be asked to enter your PIN.

3.2.1.1 PIN number – Entering the DPGUARD® Setup Menu

You are asked to give in your PIN number (1 2 3 4 5 6 7 8):

Following PIN numbers are preconfigured:

Administrator – PIN level: 12345678

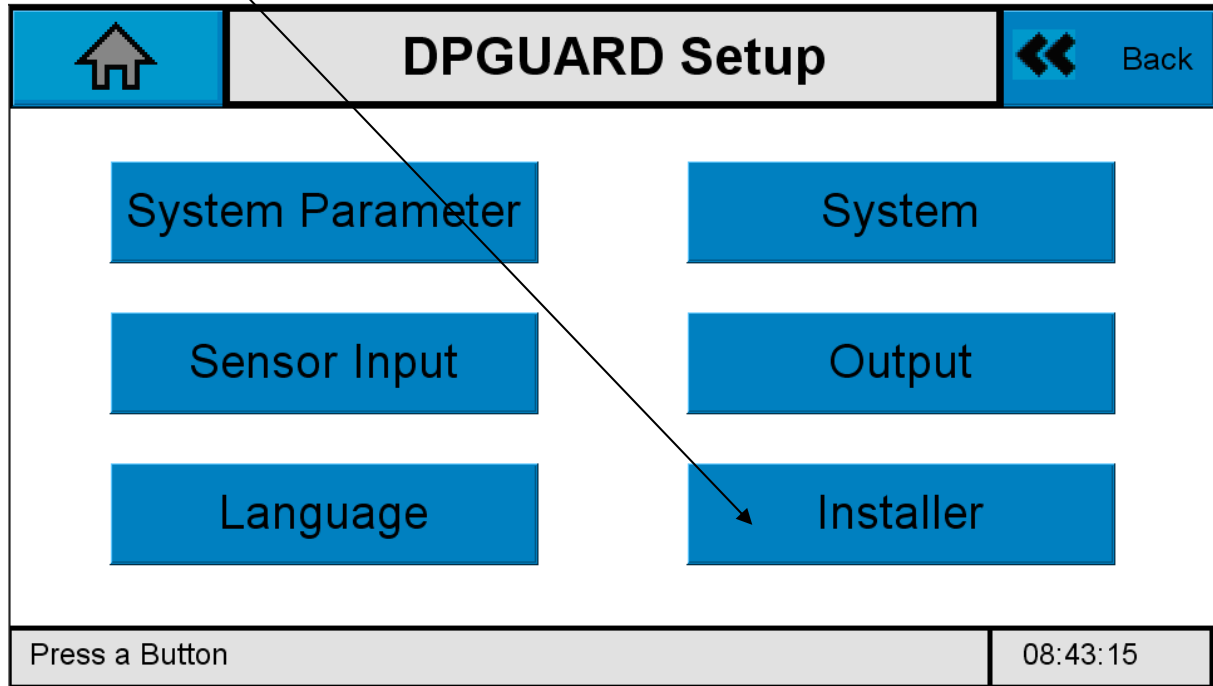
User – PIN level: 00000000

Please type in Administrator PIN number or USER PIN number and press **Enter**.

Now you are in **DPGUARD® Setup** mode.

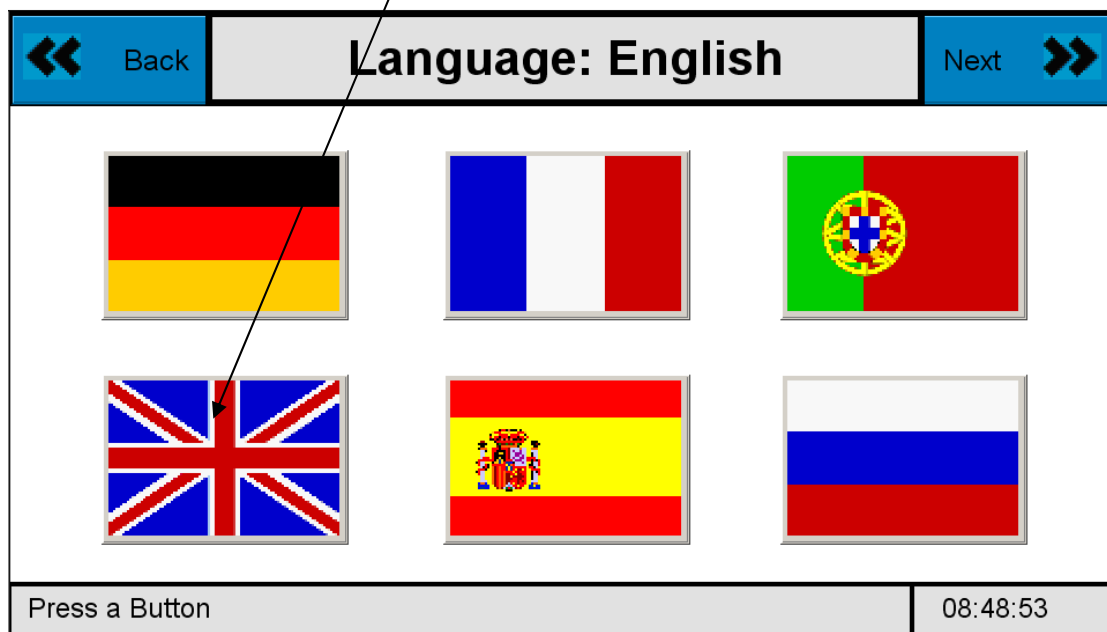
3.2.2 Installer mode to start DPGUARD adjustment

Press the **Installer** button to enter the Installer menu



3.2.2.1 Language – selection of language to be used

First screen in Installer Setup Menu is the menu to select the Language. Selected Language is shown in Header (here it is English):

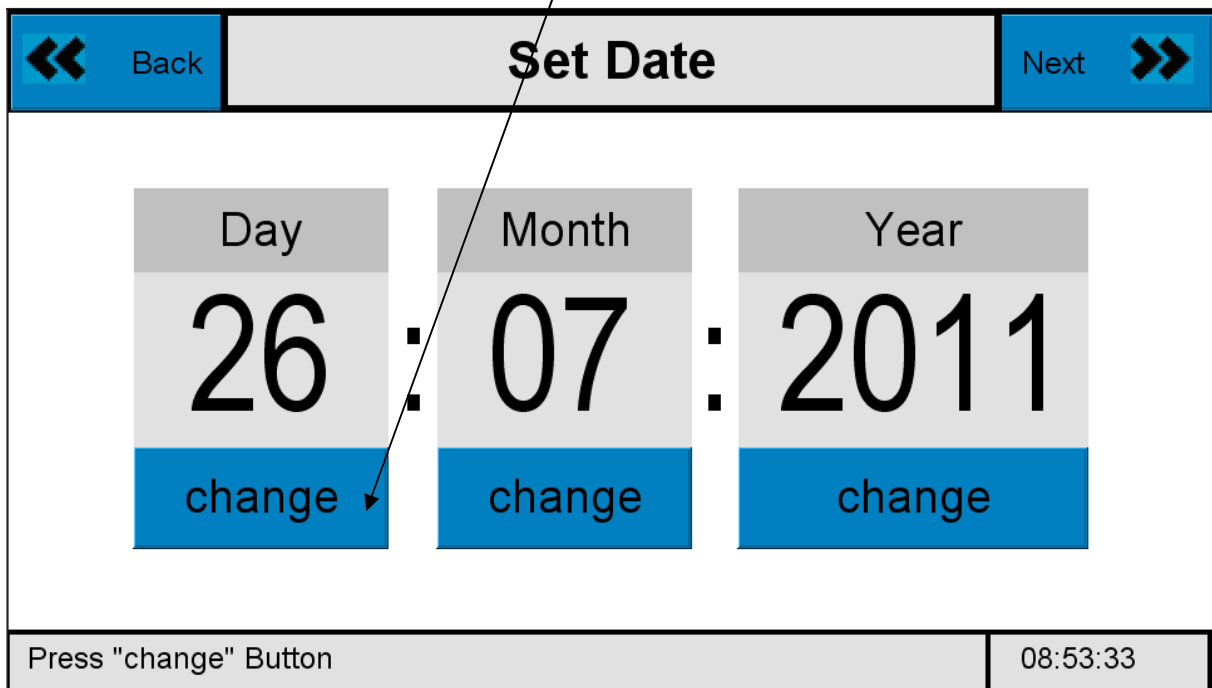


To change language – click it on. Than press the **Next >>** button to enter next menu step or go back to previous menu with the **<< Back** button. Same procedure for any other settings.



3.2.2.2 Date settings






Next menu is to **Set Date**. Click on **Change** button of **Day**, **Month** or **Year** to change date:



You will enter the **Day Setting**, **Month Setting** or **Year Setting** menu:
Type in number of Day, Month or Year and press **Enter**:

3.2.2.2.1 Day - set up the day

Enter this menu to set up the day (Set day).

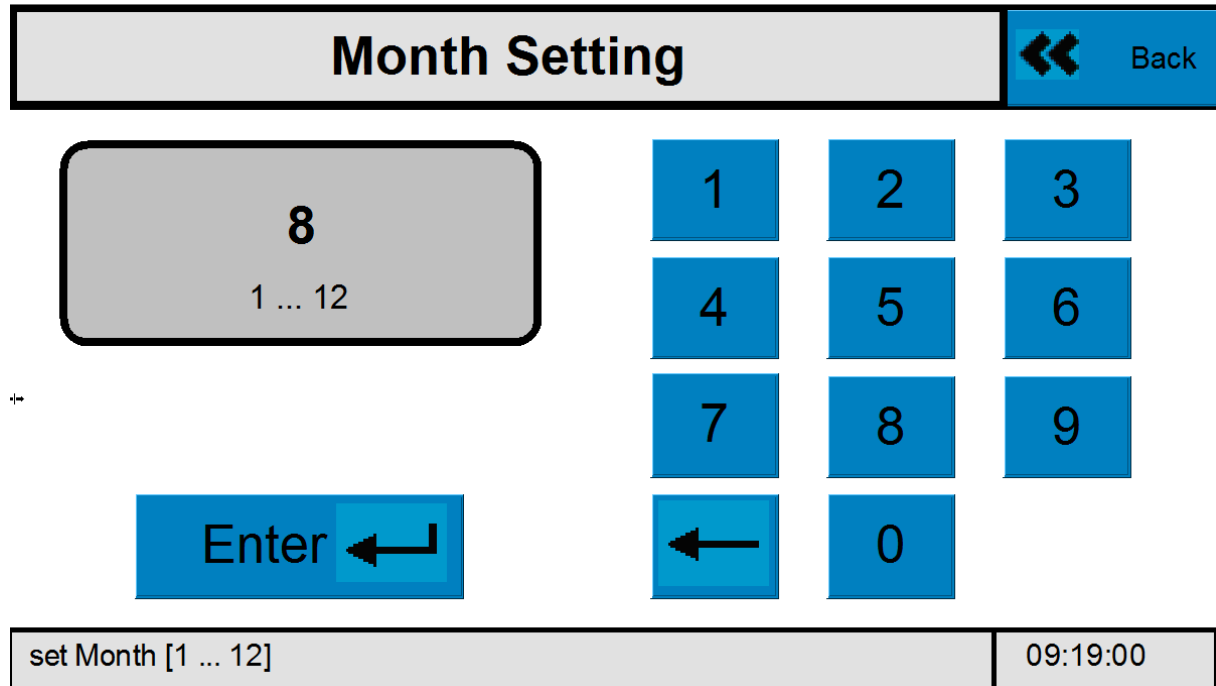
Day Setting		 Back												
<div style="border: 2px solid black; border-radius: 15px; padding: 10px; width: 150px; margin: 0 auto;"> <p style="font-size: 24px; margin: 0;">26</p> <p style="margin: 0;">1 ... 31</p> </div>	<table border="1" style="margin: 0 auto;"> <tr><td>1</td><td>2</td><td>3</td></tr> <tr><td>4</td><td>5</td><td>6</td></tr> <tr><td>7</td><td>8</td><td>9</td></tr> <tr><td></td><td>0</td><td></td></tr> </table>	1	2	3	4	5	6	7	8	9		0		<div style="border: 1px solid black; background-color: #0070C0; color: white; padding: 5px; display: inline-block;"> Enter  </div>
1	2	3												
4	5	6												
7	8	9												
	0													
set day [1 ... 31]		08:57:37												

Please type in day (e.g. 26 for the 26th of ...) and press the **Enter** button.

You will always come back to the **Set Date** menu.

Now choose change Month or Change year button to adjust date for Month or Year.

3.2.2.2.2 Month settings – set up the month



Please type in the number for month (Month setting) and save it by pressing the **Enter** button

3.2.2.2.3 Year setting – set up the year

Year Setting

◀ Back

11

11 ... 99

1	2	3
4	5	6
7	8	9
←	0	

Enter →

set Year [11 ... 99]

09:19:25

Please type in the number for „Year“ and save it by pressing the **Enter** button.
Choose **Next >>** button to enter next menu step where you are asked to **Set Time**.

3.2.2.3 Time settings – set time

Click on **Change** button for **Hour**, **Minute** or **Second** to set time:

◀ Back


Set Time

Next ▶

<div style="background-color: #ccc; padding: 5px; margin-bottom: 5px;">Hour</div> <div style="font-size: 48px; margin: 0;">09</div> <div style="background-color: #0070C0; color: white; padding: 5px; border-radius: 5px; margin-top: 5px;">change</div>	:	<div style="background-color: #ccc; padding: 5px; margin-bottom: 5px;">Minute</div> <div style="font-size: 48px; margin: 0;">03</div> <div style="background-color: #0070C0; color: white; padding: 5px; border-radius: 5px; margin-top: 5px;">change</div>	:	<div style="background-color: #ccc; padding: 5px; margin-bottom: 5px;">Second</div> <div style="font-size: 48px; margin: 0;">54</div> <div style="background-color: #0070C0; color: white; padding: 5px; border-radius: 5px; margin-top: 5px;">zeroize</div>
---	---	---	---	--

Press a Button

09:03:54

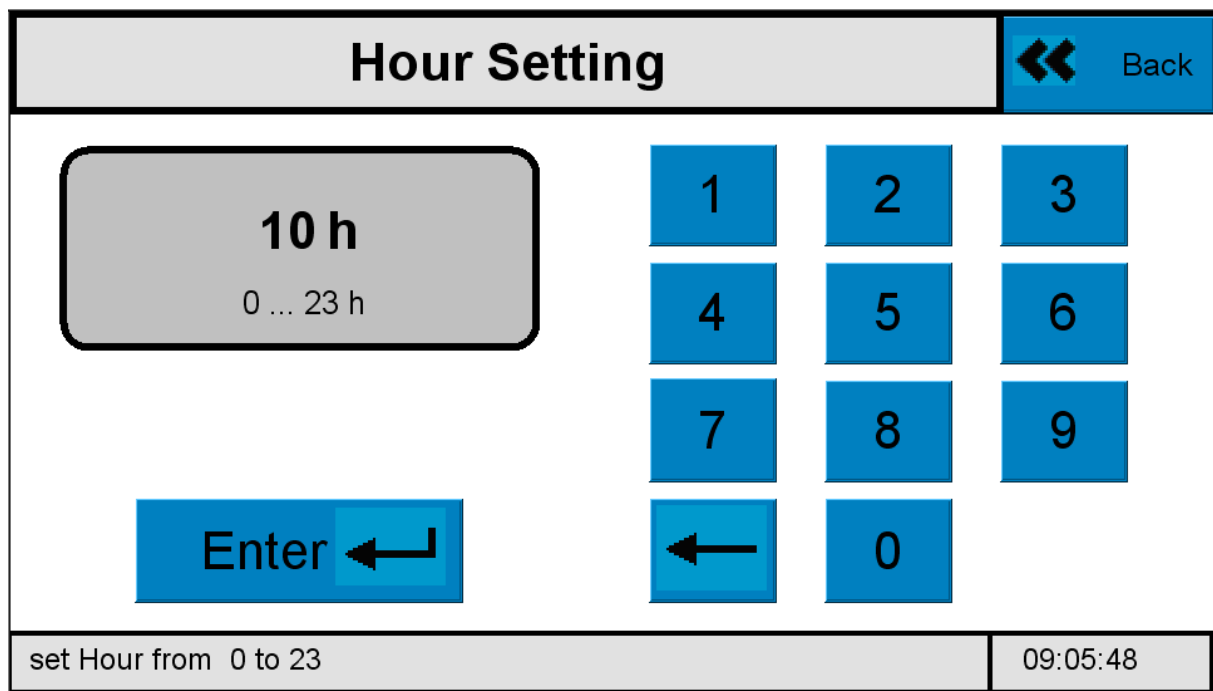
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You will enter the **Hour Setting**, **Minute Setting** or **Second Setting** menu:
Type in number of Hour or Minute and press **Enter**.

You will always come back to the **Set Time** menu.
Now choose the change button for Hour or Minute button to adjust time.

3.2.2.3.1 Hour setting – set up the hour

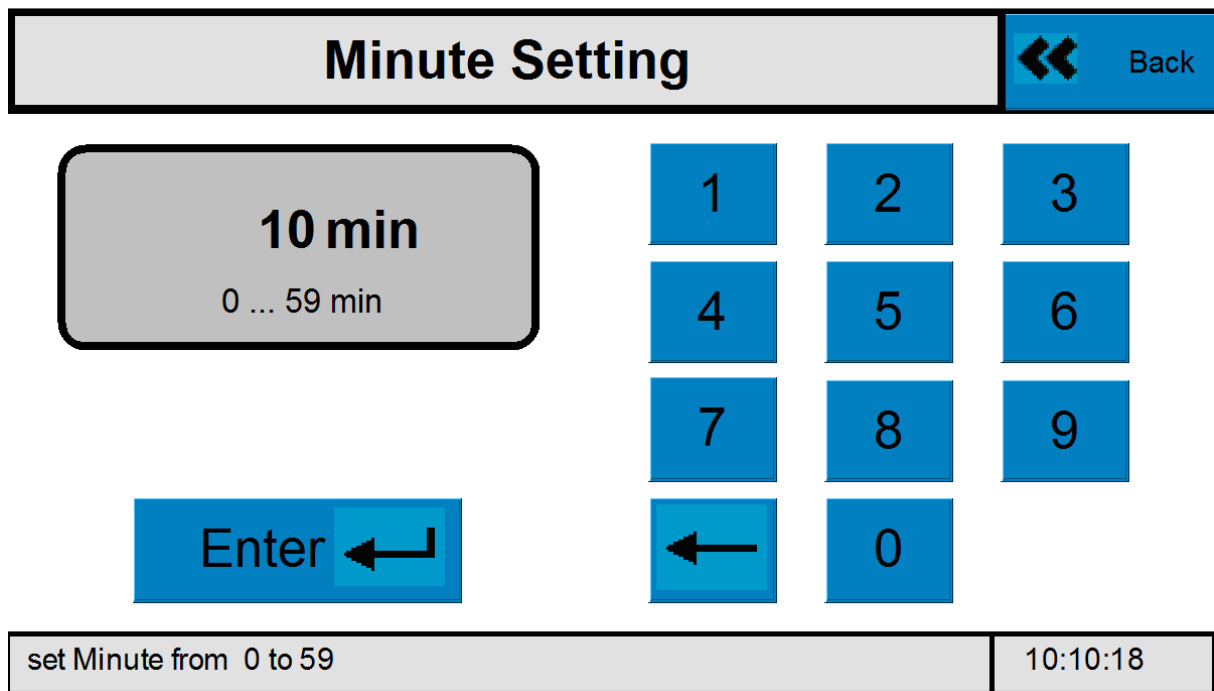
After pressing the **change** button in Set Time menu – you are entering the **Hour Setting** menu to set up hour for real time clock



Please type in the number of hours (e.g. 10 for 10 am) and press Enter.
 You will come back to the **Set Time** menu to adjust Minutes or seconds.

3.2.2.3.2 Minute setting – set up minutes

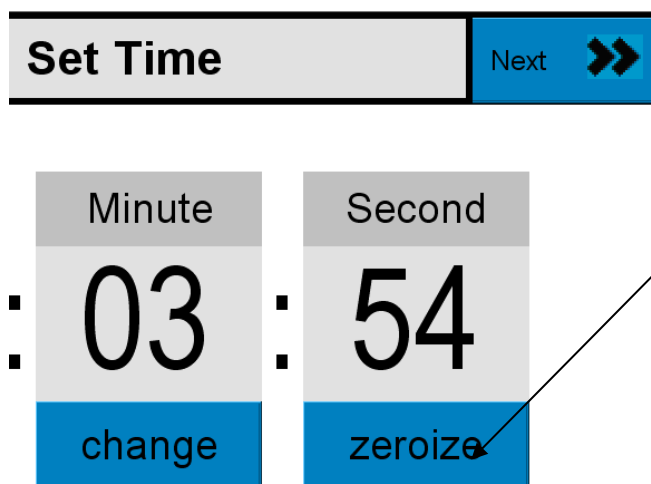
To change minutes please enter the minutes setting menu by pressing the change button. You are requested to type in actual time in minutes and save it by pressing the **Enter** key.



You will always come back to the **Set Time** menu.

Now set up seconds or choose **Next >>** button to enter next menu step.

3.2.2.3.3 Seconds setting – set up the seconds

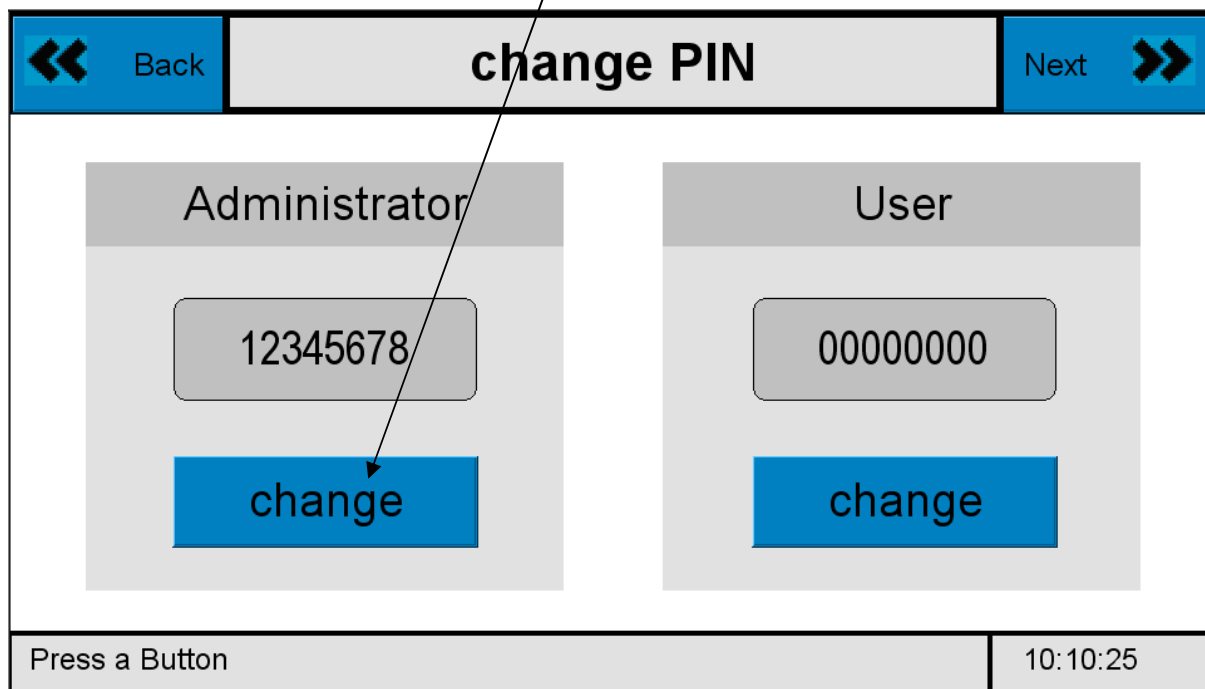


To change Seconds – or set it to zero – please **zeroize** it using the **Set Time** menu when it should be “0” by pressing the **zeroize** button.

Choose **Next >>** button to enter next menu step.

3.2.2.4 Change PIN number - password

Next menu is to **change PIN**. Click on **Change** button of **Administrator** or **User** to set new PIN numbers:



Following PIN numbers are preconfigured:

Administrator – PIN level: 12345678
User – PIN level: 00000000

Make sure to remember changed PIN numbers. In cases of loss of changed PIN numbers only FAUDI Aviation Sensor GmbH is able to reconfigure.

Type in new PIN number (e.g. 87654321) and press **Save** button to store it.

3.2.2.4.1 PIN – Insert new PIN

Change PIN number with **insert PIN** menu:

insert PIN

Back

87654321

1

2

3

4

5

6

7

8

9

0

CLR

Save

insert your PIN

10:13:42

You should see it changed on next screen:

Back

change PIN

Next

Administrator

87654321

change

User

00000000

change

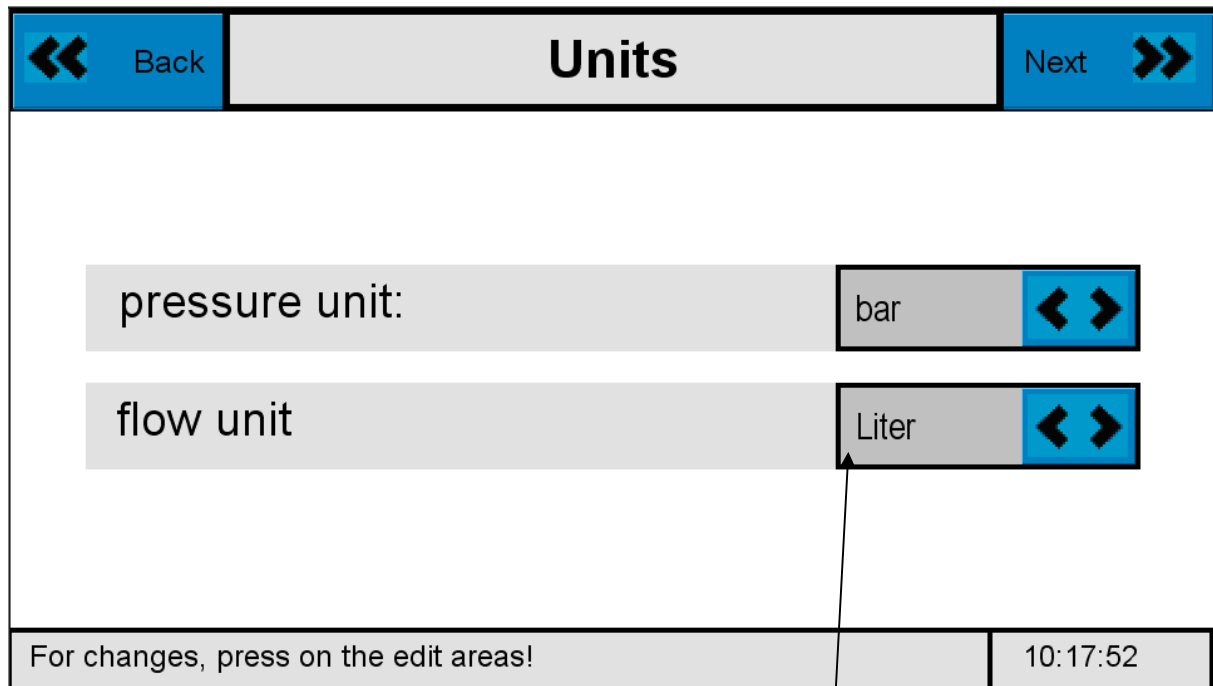
insert your PIN

10:16:01

Please follow the same procedure to change the USER PIN level.

3.2.2.5 Units – change units

Choose **Next >>** button to enter next menu step **Units** where you are asked to define measuring units for pressure and flow.



Pressure units: You can choose between:

- bar
- psi or
- kPa

and for flow units between:

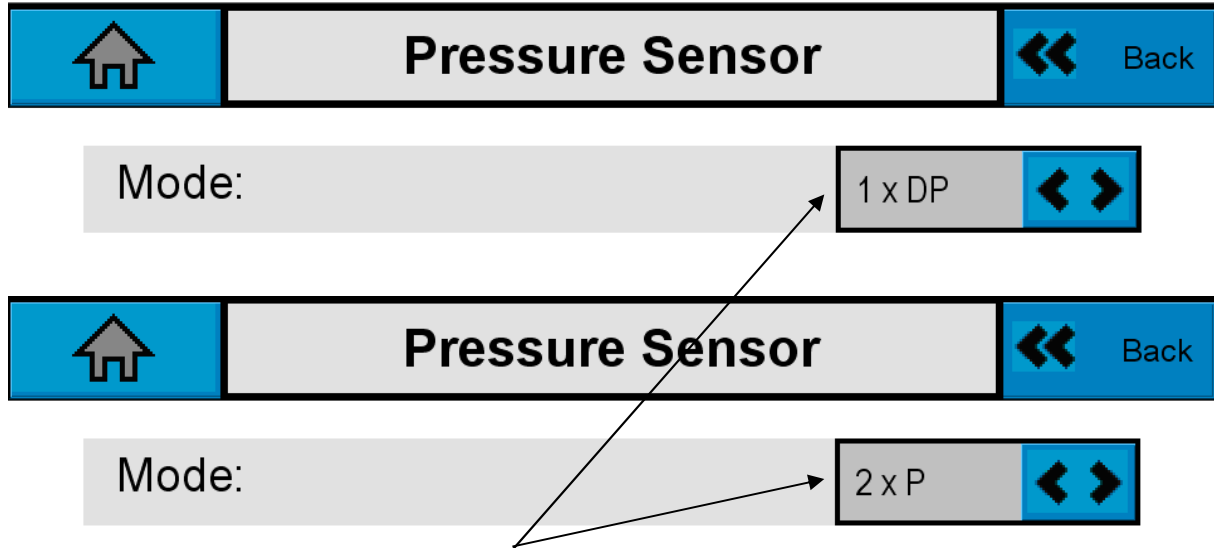
- Liter
- US gallon or
- m³/h

Choose units to be changed by clicking and selecting the **grey unit** field.

Choose **Next >>** button to enter next menu step where you are asked to select the specific type of **Pressure Sensor** in use:

3.2.2.6.1 Pressure sensor – mode selection

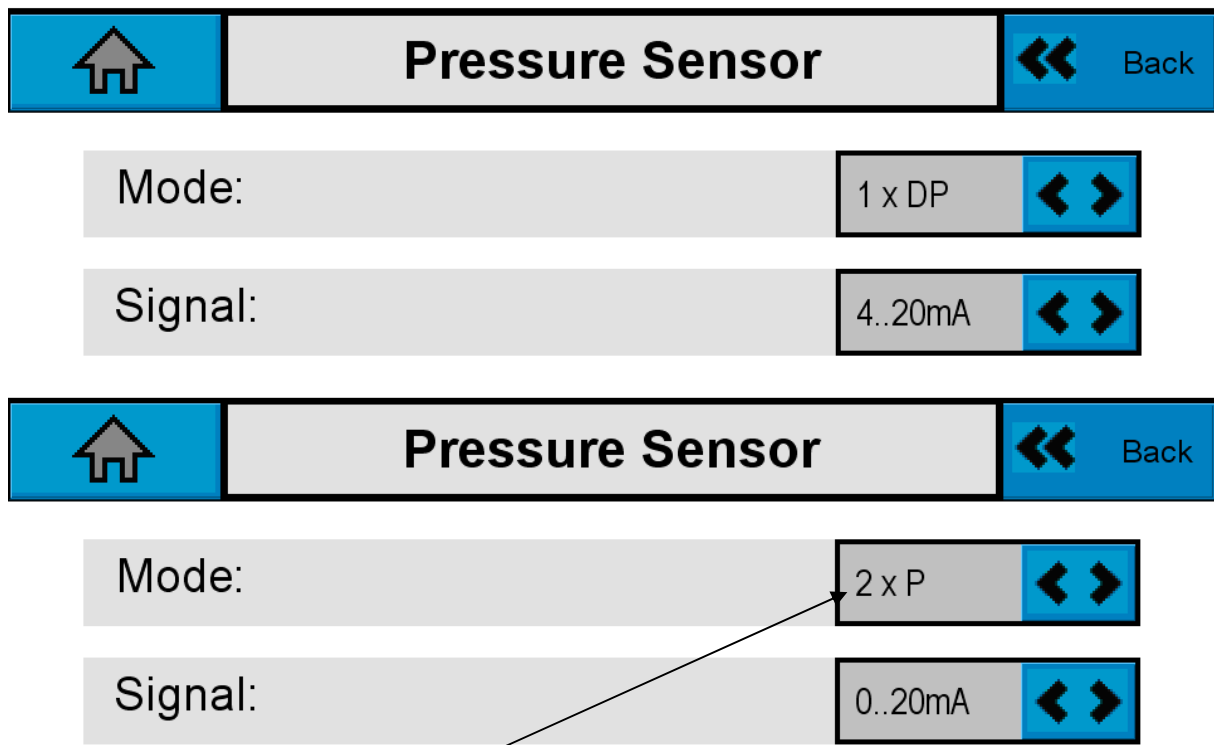
Clicking on the mode selection field – two different modes for operation could be selected:



① - Press to change between different modes of pressure sensors

Changes are automatically saved.

3.2.2.6.2 Pressure sensor – signal adjustment



①

Signal adjustment should be checked in every case to make sure that sensor signals are set up correctly.

3.2.2.6.3 Pressure sensor – pressure range

To change the max. range of pressure sensor please click on the blue highlighted max. pressure range field to enter max. range of pressure sensor menu:

max. range of pressure sensor	Back												
<div style="border: 2px solid black; border-radius: 15px; padding: 10px; width: fit-content; margin: 0 auto;"> <p style="font-size: 24px; margin: 0;">2.0 bar</p> <p style="margin: 0;">0.5 ... 10.0 bar</p> </div>	<table style="margin: 0 auto;"> <tr> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">1</td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">2</td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">3</td> </tr> <tr> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">4</td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">5</td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">6</td> </tr> <tr> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">7</td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">8</td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">9</td> </tr> <tr> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;"></td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">0</td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">.</td> </tr> </table>	1	2	3	4	5	6	7	8	9		0	.
1	2	3											
4	5	6											
7	8	9											
	0	.											
<div style="background-color: #0070C0; color: white; padding: 5px; display: inline-block;"> Enter </div>													
Enter a number within the range limits	13:37:23												

Type in respective pressure range (should be mentioned on name plate of pressure sensor or calibration protocol of last inspection / calibration for pressure transmitter) and press **Enter** button.

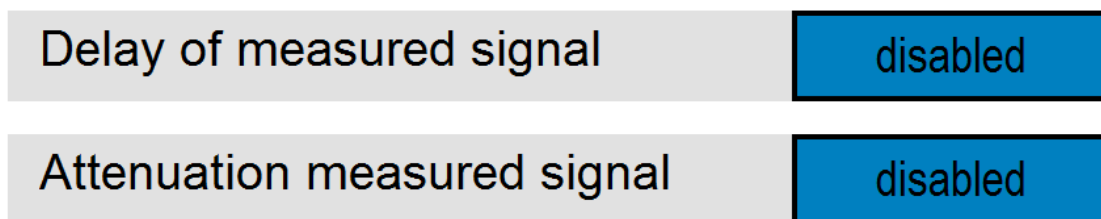
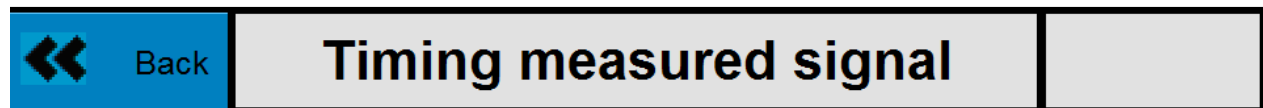
The maximum pressure range of sensors should be in the range of 0.5 to 10 bar or 10 to 150 psi (related to the units).

If max values do not fit your needs please contact FAUDI Aviation Sensor GmbH to adapt for your process.

3.2.2.6.4 *Change of delay / average of pressure sensors*

To change Delay / Average click on the blue highlighted Delay/Average field to enter

Attenuation of the measured signal change menu:



For changes, press on the edit areas!	13:39:23
---------------------------------------	----------

You can choose between delay and attenuation of signal to synchronize flow and dp signal as good as possible.


Delay of signal: Possibility to use original signal behaviour with user defined delay time. There will be no averaging of signals – only time delay.

Attenuation of measured signal: Reduces signal peaks by averaging the signals to reduce peaks and fluctuation of signals. Average time should be adjusted here.

Preconfiguration for both cases is “disabled” under normal situations.

In cases where you are not sure if signals of differential pressure and flow sensors are ok or not – go into service settings and do signal analysis (see service manual for signal setup).

3.2.2.6.4.1 Delay of measured signal:








Delay of measured signal		 Back												
disabled 0.1 ... 60.0 sec	<table border="1"> <tr><td>1</td><td>2</td><td>3</td></tr> <tr><td>4</td><td>5</td><td>6</td></tr> <tr><td>7</td><td>8</td><td>9</td></tr> <tr><td>←</td><td>0</td><td>.</td></tr> </table>	1	2	3	4	5	6	7	8	9	←	0	.	
1	2	3												
4	5	6												
7	8	9												
←	0	.												
<table border="1"> <tr><td>disable</td></tr> <tr><td>Enter ←</td></tr> </table>	disable	Enter ←												
disable														
Enter ←														
Enter a number within the range limits		15:56:31												

Delay times are intended to synchronize signals for different sensors that should be analyzed at the same time. Signal behavior highly depends on electronics and presetting of sensors in use.

You are asked to enter delay times in between 0.1 to 60 seconds. You can also disable the function.

Press the **Enter** button to save and leave this menu to enter Attenuation submenu or go to flow sensor menu.

3.2.2.6.4.2 Attenuation of measured signal

Attenuation measured signal		 Back												
<p>disabled</p> <p>0.1 ... 10.0 sec</p>	<table border="1"> <tr><td>1</td><td>2</td><td>3</td></tr> <tr><td>4</td><td>5</td><td>6</td></tr> <tr><td>7</td><td>8</td><td>9</td></tr> <tr><td></td><td>0</td><td>.</td></tr> </table>	1	2	3	4	5	6	7	8	9		0	.	
1	2	3												
4	5	6												
7	8	9												
	0	.												
<table border="1"> <tr><td>disable</td></tr> <tr><td>Enter </td></tr> </table>	disable	Enter 												
disable														
Enter 														
Enter a number within the range limits		13:53:27												

Attenuation time of signals could be used to reduce peaks and fluctuation in signal behavior. Max time for averaging of signals is 10 seconds. You can also disable the function.

You need to go back to Pressure sensor sub menu. Than choose **Next >>** button to enter next menu step **Flow Rate Sensor** where you are asked to define the specific type of flow rate sensor:

3.2.2.7 Flow rate sensor – set up

◀ Back	Flow Rate Sensor	Next ▶
Signal:	4..20mA	◀ ▶
max. Flow Range	370 gal/min	
Delay/Average:	disabled	
For changes, press on the edit areas!		10:41:56

You are asked to select between:

Signal: 0 to 20 mA
 4 to 20 mA
 Pulse (most cases where flow meters are to be used)

Max. Flow Range: Type in max Flow Range of Flow Sensor for selected type of signal output: Current based flow sensors (mA) do ask for maximum flow rates, Pulse signal based sensors do ask for pulses per liter
 Type in value and save it by pressing the **Enter** button:

◀ Back	Flow Rate Sensor	Next ▶	<p>Case 1: Current sensor with 4 to 20 mA Required Input: max flow range of sensor to adapt 20 mA signal to max flow of sensor (see calibration protocol of flow sensor)</p> <p>Here: <u>4 to 20 mA with max flow range of 4000 l/min for flow sensor.</u> Make sure that max flow of flow sensor is above rated flow or max. achievable flow of vessel.</p>
Signal:	4..20mA	◀ ▶	
max. Flow Range	4000 l/min		
Delay/Average:	change		
For changes, press on the edit areas!		14:01:27	

<< Back Flow Rate Sensor Next >>	Case 2: pulse based sensors require setting for pulses per liter. See setup of pulser or electronics for pulser. Here: signal type: Pulse with 10 pulses per liter. No need to cross check max flow of pulser with regard to vessel settings.
Signal: <input type="text" value="Pulse"/> <>	
Pulses / Liter: <input type="text" value="10.0"/>	
Delay/Average: <input type="text" value="change"/>	
For changes, press on the edit areas! 14:05:17	

Delay / Average: To handle follow up time of sensors especially if one type of sensor is much faster than the other one (flow compared to pressure) and / or average signal readout especially under high fluctuation of signal readout of pressure sensors.

Delay: To delay the original signal behavior. Type in seconds for delay

Average: To soften signal behavior by averaging the signal over period of time to be typed in.

Please refer to original documentation of sensors to check for correct settings.

3.2.2.7.1.1 Delay of measured signal:

Delay of measured signal	<< Back												
<div style="border: 2px solid black; border-radius: 15px; padding: 10px; width: fit-content; margin: 0 auto;"> <p style="font-size: 24px; margin: 0;">disabled</p> <p style="margin: 0;">0.1 ... 60.0 sec</p> </div> <div style="margin-top: 10px;"> <input style="width: 100%; height: 30px; margin-bottom: 5px;" type="button" value="disable"/> <input style="width: 100%; height: 30px;" type="button" value="Enter"/> </div>	<table style="margin: 0 auto;"> <tr><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">1</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">2</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">3</td></tr> <tr><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">4</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">5</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">6</td></tr> <tr><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">7</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">8</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">9</td></tr> <tr><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">←</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">0</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">.</td></tr> </table>	1	2	3	4	5	6	7	8	9	←	0	.
1	2	3											
4	5	6											
7	8	9											
←	0	.											
Enter a number within the range limits	15:56:31												

Delay times are intended to synchronize signals of different sensors that should be analyzed at the same time. Signal behavior highly depends on electronics and presetting of sensors in use.

You are asked to enter delay times in between 0.1 to 60 seconds. You can also disable the function.

Press the **Enter** button to save and leave this menu to enter Attenuation submenu or go to flow sensor menu.

3.2.2.7.1.2 Attenuation of measured signal

Attenuation measured signal	Back												
<div style="border: 2px solid black; border-radius: 15px; padding: 10px; width: fit-content; margin: 0 auto;"> <p style="margin: 0;">disabled</p> <p style="margin: 0;">0.1 ... 10.0 sec</p> </div> <div style="margin: 10px auto; width: 150px;"> <p style="text-align: center; padding: 5px;">disable</p> <p style="text-align: center; padding: 5px;">Enter </p> </div>	<table style="margin: 0 auto;"> <tr> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">1</td> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">2</td> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">3</td> </tr> <tr> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">4</td> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">5</td> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">6</td> </tr> <tr> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">7</td> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">8</td> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">9</td> </tr> <tr> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;"></td> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">0</td> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">.</td> </tr> </table>	1	2	3	4	5	6	7	8	9		0	.
1	2	3											
4	5	6											
7	8	9											
	0	.											
Enter a number within the range limits	13:53:27												

Attenuation time of signals could be used to reduce peaks and fluctuation in signal behavior. Max time for averaging of signals is 10 seconds. You can also disable the function.

You need to go back to Flow sensor sub menu. Than choose **Next >>** button to enter next menu step **Filter – System Parameter** where you are asked to define the specific type of flow rate sensor:

3.2.2.8 AFGUARD® free water sensor – setup

AFGUARD free water sensor is intended to measure the amount of free water in Jet fuel. Therefore the AFGUARD should be located in main stream of distribution path for Jet fuel to detect the amount of free water just in time of delivery. AFGUARD signals could be used to:

- give out actual measured amount of free water to address Alarm and/or Warning by the use of every peak in free water crossing the optical path of AFGUARD.
- give out average amount of free water as mathematical result coming from flow and free water measurement to give out averaged free water signal e.g. for single fuelling step.
- give out ALARM in case of high levels of water (water slug)

Each measurement (actual / average / water slug) could be used to address alarm and / or warning relays.

◀ Back	AFGUARD water detection	Next ▶
max. Measure Range	50 ppm	
activate AFGUARD	50 l/min	
Start-Amount of kerosene	500 l	
Delay/Average:	change	
For changes, press on the edit areas!		15:23:16

You are asked to select:

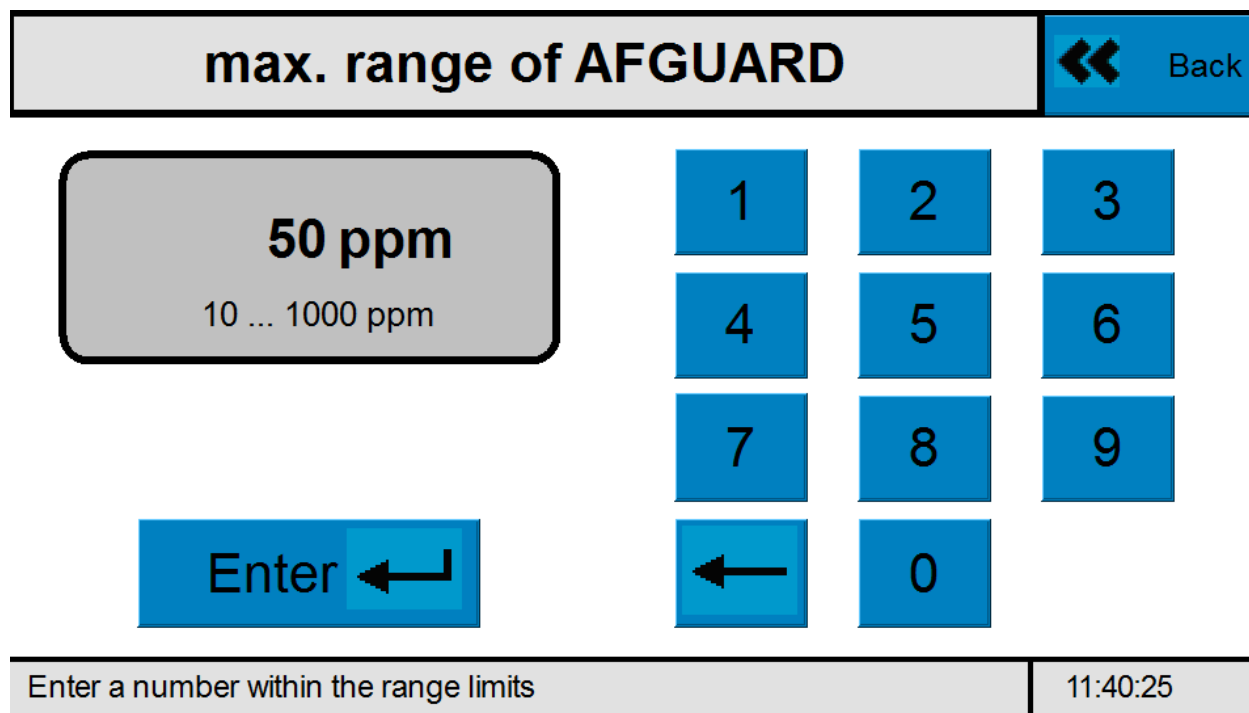
Max Measuring range: please adjust AFGUARD® calibration range (most of them should be calibrated for 0 to 50 ppm. Type in high range of calibration (here: 50 ppm) - please refer to calibration protocol of free water sensor AFGUARD® for high level.

Activate AFGUARD: Type in flow range when AFGUARD® should start with calculation of average water content.

Start-Amount of Kerosene: Type in amount of fuel when relays for warning / alarm should be activated

Delay / Average: To handle follow up time of sensors especially if one type of sensor is much faster than the other one (flow compared to pressure to average signal readout especially under high fluctuation of signal readout of pressure sensors.

3.2.2.8.1 Change of measurement range – max range of AFGUARD®



Type in high calibration range of AFGUARD® free water sensor – see calibration protocol of AFGUARD (delivered with AFGUARD) and press **Enter button** to adjust high level.

High range could be found here:

Stützpunkte der Ausgabekennlinie	Wasserdosage	Messwert Trübung
		0 ppm
	5 ppm	212
	10 ppm	270
	15 ppm	340
	20 ppm	405
	25 ppm	468
	30 ppm	530
	35 ppm	592
	40 ppm	651
	45 ppm	705
	50 ppm	753

Picture: part of calibration protocol of AFGUARD® free water sensor.

If you do not know about calibration range of AFGUARD® free water sensor - please contact your FAUDI Aviation sales contact. You need to have the serial no of AFGUARD® in use.

AFGUARD Kalibrierung		FAUDI aviation * SENSOR		
Sensornummer:	AFG0/00020/c	Datum: 11.11.2011	T. P.	
Messwiderstand	470 kOhm	50 ppm - fine droplets		
Verstärkung	Trübung 2,22	Wasser 5,54	Diodenüber 3,4	
DA-Wandlerwerte	Dunkelstrom 116	Offset Trübung 0	Offset V 0	
DA-Output	4 mA - Wert 643	20 mA - Wert 3240		
Messwerte	Bedingung	Trübung	Wasser	Diode
	0 ppm	145	359	502
	50 ppm	753	284	502
	Luft	50	213	506
	Wasser AVGAS	75 126	207 277	506 513
Stützpunkte der Ausgabekennlinie	Wasserdosage		Messwert Trübung	
	0 ppm		145	
	5 ppm		212	
	10 ppm		270	
	15 ppm		340	
	20 ppm		405	
	25 ppm		468	
	30 ppm		530	
	35 ppm		592	
	40 ppm		651	
	45 ppm		705	
50 ppm		753		
Bemerkung	Software-Version 01.05 Firmware-Version 01.05 AW-02-006			



Example for calibration protocol of AFGUARD® free water sensor

3.2.2.8.2 Activation level of AFGUARD®

AFGUARD should only deliver free water signals during fuelling. It is therefore recommended to type in min flow level to activate free water measurement.

Presetting is 50 l/min to be adapted to your processes.

activate AFGUARD

Back

50 l/min

20 ... 3400 l/min

1

2

3

4

5

6

7

8

9

←

0

Enter

Enter a number within the range limits

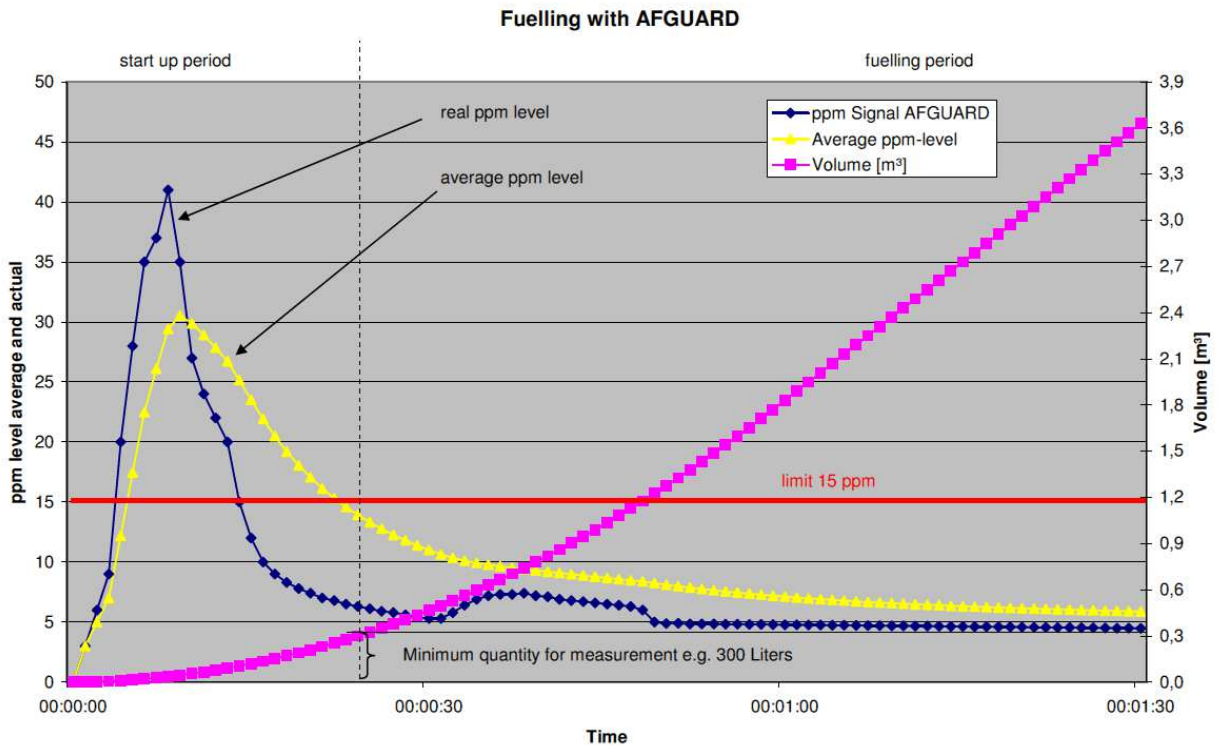
12:16:26

Type in new start conditions to activate AFGUARD® free water sensor and press **Enter button** to adjust activation level level.

3.2.2.8.3 Start amount of kerosene

The AFGUARD free water sensor gives out actual measured values of free water in jet fuel passing the optical path of the sensor. Experience shows that high values of free water (peaks) could be seen at the beginning of fuelling steps caused by residual water on pits, condensation effects in fuelling lines behind filter elements etc.

To prevent warnings / Alarms under start conditions – you will be asked to type in minimum amount of jet fuel to activate relay output for warning and / or Alarm caused by high levels of free water – see next slide (minimum quantity for measurement e.g. 300 liters).



Picture: high levels of water during start of fuelling.

Start-Amount of kerosene

◀ Back

500 l

40 ... 100000 l

Enter ↵


1	2	3
4	5	6
7	8	9
←	0	

Enter a number within the range limits

12:35:13

Type in start amount of jet fuel to activate relay output for AFGUARD® free water sensor and press Enter button to adjust start conditions.

3.2.2.8.4 Adjust AFGUARD® timing

 Back	AFGUARD timing	
Delay of measured signal	disabled	
Attenuation measured signal	1.0 sec	
Reset time after refueling	30 sec	
For changes, press on the edit areas!		13:09:41

Signal output of aFGUARD free water sensor could be delayed or equalized over short period of time by the use of attenuation of measured signal. Presetting is 1 sec for attenuation and “0” for delay.

3.2.2.8.4.1 Reset time after refuelling

Sub routine “Reset time after refueling” could be used to automatically reset counter for averaged water quantity after each refueling step. Max time to be adjusted is 60 minutes (3600 sec).

Alternatively reset could be done by the use of digital input signal to be connected to the digital input on main board DI02.

Reset time after refueling	←← Back												
<div style="border: 1px solid black; padding: 5px; display: inline-block;"> 30 sec <small>10 ... 3600 sec</small> </div>	<table border="1" style="margin: 0 auto;"> <tr><td>1</td><td>2</td><td>3</td></tr> <tr><td>4</td><td>5</td><td>6</td></tr> <tr><td>7</td><td>8</td><td>9</td></tr> <tr><td>←</td><td>0</td><td></td></tr> </table>	1	2	3	4	5	6	7	8	9	←	0	
1	2	3											
4	5	6											
7	8	9											
←	0												
<div style="border: 1px solid black; padding: 5px; display: inline-block; margin-bottom: 5px;">disable</div> <div style="border: 1px solid black; padding: 5px; display: inline-block;">Enter ←</div>													
Enter a number within the range limits	13:19:43												

3.2.2.9 Filter System Parameter

Choose **Next >>** button to enter next menu step **Filter - System Parameter** where you are asked to define parameters of filtration equipment or vessel type. Relevant data could be found on name plate of Vessel in use:

←← Back	Filter-System Parameter	Next →→
max. flow rate of the filter:	3400 l/min	
Switch-On DPGUARD:	20 %	
Loggingcycle of the data:	1 sec	
algorithm parameters:	change	
For changes, press on the edit areas!	14:10:56	

You are asked to type in:

Max. flow rate of filter:

Please type in rated flow (should be found on Name Plate of vessel. Number should be in between 100 to 10 000 liter/min You can either go for max. achievable flow. Than flow rate is controlled by DPGUARD®. Any increase of adjusted flow rate will cause Alarm.

Switch on DPGUARD®: Type in Percentage of rated flow where DPGUARD® should give out first corrected differential pressure values. Value should be in between 10 to 80 %. Normal level is below 50 %.






Logging cycle of data: The DPGUARD® is equipped with data logger to log measured signals as well as calculated differential pressure values and Warning or Alarm status. To make it work – please type in timeframe for data log. 1 sec. represents one data log per second. Minimum time is 1 second. Maximum time is 600 seconds. Data logs could be found on memory stick (located at the back of touch screen computer). Data logs are day based to make investigation as easy as possible. Files are stored in csv- Format that could be analyzed e.g. by the use of Excel.

Algorithm parameters: possibility to adjust relevant conditions for mathematical calculation of algorithm. Should be used with care.

Please make sure that maximum flow rates of filter could not be exceeded.

3.2.2.9.1 Flow rate of vessel – max flow rate/rated flow

Please enter the Filter: max. allowable flow rate menu:

Filter: max. allowable flow rate	 Back												
<div style="border: 2px solid black; border-radius: 15px; padding: 10px; width: fit-content; margin: 0 auto;"> <p style="font-size: 24px; margin: 0;">3400 l/min</p> <p style="margin: 0;">100 ... 4000 l/min</p> </div>	<table style="margin: 0 auto;"> <tr><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">1</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">2</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">3</td></tr> <tr><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">4</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">5</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">6</td></tr> <tr><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">7</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">8</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">9</td></tr> <tr><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;"></td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">0</td><td></td></tr> </table>	1	2	3	4	5	6	7	8	9		0	
1	2	3											
4	5	6											
7	8	9											
	0												
<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <p style="font-size: 24px; margin: 0;">Enter </p> </div>													
Enter a number within the range limits	14:18:26												

Type in rated flow (could be found on name plate of filter vessel) and press Enter button.

Make sure not to increase flow rate of flow sensor (DPGUARD uses internal intelligence to autocorrect of settings are wrong. If flow sensor has been set up for flow rates of 4000 l/min – max adjustable flow rate is 4000 l/min). **Entry of flow rates above flow rate sensor is not possible. Please check flow rate of flow sensor in case of denial of entry.**

3.2.2.9.2 Start condition for corrected differential measurement values

Type in start conditions in **Activation in % of maximum flow rate** change menu to indicate start point where mathematical calculation of corrected differential pressure values should start.

This level should be in between 20 and 80 % of normal level of rated flow. Typically start levels are in the range of 20 to 50 %. Press the **Enter** button to save and leave.

Activation in % of maximum. flow rate		←← Back												
<div style="border: 2px solid black; border-radius: 15px; padding: 10px; width: 150px; margin: 0 auto;"> <p style="font-size: 24px; margin: 0;">20 %</p> <p style="margin: 0;">20 ... 80 %</p> </div>	<table style="margin: 0 auto;"> <tr><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">1</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">2</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">3</td></tr> <tr><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">4</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">5</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">6</td></tr> <tr><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">7</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">8</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">9</td></tr> <tr><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">←</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">0</td><td></td></tr> </table>	1	2	3	4	5	6	7	8	9	←	0		
1	2	3												
4	5	6												
7	8	9												
←	0													
<div style="border: 1px solid black; background-color: #0070C0; color: white; padding: 5px; display: inline-block;"> Enter ← </div>														
Enter a number within the range limits		11:10:41												

Type in start level in % (from rated flow) where the DPGUARD® should start with mathematical calculation of corrected differential pressure readout.

3.2.2.9.3 Datalogger – logging cycle

Enter **Datalogging: Timeperiod** change menu to type in cycle for data logging in seconds:

Datalogging: Timeperiod

Back

1 sec

1 ... 600 sec

1

2

3

4

5

6

7

8

9

0

Enter

Enter a number within the range limits

11:13:14


Type in time period of logging sequence. Normal value should be in between 1 sec to 60 seconds (1 per minute). Maximum time is 600 seconds. Press Enter button to save and leave the menu.





Please have in mind that only logged data could be analyzed retroactive. Amount of data increases linear with number of logs.

3.2.2.9.4 Change / preset of Algorithm parameters

Possibility to preset change basic terms for calculation of mathematic algorithm.

ООО «ТИ-СИСТЕМС» ИНЖИНИРИНГ И ПОСТАВКА ТЕХНОЛОГИЧЕСКОГО ОБОРУДОВАНИЯ
 Интернет: www.tisys.ru www.tisys.kz www.tisys.by www.tesec.ru www.ти-системс.рф
 Телефоны: +7 (495) 7774788, 7489626, (925) 5007155, 54, 65
 Эл. почта: info@tisys.ru info@tisys.kz info@tisys.by


 Back
 algorithm parameters

- max. coefficient changing: 0.0100  ①
- min. flow rate difference: 30.0 %  ②
- Constant condition: Time 5.0 sec  ③
- Constant condition: Tolerance 3.0 %  ④

For changes, press on the edit areas! 10:04:01

Please handle settings with care. They do have influence in behaviour of DPGUARD and its functionality.

3.2.2.9.4.1 Change of preset max coefficient changing


 Back
 algorithm parameters

max. coefficient changing: 0.0100

When pressing the blue button you will be asked to give in max. coefficient changing numbers – see mark ①. These numbers effect behaviour of corrected dp function.

Misuse could cause fatal error.

Please contact FAUDI Aviaiton Sensor GmbH or your local distributor to discuss in front of any change.

max. coefficient changing	 Back
----------------------------------	--

0.0100

0.0001 ... 1.0000

1	2	3
4	5	6
7	8	9
←	0	.

Enter 

Enter a number within the range limits	10:09:00
--	----------

Accepted numbers should be in between 0.0001 and 1.0.

Presetting is 0.01

3.2.2.9.4.2 Change of minimum flow rate difference

By the use of this parameters you could influence the way to catch measured values of flow and dp to generate corrected dp function. Press button (see mark ②) to change minimum difference between measured values to be as stable as possible for the corrected mathematical algorithm “corrected differential pressure function”.

min. flow rate difference	 Back
----------------------------------	---

30.0 %

5.0 ... 50.0 %

1	2	3
4	5	6
7	8	9
←	0	.

Enter 

Enter a number within the range limits	10:17:21
--	----------

Presetting is 30 %.

3.2.2.9.4.3 Change of constant condition time

Fluctuation in measured signals could cause bad measurement results. Therefore DPGUARD is looking for static situation to catch signals when there is as low as possible change in flow and pressure signals. Time for evaluation is set for 5 sec.

Constant condition: Time	Back												
<div style="border: 1px solid black; border-radius: 10px; padding: 10px; width: fit-content; margin: 0 auto;"> <p style="font-size: 1.2em; margin: 0;">5.0 sec</p> <p style="margin: 0;">1.0 ... 20.0 sec</p> </div>	<table style="margin: 0 auto;"> <tr><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">1</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">2</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">3</td></tr> <tr><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">4</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">5</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">6</td></tr> <tr><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">7</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">8</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">9</td></tr> <tr><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;"></td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">0</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">.</td></tr> </table>	1	2	3	4	5	6	7	8	9		0	.
1	2	3											
4	5	6											
7	8	9											
	0	.											
<div style="border: 1px solid black; border-radius: 10px; padding: 10px; width: fit-content; margin: 0 auto;"> <p style="margin: 0;">Enter </p> </div>													
Enter a number within the range limits	10:22:24												

Minimum time should be 1 sec. max. time 20 sec. Please be carefully by changing numbers. **Misuse could cause fatal error.**

3.2.2.9.4.4 Change of constant condition tolerance

Fluctuation of signals heavily depends on system in use and could only sorted out by mathematics to find as stable situation as possible. DPGUARD is looking for stable

Constant condition: Tolerance	Back												
<div style="border: 1px solid black; border-radius: 10px; padding: 10px; width: fit-content; margin: 0 auto;"> <p style="font-size: 1.2em; margin: 0;">3.0 %</p> <p style="margin: 0;">0.1 ... 10.0 %</p> </div>	<table style="margin: 0 auto;"> <tr><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">1</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">2</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">3</td></tr> <tr><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">4</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">5</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">6</td></tr> <tr><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">7</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">8</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">9</td></tr> <tr><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;"></td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">0</td><td style="border: 1px solid black; width: 40px; height: 40px; text-align: center;">.</td></tr> </table>	1	2	3	4	5	6	7	8	9		0	.
1	2	3											
4	5	6											
7	8	9											
	0	.											
<div style="border: 1px solid black; border-radius: 10px; padding: 10px; width: fit-content; margin: 0 auto;"> <p style="margin: 0;">Enter </p> </div>													
Enter a number within the range limits	10:28:10												

measuring results to catch them when stability parameters are ok in between constant condition time (see chapter above). Accepted tolerance with regard to actual measurement could be changed by the use of button (see mark ④).

Presetting should be 2% up to 3 %.

All these settings do have influence on calculated algorithm parameters that could be displayed as corrected differential pressure function (see Filterstatus / dp function)

Current Filterstatus	
Date: 14.02.12	Time: 09:23:51
Operating Hours: 1 h 9 min	
Throughput: 96 m ³	
max. flow rate of the filter: 3400 l/min	
Alarm [corrected pressure]: 1.50 bar	

Trend
DP function
Reset
Back

current DP function

$y = 0.100 x^2 + 0.350 x$

Quadratic and linear coefficients could also be user defined (not mandatory) to start with predefined conditions. If you need to do so – please refer to service manual or contact your FAUDI Aviation Sensor contact.

3.2.2.10 Analog output – configuration of analog output

This submenu is intended to be used if user wants to connect DPGUARD® to other systems. Most important information to be used is corrected differential pressure. This information could be used as analogue output signal. Therefore it should be adjusted:

Choose **Next >>** button to enter **Analog Output** menu where you are asked to define parameters for Analog signal output:

◀ Back	Analog Output	Next ▶
Output Signal:	0..20mA	◀ ▶
20 mA correspond to:	6.0 bar	
Delay/Average:	1.0 sec	
For changes, press on the edit areas!		11:17:56

You are asked to select:

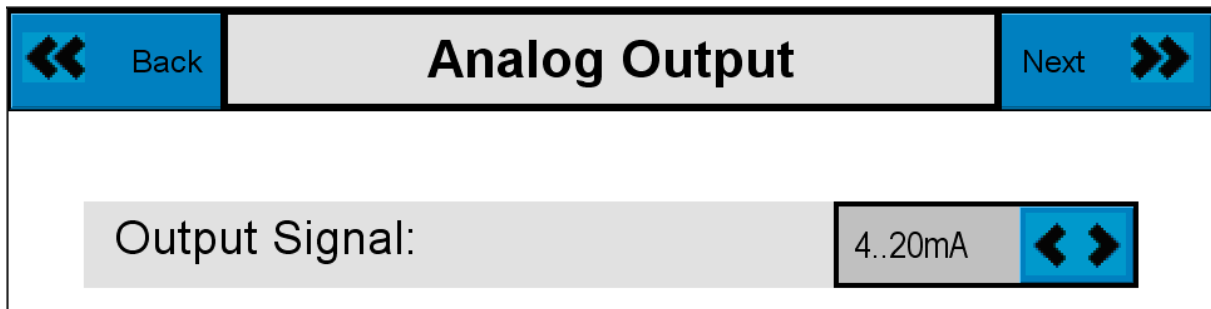
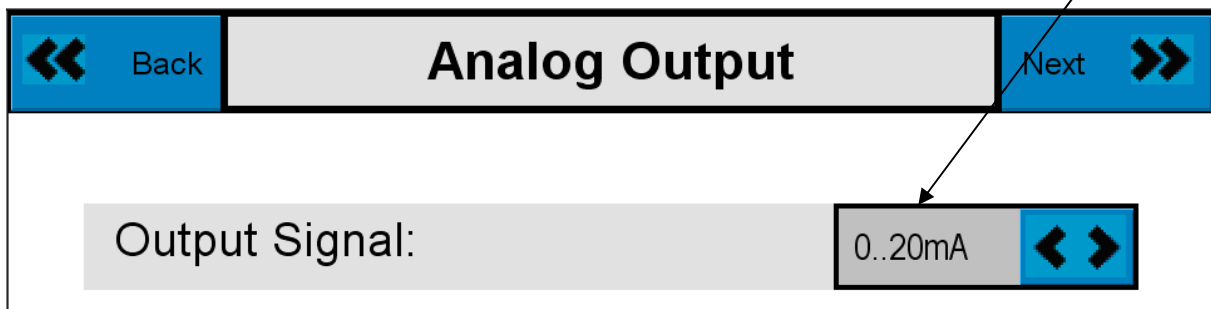
Signal: 0 to 20 mA
 4 to 20 mA

Corresponding pressure: 20 mA as high output level for Analog Output should
 correspond to a pressure level – to be defined.

Delay / Average: To give in delay – time or average signal readout.

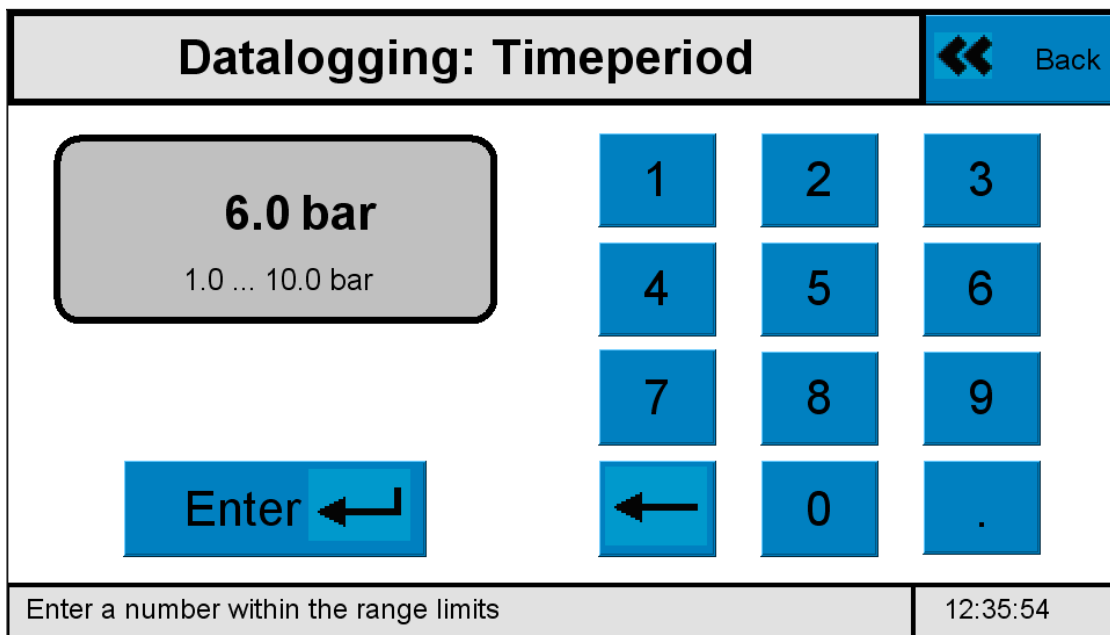
3.2.2.10.1 Change of Analog signal output

To change between different signal modes in **Output Signal** menu, please click on grey button and change between current signal of 0 to 20 mA and 4 to 20 mA.



3.2.2.10.2 Analog output signal – corresponding pressure

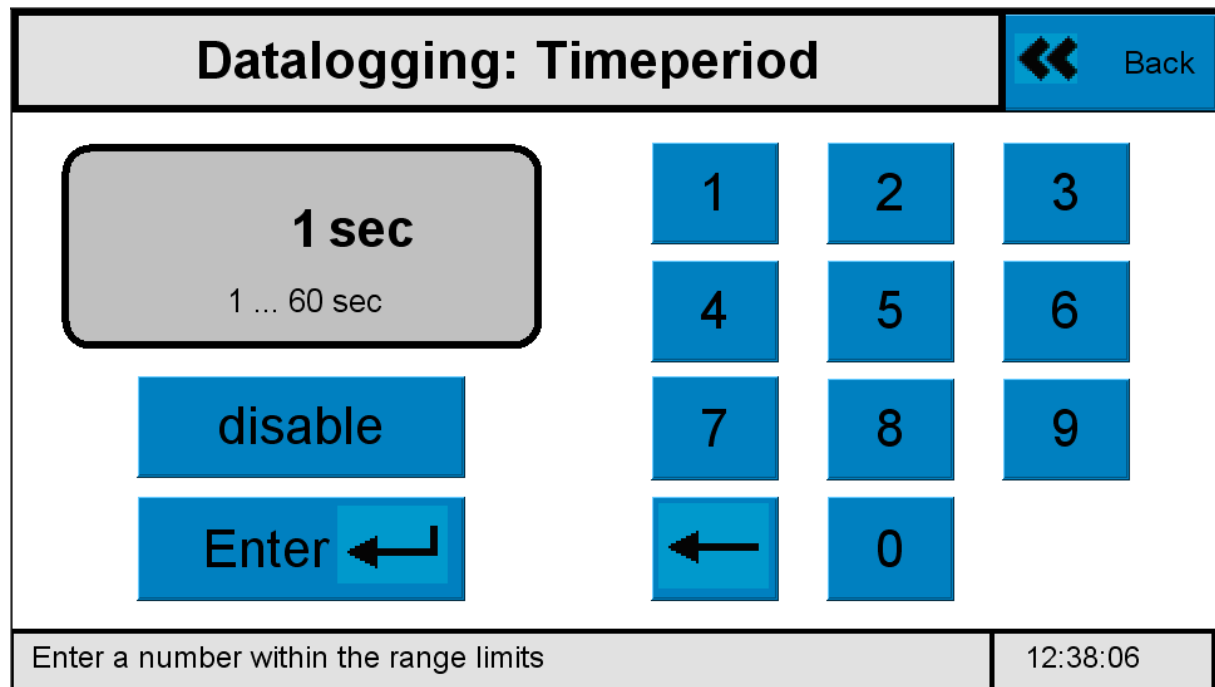
Change of corresponding pressure related to 20 mA signal output level



Insert related pressure and press **Enter** to save and leave the menu

3.2.2.10.3 Analog output signal – delay of output signal

Change of delay / Average setting by pressing the blue colored touch field



Datalogging: Timeperiod ←← Back

1 sec
1 ... 60 sec

disable

Enter ←

1 2 3
4 5 6
7 8 9
← 0

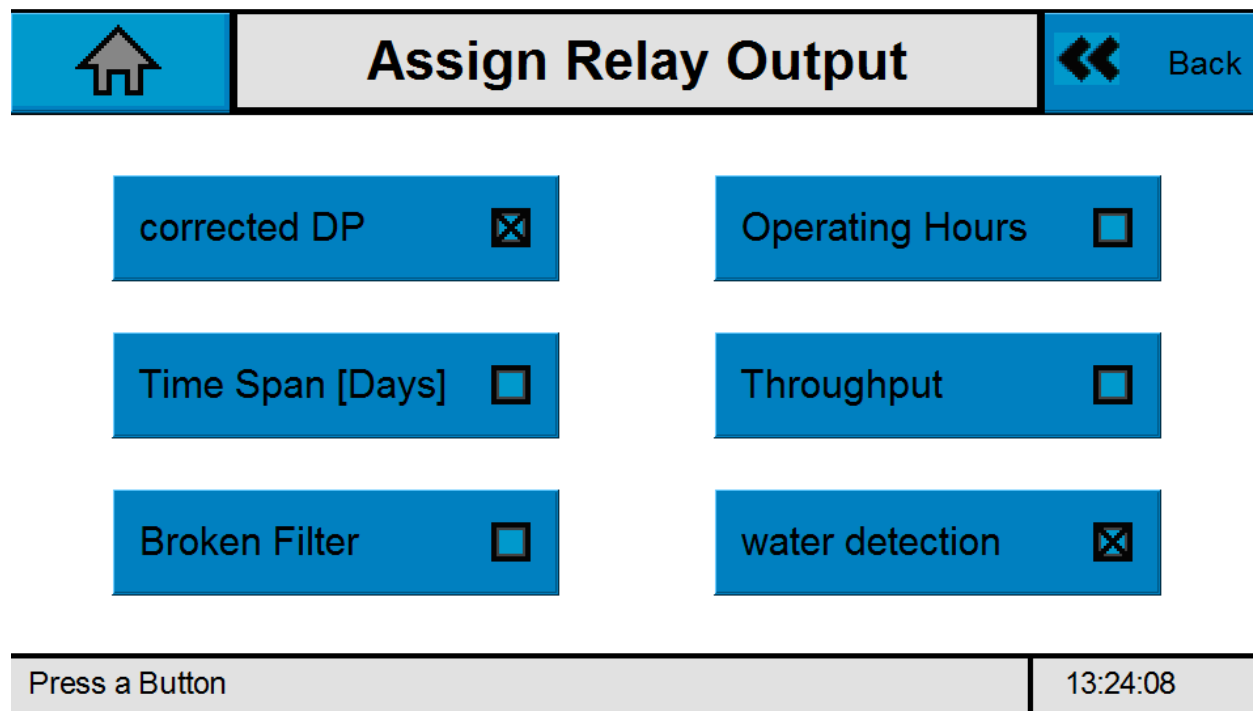
Enter a number within the range limits 12:38:06

Type in new time period for delay / average or disable function by pressing disable panel and press **Enter** key to save and return to previous menu.

3.2.2.11 Relays Output for Alarm or Warning

Choose **Next >>** button to enter next menu step to adjust Warning and Alarm levels

Appearing submenu relates to a series of warnings / alarms to be setup for safety reasons:



Picture: Relay output settings sub menu (not visible in Installer modus – see setup / output)

There are six different possibilities to address Warning and/or Alarm levels. In case of activation you can see a crossed field behind the submenu (above – there are only two activated Relais: corrected dp and water detection). Functionality behind the subroutines behave on sogged and calculated data that could be seen in Filterstatus screen (main menu Filterstatus button).

Current Filterstatus	
Date: 12.01.12	Time: 08:59:29
Operating Hours: 5 h 46 min	
Throughput: 913 m ³	
max. flow rate of the filter: 3400 l/min	
Alarm [corrected pressure]: 21.8 psi	

Trend

DP function

Reset

Back

Current Filterstatus

Date 03.08.11	Time 08:01:06
Operating Hours 4 h 2 min	
Throughput 153 m³	

measured pressure 0.11 bar	flow rate 634 l/min
--	---

Trend

Reset

Back

Logged data like

- Date
- Operating Hours
- Throughput
- Corrected differential pressure and
- pressure drop

could be addressed to initiate Alarm or Warnings
(see chapter 4.3.2.5)

3.2.2.11.1 Relays for corrected differential pressure readout

In **Corrected Difference Pressure** menu you are asked to define the level of corrected differential pressure for Warning and / or Alarm. These number should refer to elements in use (change out criteria):

Example:

Filter water separators	15 psi (~1.0 bar)
Monitors	22 psi (~1.5 bar)
Micro filters	15 psi (~1.0 bar)

Please refer to actual manufacturer requirements and guidelines (e.g. ATA103)



Alarm-Relay	Switch-On:	<input type="button" value="disabled"/>
Warning-Relay	Switch-On:	<input type="button" value="disabled"/>
Delay Switch-On:		<input type="button" value="disabled"/>

For changes, press on the edit areas!	15:11:37
---------------------------------------	----------

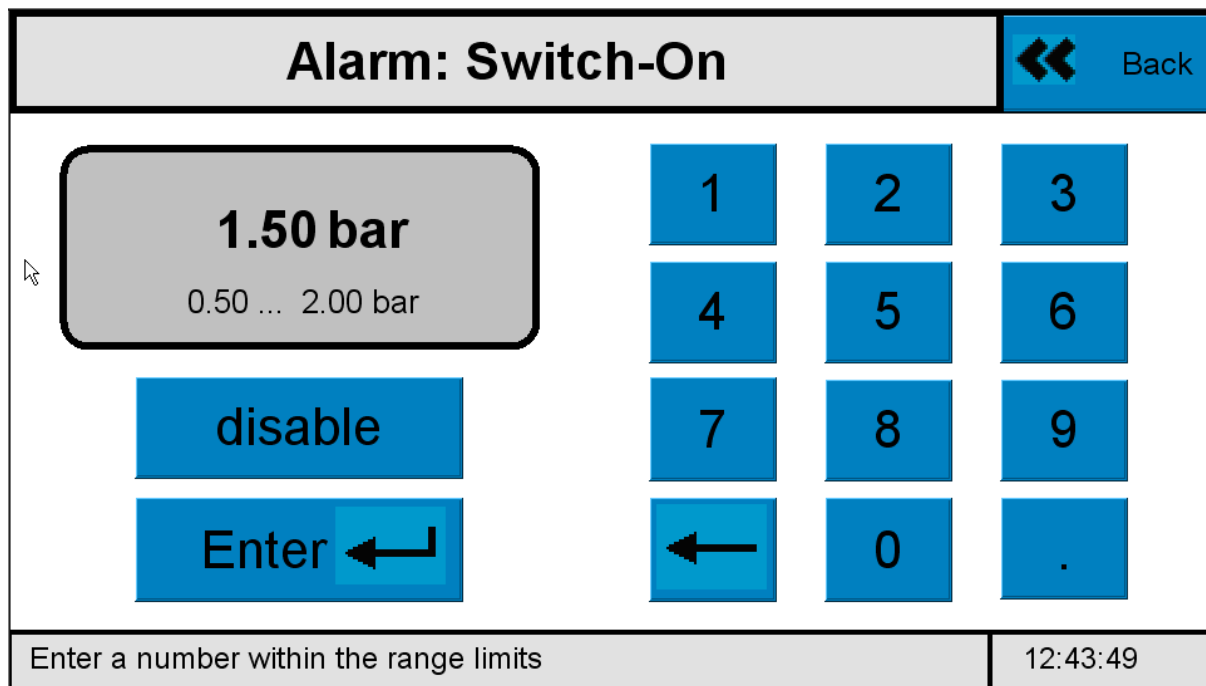
For first startup of DPGUARD®– all Warning and / or Alarm levels are deactivated. Screens should look like the one above.

You are asked to type in your numbers for Warning and / or Alarm.

For corrected difference pressure – please type in Alarm-Relay level first:

3.2.2.11.1.1 Alarm level for corrected differential pressure

Adjust **Alarm: Switch-on** level:



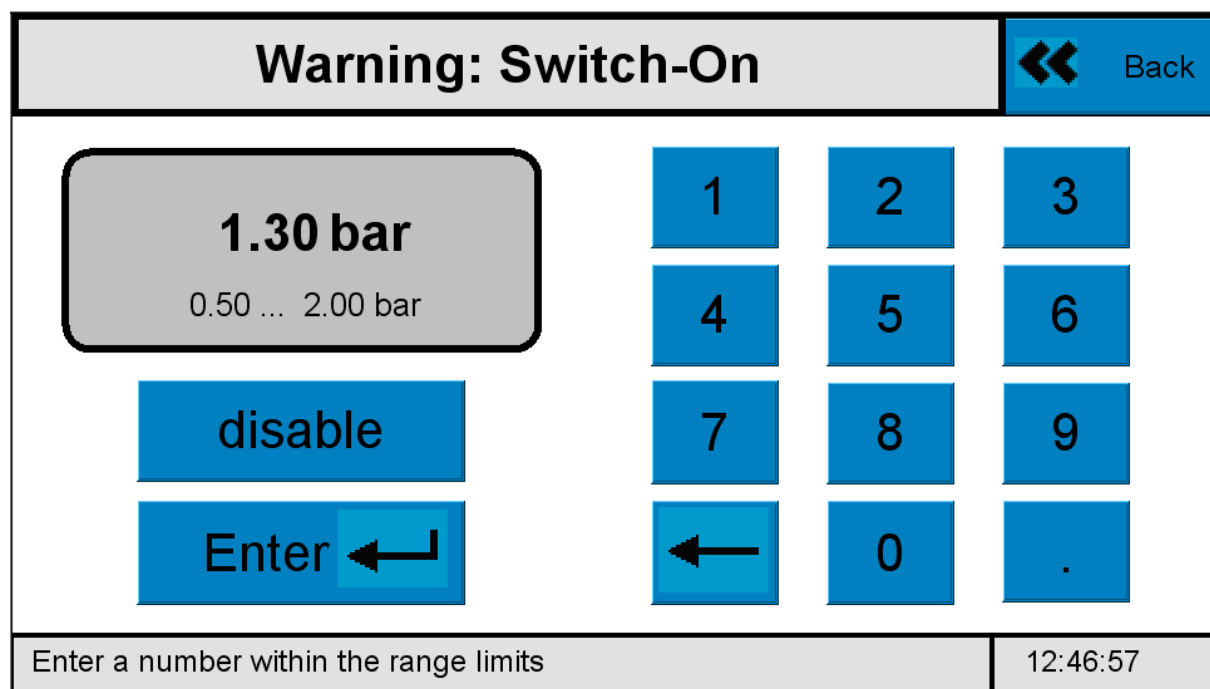
Alarm level should be close to exchange pressure level of elements. Generally alarm levels should be used to full stop processes. Max adjustable level of Alarm depends on settings for pressure sensors. If high level of pressure sensor (20 mA signal correlates to 2 bar max adjustable level for alarm equals 2 bar. You can easily see numbers of pressure sensor setup in grey highlighted field. Adjustable alarm levels should be in between 0.5 bar and 2 bar.

All Alarm functions correspond to corrected differential pressure readout. It is mandatory to have very good sensor signals for differential pressure measurement and flow. The better these signals are, the better is the corresponding calculated corrected differential pressure measurement.

Type in new Alarm level or disable function and press **Enter** button to store and return to previous menu step

3.2.2.11.1.2 Warning level for corrected differential pressure

Adjust **Warning: Switch-on** level:



Warning level should be less than Alarm level. FAUDI Aviation recommends choosing Warning levels in the range of approximately 80 to 90 % of Alarm level. Generally: Warning levels should be used to inform the user about critical behavior of filtering equipment – very close to its end of lifetime. It should be used for visual or acoustical alarm. Warning level should be adjusted in between 0.5 bar and 2 bar.

Warning function correspond to corrected differential pressure readout. It is mandatory to have very good sensor signals for differential pressure measurement and flow. The better these signals are, the better is the corresponding calculated corrected differential pressure measurement.





Type in new Warning level or disable function and press **Enter** button to store and return to previous menu step

3.2.2.11.1.3 Delay Switch-on

Possibility to give in delay time for corrected differential pressure especially to suppress alarms / warnings in case of peaks or short time amplitudes especially in case of unsynchronized sensor signals of flow and dp.

Presetting is 2.5 sec to suppress alarms that could be caused by measurement peaks.

Please be careful when changing these numbers!

Delay Switch-On:		 Back												
disabled 0.1 ... 60.0 sec	<table border="1" style="width: 100%; text-align: center;"> <tr> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>7</td> <td>8</td> <td>9</td> </tr> <tr> <td>←</td> <td>0</td> <td>.</td> </tr> </table>		1	2	3	4	5	6	7	8	9	←	0	.
1	2	3												
4	5	6												
7	8	9												
←	0	.												
<table border="1" style="width: 100%;"> <tr> <td style="text-align: center;">disable</td> </tr> <tr> <td style="text-align: center;">Enter </td> </tr> </table>	disable	Enter 												
disable														
Enter 														
Enter a number within the range limits	15:20:18													

Type in delay time and store it by pressing the Enter button.

3.2.2.11.1.4 Infoscreen in cases of mistyping

In cases of mistyping Alarm or Warning – DPGUARD® catches mistyped values to autocorrect and / or give out comments.

Warning level above Alarm:

Maximum accepted limit to be typed in is Alarm level. There is no possibility to give in higher numbers than Alarm levels.

Alarm level below Warning level:

In cases of wrong indication e.g. Alarm level below Warning level - DPGUARD® gives out a comment to inform about mistyping. Please check your levels again.

Caution!

Alarm threshold is less than the warning threshold!
Warning threshold is set to alarm threshold!

confirm

Press a Button	11:51:57
----------------	----------

When inputs are ok you should see screens like the one below:

◀ Back
corrected Difference Pressure
Next ▶

Alarm-Relay	Switch-On:	1.50 bar
Warning-Relay	Switch-On:	1.20 bar
Delay Switch-On:		2.5 sec

For changes, press on the edit areas!	10:54:19
---------------------------------------	----------

Now you will find a cross behind the submenu for corrected differential pressure.

	Assign Relay Output	 Back
---	----------------------------	--

corrected DP

Operating Hours

Time Span [Days]

Throughput

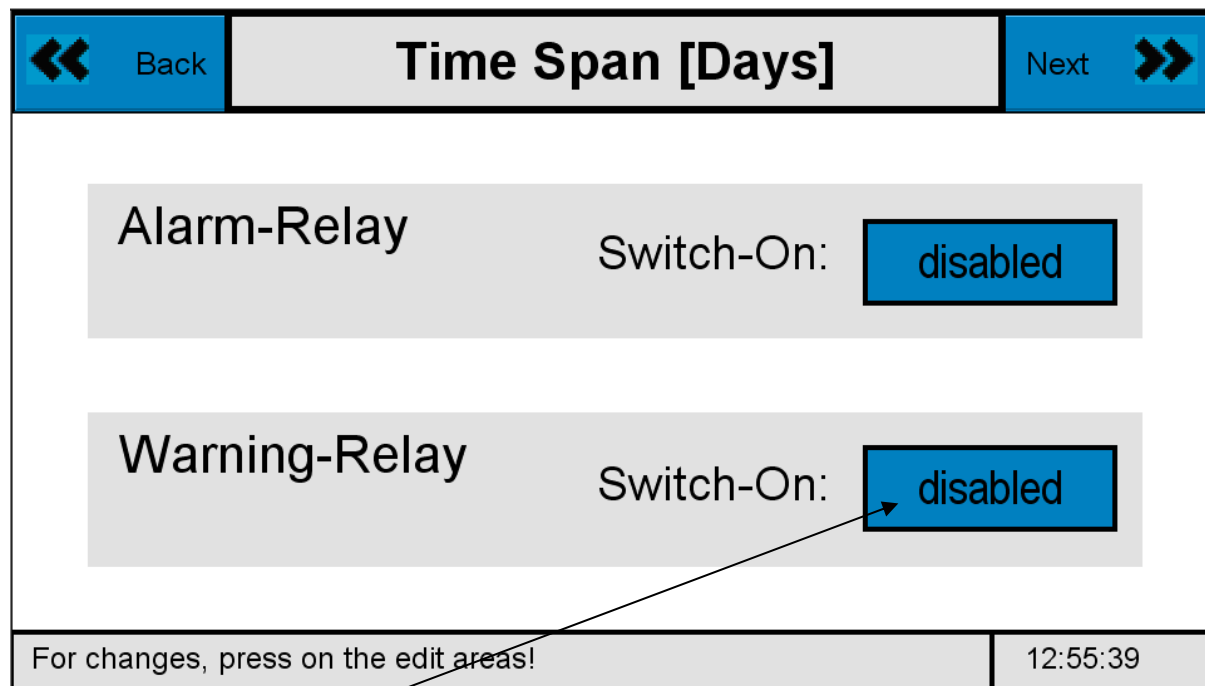
Broken Filter

Press a Button	12:20:06
----------------	----------

Please go on with the other Relays.

3.2.2.11.2 Relays for Time span [Days]

Choose **Next >>** button to enter next menu step to adjust Warning and Alarm level in **Time span [Days]** menu where you are asked to define the number of days (lifetime of elements) before Warning and / or Alarm appears to remind you about end of lifetime of elements.:



Press blue colored **button** to set up days for Alarm or warning.

Example:

Most Monitor elements do have lifetimes of two years after installation. If they do not fail according high amount of water or dirt – they need to be exchanged on a time based function.

This is what the DPGUARD® provides: Warning level should be close to life end of elements – e.g. 650 days, Alarm level should be identical for 2 years lifetime of elements.




You can either enable or disable both functions – Warning and / or Alarm for Time Span. For first installation (Installer) all Relays are deactivated (disabled).

Make sure to address Warning Relays with levels below Alarm Relays. In every other case DPGUARD® will give out comments according your input. (see Chapter 3.2.2.11.1.4 Infoscreen in cases of mistyping)

FAUDI recommends the use of electronics to extend service lifetime of elements in use – please contact your local FAUDI Aviation distributor or sales contact to discuss about possibilities for extended service lifetime of elements.

Alarm level for Time Span




Set **Alarm: Switch-On** level for Alarm Relay:

Alarm: Switch-On			 Back
<div style="border: 1px solid black; border-radius: 15px; padding: 10px; text-align: center;"> <p>disabled</p> <p>7 ... 2000 days</p> </div> <div style="text-align: center; margin-top: 10px;"> <p>disable</p> </div> <div style="text-align: center; margin-top: 10px;"> <p>Enter </p> </div>	1	2	3
	4	5	6
	7	8	9
		0	
Enter a number within the range limits			13:30:36

Type in time span for Alarm e.g. 730 days and press **Enter** button to store and return.



3.2.2.11.2.1 Warning level for Time Span

Do the same with **Warning: Switch-On** level (e.g. 650 days)

Warning: Switch-On			 Back
<div style="border: 1px solid black; border-radius: 15px; padding: 10px; text-align: center;"> <p>650 days</p> <p>7 ... 2000 days</p> </div> <div style="text-align: center; margin-top: 10px;"> <p>disable</p> </div> <div style="text-align: center; margin-top: 10px;"> <p>Enter </p> </div>	1	2	3
	4	5	6
	7	8	9
		0	
Enter a number within the range limits			13:35:32


Press **Enter** button to store and return.

Following configuration should be stored for this special case:

 Back	Time Span [Days]	Next 						
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; padding: 10px;">Alarm-Relay</td> <td style="width: 30%; padding: 10px;">Switch-On:</td> <td style="width: 40%; padding: 10px; text-align: center;"> <div style="border: 1px solid black; background-color: #0070C0; color: white; padding: 5px; display: inline-block;">730 days</div> </td> </tr> <tr> <td style="padding: 10px;">Warning-Relay</td> <td style="padding: 10px;">Switch-On:</td> <td style="padding: 10px; text-align: center;"> <div style="border: 1px solid black; background-color: #0070C0; color: white; padding: 5px; display: inline-block;">650 days</div> </td> </tr> </table>			Alarm-Relay	Switch-On:	<div style="border: 1px solid black; background-color: #0070C0; color: white; padding: 5px; display: inline-block;">730 days</div>	Warning-Relay	Switch-On:	<div style="border: 1px solid black; background-color: #0070C0; color: white; padding: 5px; display: inline-block;">650 days</div>
Alarm-Relay	Switch-On:	<div style="border: 1px solid black; background-color: #0070C0; color: white; padding: 5px; display: inline-block;">730 days</div>						
Warning-Relay	Switch-On:	<div style="border: 1px solid black; background-color: #0070C0; color: white; padding: 5px; display: inline-block;">650 days</div>						
For changes, press on the edit areas!		13:36:59						

Choose **Next >>** button to enter next menu step to adjust Warning and Alarm level in **Broken Filter: Pressure drop** menu where you are asked to define the level of acceptable pressure drop in front of Warning or Alarm.

3.2.2.11.3 Relays for Broken Filter – Pressure drop

 Back	Broken Filter: Pressure drop	Next 
--	------------------------------	--

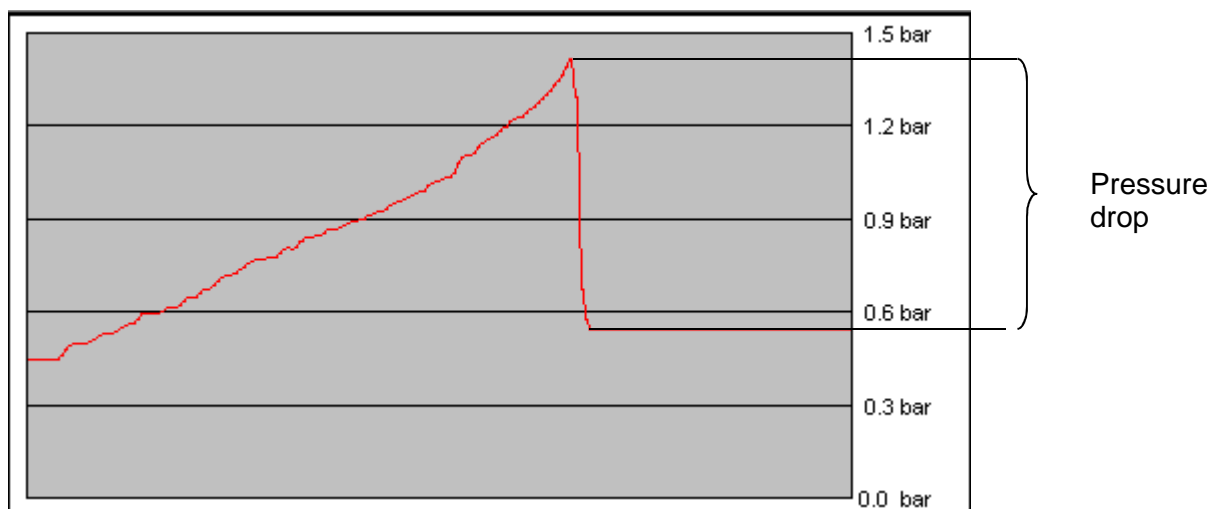
Alarm-Relay	Switch-On: disabled
-------------	---

Warning-Relay	Switch-On: disabled
---------------	---

For changes, press on the edit areas!	15:23:52
---------------------------------------	----------

The function behind belongs on logged data from corrected differential pressure measurements in front of actual corrected differential pressure readout. If detected pressure drops are going to exceed predefined values, Warning or Alarm status could be activated. In our case – Alarm Relay is set to Alarm if pressure drops exceed 5 psi related to corrected differential pressure in front of Alarm (recommendation in AS 6401).

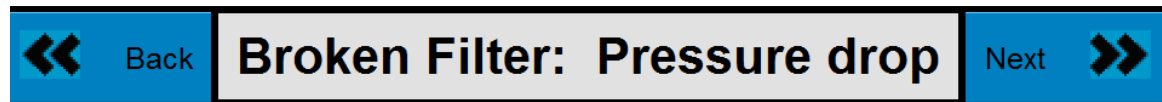
Explanation:



Picture above explains a pressure drop of a certain filter element in use – coming from 1.4 bar down to 0.55 bar caused by a rupture. DPGUARD indicates pressure drops to give out Alarm and full stop the process if Broken Filter Alarm relay is activated (5 psi represents 0.35 bar).

DPGUARD could even give out Warnings if preset warning level exceeds.

Recommendation for warning level (AS6401) is 3 psi (~0.21bar).



Alarm-Relay	Switch-On: <input style="width: 100px;" type="text" value="5.00 psi"/>
Warning-Relay	Switch-On: <input style="width: 100px;" type="text" value="3.00 psi"/>

For changes, press on the edit areas!	15:26:00
---------------------------------------	----------

3.2.2.11.3.1 Alarm level for Broken Filter

To set Alarm or Warning levels for Broken Filter – go into submenu’s for Alarm and Warning and type in value for acceptable pressure drop related to corrected differential pressure readout to activate Alarm and / or Warning.

Please make sure to give in higher levels for Alarm compared to Warning level. In case of mistyping DPGUARD® will give out comments to correct mistyped values – see chapter 3.2.2.11.1.4 Infoscreen in cases of mistyping).

AS6401: See chapter A 3.1.2.2

Filter monitors or separator elements shall be

investigated if a **sudden drop > 3 psi** in dp occurs under similar flow conditions, corrected to maximum achievable flow rate, or



replaced when a **sudden drop > 5 psi** in dp occurs under similar flow conditions

aS6401 refers to “Similar flow conditions” that are very important to notice: Therefore a lot of evaluation takes place in DPGUARD® to prevent misuse of alarm and warning situations. Please be careful with the change of parameter presetting’s.

Choose **Next >>** button to enter next menu step to adjust Warning and Alarm level in **Operating Hours** menu

3.2.2.11.4 Relays for operating hours

You are asked to define the number of hours before Warning or Alarm should be activated. In most cases the function will be deactivated.

 Back	Operating Hours	Next 
--	-----------------	--






Alarm-Relay	Switch-On: disabled
-------------	--

Warning-Relay	Switch-On: disabled
---------------	--

For changes, press on the edit areas!	15:32:49
---------------------------------------	----------

3.2.2.11.4.1 Alarm level for operating hours

Set Alarm: Switch-On level for Alarm:

Alarm: Switch-On		 Back												
<div style="border: 2px solid black; border-radius: 15px; padding: 10px; width: 80%; margin: 0 auto;"> <p style="font-size: 1.5em; margin: 0;">5000 h</p> <p style="margin: 0;">10 ... 25000 h</p> </div> <div style="margin-top: 10px;"> <div style="background-color: #0070C0; color: white; padding: 5px; text-align: center; margin-bottom: 5px;">disable</div> <div style="background-color: #0070C0; color: white; padding: 5px; text-align: center;"> Enter  </div> </div>	<table style="margin: 0 auto;"> <tr> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">1</td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">2</td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">3</td> </tr> <tr> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">4</td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">5</td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">6</td> </tr> <tr> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">7</td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">8</td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">9</td> </tr> <tr> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">  </td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">0</td> <td></td> </tr> </table>	1	2	3	4	5	6	7	8	9		0		
1	2	3												
4	5	6												
7	8	9												
	0													
Enter a number within the range limits	13:44:33													

Type in required number of operation hours before element exchange should be done. Normal ranges are in between 10 to 25000 hours. In the example above it is about 5000 hours.

Press **Enter** button to store and return to previous menu.

3.2.2.11.4.2 Warning level for operating hours

Set **Warning: Switch-On** level for warning about operating hours:

Warning: Switch-On

Back

4500 h

10 ... 25000 h

1

2

3

4

5

6

7

8

9

0

Enter a number within the range limits

13:46:00

Type in required number of operation hours before first information (Warning) about soon element exchange should be done. Normal ranges are in between 10 to 25000 hours. In the example above it is 4500 hours.

Press **Enter** button to store and return to previous menu where you can see the entries.

◀ Back	Operating Hours	Next ▶▶
<div style="border: 1px solid gray; padding: 10px; margin-bottom: 10px;"> <p>Alarm-Relay Switch-On: 5000 h</p> </div> <div style="border: 1px solid gray; padding: 10px;"> <p>Warning-Relay Switch-On: 4500 h</p> </div>		
For changes, press on the edit areas!		13:47:07

You can either disable or enable both Relays to use the functionality of Operating hours.

Press Next >> button to enter next menu step.

3.2.2.11.5 Relays for throughput

Next menu step should be used to warn or alarm about reached Throughput [m³] through filter elements in use.


You can either enable or disable this function.

◀ Back	Throughput [m³]	Next ▶▶
<div style="border: 1px solid gray; padding: 10px; margin-bottom: 10px;"> <p>Alarm-Relay Switch-On: disabled</p> </div> <div style="border: 1px solid gray; padding: 10px;"> <p>Warning-Relay Switch-On: disabled</p> </div>		
For changes, press on the edit areas!		13:50:39

3.2.2.11.5.1 Alarm level for throughput

Set **Alarm: Switch-On** settings for throughput menu:

Alarm: Switch-On

 Back

50000 m³

10 ... 1000000 m³

1

2

3

4

5

6

7

8

9

←

0

disable

Enter ←

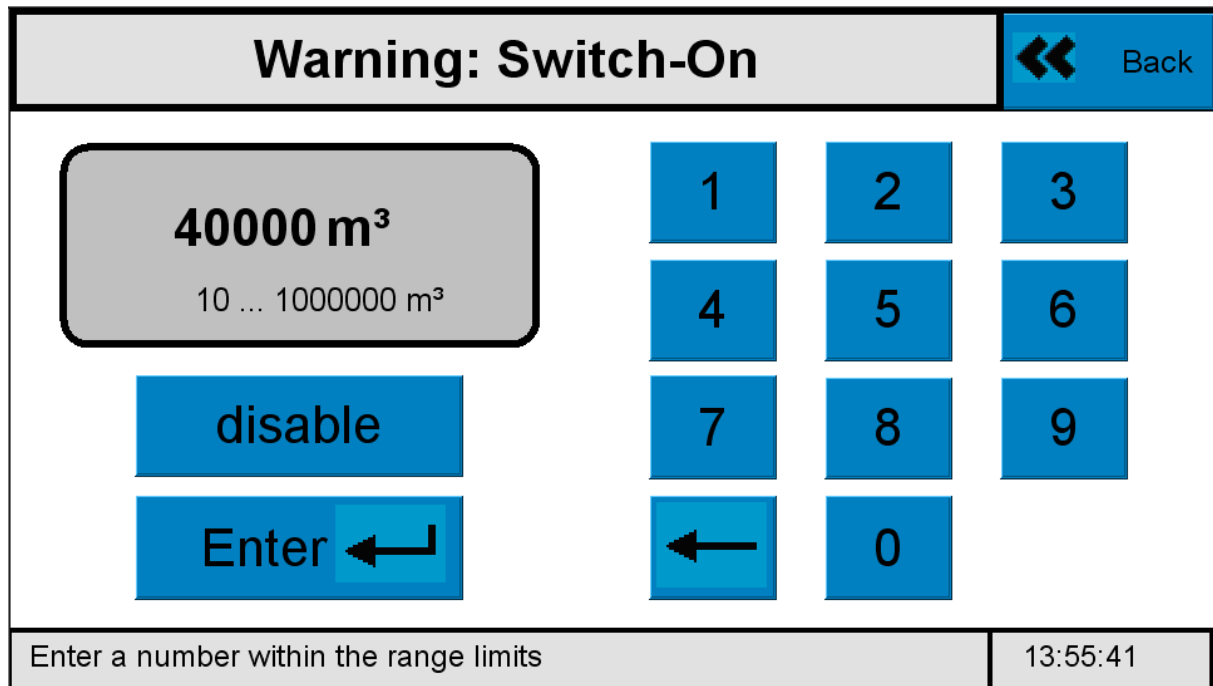
Enter a number within the range limits

13:53:03

In our case – Throughput for Alarm function has been set to 50 000 m³. It should be in general in between 10 to 1 000 000 m³.

3.2.2.11.5.2 Warning level for throughput

Set **Warning: Switch-On** settings for throughput menu:



The screenshot shows a control interface with a title bar 'Warning: Switch-On' and a 'Back' button. The main display area shows a large rounded rectangle containing '40000 m³' and a range '10 ... 1000000 m³'. Below this are buttons for 'disable', 'Enter', and a numeric keypad (0-9) with a left arrow button. At the bottom, a status bar displays 'Enter a number within the range limits' and the time '13:55:41'.

In our case – Throughput for Warning function has been set to 40 000 m³. It should be in general in between 10 to 1 000 000 m³. Press **Enter** button to return to previous menu.

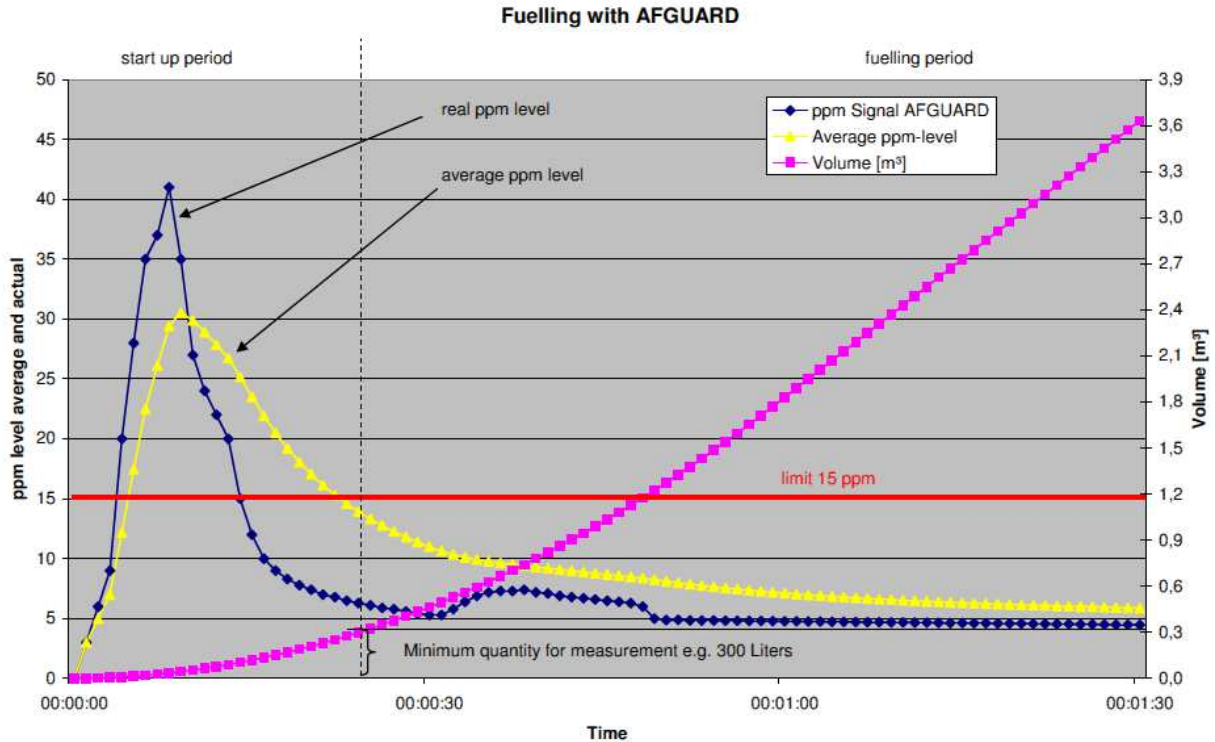
Make sure to have higher values for alarm compared to Warning function. In case of mistyping DPGUARD® will give out comment to double check the values.

3.2.2.11.6 Relays for water content

Here you can find three possibilities to address warning or alarm relays.

- A) By the use of current (actual) free water content. Please have in mind that every single peak could cause alarm or warning!
- B) By the use of averaged free water signal. Than single peaks coming from actual measurements are not critical.
- C) By the use of AFGUARD® signal output >> 20 mA, called water slug where you will have more than 500 ppm of water up to pure water. Than AFGUARD® gives out a water slug signal to immediate indicate Alarm relays.

Where the information does relate on:





Artificial fuelling process with start conditions that are not conform to jet fuel cleanliness. Real ppm level is far above the limit of 15 ppm, average ppm level (total level) is a combination of fueled volume and actual ppm signal. Both signals could be used to address alarms or warnings. Blue curve represents the actual level, yellow curve represents the total level (average level) of free water during present fuelling step. Red limit curve could be user defined to indicate abnormal levels for warning and / or alarm.

Warnings / alarm possibilities:



Actual water content:	warning level and alarm level
Average water content:	warning level and alarm level
Water slug:	alarm level

3.2.2.11.6.1 Relays for current water content

 Back	current water content	Next 
Alarm-Relay	Switch-On:	<input style="width: 100px; height: 30px;" type="text" value="40 ppm"/>
Warning-Relay	Switch-On:	<input style="width: 100px; height: 30px;" type="text" value="30 ppm"/>
Delay Switch-On:		<input style="width: 100px; height: 30px;" type="text" value="10 sec"/>
For changes, press on the edit areas!		15:42:02

You will be asked to type in free water levels for alarm or warning relays to be informed if actual free water content is reaching levels above acceptance. These levels are actual free water levels with high probability to see them under normal circumstances. Therefore it is recommended to go for relatively high delay times to prevent alarm and / or warning under normal situations. Warnings and or Alarms will only appear if ongoing peaks overstay presetting's for Delay Switch – on.

3.2.2.11.6.2 Relays for total water content

 Back	total water content	Next 
Alarm-Relay	Switch-On:	<input style="width: 100px; height: 30px;" type="text" value="15 ppm"/>
Warning-Relay	Switch-On:	<input style="width: 100px; height: 30px;" type="text" value="10 ppm"/>
Delay Switch-On:		<input style="width: 100px; height: 30px;" type="text" value="1 sec"/>
For changes, press on the edit areas!		15:52:08

These warning / alarm relays relate to averaged free water content, mathematical calculated by the use of flow and actual free water content (integrated signal).



It is recommended to use these relays outputs together with recommended limits for free water content e.g.

30 ppm for civil applications

or

15 ppm for military applications.

3.2.2.11.6.3 Water slug



	water slug detection	 Back
---	-----------------------------	--

Alarm Delay Switch-On:	5 sec
------------------------	--------------


For changes, press on the edit areas!	13:36:54
---------------------------------------	----------

Type in Alarm delay switch on for water slug. Presetting is for 5 seconds.

Alarm Delay Switch-On:	 Back
-------------------------------	--

<div style="border: 2px solid black; border-radius: 15px; padding: 10px; text-align: center;"> <p>5 sec</p> <p>1 ... 60 sec</p> </div>	1	2	3
	4	5	6
	7	8	9
	Enter 		0

Enter a number within the range limits	13:38:00
--	----------

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Now you did finish the installer menu and are ready to use the DPGUARD®.
If you want to change a single setting please go into the normal setup routine as described in chapter 4.

3.2.3 Sleep modus

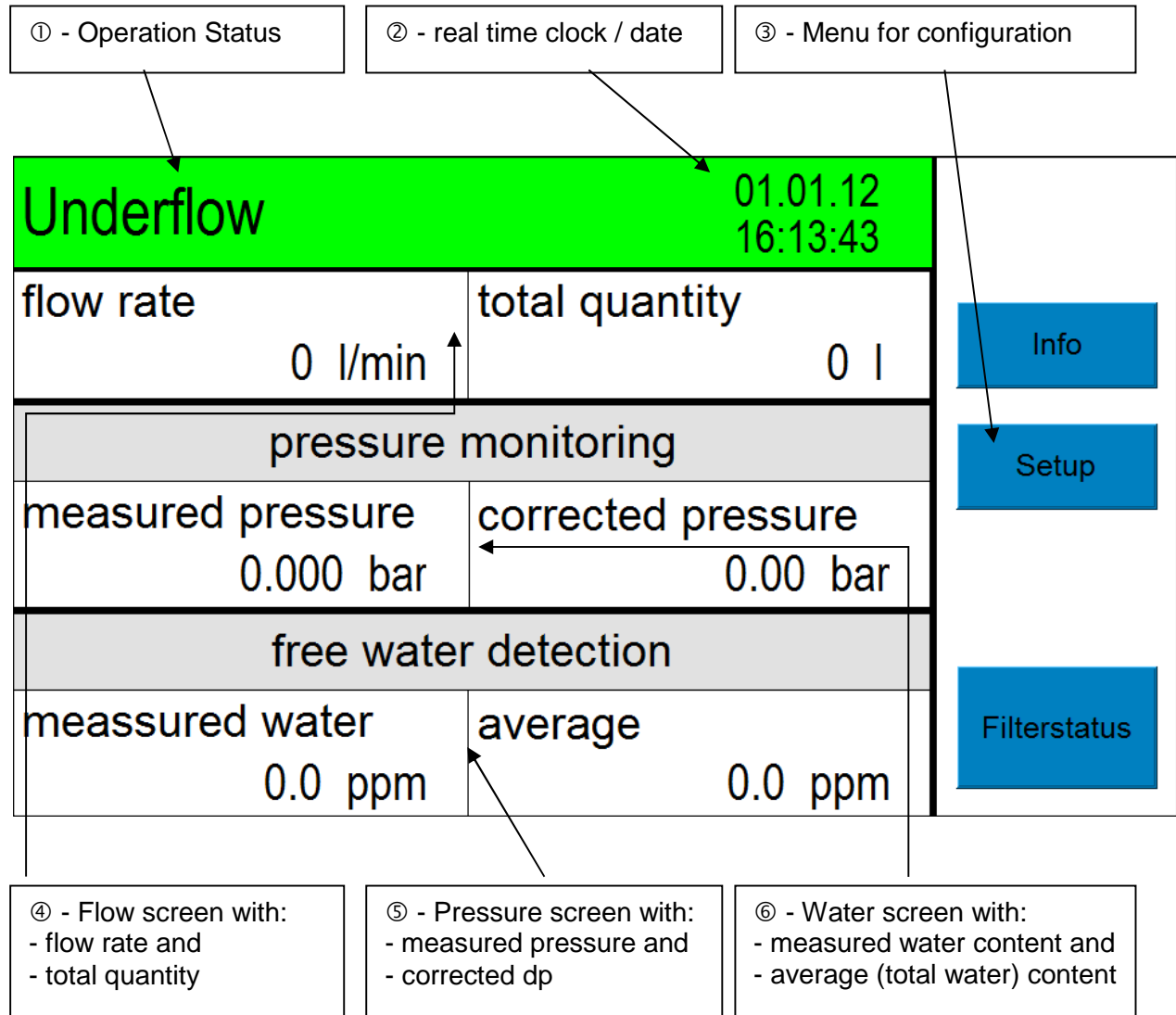
Under no flow conditions for more than 3600 seconds DPGUARD® could be switched into sleep mode to come back into operation mode when flow goes on or with a touch on the screen.

Presetting for sleep modus is 60 minutes.

Energy consumption caused by activated screen compared to sleep modus is slightly lower (20 mA). If you want to change sleep modus times – please contact FAUDI Aviation Sensor GmbH.

4 Operation of DPGUARD®

4.1 Main menu

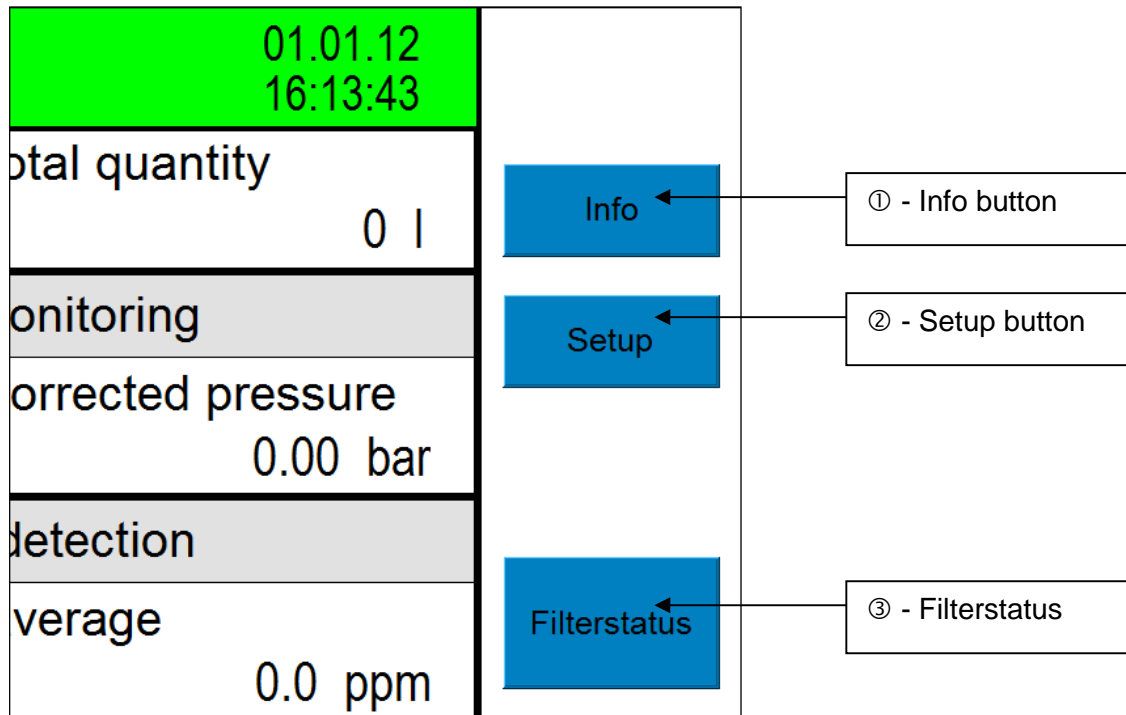


Elaboration of terms on main screen:

①	Operation status: Status line where all alarms and warnings are displayed during operation
②	Real clock an time – for data logger and evaluation of logged data
③	Menu for configuration of DPGUARD® The DPGUARD® is a touch screen minicomputer – Submenus could be addressed by touch on setup button.
④	Flow screen with actual flow rate and total fuelled volume for actual fuelling step
⑤	Pressure screen with measured differential pressure across filter elements and corrected differential pressure related to rated flow (max. achievable flow)

content for actual fuelling process as combination of filled volume and free water content.

4.1.1 Menu on Main Screen



Elaboration of terms:

		See Chapter
①	Info button – to reach contact info's and relevant info's for online support	
②	Setup button to enter setup menu	
③	Filter status to enter the filter based data and related filter graph menu	

4.2 Normal operation

Underflow		01.01.12 16:13:43	
flow rate	total quantity		
0 l/min	0 l		Info
pressure monitoring			Setup
measured pressure	corrected pressure		
0.000 bar	0.00 bar		
free water detection			
measured water	average		Filterstatus
0.0 ppm	0.0 ppm		

Under normal circumstances all sensor signals are displayed together with their mathematical correlated corrections. By pressing the pressure monitoring area you will reach the “corrected dp sub screen as described in chapter 4.3.1.

By pressing the free water detection area you will reach the “water content” area as described in chapter 4.3.2.

In general it is not needed to do so but the amount of signals to be displayed are reduced on subscreens. It could be helpful to only display what is needed for special operations.

4.2.1 Change of colors in case of warning or alarm

Normal color for operation modus should be green or white / grey.

Signals that change into yellow indicate warning

Signals that change into red color indicate alarm situation.

Yellow status is always related to warning relays output – active relays for warning.

Red status always relates to alarm relays output to activate the alarm relay.

4.3 Switch between screens:

By a touch on defined areas on main screen, sub screens could be reached to separately indicate corrected dp function or free water measurement.

The screenshot shows the main screen with the following data:

- Status: o.k. (01.01.12, 16:54:35)
- flow rate: 512 l/min
- total quantity: 7899 l
- pressure monitoring:
 - measured pressure: 0.040 bar
 - corrected pressure: 0.21 bar
- free water detection:
 - measured water: 8.2 ppm
 - average: 7.9 ppm

Callouts on the right side:

- Info** button: Press this red framed area to address corrected dp sub screen
- Setup** button: Press this blue framed area to address free water sub screen
- Filterstatus** button: Press this blue framed area to address free water sub screen

4.3.1 Menu on Main Screen

The screenshot shows the main screen with the following data:

- bar
- 10:07:57
- 25.07.11
- w rate: 1000 l/min

Callouts on the right side:

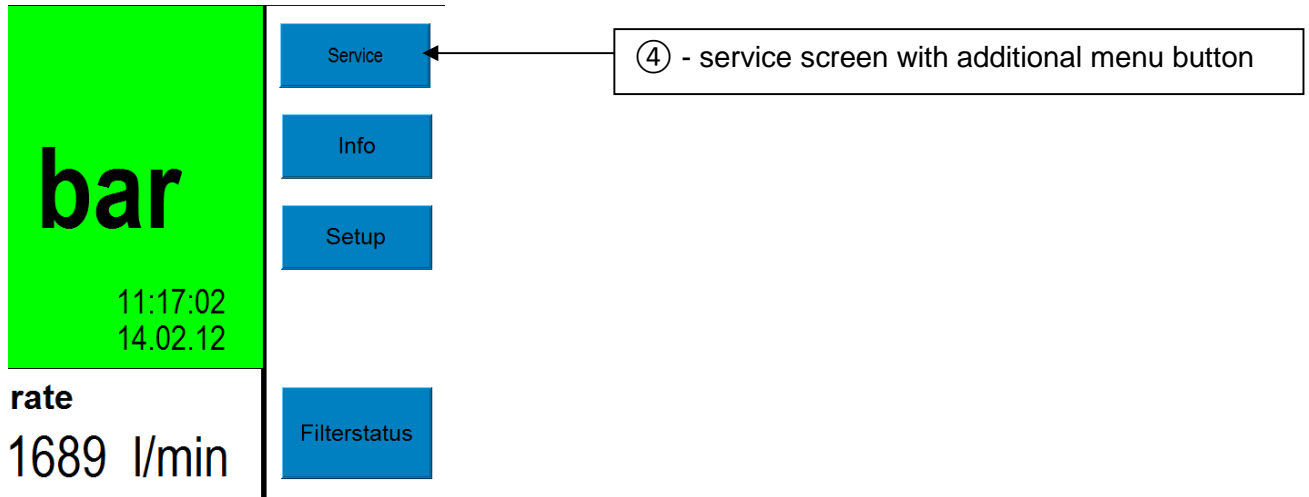
- ① - Info button
- ② - Setup button
- ③ - Filterstatus

Elaboration of terms:

		See Chapter
①	Info button – to reach contact info's and relevant info's for online support	
②	Setup button to enter setup menu	
③	Filter status to enter the filter based data and related filter graph menu	

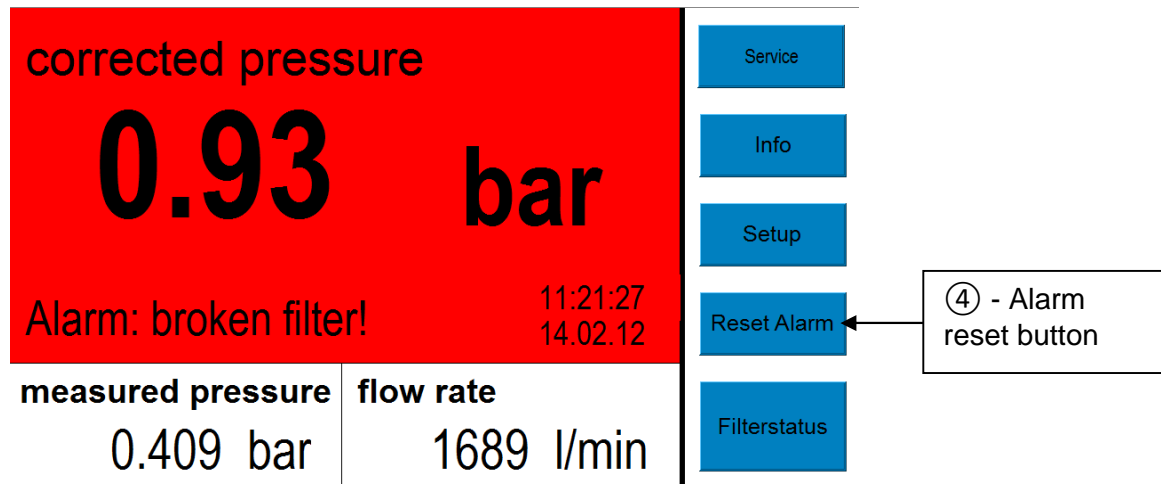
④	Service operation enabled – see service manual	4.3.1.1
⑤	Alarm reset button	4.3.1.2

4.3.1.1 Service screen




4.3.1.2 Reset Alarm screen

In any case of activated alarm – additional touch button appears to reset alarm manually by a touch on screen. Alarm could either be deactivated by the use of external reset button (see chapter 8 “List of settings”, mark 40)



4.3.1.3 Normal Operation

4.3.2 Main Screen

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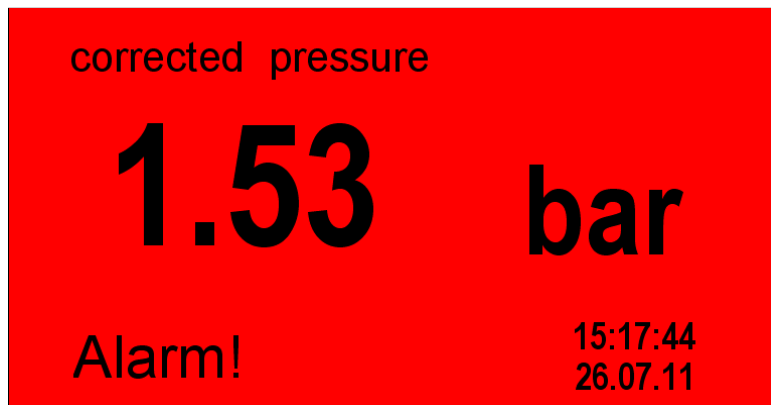
Under normal circumstances – all sensor signals (pressure sensors, flow signal and AFGUARD free water content) are OK, with no Alarm and Warning to inform about critical situations – the DPGUARD® main screen should look as following:

<p>corrected pressure</p> <h1>0.54 bar</h1> <p>Status: o.k. 14:57:26 26.07.11</p>		Info
		Setup
measured pressure	flow rate	Filterstatus
0.31 bar	999 l/min	

When Warning levels are achieved – screen colour changes from green into yellow:

<p>corrected pressure</p> <h1>1.33 bar</h1> <p>Warning! 15:16:10 26.07.11</p>	
--	--

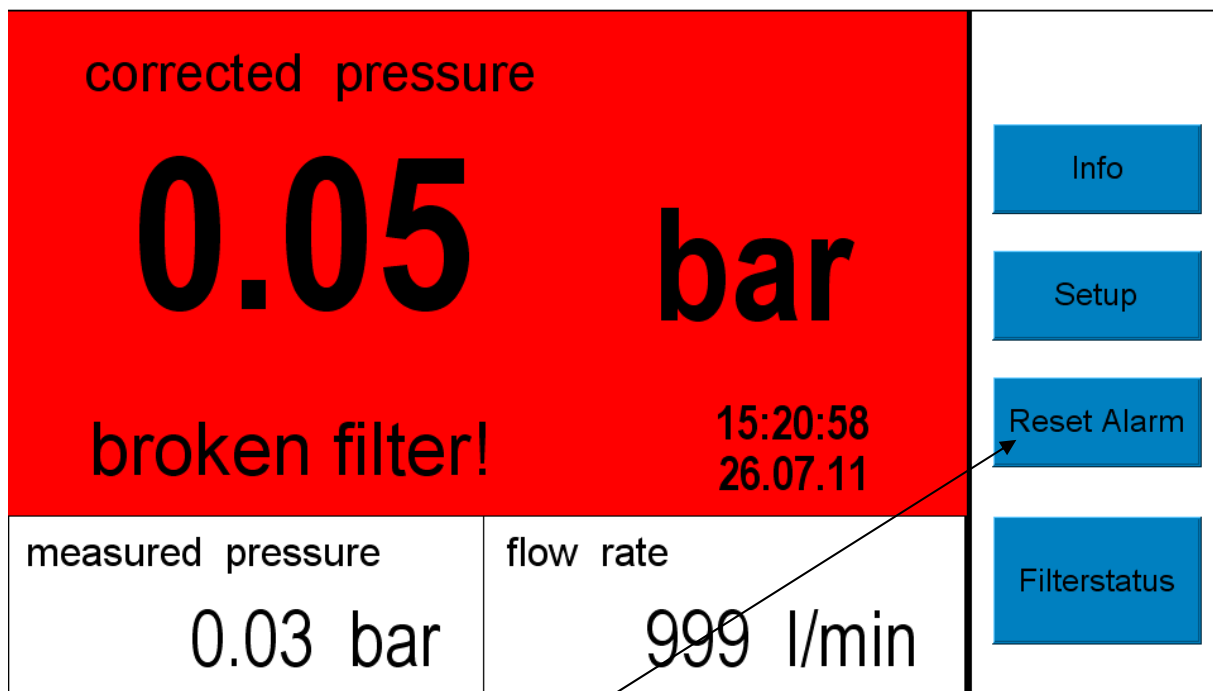
When Alarm levels are achieved – screen color changes from green / yellow into red with blinking of screen:



There are few differences in Alarm functions:

4.3.2.1 Broken Filter:

Gives an indication about high pressure drops across filter elements with immediate shut down of system (only if Filter breakthrough function is enabled). To proceed further on – a submenu: **Reset Alarm** pops up where the user is asked to reset the alarm:



To do so – please click on **Reset Alarm** button.

Then you are asked to enter the User or Administrator Password (PIN)
Password levels are preconfigured to (could be changed during setup mode):

User : 00000000
Administrator: 12345678

4.3.2.1.1 *Reset Alarm by the use of external switch*

Alarm could either be reset by the use of an external reset switch. DPGUARD consists of different digital inputs. Digital input DI01 has been setup to reset Alarm via external button. Please refer to DPGUARD installation instructions for setup of digital input procedure.

Pre-setting of DPGUARD is without manually reset functionality

4.3.2.1.1.1 Activation of manually alarm reset:

Please refer to service manual to change manually alarm reset:

⏠
Algorithmus Setting
⏪ Back

Mode: Points ⏪ ⏩

coefficients setting: change

Manually reset alarms: disabled ⏪ ⏩

constant delta pressure: disabled ⏪ ⏩

Click on it to change between:

- disabled
- and
- enabled

For changes, press on the edit areas!
11:34:02

4.3.2.2 Underflow

When flow sensor delivers signals below start up Switch – on level of DPGUARD® (system parameter menu) – following status will be displayed.

corrected pressure		<div style="background-color: #0070C0; color: white; padding: 5px; text-align: center;">Info</div> <div style="background-color: #0070C0; color: white; padding: 5px; text-align: center;">Setup</div> <div style="background-color: #0070C0; color: white; padding: 5px; text-align: center;">Filterstatus</div>
<h1>0.30 bar</h1>		
<h2>Underflow</h2>		
measured pressure	flow rate	
0.03 bar	199 l/min	
		15:32:10 26.07.11

In this case the DPGUARD® is without function for corrected differential pressure readout. To change parameters for switch on DPGUARD earlier – please refer to chapter 3.2.2.9.2

4.3.2.3 Broken wire

When signal of sensors are below preconfigured signal quality (e.g. 4 to 20 mA with signal heights of less than 4 mA) following Alarm status will be displayed:

corrected pressure	
<h1>0.30 bar</h1>	
<h2>broken wire!</h2>	
15:35:25 26.07.11	

Please check cabling to make sure that all connections are OK.
Faulty alarm could either be caused by wrong pre-setting of sensor signals.

4.3.2.4 Pressure fluctuations

DPGUARD catches electrical signals coming from flow and differential pressure transmitters or sensors. In any case, under static flow conditions measured pressure conditions should not change. If measured pressure signals change during static flow condition critical situation e.g. filter clogging goes on. To detect these circumstances, DPGUARD consists about a special functionality to detect and give out warnings related to this critical behaviour. Function to detect pressure fluctuation could only be addressed in service mode (see service manual)

Alarm pressure fluctuation! screen:

<p>corrected pressure</p> <h1 style="margin: 0;">0.72 bar</h1>		<p>Info</p> <p>Setup</p>
<p>Alarm: pressure fluctuation! 12:02:26 14.02.12</p>		
<p>measured pressure</p> <p>0.297 bar</p>	<p>flow rate</p> <p>1689 l/min</p>	<p>Filterstatus</p>

DPGUARD does have a presetting with disabled functionality to give out pressure fluctuation alarms.

4.3.2.5 Filter status screen

Press **Filterstatus** on main screen to enter **Current Filter status** menu

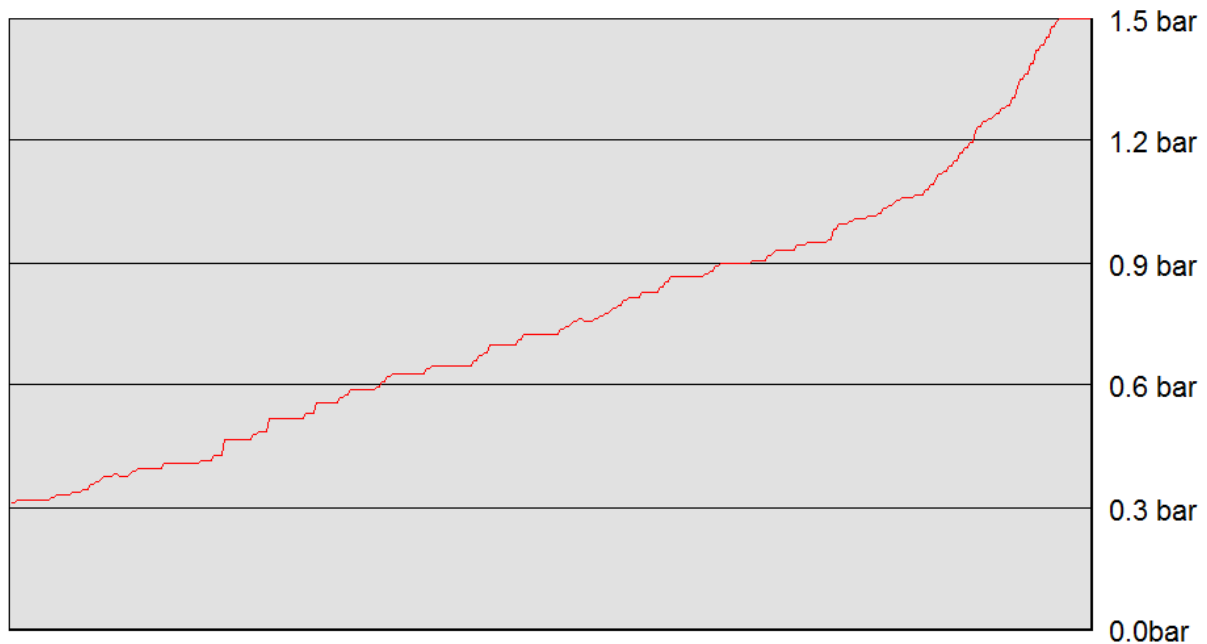
Current Filterstatus				
Date:	12.01.12	Time:	08:59:29	<p>Trend</p> <p>DP function</p> <p>Reset</p> <p>Back</p>
Operating Hours:	6 h 40 min			
Throughput:	1028 m ³			
max. flow rate of the filter:	3400 l/min			
Alarm [corrected pressure]:	22.0 psi			

Here you can find:

Date	of last filter change
Time	of last filter change
Operating hours	since last filter change
Throughput	since last filter change
Max flow rate of the filter	see setup menu for vessel (nameplate of vessel)
Alarm [corrected pressure)]	adjusted alarm level
Trend button	to have an idea about the corrected differential pressure behaviour of filter element in use
DP function button	to give out actual differential pressure function (self learned)
Reset button	to reset DPGUARD® after filter element exchange – only possible under with password level
Back button	to go back to main screen

4.3.2.5.1 Trend

Gives out filter behaviour over whole period of installation time of filter element in use by the use of logged data for corrected differential pressure readout and time and date of change out correlated to actual time (artificial curve).



Start: time + date

End of service: time + date

By pressing the trend button you can easily observe the filter behaviour without additional paperwork. All relevant data are stored on memory stick that is located inside DPGUARD®

4.3.2.5.2 Actual differential pressure curve

DPGUARD could give out actual differential pressure curve of elements in use. You will easily find out that differential pressure behaviour of elements in use is changing over time. Therefore FAUDI recommend to use intelligent electronics like the DPGUARD to mathematical correct give out actual differential pressure behaviour of elements in use. Do not try to compare with static mathematical correlations. They will fail.

<p>corrected pressure</p> <h1>1.00 bar</h1> <p>Status: o.k. 12:25:02 14.02.12</p>	<p>Function could be addressed on main screen, Filterstatus</p> <p>Info</p> <p>Setup</p> <p>Filterstatus</p>
<p>measured pressure flow rate</p> <p>0.442 bar 1689 l/min</p>	<p>Next button: DP function</p> <p>Trend</p> <p>DP function</p> <p>Reset</p> <p>Back</p>
<p>ent Filterstatus</p> <p>Time: 12:12:25</p> <p>0 h 8 min</p> <p>14 m³</p> <p>ate of the filter: 3400 l/min</p> <p>ected pressure]: 1.50 bar</p>	<p>current DP function</p> $y = 0.100 x^2 + 0.350 x$ <p>Back</p> <p>Gives out actual learned dp function Data related to actual dp function will be logged together with measured values of:</p> <ul style="list-style-type: none"> • Date • Tie • Measured flow • Measured dp • Corrected dp • Status of DPGUARD

4.3.2.5.3 Reset button

By the touch of this button – user does a filter reset.

This should only be done if physical filter exchange has been done

Gives out filter data as log file for time of filter elements in use and overall throughput

DPGUARD

Discription: Filterelement Operating Status

Date of Change: 06.02.12

Time of Change: 16:19:08

Date of Start: 12.01.12

Time of Start: 08:59:29

Operating Hours: 7 h 22 min

Flow Volume: 1114 m³

max. Flow rate: 184 m³/h


max. measured DP: 6.6 psi

max. corrected DP: 11.2 psi

5 Setup routine to change values and settings

5.1 Info screen

When pressing the INFO button – all relevant contact info's are displayed on this screen



Firmware: V0101_20110616

LZS/Boot: 21101296_20091111

FAUDI Aviation Sensor GmbH
Scharnhorststrasse 7 B
D-35260 Stadtallendorf

Fax: +49 6428 4465 - 221
Email: sensor@faudi-aviation.com
Web: www.faudi-aviation.com

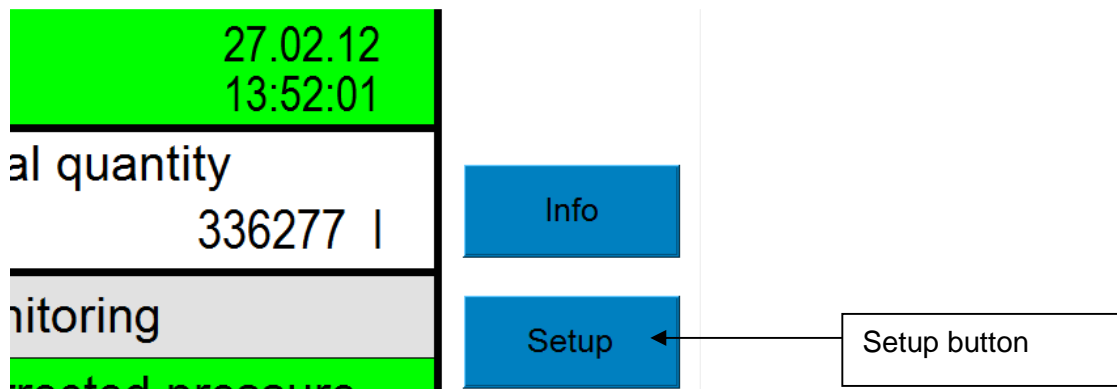
Firmware / LZS/Boot

When contacting FAUDI Aviation GmbH for service purposes – please make sure to have Firmware and LZS/BOOT – data prepared. These data are relevant to make online service available.

Touching the screen again – you will be back on Main screen.

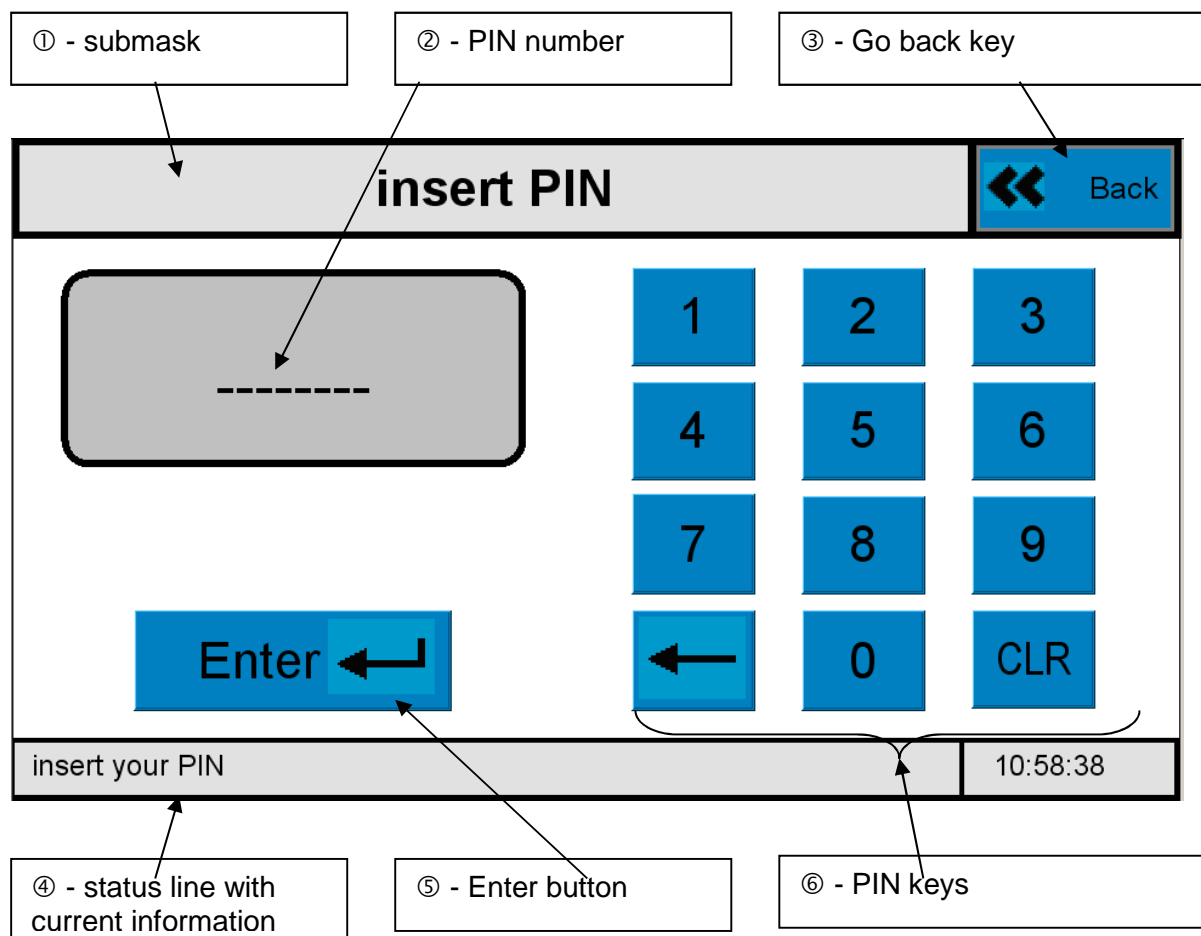
5.2 Setup screen – to be addressed from main screen

To enter the setup procedure – please click on Setup button.



After pressing the setup button – you are immediately asked to enter your PIN number

5.2.1 PIN number



Elaboration of terms on PIN number screen

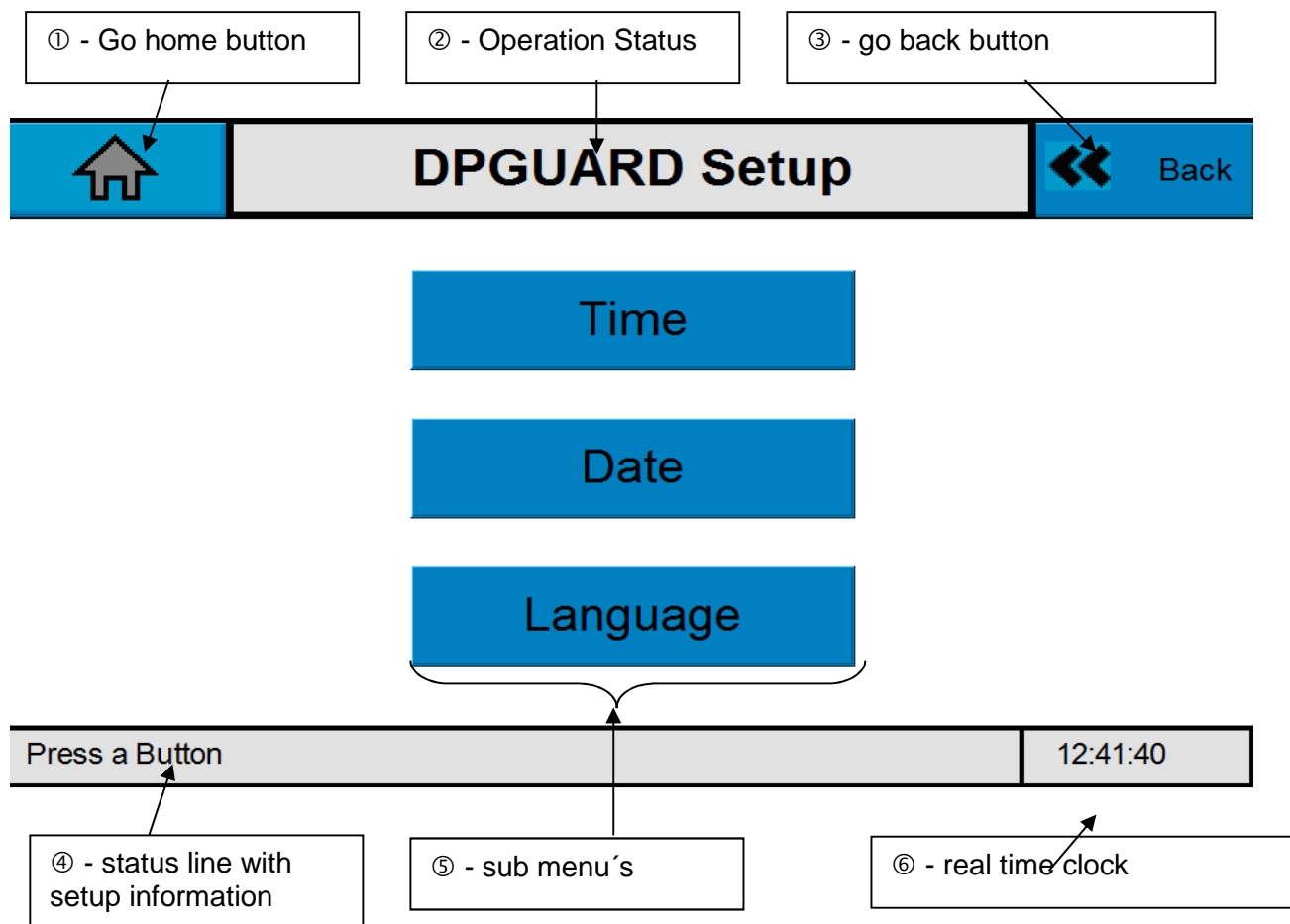
①	Sub mask – Headline
②	PIN key field to enter 8 digits PIN number via PIN keys ⑥
③	Go back key to enter previous menu
④	Status line with information about current sub menu
⑤	Enter button to accept PIN number and enter setup menu
⑥	PIN keys to give in PIN code

Following PIN numbers are preconfigured:

Administrator – PIN level: 12345678
User – PIN level: 00000000
Third PIN level (Service): to be advised by FAUDI

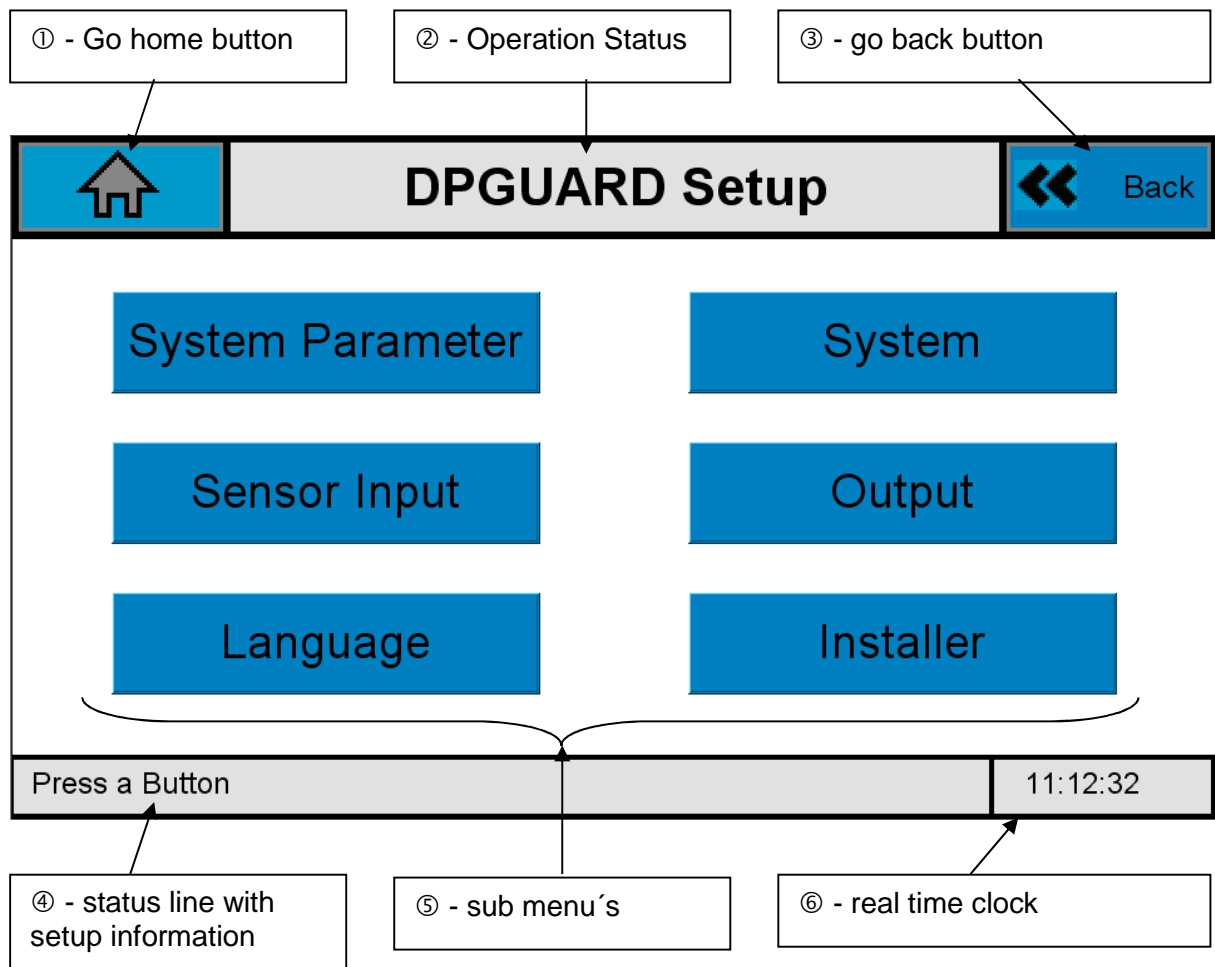
After entering your PIN number you should enter one of the following menu levels:

5.2.2 Setup menu for User level



User is limited to only change time, date and language settings.

5.2.3 Setup menu for Administrator level

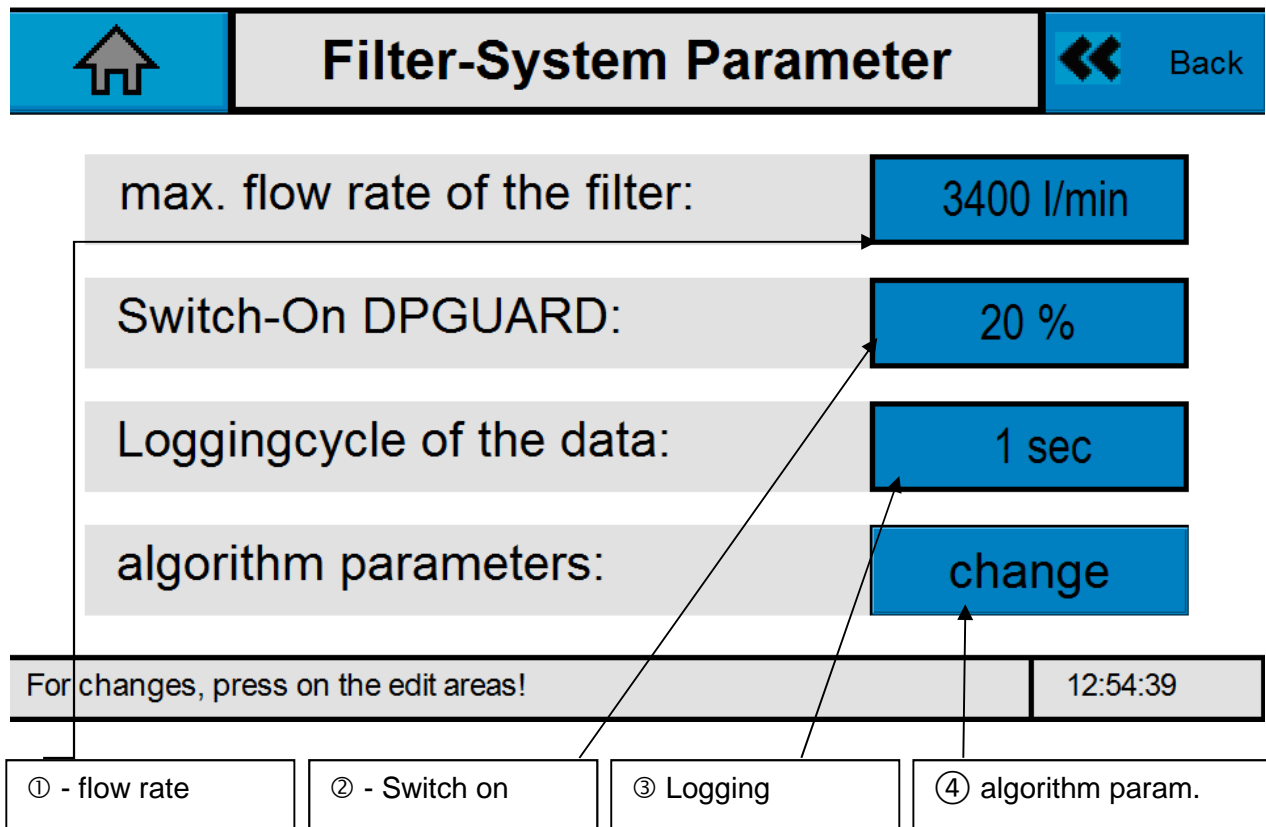


Elaboration of terms on setup screen for both levels:

①	GO home button – to quit setup menu and enter main screen
②	Operation status to indicate setup level
③	Go back menu to enter previous menu
④	Status line with current setup information
⑤	Sub menus to enter relevant setup menus
⑥	Real clock

5.2.4 Configuration menu System Parameter

By pressing the System Parameter button user reaches the System Parameter level where input of system parameters is required.



Elaboration of terms:

		See Chapter
①	Maximum flow rate / rated flow of vessel / filter elements in use – refer to vessel data.	
②	Switch – on DPGUARD®: describes the percentage of maximum / rated flow where mathematical calculation starts to work. Please do not enter data below 20 %.	
③	Logging cycle of data logger – time within measured and calculated data are stored together with alarm / warning status. Gives the opportunity to retrospective analyzes data of filter elements.	
④	Algorithm parameters to adapt the way of catching the relevant sensor parameters	

Following input should be done:

5.2.4.1 Maximum flow rate / rated flow:

Please enter the rated flow of the vessel in use by entering the relevant data via menu below. In the example below it is 2.500 L/min

① - submask

② - maximum flow

③ - go back key

④ - status line with current information

⑤ - Enter button

⑥ - insert keys

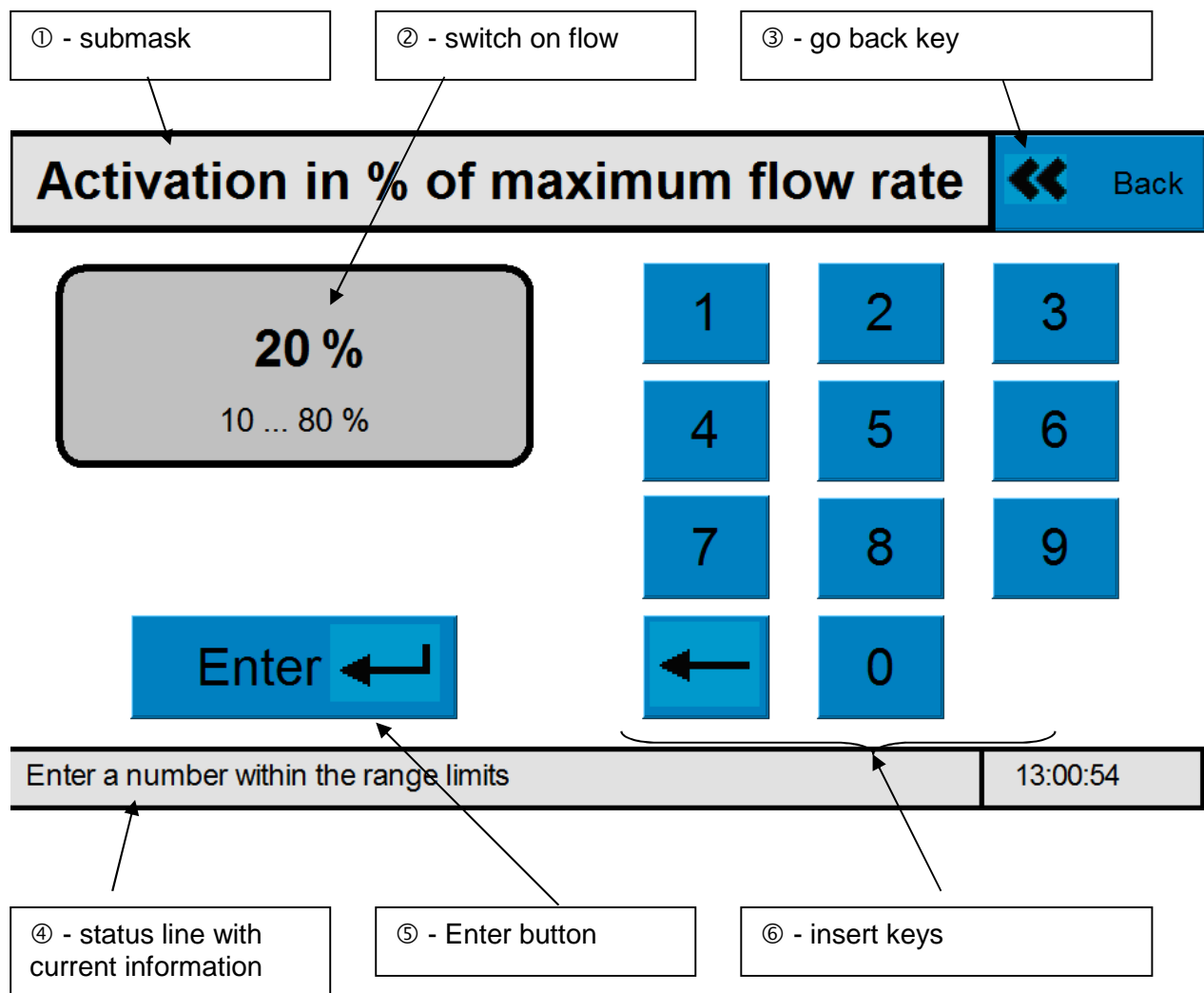
Elaboration of terms on flow rate screen

①	Sub mask – Headline
②	Insertion field to enter maximum allowable flow / rated flow across elements / vessel, related to nameplate on vessel ⑥
③	Go back key to enter previous menu
④	Status line with information about current sub menu
⑤	Enter button to accept inserted flow rate and go back to previous menu
⑥	Key pad to give in maximum allowable flow / rated flow number

After pressing the switch on button ② – see menu 3.3.3, next submenu appears:

5.2.4.2 Start flow – Switch on flow [%]

Please enter start flow conditions. This is the level of flow to activate the mathematical calculation of corrected differential pressure. Do not try to level it down below 20 % or up to or above 80 % It should be in between 20% ... 80 % . .
In normal cases it is above 50 % (In the example below it is 20 %)



Elaboration of terms on flow rate screen

①	Sub mask – Headline
②	Insertion field to switch on flow condition for mathematical calculation of corrected differential pressure readout. Should be in between 20% ... up to 80 %.
③	Go back key to enter previous menu
④	Status line with information about current sub menu

⑥ Key pad to give in switch on flow condition

5.2.4.3 Data logging [sec]

Please enter the logging time in seconds. Shortest time period is 1 second.

① - submask	② - logging time steps	③ - go back key
-------------	------------------------	-----------------


④ - status line with current information	⑤ - Enter button	⑥ - insert keys
--	------------------	-----------------

Elaboration of terms on flow rate screen

①	Sub mask – Headline
②	Insertion field to give in time period for data logger. Should be in between 1 second and 600 seconds.
③	Go back key to enter previous menu
④	Status line with information about current sub menu
⑤	Enter button to accept inserted logging time – go back to previous menu
⑥	Key pad to give in logging time numbers


5.2.4.3.1 Change / preset of Algorithm parameters

Possibility to preset change basic terms for calculation of mathematic algorithm.

 Back	algorithm parameters	
max. coefficient changing:	0.0100	①
min. flow rate difference:	30.0 %	②
Constant condition: Time	5.0 sec	③
Constant condition: Tolerance	3.0 %	④
For changes, press on the edit areas!		10:04:01

Please handle settings with care. They do have influence in behaviour of DPGUARD and its functionality.


5.2.4.3.1.1 Change of preset max coefficient changing

 Back	algorithm parameters	
max. coefficient changing:	0.0100	

When pressing the blue button you will be asked to give in max. coefficient changing numbers – see mark ①. These numbers effect behaviour of corrected dp function.

Misuse could cause fatal error.

Please contact FAUDI Aviation Sensor GmbH or your local distributor to discuss in front of any change.

max. coefficient changing	 Back
----------------------------------	--

0.0100

0.0001 ... 1.0000

1	2	3
4	5	6
7	8	9
←	0	.

Enter 

Enter a number within the range limits	10:09:00
--	----------

Accepted numbers should be in between 0.0001 and 1.0.

Presetting is 0.01

5.2.4.3.1.2 Change of minimum flow rate difference

By the use of this parameters you could influence the way to catch measured values of flow and dp to generate corrected dp function. Press button (see mark ②) to change minimum difference between measured values to be as stable as possible for the corrected mathematical algorithm “corrected differential pressure function”.

min. flow rate difference	 Back
----------------------------------	---

30.0 %

5.0 ... 50.0 %

1	2	3
4	5	6
7	8	9
←	0	.

Enter 

Enter a number within the range limits	10:17:21
--	----------

Presetting is 30 %.

5.2.4.3.1.3 Change of constant condition time

Fluctuation in measured signals could cause bad measurement results. Therefore DPGUARD is looking for static situation to catch signals when there is as low as possible change in flow and pressure signals. Time for evaluation is set for 5 sec.

Constant condition: Time		←← Back												
<div style="border: 1px solid black; border-radius: 10px; padding: 10px; text-align: center;"> 5.0 sec 1.0 ... 20.0 sec </div>		<table border="1"> <tr><td>1</td><td>2</td><td>3</td></tr> <tr><td>4</td><td>5</td><td>6</td></tr> <tr><td>7</td><td>8</td><td>9</td></tr> <tr><td>←</td><td>0</td><td>.</td></tr> </table>	1	2	3	4	5	6	7	8	9	←	0	.
1	2	3												
4	5	6												
7	8	9												
←	0	.												
<div style="border: 1px solid black; border-radius: 10px; padding: 10px; text-align: center;"> Enter ← </div>														
Enter a number within the range limits		10:22:24												

Minimum time should be 1 sec. max. time 20 sec. Please be carefully by changing numbers. **Misuse could cause fatal error.**

Presetting is 5 sec

5.2.4.3.1.4 Change of constant condition tolerance

Fluctuation of signals heavily depends on system in use and could only sorted out by mathematics to find as stable situation as possible. DPGUARD is looking for stable

Constant condition: Tolerance		←← Back												
<div style="border: 1px solid black; border-radius: 10px; padding: 10px; text-align: center;"> 3.0 % 0.1 ... 10.0 % </div>		<table border="1"> <tr><td>1</td><td>2</td><td>3</td></tr> <tr><td>4</td><td>5</td><td>6</td></tr> <tr><td>7</td><td>8</td><td>9</td></tr> <tr><td>←</td><td>0</td><td>.</td></tr> </table>	1	2	3	4	5	6	7	8	9	←	0	.
1	2	3												
4	5	6												
7	8	9												
←	0	.												
<div style="border: 1px solid black; border-radius: 10px; padding: 10px; text-align: center;"> Enter ← </div>														
Enter a number within the range limits		10:28:10												

measuring results to catch them when stability parameters are ok in between constant condition time (see chapter above). Accepted tolerance with regard to actual measurement could be changed by the use of button (see mark ④).

Presetting should be 2% up to 3 %.

All these settings do have influence on calculated algorithm parameters that could be displayed as corrected differential pressure function (see Filterstatus / dp function)

Current Filterstatus	
Date: 14.02.12	Time: 09:23:51
Operating Hours: 1 h 9 min	
Throughput: 96 m ³	
max. flow rate of the filter: 3400 l/min	
Alarm [corrected pressure]: 1.50 bar	

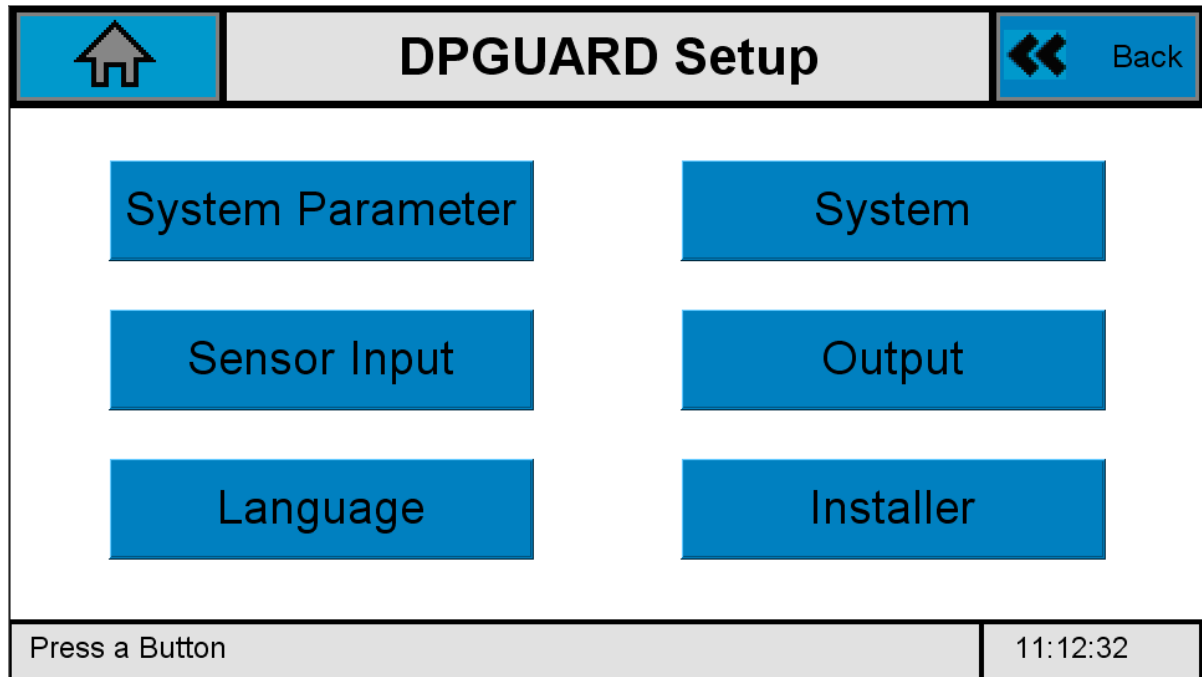
Trend	
DP function	current DP function
Reset	
Back	

$$y = 0.100 x^2 + 0.350 x$$

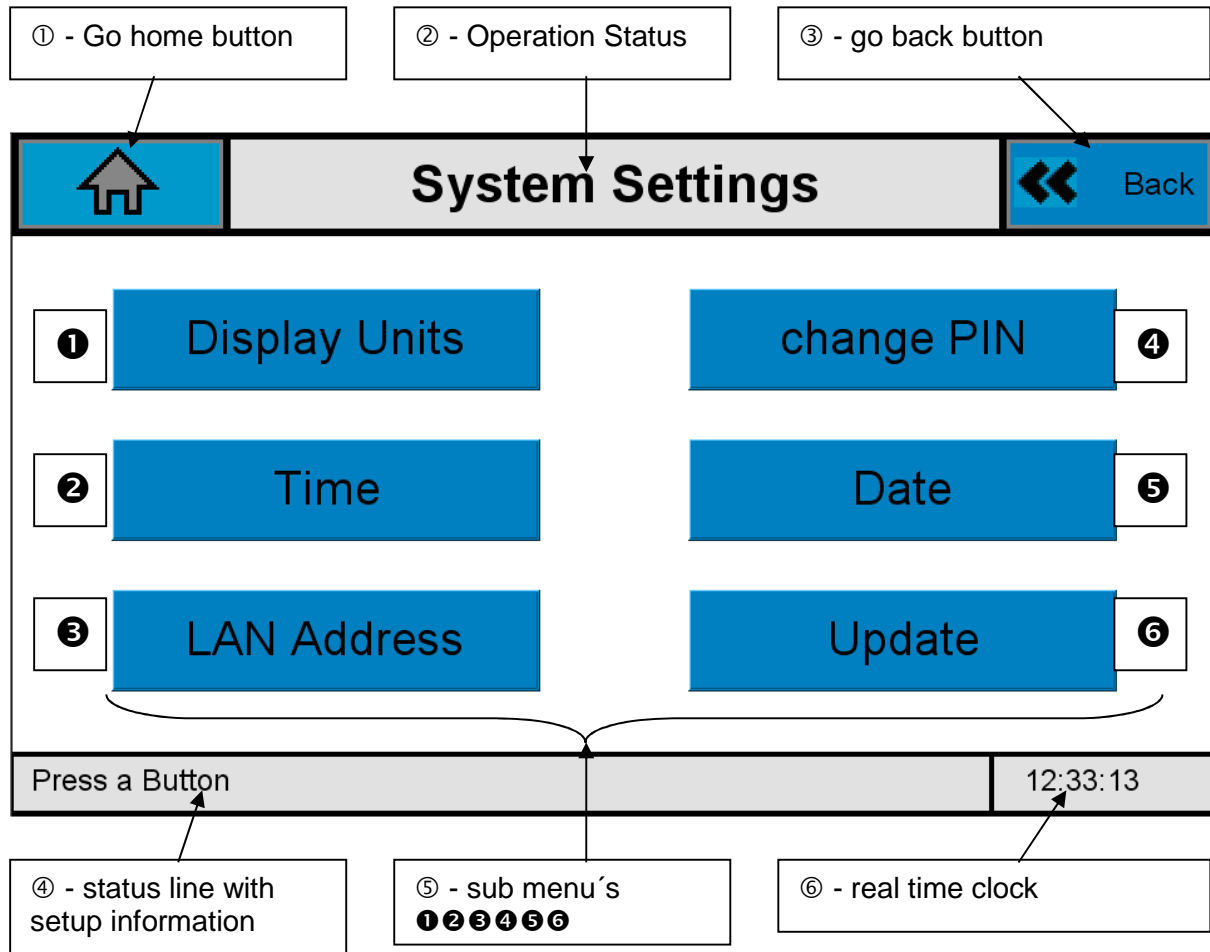
Quadratic and linear coefficients could also be user defined (not mandatory) to start with predefined conditions. If you need to do so – please refer to service manual or contact your FAUDI Aviation Sensor responsible.

5.2.5 System settings - setup menu

Enter the DPGUARD® setup menu and press the **System** button to enter the Setup menu for system parameters



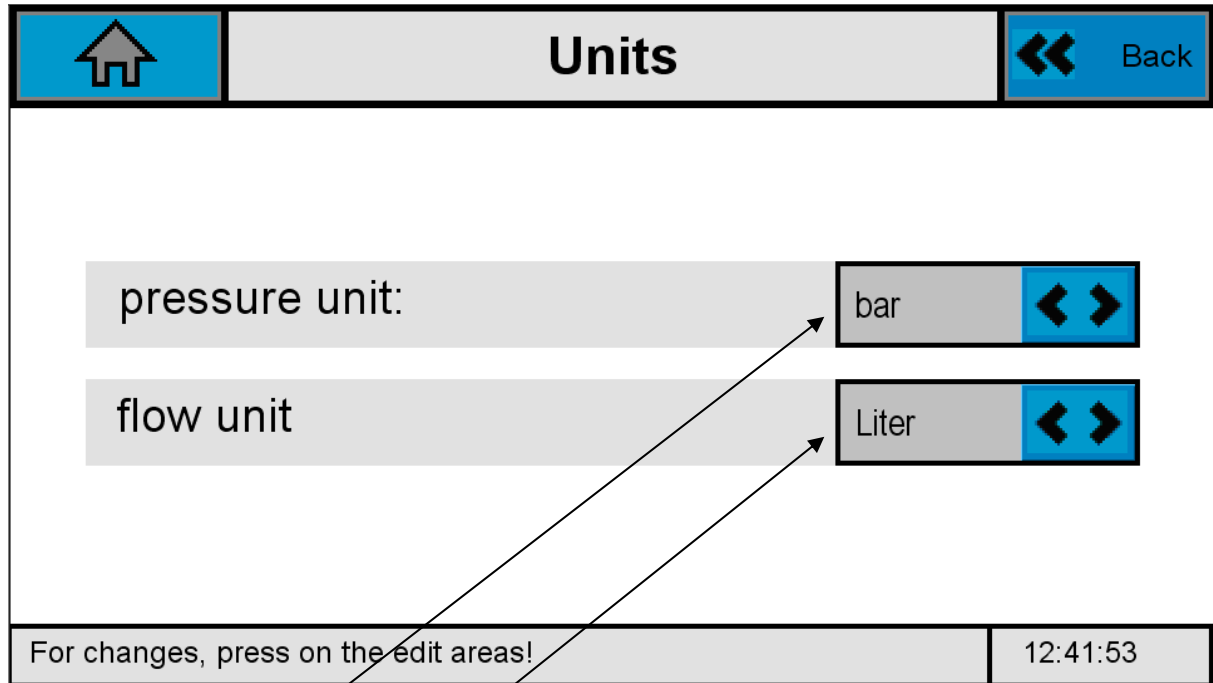
Following screen should appear:



Elaboration of terms on setting screen:

		See chapter
①	GO home button – to quit setup menu and enter main screen	
②	Operation status to indicate setup level	
③	Go back menu to enter previous menu	
④	Status line with current setup information	
⑤	Sub menus to enter relevant setup menus	
⑥	Real clock	
①	Display units – submenu to change units	
②	Time – submenu to change time settings	
③	LAN Address – submenu to change addresses	
④	PIN – submenu to change PIN numbers	
⑤	DATE – submenu to change DATE settings	
⑥	Update – sub USB menu to run automatic update via	

5.2.5.1 Display units – change between bar / psi and liter / gal



① - pressure unit

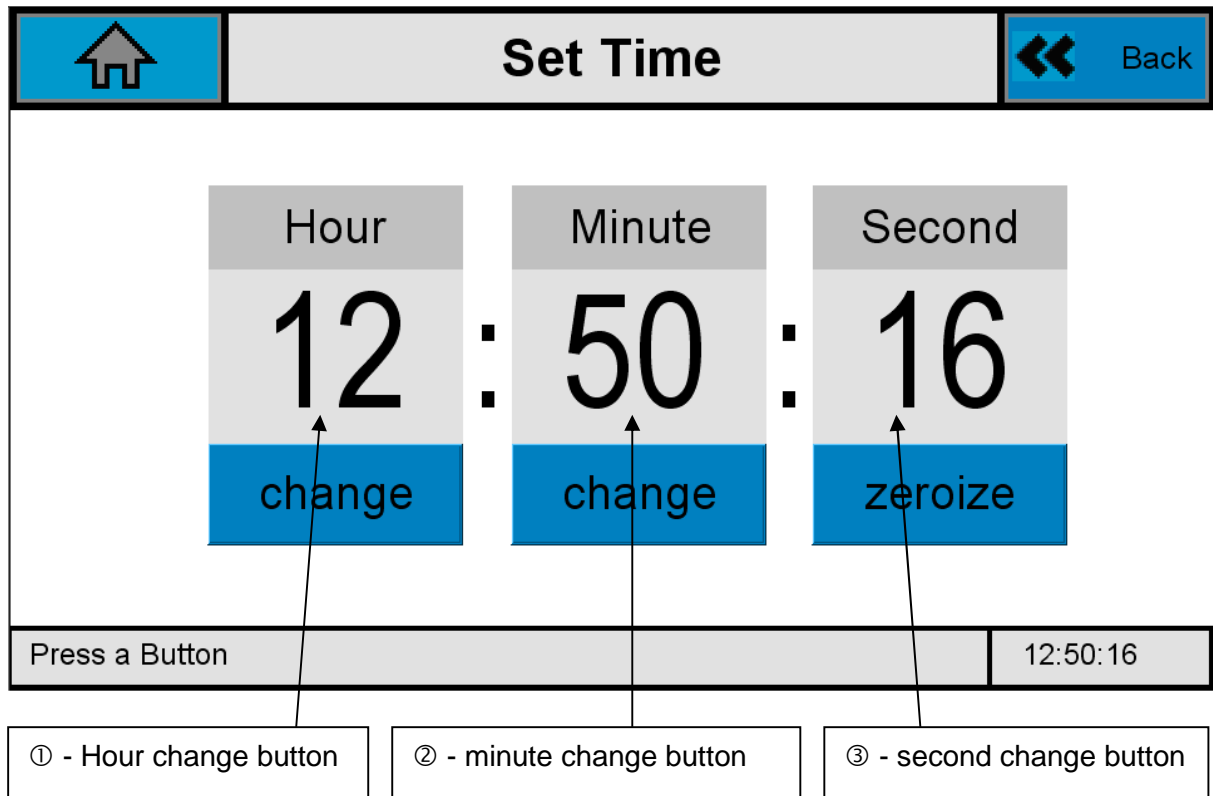
② - flow units

Elaboration of terms:

		See Chapter
①	Pressure unit - – change between <ul style="list-style-type: none"> • bar, • psi and • kPa 	
②	Flow unit – change between <ul style="list-style-type: none"> • litre/minute, • gal/minute and • m³/h 	

Changes in units do have influence on all submenus – Please do not change during operation.

5.2.5.2 Time – set time



The screenshot shows a 'Set Time' menu with a home icon on the left and a 'Back' button on the right. The time is displayed as 12:50:16. Below each unit (Hour, Minute, Second) is a blue button labeled 'change', 'change', and 'zeroize' respectively. A 'Press a Button' bar is at the bottom, and a legend below it identifies the buttons: ① - Hour change button, ② - minute change button, and ③ - second change button.

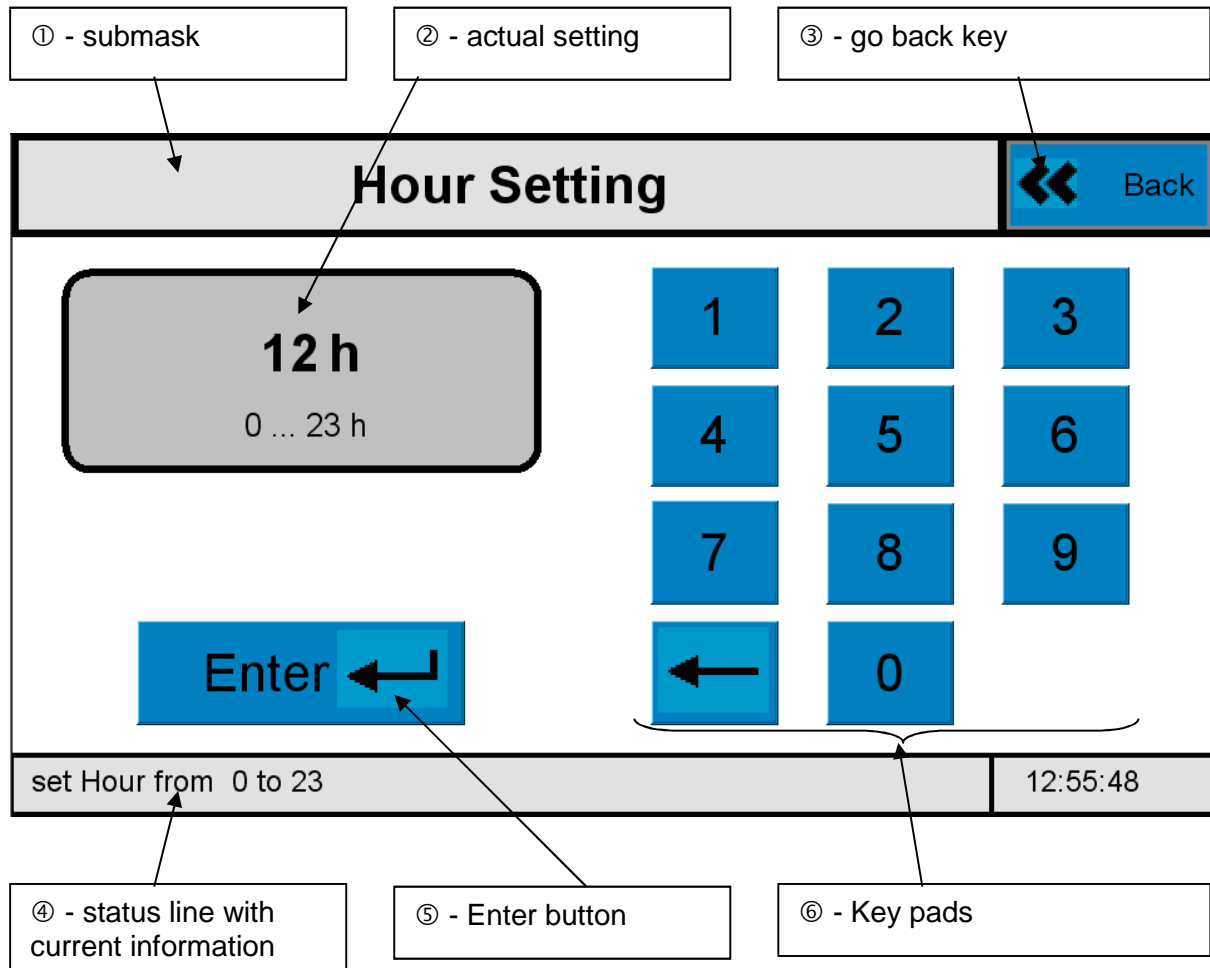
Elaboration of terms:

		See Chapter
①	Hour change button – press to change	
②	Minute change button – press to change	
③	Second change button – press to change	

Changes in units do have influence on all submenus and data logs – please do not change during operation.

5.2.5.2.1 Hour setting – submenu time settings

Press the hour change button to enter Hour Setting submenu



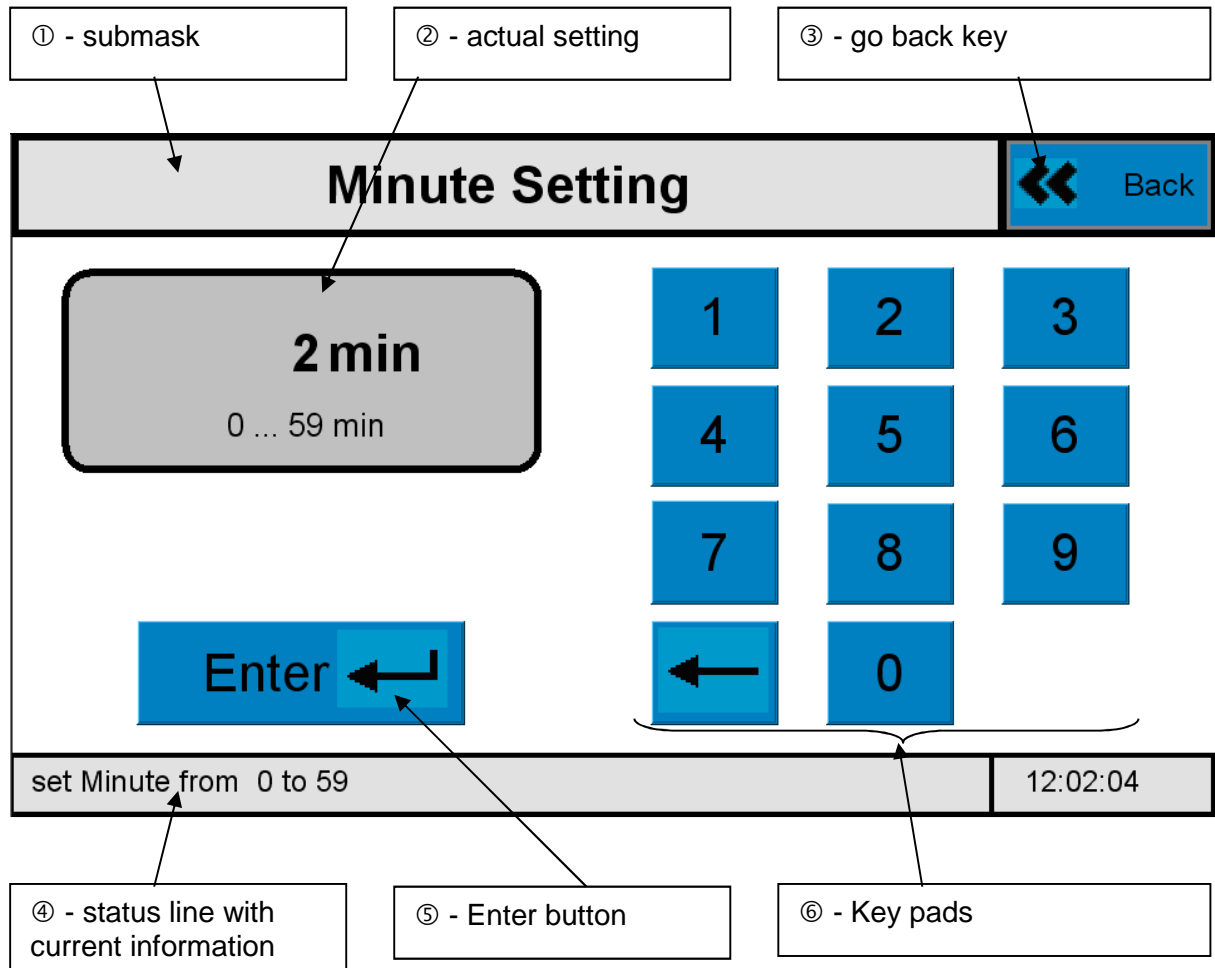
Elaboration of terms on PIN number screen

①	Sub mask – Headline
②	PIN key field to enter hour (time setting)
③	Go back key to enter previous menu
④	Status line with information about current sub menu
⑤	Enter button to accept hour setting - hit enter button to go back to time setting menu
⑥	Key pad to give in Hour to be set

Enter actual hour via key pads and press enter.

5.2.5.2.2 Minute setting – submenu time setting

Press the minute change button to enter Minute Setting submenu



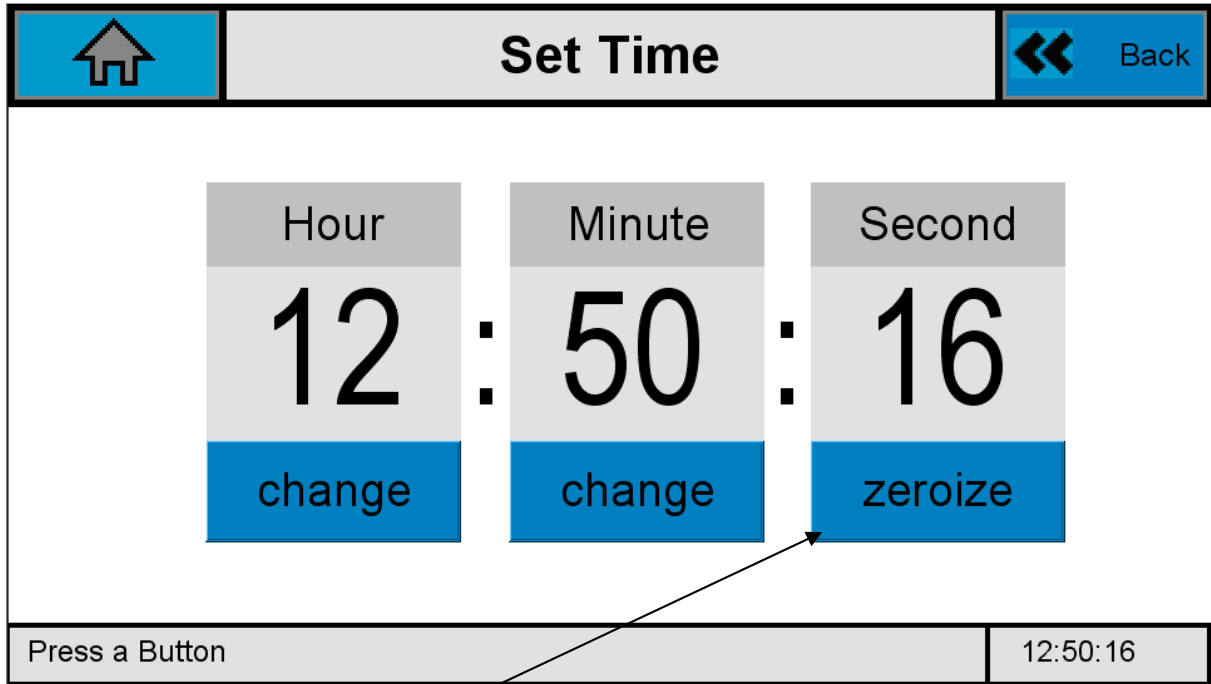
Elaboration of terms on PIN number screen

①	Sub mask – Headline
②	PIN key field to enter hour (time setting)
③	Go back key to enter previous menu
④	Status line with information about current sub menu
⑤	Enter button to accept minute setting - hit enter button to go back to time setting menu
⑥	Key pad to give in Minute to be set

Enter actual minutes via key pads and press enter.

5.2.5.2.3 Second setting – submenu time setting



To change seconds setting – only press **zeroize** button to zero second timer when needed



① - please press **zeroize** button when second setting should be done for “0” seconds.

Changes in units do have influence on all submenus and data logs – please do not change during operation.

5.2.5.3 LAN Address – system setting menu

	Network Setting	 Back
IP Address	192 . 168 . 26 . 156	
Subnet Mask	255 . 255 . 255 . 0	
Gateway	0 . 0 . 0 . 0	
Caution!	A changing of the mask is effective only after a reboot!	Reboot
Change the single edit mask		13:09:48

All blue coloured fields could be changed by pressing on it to insert the correct numbers.

Example to change IP Address:

By pressing the first IP address field **192** – the next submenu appears:

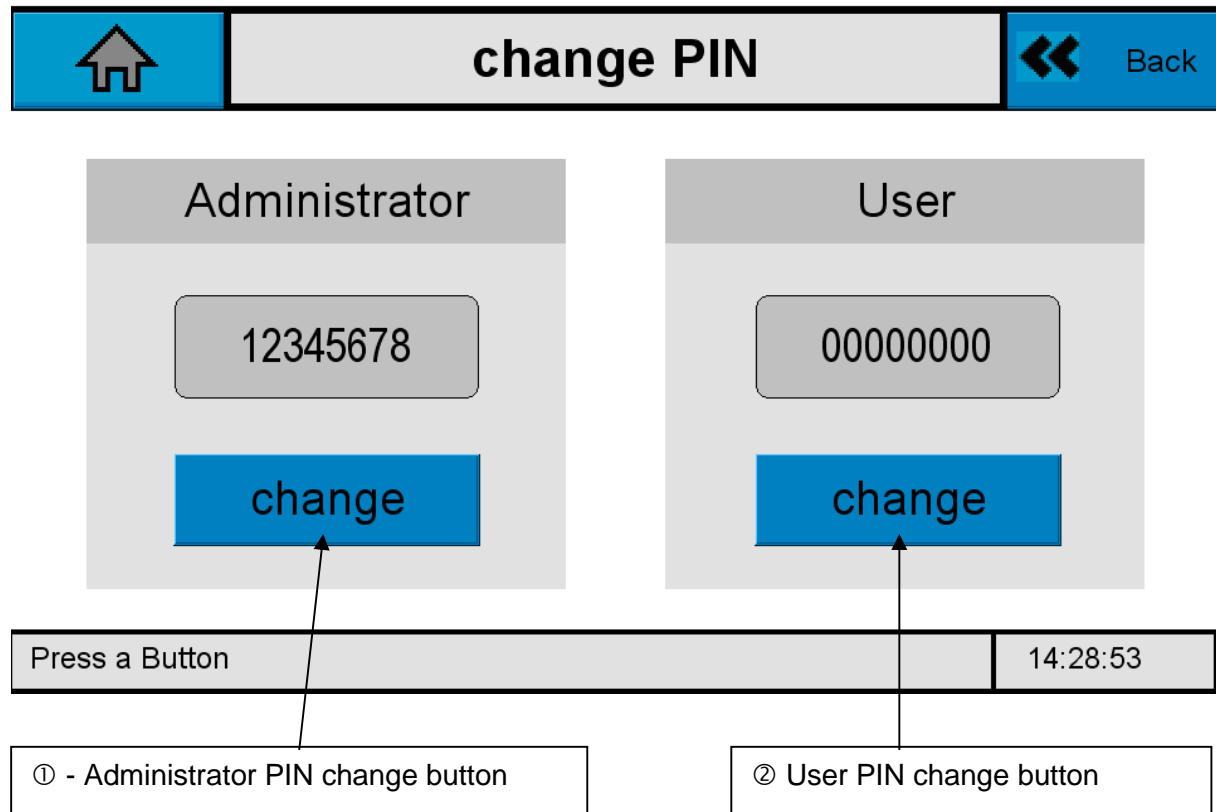
Changes in LAN address will only effect after pressing the **Reboot** button.

xxx.168.26.156		⏪ Back												
<div style="border: 1px solid black; padding: 10px; width: fit-content;"> <p style="font-size: 24px; margin: 0;">192</p> <p style="margin: 0;">0 ... 255</p> </div>	<table border="1"> <tr><td>1</td><td>2</td><td>3</td></tr> <tr><td>4</td><td>5</td><td>6</td></tr> <tr><td>7</td><td>8</td><td>9</td></tr> <tr><td>⏪</td><td>0</td><td></td></tr> </table>	1	2	3	4	5	6	7	8	9	⏪	0		
1	2	3												
4	5	6												
7	8	9												
⏪	0													
Enter ⏪														
Networkmask [0..255]		12:24:03												

Now you are asked to give in new numbers (between 0 and 255). Press enter to address the next IP Address field.
 You should do so till all relevant numbers are set.
 Than press the **Reboot** button to reconfigure DPGUARD®.
 After Exchange of Addresses – a complete **Reboot** should be done – please hit the **Reboot** button after finishing the relevant changes.

5.2.5.4 Change PIN – System setting menu

After pressing the change PIN button you are requested to change User or Administrator PIN level by pressing the change button



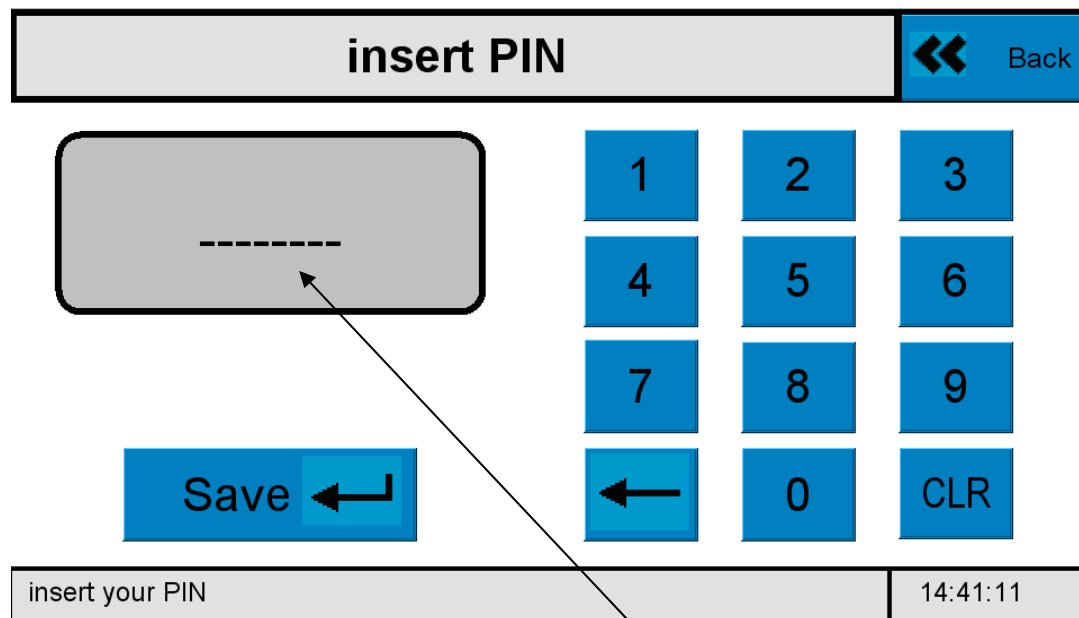
Elaboration of terms:

		See Chapter
①	Administrator PIN number change button – press to change PIN number	
②	User PIN number change button – press to change PIN number	

FAUDI Aviation GmbH highly recommends changes of PIN numbers. Please make sure to remember changed numbers.

Changed and lost numbers could only be reconfigured by FAUDI Aviation Sensor.

5.2.5.4.1 Change of PIN - number:



① - PIN number should be 8 digits long

Insert new PIN number by pressing Key pad numbers
The new PIN should be 8 digits long. Make sure to remember the new number.
Press save button to save new number and return to previous menu or go back via Back button.

5.2.5.4.2 PIN level – authorization

There are two three authorization levels to communicate with **DPGUARD®**

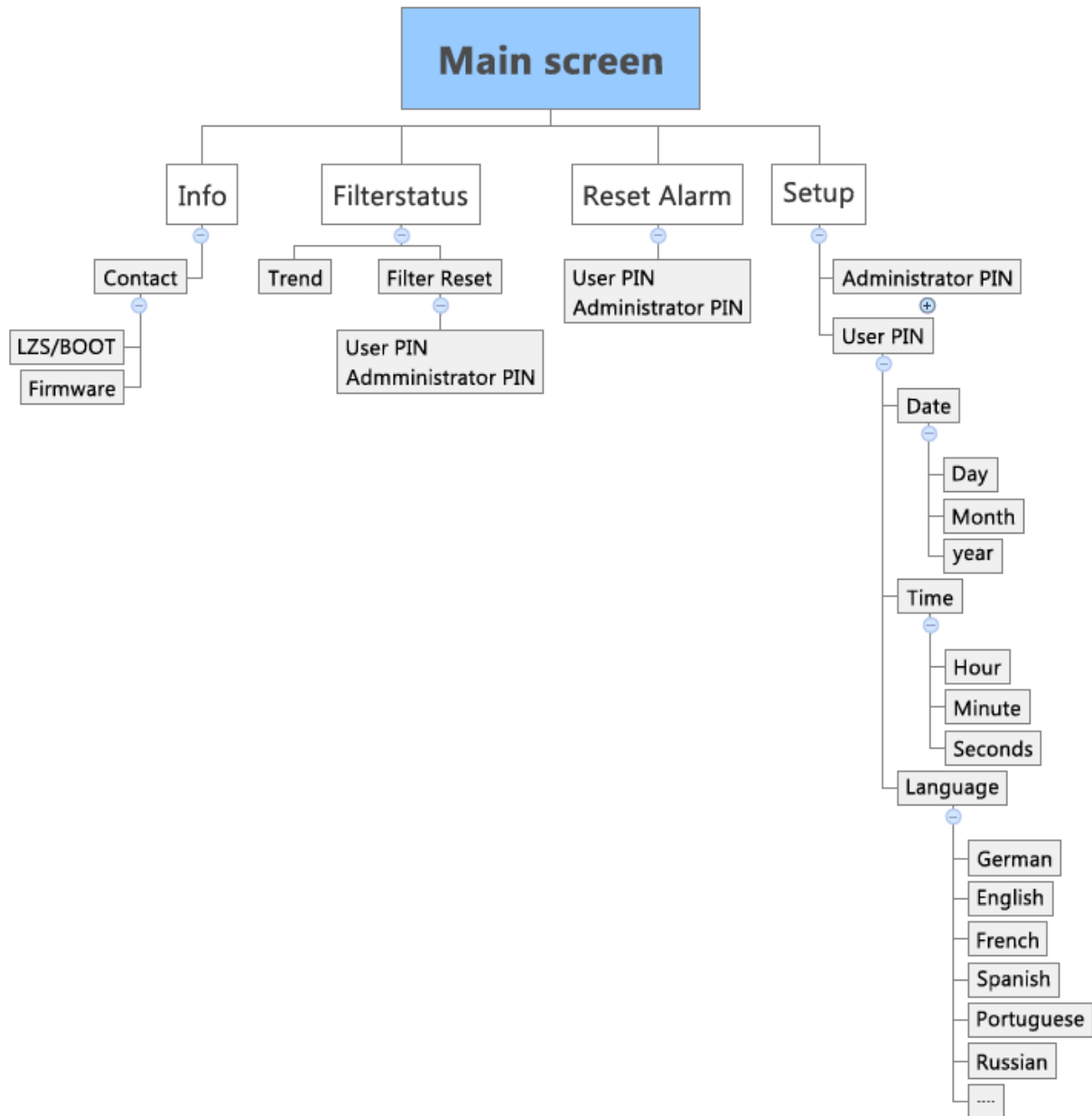
USER – PIN level
ADMINISTRATOR – PIN level
SERVICE – PIN level

Description in this manual is only for USER and ADMINISTRATOR – PIN level.

SERVICE operation does have a separate manual for setup and servicing of DPGUARD.

5.2.5.4.2.1 User – PIN level

Users do have reduced access to configuration and setup routines.
Menu structure for users is listed below:

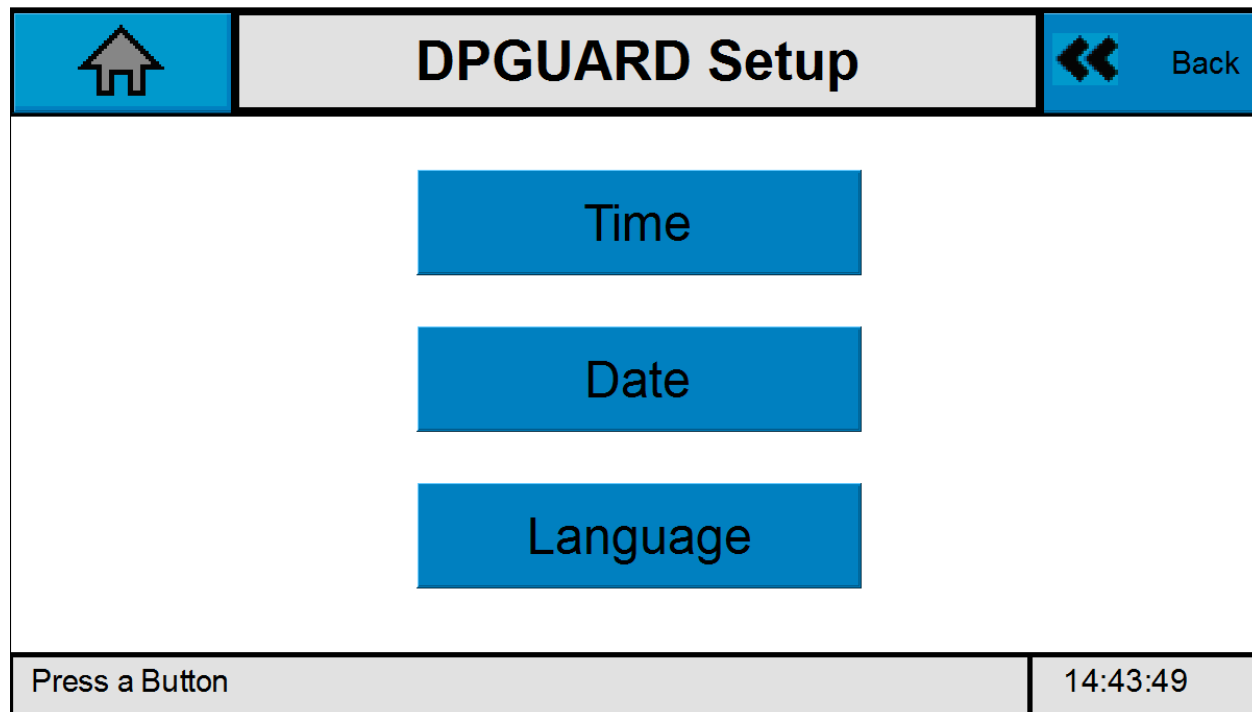


User access authorisation to set up DPGUARD®

User setup menu is listed below. They are allowed to change:

Time and Date settings

Language settings



Additional hereto USERS have access to Main screen and related buttons like Info screen (see chapter: 5.1 Info screen) and Filter status (see chapter: 4.3.2.5)

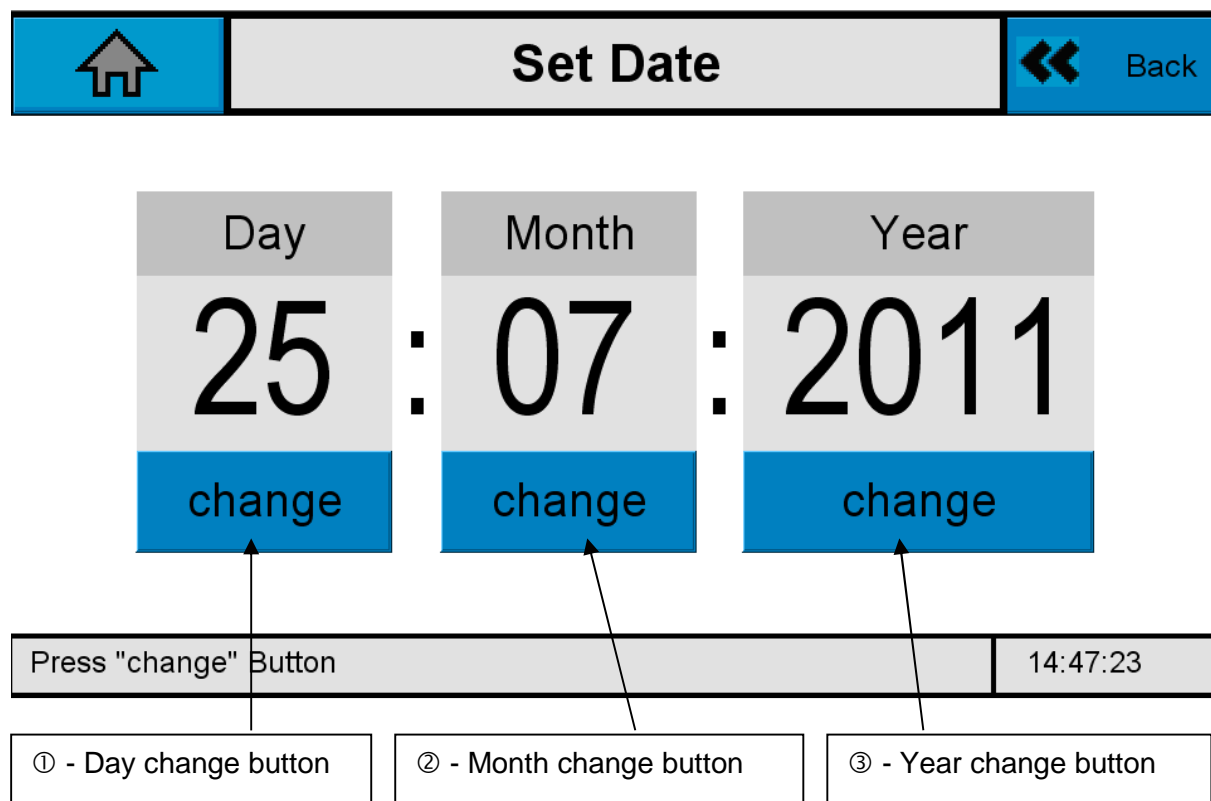
Filter status screen)

<p>corrected pressure</p> <h1>0.37 bar</h1> <p>Status: o.k. 14:44:52 03.08.11</p>		<p>Info</p> <p>Setup</p>
<p>measured pressure</p> <h2>0.11 bar</h2>	<p>flow rate</p> <h2>634 l/min</h2>	<p>Filterstatus</p>

5.2.5.4.2.2 Administrator PIN level

Administrators do have full access on all relevant menu levels to run the DPGUARD®.

5.2.5.5 Date setting – system settings menu



Elaboration of terms:






		See Chapter
①	Day change button – press to change	
②	Month change button – press to change	
③	Year change button – press to change	

Changes in units do have influence on all submenus and data logs – please do not change during operation.

Example on how to change date settings

When pressing Day, Month or Year – new sub mask appears where you are asked to give in new numbers for Day, month or year.

5.2.5.5.1 Day setting:


Day Setting		 Back												
<div style="border: 2px solid black; border-radius: 15px; padding: 10px; width: 150px; margin: 0 auto;"> <p style="font-size: 24px; margin: 0;">25</p> <p style="margin: 0;">1 ... 31</p> </div>	<table style="margin: 0 auto;"> <tr><td style="border: 1px solid black; padding: 5px;">1</td><td style="border: 1px solid black; padding: 5px;">2</td><td style="border: 1px solid black; padding: 5px;">3</td></tr> <tr><td style="border: 1px solid black; padding: 5px;">4</td><td style="border: 1px solid black; padding: 5px;">5</td><td style="border: 1px solid black; padding: 5px;">6</td></tr> <tr><td style="border: 1px solid black; padding: 5px;">7</td><td style="border: 1px solid black; padding: 5px;">8</td><td style="border: 1px solid black; padding: 5px;">9</td></tr> <tr><td style="border: 1px solid black; padding: 5px;"></td><td style="border: 1px solid black; padding: 5px;">0</td><td></td></tr> </table>	1	2	3	4	5	6	7	8	9		0		<div style="border: 1px solid black; padding: 5px; width: 100px; margin: 0 auto;"> <p style="margin: 0;">Enter </p> </div>
1	2	3												
4	5	6												
7	8	9												
	0													
set day [1 ... 31]		14:51:17												

Set new day (between 1 and 31) and press enter after you are finished with your entry.

Repeat for month and year.

5.2.5.5.2 Month setting – set Month

Month Setting

 Back

8

1 ... 12

1

2

3

4

5

6


7

8

9

←

0

Enter 


set Month [1 ... 12]

09:19:00

Please type in new month and save your entry by pressing the Enter key.

5.2.5.5.3 Year setting

Year Setting

 Back

11

11 ... 99

1

2

3

4

5

6


7

8

9

←

0

Enter 

set Year [11 ... 99]

09:19:25

Version 0		Operating instructions DPGUARD® silver with accessories English	FAUDI ●●● aviation * SENSOR
Page: 121	of: 178		

Please type in new year and save your entry by pressing the Enter key.
You need to go back to previous menu to enter the next subroutine if needed.

5.2.5.6 Update via USB-Stick

This submenu is reserved for update purposes. To do so you need to receive a Software update from FAUDI Aviation GmbH in Germany.

For update purposes please insert USB Stick with new Software into USB connector



Plug the USB-Stick with the update into the
USB-Slot and press the Update-Button!



① - Press UPDATE button after USB-Stick is connected with USB plug connector (located on main platine of DPGUARD®)

5.2.6 Sensor Input – DPGUARD® Setup menu

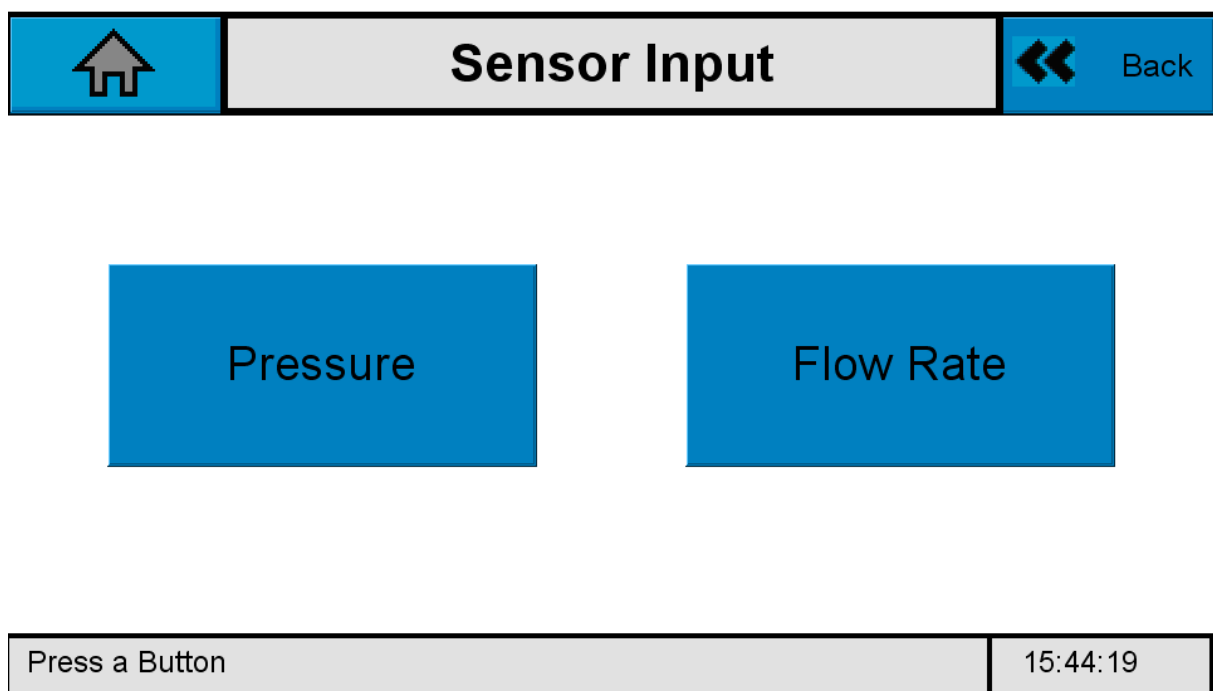
Please open the setup menu by entering your PIN number (only administrators are allowed to enter this level).

Then press the **Sensor Input** button:

Now you are in **Sensor input** menu to set up sensor signals for DPGUARD®.

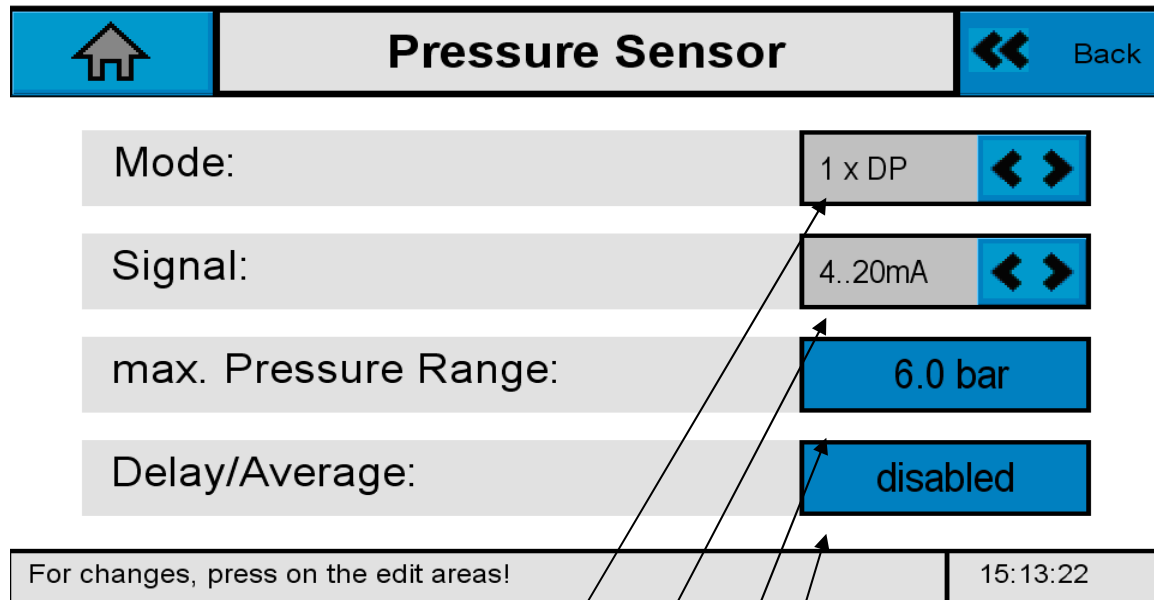
You are asked to adjust pressure and flow sensors.

To do so, please activate pressure or Flow button to enter the related subroutine.



Menu to activate pressure or flow rate configuration menu

5.2.6.1 Pressure sensor



① - Pressure sensor type

② - signal quality (current – mA)

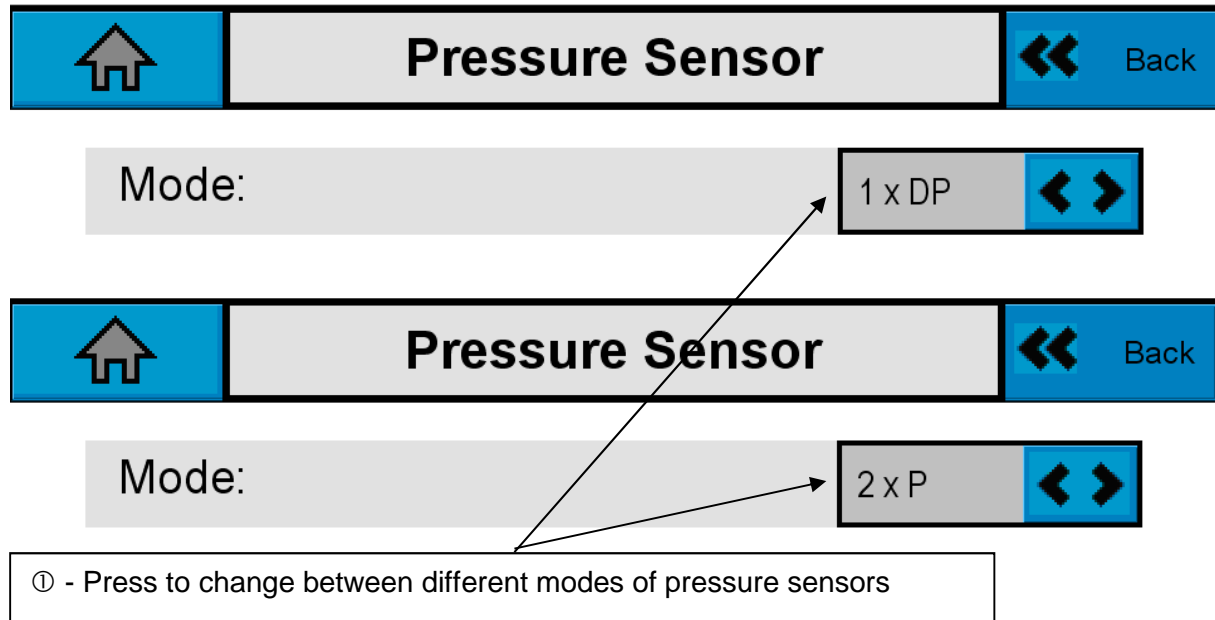
③ - maximum. range of pressure sensor

④ - time delay of pressure sensor signal

Elaboration of terms:

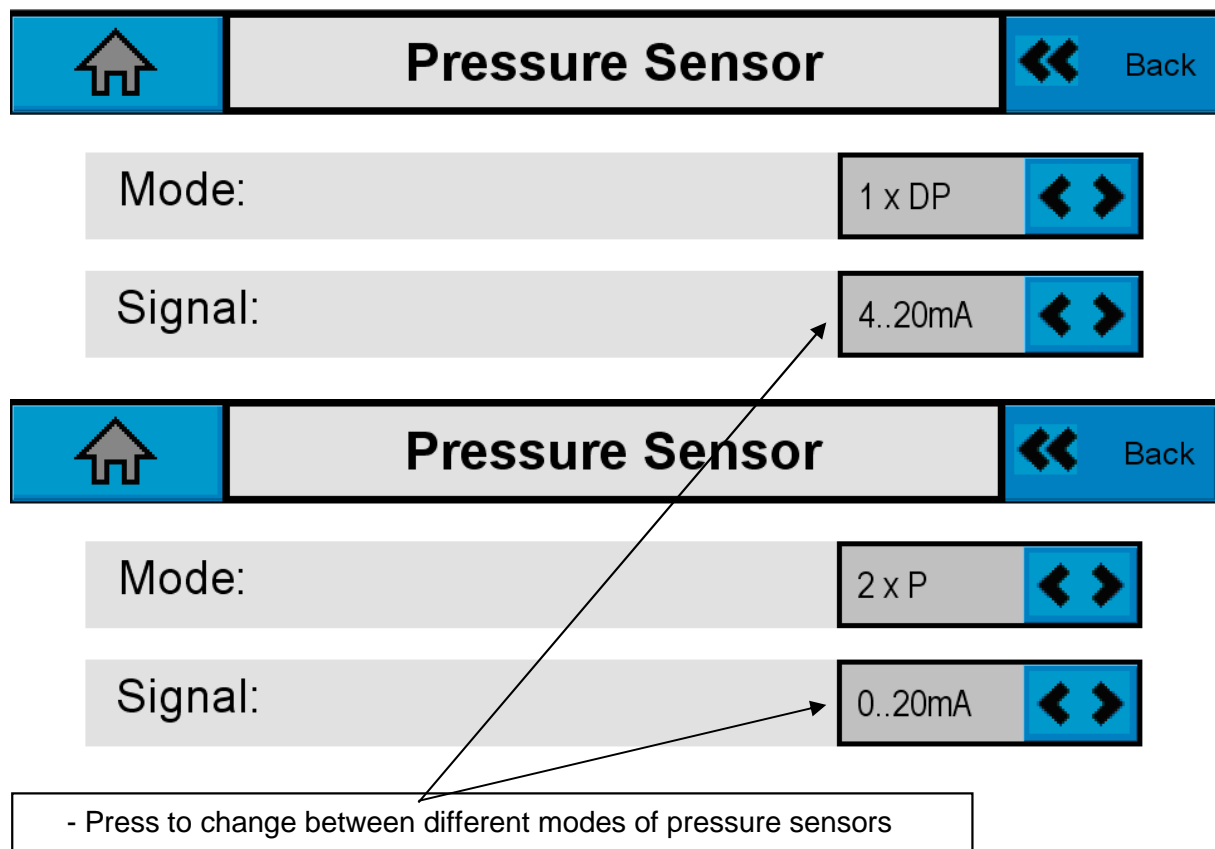
		See Chapter
①	Press to change between different types of sensor configuration: 1 * DP – there is one differential pressure sensor installed 2 * P – there are two pressure sensors installed to measure inlet pressure and outlet pressure. Both sensors should be from same type and manufacturer with same pressure settings and signal quality.	
②	Signal quality change button to change between 0 to 20 mA or 4 to 20 mA signal level for sensors ①	
③	Maximum pressure range of sensors ①. Should be as close to real max. pressure level as possible (e.g. 2 bars for monitor filters with exchange level of 1.5 bar.)	
④	Time delay of sensors ① to adapt on flow sensor or equalize signal level.	

5.2.6.1.1 Pressure sensor mode – Pressure sensor





The interface shows a 'Pressure Sensor' screen with a home icon on the left and a 'Back' button on the right. Below the title, there is a 'Mode:' field. In the first screenshot, the mode is set to '1 x DP'. In the second screenshot, the mode is set to '2 x P'. A callout box with a circled '1' contains the text: 'Press to change between different modes of pressure sensors'. Arrows point from this callout to the mode selection buttons in both screenshots.

5.2.6.1.2 Signal mode – Pressure sensor



The interface shows a 'Pressure Sensor' screen with a home icon on the left and a 'Back' button on the right. Below the title, there are two fields: 'Mode:' and 'Signal:'. In the first screenshot, the mode is '1 x DP' and the signal is '4..20mA'. In the second screenshot, the mode is '2 x P' and the signal is '0..20mA'. A callout box contains the text: '- Press to change between different modes of pressure sensors'. Arrows point from this callout to the mode selection buttons in both screenshots.

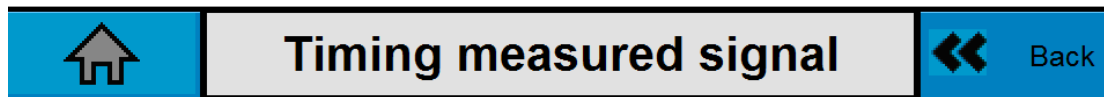
5.2.6.1.3 *Maximum pressure range – pressure sensor*

max. range of pressure sensor		 Back
<div style="border: 1px solid black; border-radius: 15px; padding: 10px; text-align: center;"> <p>6.0 bar</p> <p>1.0 ... 10.0 bar</p> </div>	<div style="display: flex; flex-wrap: wrap;"> <div style="width: 33%; text-align: center;">1</div> <div style="width: 33%; text-align: center;">2</div> <div style="width: 33%; text-align: center;">3</div> <div style="width: 33%; text-align: center;">4</div> <div style="width: 33%; text-align: center;">5</div> <div style="width: 33%; text-align: center;">6</div> <div style="width: 33%; text-align: center;">7</div> <div style="width: 33%; text-align: center;">8</div> <div style="width: 33%; text-align: center;">9</div> <div style="width: 33%; text-align: center;">←</div> <div style="width: 33%; text-align: center;">0</div> <div style="width: 33%; text-align: center;">.</div> </div>	
	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> Enter  </div>	
Enter a number within the range limits		15:34:14

Use key pads to enter maximum range of pressure sensor – than press enter to go to previous menu

5.2.6.1.4 Delay / Average – Pressure sensor

To delay the pressure sensor signal if flow signal is behind sensor signal. Could also be used to give out an average of pressure sensor readout signal.



Delay of measured signal	disabled
Attenuation measured signal	disabled

For changes, press on the edit areas!	15:55:40
---------------------------------------	----------

5.2.6.1.4.1 Delay of measured signal:



<div style="border: 1px solid black; border-radius: 10px; padding: 10px; background-color: #e0e0e0;"> <p>disabled</p> <p>0.1 ... 60.0 sec</p> </div>	1	2	3
	4	5	6
disable	7	8	9
Enter ←	←	0	.

Enter a number within the range limits	15:55:10
--	----------

Delay times are intended to synchronize signals of different sensors that should be analyzed at the same time. Signal behavior highly depends on electronics and presetting of sensors in use.

You are asked to enter delay times in between 0.1 to 60 seconds. You can also disable the function.

Press the **Enter** button to save and leave this menu to enter Attenuation submenu or go to flow sensor menu.

5.2.6.1.4.2 Attenuation of measured signal

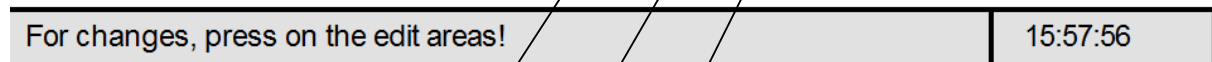
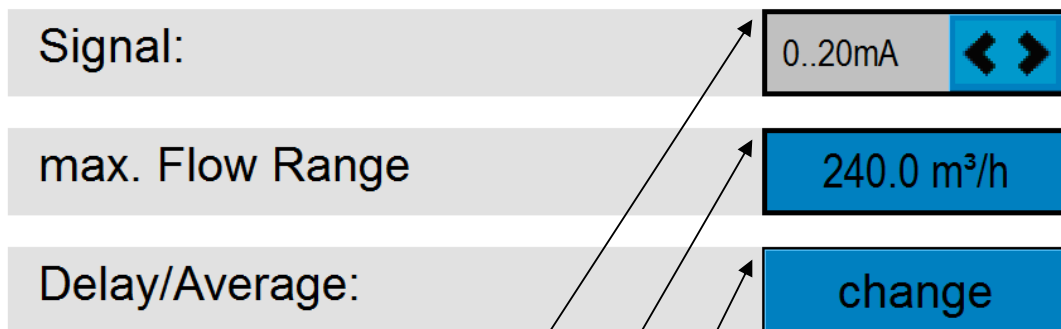
Attenuation measured signal		Back												
<div style="border: 2px solid black; border-radius: 15px; padding: 10px; width: fit-content; margin: 0 auto;"> <p style="margin: 0;">disabled</p> <p style="margin: 0;">0.1 ... 10.0 sec</p> </div>	<table style="margin: 0 auto; border-collapse: separate; border-spacing: 5px;"> <tr> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">1</td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">2</td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">3</td> </tr> <tr> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">4</td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">5</td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">6</td> </tr> <tr> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">7</td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">8</td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">9</td> </tr> <tr> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;"></td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">0</td> <td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; line-height: 40px;">.</td> </tr> </table>		1	2	3	4	5	6	7	8	9		0	.
1	2	3												
4	5	6												
7	8	9												
	0	.												
disable														
Enter														
Enter a number within the range limits	13:53:27													

Attenuation time of signals could be used to reduce peaks and fluctuation in signal behavior. Max time for averaging of signals is 10 seconds. You can also disable the function.

You need to go back to Flow sensor sub menu. Than choose **Next >>** button to enter next menu step **Filter – System Parameter** where you are asked to define the specific type of flow rate sensor:

5.2.6.2 Flow sensor – Sensor input menu

Please proceed as described for the pressure sensor. Enter setup menu (only administrators are allowed to do so) and press sensor Input button to select Flow button for the adjustment of flow sensor related parameters.

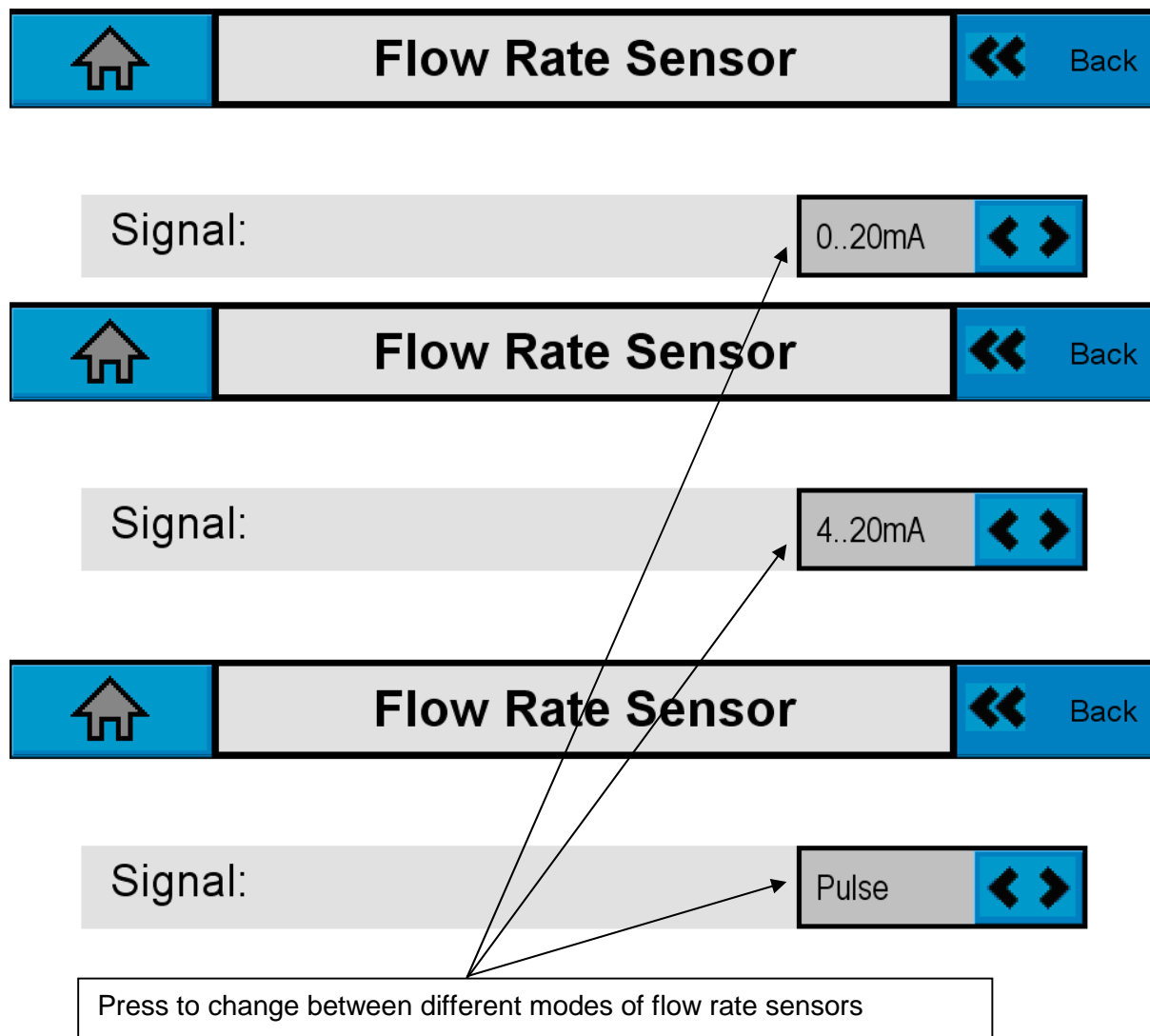


- ① - signal quality (current – mA)
- ② - Maximum range of flow sensor
- ③ - Time delay of flow sensor signal

Elaboration of terms:

		See Chapter
①	Signal quality change button to change between: current and puls output operated sensors: 0 to 20 20 mA Pulsed signal	
②	Maximum flow range of sensors for mA based sensors or pulses/Liter for pulsed sensors	
③	Time delay of sensors to adapt on pressure sensor or equalize signal level.	






5.2.6.2.1 Signal – flow rate sensor



5.2.6.2.2 Max flow range - flow rate sensor



Linear sensor signal

Under current sensor signal (0 / 4 ... mA) press max flow range and set maximum flow rate according next menu, than press enter. Make sure that maximum flow rate is equal or above rated flow. Refer to calibration protocol of flow rate sensor.

max. range of flow meter		 Back												
<div style="border: 1px solid black; border-radius: 10px; padding: 10px; width: fit-content; margin: 0 auto;"> <p style="font-size: 24px; margin: 0;">1400 l/min</p> <p style="margin: 0;">100 ... 10000 l/min</p> </div>	<table style="border-collapse: collapse; margin: 0 auto;"> <tr> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center; margin: 2px;">1</td> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center; margin: 2px;">2</td> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center; margin: 2px;">3</td> </tr> <tr> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center; margin: 2px;">4</td> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center; margin: 2px;">5</td> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center; margin: 2px;">6</td> </tr> <tr> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center; margin: 2px;">7</td> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center; margin: 2px;">8</td> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center; margin: 2px;">9</td> </tr> <tr> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center; margin: 2px;">  </td> <td style="border: 1px solid black; width: 40px; height: 40px; text-align: center; margin: 2px;">0</td> <td style="width: 40px;"></td> </tr> </table>	1	2	3	4	5	6	7	8	9		0		
1	2	3												
4	5	6												
7	8	9												
	0													
<div style="border: 1px solid black; border-radius: 5px; padding: 5px; width: fit-content; margin: 0 auto;"> <p style="margin: 0;">Enter </p> </div>														
Enter a number within the range limits		20:15:01												

Pulsed sensor signal:

When pulsed sensor signals should be used – there is no need to give in max flow rate. Only pulses / volume should be indicated.

Pulses / Liter:			 Back
<div style="font-size: 24px; font-weight: bold;">10.0</div> <div style="font-size: 16px;">0.1 ... 85.7</div>	<div style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">1</div> <div style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">2</div> <div style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">3</div> <div style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">4</div> <div style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">5</div> <div style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">6</div> <div style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">7</div> <div style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">8</div> <div style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">9</div> <div style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">←</div> <div style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">0</div> <div style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">.</div>		
<div style="background-color: #0070C0; color: white; padding: 5px; display: inline-block;"> Enter  </div>			
Enter a number within the range limits			20:17:24

Give in pulses per liter / gallon (depending on system settings / Display units), than press enter button.

5.2.6.2.3 Delay / average of flow rate sensor




Could be addressed to delay sensor readout if pressure sensor readout is not as fast as flow sensor readout. Could also be used to calculate an average of flow signal over period of time.

	flow meter timing	 Back
---	--------------------------	--

Delay of measured signal	disabled
Attenuation measured signal	disabled

For changes, press on the edit areas!	15:59:12
---------------------------------------	----------

5.2.6.2.3.1 Delay of measured signal:




Delay of measured signal			 Back
disabled 0.1 ... 60.0 sec	1	2	3
	4	5	6
<div style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">disable</div> <div style="background-color: #0070C0; color: white; padding: 5px; display: flex; align-items: center;"> Enter  </div>	7	8	9
		0	.
Enter a number within the range limits			15:56:31

Delay times are intended to synchronize signals of different sensors that should be analyzed at the same time. Signal behavior highly depends on electronics and presetting of sensors in use.

You are asked to enter delay times in between 0.1 to 60 seconds. You can also disable the function.

Press the Enter button to save and leave this menu to enter Attenuation submenu or go to flow sensor menu.

5.2.6.2.3.2 Attenuation of measured signal

Attenuation measured signal		 Back	
<div style="border: 2px solid black; border-radius: 15px; padding: 10px; text-align: center;"> <p>disabled</p> <p>0.1 ... 10.0 sec</p> </div> <div style="text-align: center; margin-top: 10px;"> <p>disable</p> <p>Enter </p> </div>	1	2	3
	4	5	6
	7	8	9
		0	.
Enter a number within the range limits		13:53:27	

Attenuation time of signals could be used to reduce peaks and fluctuation in signal behavior. Max time for averaging of signals is 10 seconds. You can also disable the function.

You need to go back to Flow sensor sub menu. Than choose **Next >>** button to enter next menu step **Filter – System Parameter** where you are asked to define the specific type of flow rate sensor:

5.2.6.3 AFGUARD® free water sensor – setup

AFGUARD free water sensor is intended to measure the amount of free water in Jet fuel. Therefor the AFGUARD should be located in main stream of distribution path for Jet fuel to detect the amount of free water just in time of delivery. AFGUARD signals could be used to:

- give out actual measured amount of free water to address Alarm and/or Warning by the use of every peak in free water crossing the optical path of AFGUARD.
- give out average amount of free water as mathematical result coming from flow and free water measurement to give out averaged free water signal e.g. for single fuelling step.
- give out ALARM in case of high levels of water (water slug)

Each measurement (actual / average / water slug) could be used to address alarm and / or warning relays.

◀ Back	AFGUARD water detection	Next ▶
max. Measure Range	50 ppm	
activate AFGUARD	50 l/min	
Start-Amount of kerosene	500 l	
Delay/Average:	change	
For changes, press on the edit areas!		15:23:16

You are asked to select:

Max Measuring range: please adjust AFGUARD® calibration range (most of them should be calibrated for 0 to 50 ppm. Type in high range of calibration (here: 50 ppm) - please refer to calibration protocol of free water sensor AFGUARD® for high level.

Activate AFGUARD: Type in flow range when AFGUARD® should start with calculation of average water content.

Start-Amount of Kerosene: Type in amount of fuel when relays for warning / alarm should be activated

Delay / Average: To handle follow up time of sensors especially if one type of sensor is much faster than the other one (flow compared to pressure to average signal readout especially under high fluctuation of signal readout of pressure sensors.

5.2.6.3.1 Change of measurement range – max range of AFGUARD®

max. range of AFGUARD

50 ppm

10 ... 1000 ppm

1

2

3

4

5

6

7

8

9

←

0

Enter

Enter a number within the range limits
11:40:25

Type in high calibration range of AFGUARD® free water sensor – see calibration protocol of AFGUARD (delivered with AFGUARD) and press **Enter button** to adjust high level.

High range could be found here:

	Wasserdosage	Messwert Trübung
	0 ppm	145
	5 ppm	212
	10 ppm	270
	15 ppm	340
	20 ppm	405
	25 ppm	468
	30 ppm	530
	35 ppm	592
	40 ppm	651
	45 ppm	705
	50 ppm	753


Stützpunkte der Ausgabekennlinie

Picture: part of calibration protocol of AFGUARD® free water sensor.

ООО «ТИ-СИСТЕМС» ИНЖИНИРИНГ И ПОСТАВКА ТЕХНОЛОГИЧЕСКОГО ОБОРУДОВАНИЯ
 Интернет: www.tisys.ru www.tisys.kz www.tisys.by www.tesec.ru www.ти-системс.рф
 Телефоны: +7 (495) 7774788, 7489626, (925) 5007155, 54, 65
 Эл. почта: info@tisys.ru info@tisys.kz info@tisys.by

If you do not know about calibration range of AFGUARD® free water sensor - please contact your FAUDI Aviation sales contact. You need to have the the serial no of AFGUARD® in use.

AFGUARD Kalibrierung		FAUDI ●●● aviation * SENSOR		
Sensornummer:	AFG0/00020/c	Datum:	11.11.2011	
Messwiderstand	470 kOhm	50 ppm - fine droplets		
Verstärkung	Trübung	Wasser	Diodenüb	
	2,22	5,54	3	
DA-Wandlerwerte	Dunkelstrom	Offset Trübung	Offset	
	116	0		
DA-Output	4 mA - Wert	20 mA - Wert		
	643	3240		
Messwerte	Bedingung	Trübung	Wasser	Diode
	0 ppm	145	359	502
	50 ppm	753	284	502
	Luft	50	213	506
	Wasser	75	207	506
	AVGAS	126	277	513
Stützpunkte der Ausgabekennlinie	Wasserdosage		Messwert Trübung	
	0 ppm		145	
	5 ppm		212	
	10 ppm		270	
	15 ppm		340	
	20 ppm		405	
	25 ppm		468	
	30 ppm		530	
	35 ppm		592	
	40 ppm		651	
	45 ppm		705	
50 ppm		753		
Bemerkung	Software-Version 01.05			
	Firmware-Version 01.05			
	AW-02-006			




Example for calibration protocol of AFGUARD® free water sensor

5.2.6.3.2 Activation level of AFGUARD®

AFGUARD should only deliver free water signals during fuelling. It is therefore recommended to type in min flow level to activate free water measurement.

Presetting is 50 l/min to be adapted to your processes.

activate AFGUARD

 Back

50 l/min

20 ... 3400 l/min

1

2

3

4

5

6


7

8

9

←

0

Enter 

Enter a number within the range limits

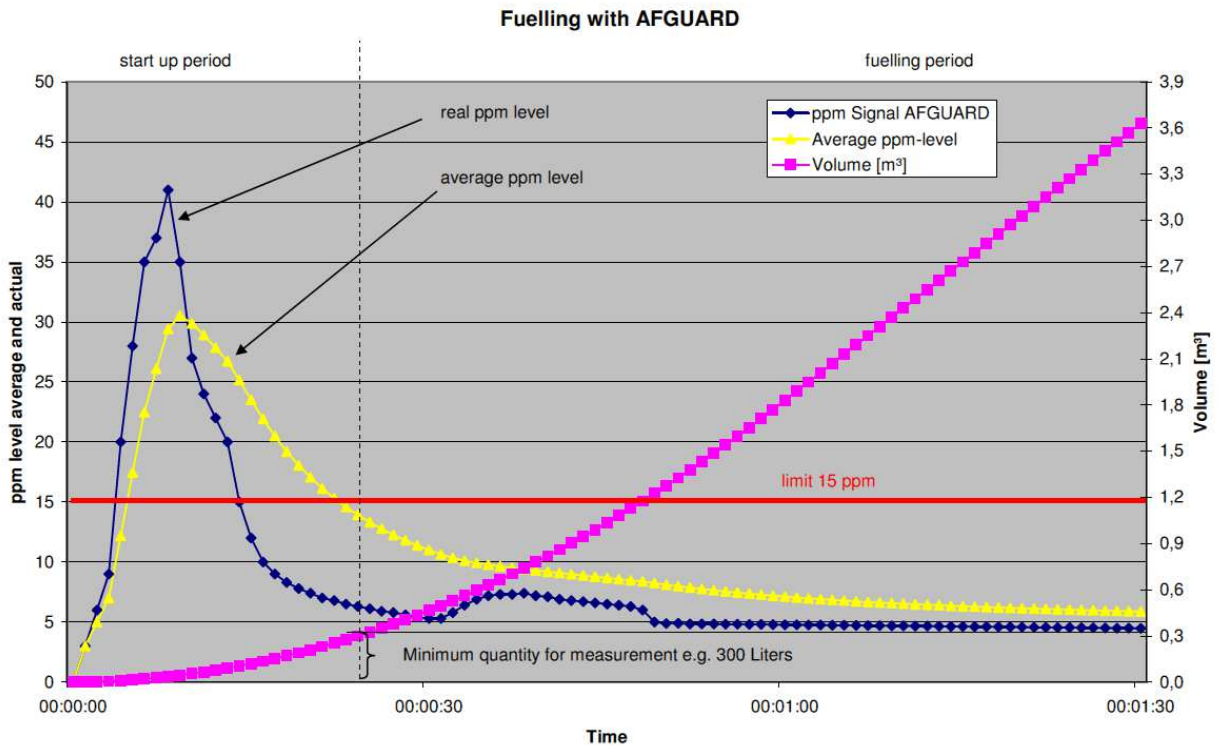
12:16:26

Type in new start conditions to activate AFGUARD® free water sensor and press **Enter button** to adjust activation level level.

5.2.6.3.3 Start amount of kerosene

The AFGUARD free water sensor gives out actual measured values of free water in jet fuel passing the optical path of the sensor. Experience shows that high values of free water (peaks) could be seen at the beginning of fuelling steps caused by residual water on pits, condensation effects in fuelling lines behind filter elements etc.

To prevent warnings / Alarms under start conditions – you will be asked to type in minimum amount of jet fuel to activate relay output for warning and / or Alarm caused by high levels of free water – see next slide (minimum quantity for measurement e.g. 300 liters).



Picture: high levels of water during start of fuelling.

Start-Amount of kerosene

◀ Back

500 l

40 ... 100000 l

Enter ↩


1	2	3
4	5	6
7	8	9
←	0	

Enter a number within the range limits

12:35:13

Type in start amount of jet fuel to activate relay output for AFGUARD® free water sensor and press Enter button to adjust start conditions.

5.2.6.3.4 Adjust AFGUARD® timing




 Back	AFGUARD timing	
Delay of measured signal	disabled	
Attenuation measured signal	1.0 sec	
Reset time after refueling	30 sec	
For changes, press on the edit areas!		13:09:41

Signal output of aFGUARD free water sensor could be delayed or equalized over short period of time by the use of attenuation of measured signal. Presetting is 1 sec for attenuation and “0” for delay.

5.2.6.3.4.1 Reset time after refuelling

Sub routine “Reset time after refueling” could be used to automatically reset counter for averaged water quantity after each refueling step. Max time to be adjusted is 60 minutes (3600 sec).

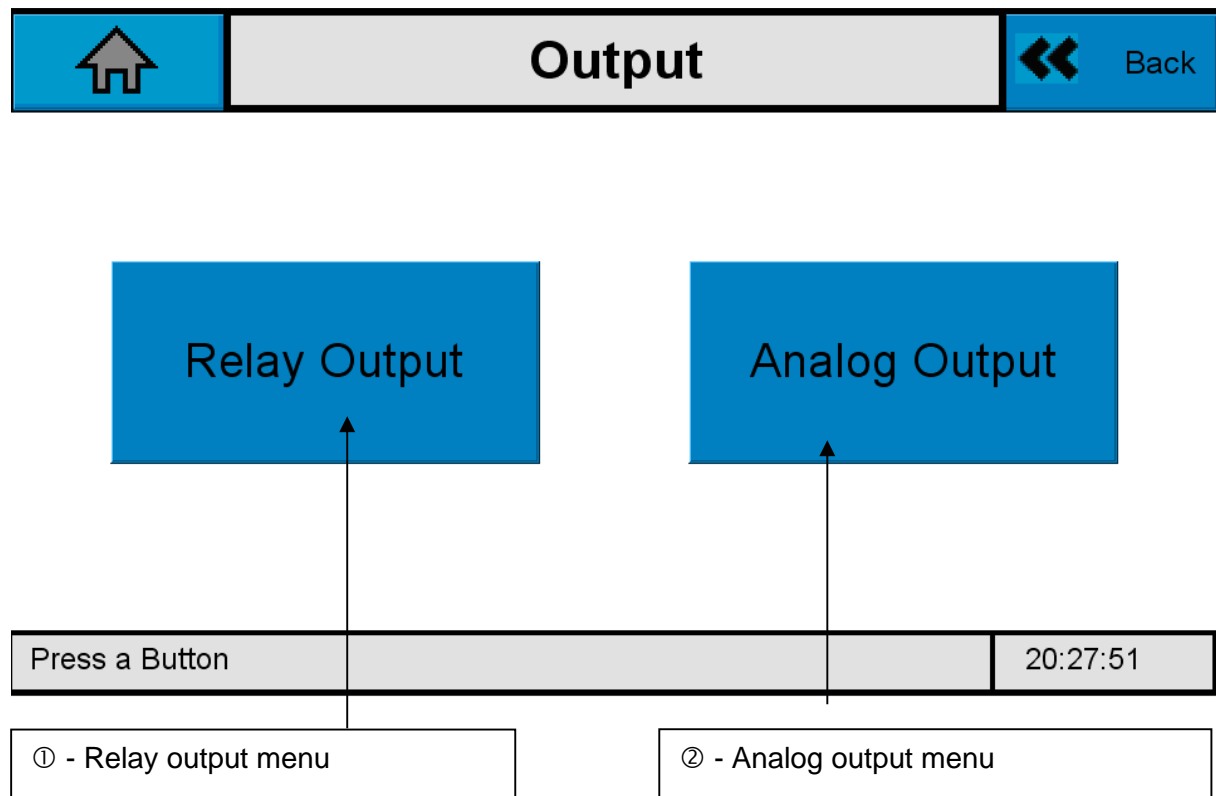
Alternatively reset could be done by the use of digital input signal to be connected to the digital input on main board DI02.

Reset time after refueling		 Back	
30 sec 10 ... 3600 sec	1	2	3
disable	4	5	6
Enter 	7	8	9
		0	
Enter a number within the range limits		13:19:43	

5.2.7 Output – DPGUARD® setup menu

To enter the output menu please press the setup menu button (Main screen) and click on the Output button on DPGUARD® setup routine.

You should be prepared to give in flow, time and volume related numbers to adjust Relays for Warning and / or Alarm and Analog output signal to be connected to another System.

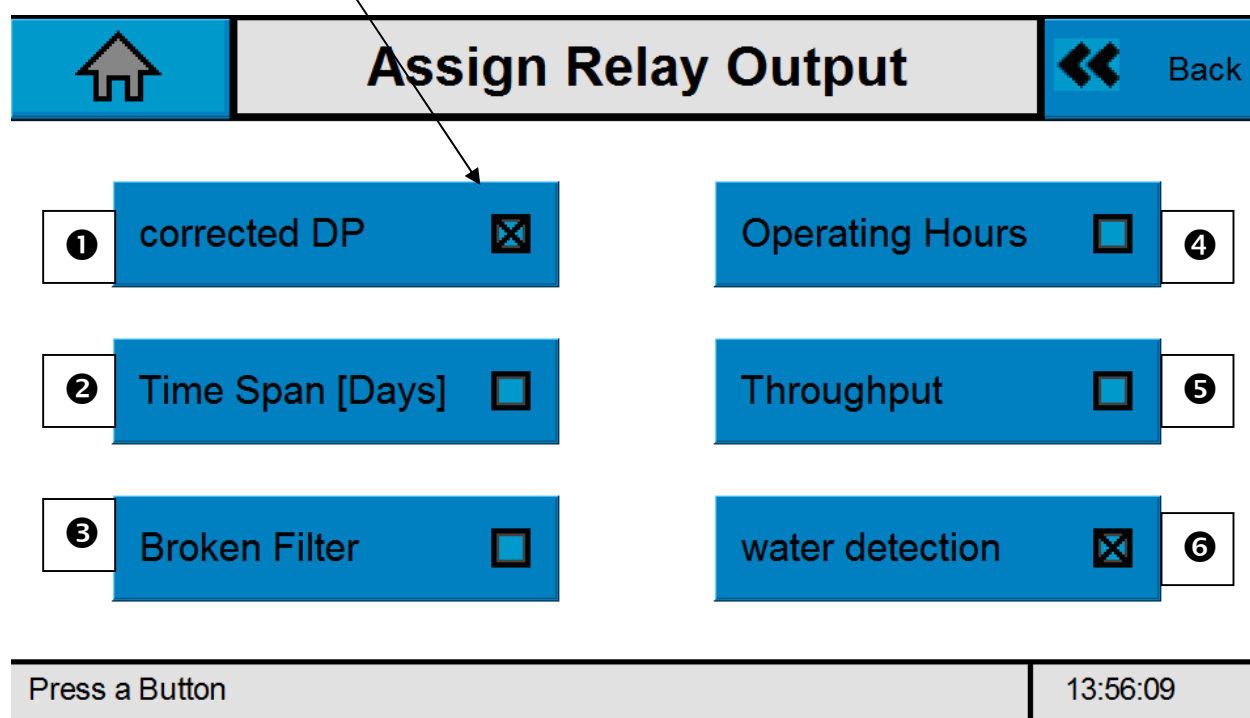


Elaboration of terms:

		See Chapter
①	Relay output menu to address Alarm and / or Warning for Corrected differential pressure readout	
	Time span (days) as time for elements in use – could be used to give warning / alarm if lifetime of elements is over	
	Filter Breakthrough – could be addressed to observe filter media behavior. If drops in corrected differential pressure curve are observed – Alarm could be addressed.	
	Operation hours – could be used to give out warning / alarm if predefined operating hours are reached.	
	Throughput – could be used for warning / alarm if predefined throughput is reached.	
②	Analog output menu to adjust analog signal	

5.2.7.1 Relay output menu

Clicking on the Relay output button the Relay Output menu opens. You can choose between five different subroutines to address Warning and Alarm Relays. Activated subroutines could be identified by a cross mark behind the subroutine title.



① - marked submenu to identify active submenus for Warning and Alarm

Elaboration of terms on setting screen:

		See chapter
①	Corrected dp – submenu to change settings	
②	Time span (days) – submenu to change settings	
③	Broken Filter – submenu to change settings	
④	Operating hours – submenu to change settings	
⑤	Throughput – submenu to change settings	
⑥	Water sensor signal coming from AFGUARD®	

Each Submenu with Warning / Alarm function could be addressed or disabled. When disabling is required – please press disable first and then press enter button to enter previous menu. Addressed Warning / Alarm submenu’s could be identified via cross marker in blue submenu.

There are six different possibilities to address Warning or Alarm levels. In case of activation you can see a crossed field behind the submenu (above – there are no activated Relais). Functionality behind the subroutines behave on logged and/or calculated date that could be seen in Filterstatus screen (Main menu - Filterstatus button). There you can see logged data like

Operating Hours since last Filter element exchange

Date and Time of last filter element exchange

Current Filterstatus

Date: 12.01.12	Time: 08:59:29	<div style="background-color: #0070c0; color: white; padding: 5px; margin-bottom: 5px;">Trend</div> <div style="background-color: #0070c0; color: white; padding: 5px; margin-bottom: 5px;">DP function</div> <div style="background-color: #0070c0; color: white; padding: 5px; margin-bottom: 5px;">Reset</div> <div style="background-color: #0070c0; color: white; padding: 5px;">Back</div>
Operating Hours: 7 h 5 min		
Throughput: 1080 m ³		
max. flow rate of the filter: 204.0 m ³ /h		
Alarm [corrected pressure]: 22.0 psi		



Throughput since last Filter element exchange

Max flow rate of the filter vessel with related alarm level for corrected differential pressure measurement

Additional hereto:

- Corrected differential pressure and pressure drop could be addressed to initiate Alarm or Warnings.
- Pressure fluctuation during static flow conditions could be used to address Alarm situation. (whenever pressure changes under static flow conditions – there are changes in filter element behavior caused by rupture or clogging of filter elements. Presetting for pressure fluctuation is “disabled”.

5.2.7.1.1 Corrected differential pressure submenu – output menu

	corrected Difference Pressure	 Back
Alarm-Relay	Switch-On:	disabled
Warning-Relay	Switch-On:	disabled
Delay Switch-On:		disabled
For changes, press on the edit areas!		16:06:49

For first startup of DPGUARD® – all Warning and / or Alarm levels are deactivated. Screens should look like the one above.

You are asked to enter your numbers for Warning and / or Alarm.

For corrected difference pressure – please type in Alarm-Relay level first:

Alarm level should be close to exchange pressure level of elements.

Generally alarm levels should be used to full stop processes.

Alarm levels should be in between 0.5 bar and 2 bar.

All Alarm functions correspond to corrected differential pressure readout. It is mandatory to have very good sensor signals for differential pressure measurement and flow. The better these signals are, the better is the corresponding calculated corrected differential pressure measurement.

Type in new Alarm level or disable function and press **Enter** button to store and return to previous menu step


corrected Difference Pressure
 Back

Alarm-Relay	Switch-On: 1.50 bar
Warning-Relay	Switch-On: 1.20 bar
Delay Switch-On:	2.5 sec

For changes, press on the edit areas! 13:23:19





Press to adjust alarm relay level for corrected differential pressure readout

Press to adjust warning relay level for corrected differential pressure readout

Alarm level – corrected differential pressure readout

Alarm: Switch-On



 Back

<p style="font-size: 24pt; font-weight: bold;">1.50 bar</p> <p>0.50 ... 6.00 bar</p>	<table border="0"> <tr><td style="border: 1px solid black; padding: 5px;">1</td><td style="border: 1px solid black; padding: 5px;">2</td><td style="border: 1px solid black; padding: 5px;">3</td></tr> <tr><td style="border: 1px solid black; padding: 5px;">4</td><td style="border: 1px solid black; padding: 5px;">5</td><td style="border: 1px solid black; padding: 5px;">6</td></tr> <tr><td style="border: 1px solid black; padding: 5px;">7</td><td style="border: 1px solid black; padding: 5px;">8</td><td style="border: 1px solid black; padding: 5px;">9</td></tr> <tr><td style="border: 1px solid black; padding: 5px;"></td><td style="border: 1px solid black; padding: 5px;">0</td><td style="border: 1px solid black; padding: 5px;">.</td></tr> </table>	1	2	3	4	5	6	7	8	9		0	.
1	2	3											
4	5	6											
7	8	9											
	0	.											
disable													
Enter 													

Enter a number within the range limits 20:37:05

Give in new alarm level and press enter button to close menu
If you want to disable the function – please click disable first and than press enter button to leave submenu with saving.

Warning level – corrected differential pressure readout

Warning: Switch-On		 Back													
<div style="border: 2px solid black; border-radius: 15px; padding: 10px; background-color: #f0f0f0;"> <p style="font-size: 24px; margin: 0;">1.30 bar</p> <p style="margin: 0;">0.50 ... 6.00 bar</p> </div> <div style="margin-top: 10px; text-align: center;"> <div style="background-color: #0070c0; color: white; padding: 5px; margin-bottom: 5px; display: inline-block;">disable</div> <div style="background-color: #0070c0; color: white; padding: 5px; margin-top: 5px; display: inline-block;"> Enter  </div> </div>	<table style="border-collapse: collapse; width: 100%;"> <tr><td style="background-color: #0070c0; color: white; width: 30px; height: 30px; margin: 5px;">1</td><td style="background-color: #0070c0; color: white; width: 30px; height: 30px; margin: 5px;">2</td><td style="background-color: #0070c0; color: white; width: 30px; height: 30px; margin: 5px;">3</td></tr> <tr><td style="background-color: #0070c0; color: white; width: 30px; height: 30px; margin: 5px;">4</td><td style="background-color: #0070c0; color: white; width: 30px; height: 30px; margin: 5px;">5</td><td style="background-color: #0070c0; color: white; width: 30px; height: 30px; margin: 5px;">6</td></tr> <tr><td style="background-color: #0070c0; color: white; width: 30px; height: 30px; margin: 5px;">7</td><td style="background-color: #0070c0; color: white; width: 30px; height: 30px; margin: 5px;">8</td><td style="background-color: #0070c0; color: white; width: 30px; height: 30px; margin: 5px;">9</td></tr> <tr><td style="background-color: #0070c0; color: white; width: 30px; height: 30px; margin: 5px;">←</td><td style="background-color: #0070c0; color: white; width: 30px; height: 30px; margin: 5px;">0</td><td style="background-color: #0070c0; color: white; width: 30px; height: 30px; margin: 5px;">.</td></tr> </table>	1	2	3	4	5	6	7	8	9	←	0	.		
1	2	3													
4	5	6													
7	8	9													
←	0	.													
Enter a number within the range limits		20:38:09													

Type in new warning level and press enter button to close menu.

Warning level should be less than Alarm level. FAUDI Aviation recommends to choose Warning levels in the range of approximately 80 to 90 % of Alarm level.
Generally: Warning levels should be used to inform the user about critical behavior of filtering equipment – very close to its end of lifetime. It should be used for visual or acoustical alarm.
Warning level should be adjusted in between 0.5 bar and 2 bar.




Warning function correspond to corrected differential pressure readout. It is mandatory to have very good sensor signals for differential pressure measurement and flow. The better these signals are, the better is the corresponding calculated corrected differential pressure measurement.

Type in new Warning level or disable function and press **Enter** button to store and return to previous menu step

5.2.7.1.1.1 Delay Switch-on

You can give in delay time for corrected differential pressure especially to suppress alarms / warnings in case of peaks or short time amplitudes in case of unsynchronized sensor signals for flow and dp.

Pre-setting is 2.5 sec.

Delay Switch-On:			 Back
disabled 0.1 ... 60.0 sec	1	2	3
	4	5	6
<div style="background-color: #0070C0; color: white; padding: 5px; margin-bottom: 5px;">disable</div> <div style="background-color: #0070C0; color: white; padding: 5px;">Enter </div>	7	8	9
		0	.
Enter a number within the range limits			15:20:18

Type in delay time and store it by pressing the Enter button.

5.2.7.1.2 Info screen in cases of mistyping

In cases of mistyping Alarm or Warning – DPGUARD® catches mistyped values to autocorrect or give out comments.

Warning level above Alarm:

Maximum accepted limit to be typed in is Alarm level. There is no possibility to give in higher numbers than Alarm levels.

Alarm level below Warning level.

In Cases of wrong indication e.g. Alarm level below Warning level - DPGUARD gives out a comment to inform about mistyping. Please check your levels again.



Caution!

Alarm threshold is less than the warning threshold!
Warning threshold is set to alarm threshold!

confirm

Press a Button	11:51:57
----------------	----------

You should see a screen like the one below (values are differing) if all entries are accepted:

	corrected Difference Pressure	 Back
Alarm-Relay	Switch-On:	<input style="width: 100%;" type="text" value="22.0 psi"/>
Warning-Relay	Switch-On:	<input style="width: 100%;" type="text" value="18.0 psi"/>
Delay Switch-On:		<input style="width: 100%;" type="text" value="5.0 sec"/>
For changes, press on the edit areas!		16:11:16

Now you will find a cross behind the submenu for corrected differential pressure.

	Assign Relay Output	 Back
---	----------------------------	--

corrected DP <input checked="" type="checkbox"/>	Operating Hours <input type="checkbox"/>
Time Span [Days] <input type="checkbox"/>	Throughput <input type="checkbox"/>
Broken Filter <input type="checkbox"/>	

Press a Button	12:20:06
----------------	----------

Please go on with the other Relais.

5.2.7.1.3 Time Span (Days) submenu – Relay output

	Time Span [Days]	 Back
---	-------------------------	--

Alarm-Relay	Switch-On: <input type="button" value="disabled"/>
Warning-Relay	Switch-On: <input type="button" value="disabled"/>

For changes, press on the edit areas!	20:58:23
---------------------------------------	----------

Warning and Alarm can be addressed if customer wanted to have indication about lifetime or residual lifespan of filter elements in use.

Press blue button to address which kind of Relay should be enabled / disabled

Alarm: Switch-On

Back

730 days

7 ... 2000 days

123

456

789

←0

disable

Enter ←

Enter a number within the range limits
21:06:10

In this case two years of filter lifetime has been adjusted to give out Alarm if time is over.

Warning: Switch-On

Back

650 days

7 ... 2000 days

123

456

789

←0

disable

Enter ←

Enter a number within the range limits
21:07:36

Warning level has been set to 650 days to address procurement department for new filter elements

New status:

	Time Span [Days]	 Back
---	-------------------------	--

Alarm-Relay	Switch-On:	<input type="text" value="730 days"/>
--------------------	------------	---------------------------------------

Warning-Relay	Switch-On:	<input type="text" value="650 days"/>
----------------------	------------	---------------------------------------

For changes, press on the edit areas!	21:08:48
---------------------------------------	----------

New Warning / alarm functions enabled:

	Relay Output	 Back
---	---------------------	--

corrected DP	<input checked="" type="checkbox"/>
--------------	-------------------------------------

Operating Hours	<input type="checkbox"/>
-----------------	--------------------------

Time Span [Days]	<input checked="" type="checkbox"/>
------------------	-------------------------------------



Throughput	<input type="checkbox"/>
------------	--------------------------

Broken Filter	<input type="checkbox"/>
---------------	--------------------------


For changes, press on the edit areas!	21:09:21
---------------------------------------	----------

5.2.7.1.4 Broken Filter submenu – Relay output menu






Broken Filter submenu addresses a function to make sure that pressure drops in between short period of time could be observed

	Broken Filter: Pressure drop	 Back						
<table border="0"> <tr> <td>Alarm-Relay</td> <td>Switch-On:</td> <td><input type="button" value="disabled"/></td> </tr> <tr> <td>Warning-Relay</td> <td>Switch-On:</td> <td><input type="button" value="disabled"/></td> </tr> </table>			Alarm-Relay	Switch-On:	<input type="button" value="disabled"/>	Warning-Relay	Switch-On:	<input type="button" value="disabled"/>
Alarm-Relay	Switch-On:	<input type="button" value="disabled"/>						
Warning-Relay	Switch-On:	<input type="button" value="disabled"/>						
For changes, press on the edit areas!		21:13:07						

Alarm Relay for pressure drop in psi

Alarm: Pressure drop		 Back														
<table border="1"> <tr> <td>5.00 psi</td> </tr> <tr> <td>0.20 ... 29.00 psi</td> </tr> </table>	5.00 psi	0.20 ... 29.00 psi	<table border="0"> <tr> <td><input type="button" value="1"/></td> <td><input type="button" value="2"/></td> <td><input type="button" value="3"/></td> </tr> <tr> <td><input type="button" value="4"/></td> <td><input type="button" value="5"/></td> <td><input type="button" value="6"/></td> </tr> <tr> <td><input type="button" value="7"/></td> <td><input type="button" value="8"/></td> <td><input type="button" value="9"/></td> </tr> <tr> <td><input type="button" value="←"/></td> <td><input type="button" value="0"/></td> <td><input type="button" value="."/></td> </tr> </table>	<input type="button" value="1"/>	<input type="button" value="2"/>	<input type="button" value="3"/>	<input type="button" value="4"/>	<input type="button" value="5"/>	<input type="button" value="6"/>	<input type="button" value="7"/>	<input type="button" value="8"/>	<input type="button" value="9"/>	<input type="button" value="←"/>	<input type="button" value="0"/>	<input type="button" value="."/>	
5.00 psi																
0.20 ... 29.00 psi																
<input type="button" value="1"/>	<input type="button" value="2"/>	<input type="button" value="3"/>														
<input type="button" value="4"/>	<input type="button" value="5"/>	<input type="button" value="6"/>														
<input type="button" value="7"/>	<input type="button" value="8"/>	<input type="button" value="9"/>														
<input type="button" value="←"/>	<input type="button" value="0"/>	<input type="button" value="."/>														
<input type="button" value="disable"/>																
<input type="button" value="Enter ←"/>																
Enter a number within the range limits		16:12:36														

Warning Relay for pressure drop in psi

Warning: Pressure drop		 Back												
<div style="border: 2px solid black; border-radius: 15px; padding: 10px; width: fit-content; margin: 0 auto;"> <p style="font-size: 24px; margin: 0;">3.00 psi</p> <p style="margin: 0;">0.10 ... 5.00 psi</p> </div> <div style="margin-top: 10px; text-align: center;"> <div style="background-color: #0070C0; color: white; padding: 5px; width: 100px; margin: 0 auto;">disable</div> <div style="background-color: #0070C0; color: white; padding: 5px; width: 100px; margin: 5px auto;"> Enter  </div> </div>	<table style="margin: 0 auto;"> <tr><td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center;">1</td><td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center;">2</td><td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center;">3</td></tr> <tr><td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center;">4</td><td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center;">5</td><td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center;">6</td></tr> <tr><td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center;">7</td><td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center;">8</td><td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center;">9</td></tr> <tr><td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center;"></td><td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center;">0</td><td style="background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center;">.</td></tr> </table>	1	2	3	4	5	6	7	8	9		0	.	
1	2	3												
4	5	6												
7	8	9												
	0	.												
Enter a number within the range limits		16:13:00												

If you are not sure on how to proceed – please ask your local distributor or contact FAUDI Aviation Sensor GmbH in Germany.

Recommendation for actions to take – out of AS6401, issue 2009-03-11, page 125 of 181

AS6401: See chapter A 3.1.2.2

Filter monitors or separator elements shall be

investigated if a **sudden drop > 3 psi** in dp occurs under similar flow conditions, corrected to maximum achievable flow rate, or

replaced when a **sudden drop > 5 psi** in dp occurs under similar flow conditions

5.2.7.1.5 Operating hours submenu – Output menu








You are asked to define the number of hours before Warning or Alarm should be activated. In most cases the function will be deactivated.

Alarm level for operating hours

Set Alarm: Switch-On level for Alarm:








Type in required number of operation hours before element exchange should be done. Normal ranges are in between 10 to 25000 hours. In the example above it is about 5000 hours.

Press **Enter** button to store and return to previous menu.

Alarm: Switch-On		 Back												
5000 h 10 ... 25000 h	<table border="1"> <tr><td>1</td><td>2</td><td>3</td></tr> <tr><td>4</td><td>5</td><td>6</td></tr> <tr><td>7</td><td>8</td><td>9</td></tr> <tr><td></td><td>0</td><td></td></tr> </table>	1	2	3	4	5	6	7	8	9		0		
1	2	3												
4	5	6												
7	8	9												
	0													
<table border="1"> <tr><td>disable</td></tr> <tr><td>Enter </td></tr> </table>	disable	Enter 												
disable														
Enter 														
Enter a number within the range limits		13:44:33												



Warning level for operating hours

Set **Warning: Switch-On** level for warning about operating hours:

Warning: Switch-On		 Back												
4500 h 10 ... 25000 h	<table border="1"> <tr><td>1</td><td>2</td><td>3</td></tr> <tr><td>4</td><td>5</td><td>6</td></tr> <tr><td>7</td><td>8</td><td>9</td></tr> <tr><td></td><td>0</td><td></td></tr> </table>	1	2	3	4	5	6	7	8	9		0		
1	2	3												
4	5	6												
7	8	9												
	0													
<table border="1"> <tr><td>disable</td></tr> <tr><td>Enter </td></tr> </table>	disable	Enter 												
disable														
Enter 														
Enter a number within the range limits		13:46:00												

Type in required number of operation hours before first information (Warning) about soon element exchange should be done. Normal ranges are in between 10 to 25000 hours. In the example above it is 4500 hours.

Press **Enter** button to store and return to previous menu where you can see the entries.

 Back	<h2>Operating Hours</h2>	Next 						
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%; padding: 10px;"> <div style="background-color: #f0f0f0; padding: 10px; border: 1px solid #ccc;"> <h3>Alarm-Relay</h3> </div> </td> <td style="width: 30%; padding: 10px;"> Switch-On: </td> <td style="width: 30%; padding: 10px;"> <div style="background-color: #0070c0; color: white; padding: 5px 10px; border: 1px solid black; display: inline-block;">5000 h</div> </td> </tr> <tr> <td style="padding: 10px;"> <div style="background-color: #f0f0f0; padding: 10px; border: 1px solid #ccc;"> <h3>Warning-Relay</h3> </div> </td> <td style="padding: 10px;"> Switch-On: </td> <td style="padding: 10px;"> <div style="background-color: #0070c0; color: white; padding: 5px 10px; border: 1px solid black; display: inline-block;">4500 h</div> </td> </tr> </table>			<div style="background-color: #f0f0f0; padding: 10px; border: 1px solid #ccc;"> <h3>Alarm-Relay</h3> </div>	Switch-On:	<div style="background-color: #0070c0; color: white; padding: 5px 10px; border: 1px solid black; display: inline-block;">5000 h</div>	<div style="background-color: #f0f0f0; padding: 10px; border: 1px solid #ccc;"> <h3>Warning-Relay</h3> </div>	Switch-On:	<div style="background-color: #0070c0; color: white; padding: 5px 10px; border: 1px solid black; display: inline-block;">4500 h</div>
<div style="background-color: #f0f0f0; padding: 10px; border: 1px solid #ccc;"> <h3>Alarm-Relay</h3> </div>	Switch-On:	<div style="background-color: #0070c0; color: white; padding: 5px 10px; border: 1px solid black; display: inline-block;">5000 h</div>						
<div style="background-color: #f0f0f0; padding: 10px; border: 1px solid #ccc;"> <h3>Warning-Relay</h3> </div>	Switch-On:	<div style="background-color: #0070c0; color: white; padding: 5px 10px; border: 1px solid black; display: inline-block;">4500 h</div>						
For changes, press on the edit areas!		13:47:07						

You can either disable or enable both Relays to use the functionality of Operating hours.

Press **Next >>** button to enter next menu step.



5.2.7.1.6 *Throughput [m³] submenu – output menu*

Relays for throughput

Next menu step should be used to give out Warning or Alarm if predefined **Throughput [m³]** through filter elements is reached or tends to increase levels for use.






You can either enable or disable this function.

In first instance the function should be disabled.

 Back	<h2>Throughput [m³]</h2>	Next 
<div style="border: 1px solid gray; padding: 10px; margin-bottom: 10px;"> <p>Alarm-Relay Switch-On: disabled</p> </div> <div style="border: 1px solid gray; padding: 10px;"> <p>Warning-Relay Switch-On: disabled</p> </div>		
For changes, press on the edit areas!		13:50:39

Alarm level for throughput

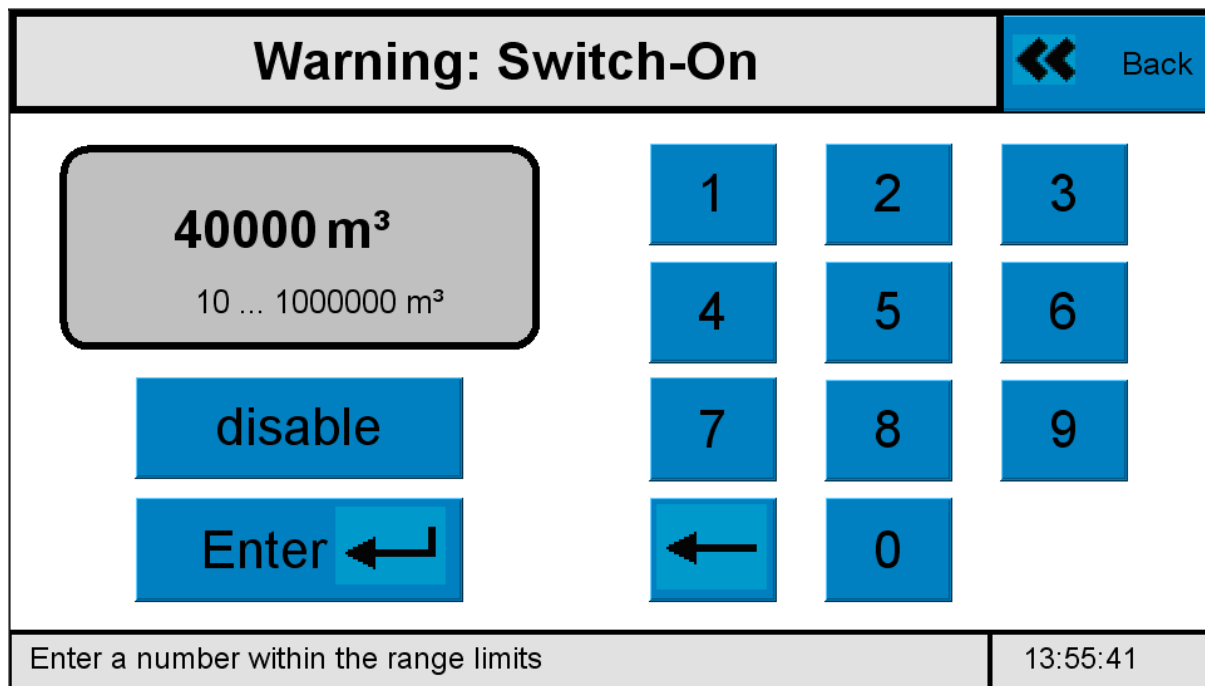
Set Alarm: Switch-On settings for throughput menu:

<h2>Alarm: Switch-On</h2>		 Back												
<div style="border: 2px solid black; border-radius: 15px; padding: 10px; width: fit-content; margin: 0 auto;"> <p>50000 m³</p> <p>10 ... 1000000 m³</p> </div> <div style="margin-top: 10px;"> <div style="border: 1px solid black; background-color: #0070C0; color: white; padding: 5px; width: 100%; text-align: center; margin-bottom: 5px;">disable</div> <div style="border: 1px solid black; background-color: #0070C0; color: white; padding: 5px; width: 100%; text-align: center;">Enter </div> </div>	<table border="0"> <tr> <td style="border: 1px solid black; background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; margin: 5px;">1</td> <td style="border: 1px solid black; background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; margin: 5px;">2</td> <td style="border: 1px solid black; background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; margin: 5px;">3</td> </tr> <tr> <td style="border: 1px solid black; background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; margin: 5px;">4</td> <td style="border: 1px solid black; background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; margin: 5px;">5</td> <td style="border: 1px solid black; background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; margin: 5px;">6</td> </tr> <tr> <td style="border: 1px solid black; background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; margin: 5px;">7</td> <td style="border: 1px solid black; background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; margin: 5px;">8</td> <td style="border: 1px solid black; background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; margin: 5px;">9</td> </tr> <tr> <td style="border: 1px solid black; background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; margin: 5px;"></td> <td style="border: 1px solid black; background-color: #0070C0; color: white; width: 40px; height: 40px; text-align: center; margin: 5px;">0</td> <td></td> </tr> </table>	1	2	3	4	5	6	7	8	9		0		
1	2	3												
4	5	6												
7	8	9												
	0													
Enter a number within the range limits		13:53:03												

In example above – Throughput for Alarm function has been set to 50 000 m³. It should be in general in between 10 to 1 000 000 m³.

Warning level for throughput

Set **Warning: Switch-On** settings for throughput menu:



The screenshot shows a control interface with a title bar 'Warning: Switch-On' and a 'Back' button. The main area displays a large rounded rectangle containing '40000 m³' and a range '10 ... 1000000 m³'. Below this are buttons for 'disable', 'Enter' (with a right arrow), and a numeric keypad (0-9) with a left arrow button. At the bottom, a status bar shows 'Enter a number within the range limits' and the time '13:55:41'.

In our case – Throughput for Warning function has been set to 40 000 m³. It should be in general in between 10 to 1 000 000 m³. Press **Enter** button to return to previous menu.

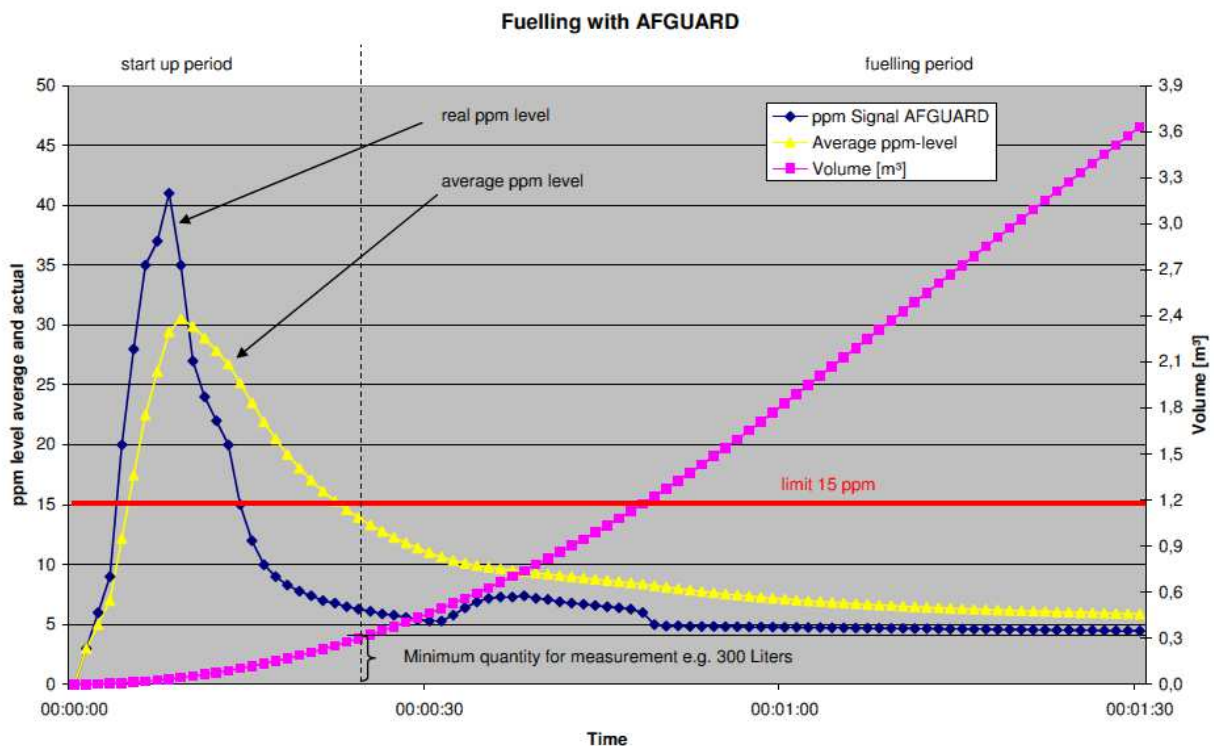
Make sure to have higher values for alarm compared to Warning function. In case of mistyping DPGUARD® will give out comment to double check the values.

5.2.7.1.7 Relays for water content

Here you can find three possibilities to address warning or alarm relays.

- D) By the use of current (actual) free water content. Please have in mind that every single peak could cause alarm or warning!
- E) By the use of averaged free water signal. Than single peaks coming from actual measurements are not critical.
- F) By the use of AFGUARD® signal output >> 20 mA, called water slug where you will have more than 500 ppm of water up to pure water. Than AFGUARD® gives out a water slug signal to immediate indicate Alarm relays.

Where the information does relate on:





Artificial fuelling process with start conditions that are not conform to jet fuel cleanliness. Real ppm level is far above the limit of 15 ppm, average ppm level (total level) is a combination of fueled volume and actual ppm signal. Both signals could be used to address alarms or warnings. Blue curve represents the actual level, yellow curve represents the total level (average level) of free water during present fuelling step. Red limit curve could be user defined to indicate abnormal levels for warning and / or alarm.

Warnings / alarm possibilities:



Actual water content:	warning level and alarm level
Average water content:	warning level and alarm level
Water slug:	alarm level

5.2.7.1.7.1 Relays for current water content

 Back	current water content	Next 									
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%; padding: 5px;">Alarm-Relay</td> <td style="width: 20%; padding: 5px;">Switch-On:</td> <td style="width: 40%; padding: 5px; text-align: center;"> <div style="border: 1px solid black; background-color: #007bff; color: white; padding: 5px 15px; display: inline-block;">40 ppm</div> </td> </tr> <tr> <td style="padding: 5px;">Warning-Relay</td> <td style="padding: 5px;">Switch-On:</td> <td style="padding: 5px; text-align: center;"> <div style="border: 1px solid black; background-color: #007bff; color: white; padding: 5px 15px; display: inline-block;">30 ppm</div> </td> </tr> <tr> <td style="padding: 5px;">Delay Switch-On:</td> <td></td> <td style="padding: 5px; text-align: center;"> <div style="border: 1px solid black; background-color: #007bff; color: white; padding: 5px 15px; display: inline-block;">10 sec</div> </td> </tr> </table>			Alarm-Relay	Switch-On:	<div style="border: 1px solid black; background-color: #007bff; color: white; padding: 5px 15px; display: inline-block;">40 ppm</div>	Warning-Relay	Switch-On:	<div style="border: 1px solid black; background-color: #007bff; color: white; padding: 5px 15px; display: inline-block;">30 ppm</div>	Delay Switch-On:		<div style="border: 1px solid black; background-color: #007bff; color: white; padding: 5px 15px; display: inline-block;">10 sec</div>
Alarm-Relay	Switch-On:	<div style="border: 1px solid black; background-color: #007bff; color: white; padding: 5px 15px; display: inline-block;">40 ppm</div>									
Warning-Relay	Switch-On:	<div style="border: 1px solid black; background-color: #007bff; color: white; padding: 5px 15px; display: inline-block;">30 ppm</div>									
Delay Switch-On:		<div style="border: 1px solid black; background-color: #007bff; color: white; padding: 5px 15px; display: inline-block;">10 sec</div>									
For changes, press on the edit areas!		15:42:02									

You will be asked to type in free water levels for alarm or warning relays to be informed if actual free water content is reaching levels above acceptance. These levels are actual free water levels with high probability to see them under normal circumstances. Therefore it is recommended to go for relatively high delay times to prevent alarm and / or warning under normal situations. Warnings and or Alarms will only appear if ongoing peaks overstay presetting's for Delay Switch – on.

5.2.7.1.7.2 Relays for total water content

 Back	total water content	Next 
Alarm-Relay	Switch-On:	<input style="width: 100px; height: 30px;" type="text" value="15 ppm"/>
Warning-Relay	Switch-On:	<input style="width: 100px; height: 30px;" type="text" value="10 ppm"/>
Delay Switch-On:		<input style="width: 100px; height: 30px;" type="text" value="1 sec"/>
For changes, press on the edit areas!		15:52:08

These warning / alarm relays relate to averaged free water content, mathematical calculated by the use of flow and actual free water content (integrated signal).



It is recommended to use these relays outputs together with recommended limits for free water content e.g.

30 ppm for civil applications

or

15 ppm for military applications.

5.2.7.1.7.3 Water slug



	water slug detection	 Back
---	-----------------------------	--

Alarm Delay Switch-On:	5 sec
------------------------	--------------

For changes, press on the edit areas!	13:36:54
---------------------------------------	----------

Type in Alarm delay switch on for water slug. Presetting is for 5 seconds.

Alarm Delay Switch-On:	 Back
-------------------------------	--

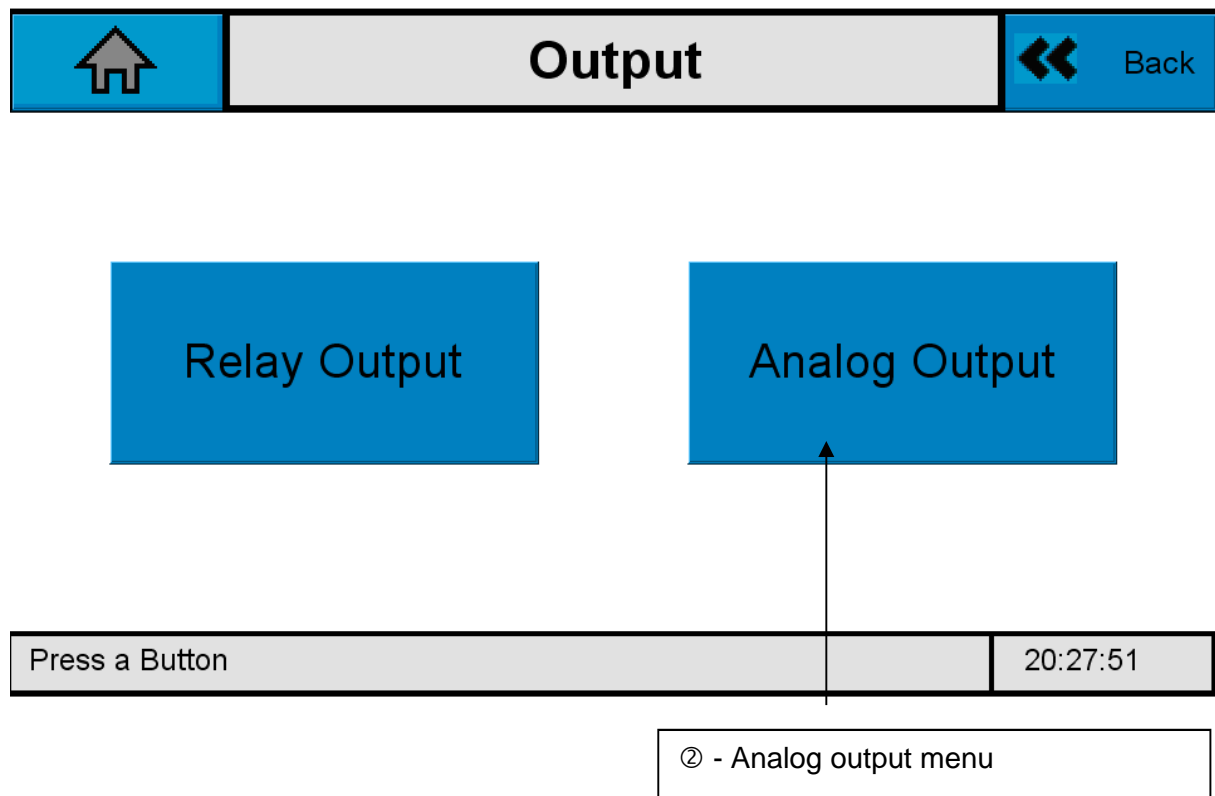
<div style="border: 2px solid black; border-radius: 15px; padding: 10px; text-align: center;"> <p>5 sec</p> <p>1 ... 60 sec</p> </div>	1	2	3
	4	5	6
	7	8	9
	Enter 		0

Enter a number within the range limits	13:38:00
--	----------

Now you did finish the Relays output menu and are ready to go ahead with the definition for DPGUARD® use
If you want to change a single setting please go into the normal setup routine as described in chapter 4.

5.2.7.2 Analog output submenu – output menu

This menu should be used to adjust the analog output signal for corrected differential pressure level to connect with other systems.




Elaboration of terms:

		See Chapter
②	Analog output menu to adjust analog signal	

5.2.7.2.1 Analog output level




Output Signal:	0..20mA		❶
20 mA correspond to:	6.0 bar		❷
Delay/Average:	1.0 sec		❸




By pressing the output signal button ❶ (blue field) output readout levels could be adjusted between 0 to 20 mA.



Output Signal:	0..20mA	
----------------	---------	---

and 4 to 20 mA







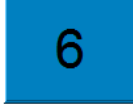











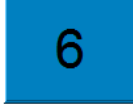











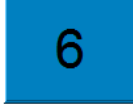









Output Signal:	4..20mA	
----------------	---------	---

– only current based sensor signals are allowed

Next action to take is to address the max pressure level  that correspond to 20 mA:

5.2.7.2.2 *Pressure level corresponding to Analog signal level*

20 mA correspond to		 Back												
<div style="border: 2px solid black; border-radius: 15px; padding: 10px; width: fit-content; margin: 0 auto;"> <p style="font-size: 24px; margin: 0;">2.0 bar</p> <p style="margin: 0;">0.5 ... 10.0 bar</p> </div>	<table style="width: 100%; text-align: center;"> <tr> <td style="width: 33%;"></td> <td style="width: 33%;"></td> <td style="width: 33%;"></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table>													
														
														
														
														
														
Enter a number within the range limits		13:26:44												

Type in pressure level and save it while pressing the enter key

To delay the signal readout it is possible to enter the delay time in seconds.

5.2.7.2.3 *Analog output delay time*

Alarm: Switch-On

Back

1 sec

1 ... 60 sec

disable

Enter

1	2	3
4	5	6
7	8	9
	0	

Enter a number within the range limits

21:36:26

5.2.8 Language menu


① - German

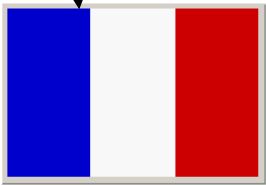
② - French


③ - Portuguese

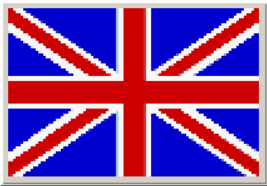
Language: English


Back

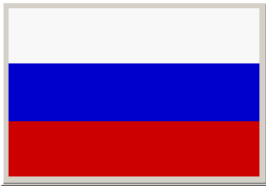













Press a Button

07:27:51

④ - English

⑤ - Spanish

⑥ - Russian

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User can easily choose between Languages by clicking on it.

Current available Languages are:

German
French
Portuguese
English
Spanish
Russian

Languages that are not included are blanked.

For Service purposes (connected via Ethernet cable) or under web mode conditions it is possible to work with different languages:

First language – e.g. English mode in DPGUARD®

Second language – e.g. German mode for web-connection.

Under these conditions it is very easy to work remotely.

5.2.9 Installer menu – see Chapter 4

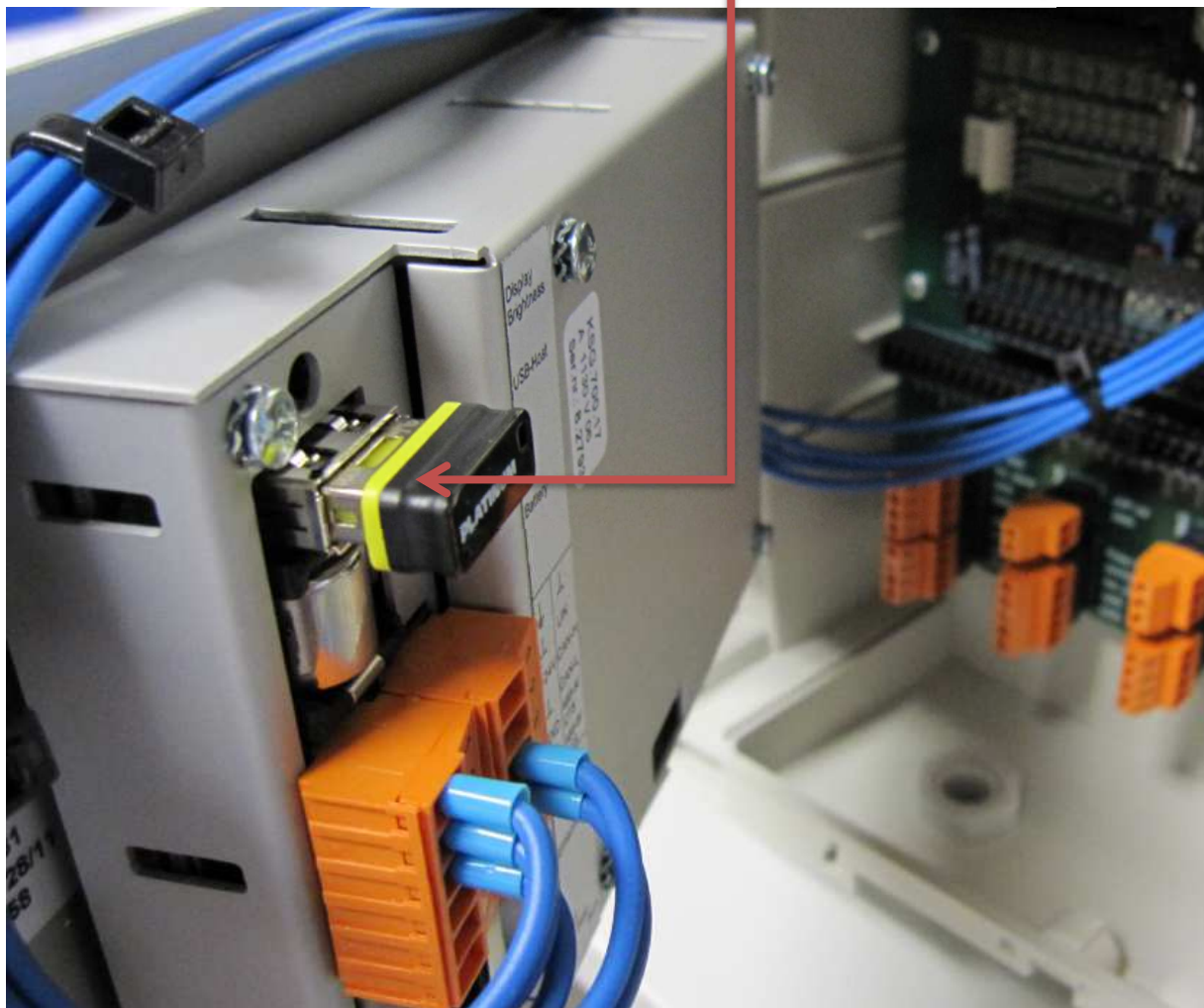
6 Datalogger

The DPGUARD consists about an in build data logger. All relevant data are stored there.

→ See Chapter 3.2.2.9.3 Datalogger – logging cycle.

These data are stored during Process onto an USB memory stick that could be found on the backside of the DPGUARD®.

To get access of these data – please open the housing and remove the USB memory stick.







Logged data could be analyzed with every computer based software that is able to read CSV data or Excel files.

Please insert the memory stick into a windows based computer. You can see following data structure:

There are two subfolders:

1. filterdata
2. logging

Name	Änderungsdatum	Typ	Größe
 filterdata	06.09.2011 17:06	Dateiordner	
 logging	06.09.2011 17:06	Dateiordner	
 filterdata.dpg	08.06.2011 09:06	DPG-Datei	1 KB
 Test2.txt	31.05.2011 10:17	Textdokument	404 KB

Subfolder „filterdata“ contains logged data that belongs to processed filter exchanges. Every filter exchange does have its own data file – see example below.

 filterelement_20120206_161907.csv	06.02.2012 16:18	Microsoft Excel-C...	1 KB
---	------------------	----------------------	------

Above example shows actual data file of filter elements that have been exchanged on the sixth of February 2012. For every filter exchange you will find Date and time of exchange in its filename: (Year: 2012, Month: 02, Day: 06, Hour:16, Minute: 19, Second: 07) e.g. „filterelement_20110906_170713.csv“.

The related log files could be opened to see stored data according the element life.

DPGUARD

Discription: Filterelement Operating Status

Date of Chan 06.02.12

Time of Chan 16:19:08

Date of Start: 12.01.12

Time of Start 08:59:29

Operating Hc 7 h 22 min

Flow Volume 1114 m³

max. Flow rate 184 m³/h

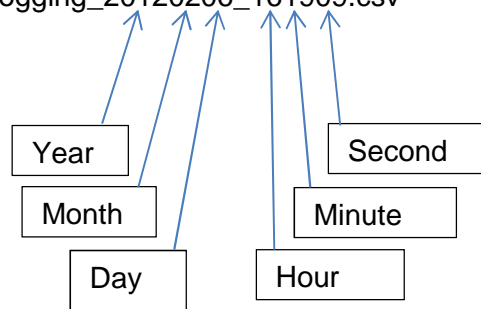
max. measur 6.6 psi

max. correcte 11.2 psi

Related details according lifetime of filter elements could also be analyzed. To do so, please click on to the logging subfolder:

	DPGUARD_Logging_20120105_104226.csv	12.01.2012 08:57	Microsoft Excel-C...	16.400 KB
	DPGUARD_Logging_20120112_085931.csv	06.02.2012 16:18	Microsoft Excel-C...	2.623 KB
	DPGUARD_Logging_20120126_141017.csv	26.01.2012 14:11	Microsoft Excel-C...	16 KB
	DPGUARD_Logging_20120126_141233.csv	05.01.2012 10:41	Microsoft Excel-C...	11.823 KB
	DPGUARD_Logging_20120206_161909.csv	06.02.2012 16:19	Microsoft Excel-C...	5 KB

Filterelement related data are also stored according time and date of exchange.
DPGUARD_Logging_20120206_161909.csv



Date and time are corresponding to data in subfolder “filter data”, whereas seconds are a little bit behind the name of saved filter element data.
Logged data are below: with timestamp, logged corrected dp, measured dp, measured flow and overall status.

Date	Time	corrected DP		measured DP		measured Flow		y = a x ² + b x		Status DPGU
								a	b	
06.02.2012	16:19:09	10.74	psi	4.94	psi	125.90	m ³ /h	1.000	0.500	o.k.
06.02.2012	16:19:10	10.74	psi	4.94	psi	125.90	m ³ /h	1.000	0.500	o.k.
06.02.2012	16:19:11	10.74	psi	4.94	psi	125.90	m ³ /h	1.000	0.500	o.k.
06.02.2012	16:19:11	10.74	psi	4.94	psi	125.90	m ³ /h	1.000	0.500	o.k.
06.02.2012	16:19:12	10.72	psi	4.93	psi	125.96	m ³ /h	1.000	0.500	o.k.
06.02.2012	16:19:14	10.72	psi	4.93	psi	125.96	m ³ /h	1.000	0.500	o.k.
06.02.2012	16:19:15	10.73	psi	4.94	psi	125.96	m ³ /h	1.000	0.500	o.k.
06.02.2012	16:19:16	10.73	psi	4.94	psi	125.96	m ³ /h	1.000	0.500	o.k.
06.02.2012	16:19:17	10.73	psi	4.94	psi	125.96	m ³ /h	1.000	0.500	o.k.

Above example shows logged data with a second based logging time:

You will find there:

- Date of log
- Time of log
- Corrected dp
- Measured dp
- Measured flow
- Coefficient of dp function
- Status of DPGUARD

It is recommended to do data back up whenever filter exchange is due to be done or when revisions of filter cartridges are callable.

Without memory stick – DPGUARD does not work.

Additional button shows that insufficient or no memory stick is available:

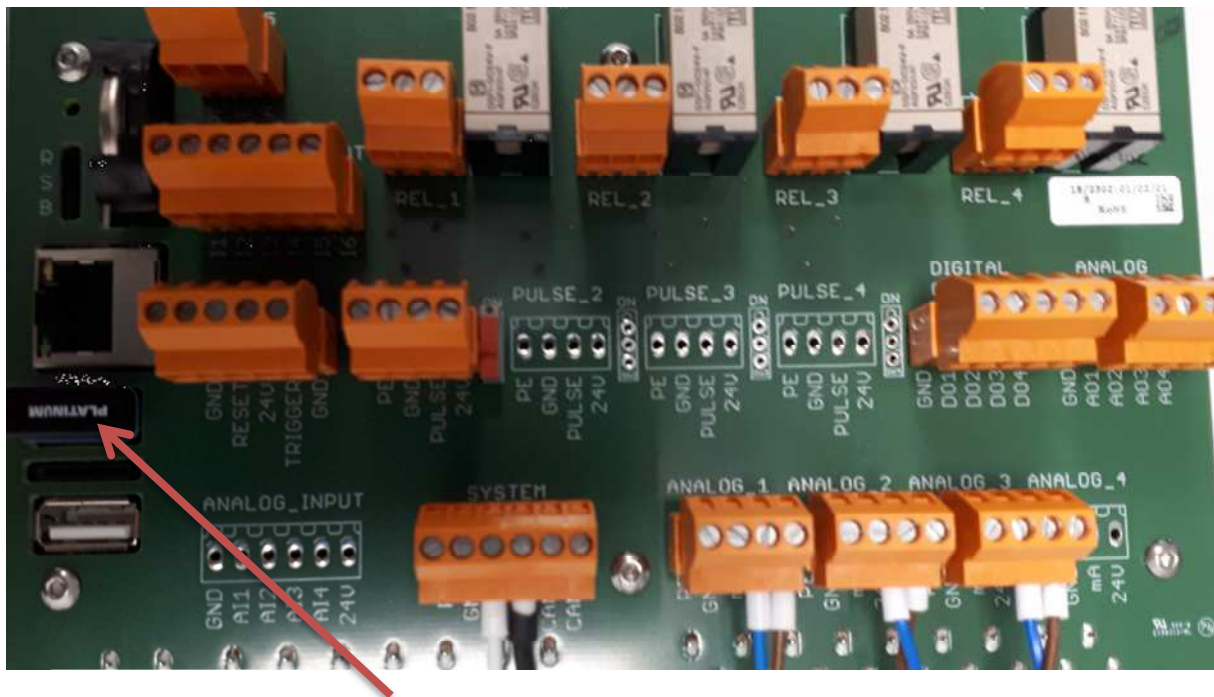
<p>corrected pressure</p> <h1 style="margin: 0;">1.00 bar</h1> <p>Status: o.k. 13:33:02 14.02.12</p>		<div style="background-color: #0070C0; color: white; padding: 5px; text-align: center; margin-bottom: 10px;">USB Reboot</div> <div style="background-color: #0070C0; color: white; padding: 5px; text-align: center; margin-bottom: 10px;">Info</div> <div style="background-color: #0070C0; color: white; padding: 5px; text-align: center; margin-bottom: 10px;">Setup</div> <div style="background-color: #0070C0; color: white; padding: 5px; text-align: center; margin-top: 20px;">Filterstatus</div>
<p>measured pressure</p> <h2 style="margin: 0;">0.442 bar</h2>	<p>flow rate</p> <h2 style="margin: 0;">1690 l/min</h2>	

Please make sure not to remove memory stick while DPGUARD® is in use.

7 Update via USB

A very comfortable way to do update whenever program changes or program updates are due could be done by the use of inbuilt USB-connector.

To do so, please open the housing to get access to the controller. You should see the following result:



Please replace the memory stick against the one with updated software and close the housing.

You should only proceed in the way described when there is no process running. Do not remove memory stick under process conditions (when DPGUARD is working or logs should be done)

Whenever update is needed, please make sure that no fuelling is ongoing.

7.1 Activation of update

Generally update process start automatically during next boot session.

You can either activate it manually. Please go into submenu (see next pictures and press update button to start update.

corrected pressure <h1 style="margin: 0;">0.54 bar</h1> Status: o.k. 14:57:26 26.07.11	Info Setup ←	From main menu please press Setup button
measured pressure: 0.31 bar flow rate: 999 l/min Filterstatus		

<div style="border: 1px solid black; padding: 5px;"> <div style="display: flex; justify-content: space-between;">insert PIN← Back</div> <div style="display: flex; align-items: center; margin: 10px 0;"> <div style="border: 1px solid gray; width: 100px; height: 30px; margin-right: 10px;">-----</div> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>1</td><td>2</td><td>3</td></tr> <tr><td>4</td><td>5</td><td>6</td></tr> <tr><td>7</td><td>8</td><td>9</td></tr> <tr><td>Enter ←</td><td>←</td><td>0 CLR</td></tr> </table> </div> </div> <div style="display: flex; justify-content: space-between; font-size: small; margin-top: 5px;"> insert your PIN 10:58:38 </div>	1	2	3	4	5	6	7	8	9	Enter ←	←	0 CLR	You will be asked to enter Administrator PIN number. Please give in: „12345678“ or previously changed own PIN for Administrator level.
1	2	3											
4	5	6											
7	8	9											
Enter ←	←	0 CLR											

<div style="border: 1px solid black; padding: 5px;"> <div style="display: flex; justify-content: space-between;">DPGUARD Setup← Back</div> <table style="width: 100%; text-align: center; margin-top: 10px;"> <tr> <td style="border: 1px solid gray; padding: 5px;">System Parameter</td> <td style="border: 1px solid gray; padding: 5px;">System ←</td> </tr> <tr> <td style="border: 1px solid gray; padding: 5px;">Sensor Input</td> <td style="border: 1px solid gray; padding: 5px;">Output</td> </tr> <tr> <td style="border: 1px solid gray; padding: 5px;">Language</td> <td style="border: 1px solid gray; padding: 5px;">Installer</td> </tr> </table> </div> <div style="display: flex; justify-content: space-between; font-size: small; margin-top: 5px;"> Press a Button 11:12:32 </div>	System Parameter	System ←	Sensor Input	Output	Language	Installer	Now you are in submenu to change DPGUARD settings. Please press System button to enter the system settings menu
System Parameter	System ←						
Sensor Input	Output						
Language	Installer						

<div style="border: 1px solid black; padding: 5px;"> <div style="display: flex; justify-content: space-between;">System Settings← Back</div> <table style="width: 100%; text-align: center; margin-top: 10px;"> <tr> <td style="border: 1px solid gray; padding: 5px;">Display Units</td> <td style="border: 1px solid gray; padding: 5px;">change PIN</td> </tr> <tr> <td style="border: 1px solid gray; padding: 5px;">Time</td> <td style="border: 1px solid gray; padding: 5px;">Date</td> </tr> <tr> <td style="border: 1px solid gray; padding: 5px;">LAN Address</td> <td style="border: 1px solid gray; padding: 5px;">Update ←</td> </tr> </table> </div> <div style="display: flex; justify-content: space-between; font-size: small; margin-top: 5px;"> Press a Button 12:33:13 </div>	Display Units	change PIN	Time	Date	LAN Address	Update ←	Please press update button to proceed update. Make sure that new USB-memory stick with required software update has already been inserted.
Display Units	change PIN						
Time	Date						
LAN Address	Update ←						

<div style="border: 1px solid black; padding: 5px;"> <div style="display: flex; justify-content: space-between;">Update via USB-Stick← Back</div> <p style="text-align: center; margin-top: 10px; font-size: small;">Plug the USB-Stick with the update into the USB-Slot and press the Update-Button!</p> <div style="text-align: center; margin: 20px 0;"> <div style="border: 1px solid gray; width: 60px; height: 30px; background-color: #0070C0; color: white; margin: 0 auto;">Update</div> </div> </div> <div style="display: flex; justify-content: space-between; font-size: small; margin-top: 5px;"> Press the "Update"-Button 14:56:13 </div>	After pressing the update button – fully automated Software update will start together with restart of the unit. After successful update please check the settings to make sure that all settings are OK.
--	---


8 List of settings

Attached you will find a list of settings to be used for setup procedures.
You can find this file on your CD ROM that should be delivered together with your DPGUARD (back side of installation manual)

F A U D I DPGUARD – SETTINGS CHECKLIST

No.	Parameter	Presetting - value	User settings	Comment
Installer (1 ... 37)				
1	Language	English		--
2	Date	Current		Day / Month / Year - check settings
3	Time	Current		(dependent on location)
4	Admin Password	12345678		could / should be user defined
5	User Password	0		could / should be user defined
6	Pressure Units	Psi		--
7	Flow Units	Liter		--
8	Pressure Sensor Mode	1 x DP		for PMD 75 - check "zero" calibration
9	Pressure signal	4 ... 20 mA		
10	Max. Pressure Range	42 Psi		TBC by supplier PMD 42: 42 psi = 2,9 bar
11	Delay pressure sensor	Disabled		to synchronize with other signals
12	Attenuation pressure sensor	1 sec		to equalize signal behaviour
13	Flow Signal	puls / piter		Pulse/Litre count preferred if available
14	Max. Flow Range			not required if setting is: pulse/liter
15	Delay of flow sensor	Disabled		to synchronize with other signals
16	Attenuation of flow sensor	1 sec		to equalize signal behaviour
17	Max Flow Range of Filter	3400 l/min		rated flow or max achievable flow - TBC by user
18	DPGUARD Switch On	20%		Percentage of max Flow when DPGUARD should start

19	Logging Cycle	60 seconds		TBC by user (start with low numbers)
20	max. coefficient changing	0.01		only for point algorithmus
21	min flow rate difference	30%		
22	const condition time	5 sec		divided into 2.5 sec plus 2.5 sec constant time
23	constant condition tolerance	2.5 %		condition related to actual measurement
24	Analogue Output	4.20mA		only for direct connection to PLC system
25	20 mA correpond to	29 psi		not required
26	Delay / average	1 sec		not required
27	DP Alarm Relay Value	Monitor: 22 psi		TBC by user
28	DP Warning Relay Value	Monitor 18 psi		TBC by user
39	DP Relay Delay	2.5 sec		presetting do not touch
30	Element Life Alarm	Monitor 365 days		TBC by user
31	Element Life Warning	Monitor 335 days		TBC by user
32	Broken Filter Alarm	5psi		AS 6401
33	Broken Filter Warning	3psi		AS 6402
34	Operating Hours Alarm	disabled		not required
35	Operating Hours Warning	disabled		not required
36	Throughput Alarm	disabled		not required
37	Throughput Warning	disabled		not required
38	Flow below 50 % - see No 17			additional relais output No. DO 09 / DO 09M (connector X14)
39	Flow above 50 % - see No 17			additional relais output No. DO 08 / DO 08M (connector X14)
40	Reset Alarm (only broken filter)			digital Input to reset Alarm via external switch connector X 13, DI01, press for more than 1 second to reset alarm, use Internal power supply 24 VDC (GRND internally connected)

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41	DP function			to be found under "filterstatus"/"DP function"
----	-------------	--	--	--

	Service Display			
42	service display - average broken filter	60		response speed for broken filter (regarding peaks)
	Algorithmus settings			
43	Mode	Points		change between diff. Functions
44	coefficient setting quadratic	0.1		
45	coefficient setting linear	0.35		
46	manually reset alarms	disabled		to set alarms by the use of external switch
47	constant delta pressure	disabled		give out alarm in case of pressure fluctuation

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