Quick-Start for READ30

The program READ30 was written for the purpose of reading and configuring the digital pressure-Transmitter of the series 30. The two features are divided into the following parts:

READ30:   Measure with the digital transmitter, show the Values on a graph and save them to file on your disk,
PROG30:   change the configuration of the digital transmitter.

The installation of READ30 is started with „setup.exe" on the enclosed CD. As PROG30 is a module of READ30 it is also installed.

1   READ30, Record measurements

On the start of the READ30-software a dialog-box appears requesting to select the baud-rate (9600 or 11520), COM-port and echo mode for the transmission (on/ off). To allow a communication with the digital-transmitter from a computer or palmtop, a RS-232 to RS-485 converter (e.g. *Converter K-107* from KELLER) has to be inserted between computer and digital-transmitter.
This dialog-box can be reopened and the settings changed at any time from the menu *Settings -> Interface..*.

choose COM-Port

set echo to „ON" if a RS485 converter from KELLER is used
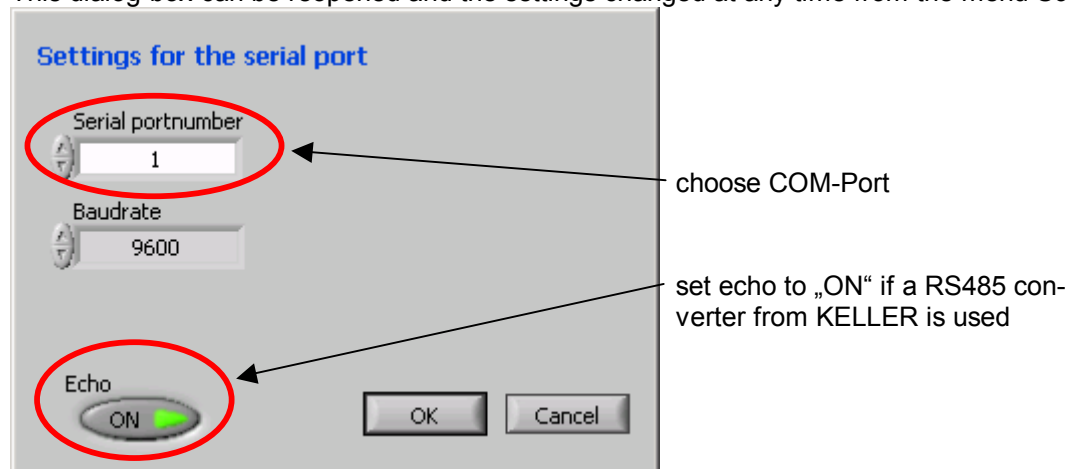
1.1   Channel set-up

In order to allow the program to record values, the needed channels on selected transmitters has to be set-up. This can be done by selecting in the menu *Settings -> Configuration...*
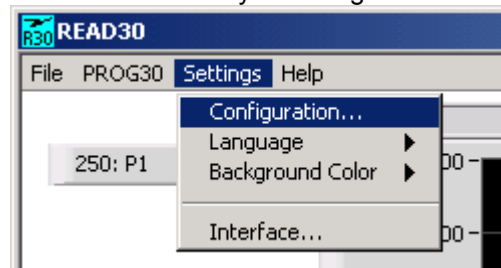
Again, a new Window pops-up.

With **Number of graphs** select how many lines should be recorded. In the list at its right as many rows are shown as numbers of graphs are set, allowing you to configure each line separately.
In **Instrument addresses** set the RS-485 address of the digital-transmitter from which the values should be recorded. Take in account that the address 250 is only allowed if there is only one digital-transmitter connected to the RS-485 bus. Otherwise select an address between 1 and 249.
With Channel select which channel in the digital-transmitter should be recorded.

On the right hand side of the window change (if needed) the resolution of the x- and y-axes of the graph. These settings do not affect the recording.

Example for one recording line:

Example for 16 recording lines on 13 digital-transmitter.

1.2   Recording

The bottom left corner is devoted to the measurement itself. Set measurement interval and then start and stop the recording itself.

Start a measurement:
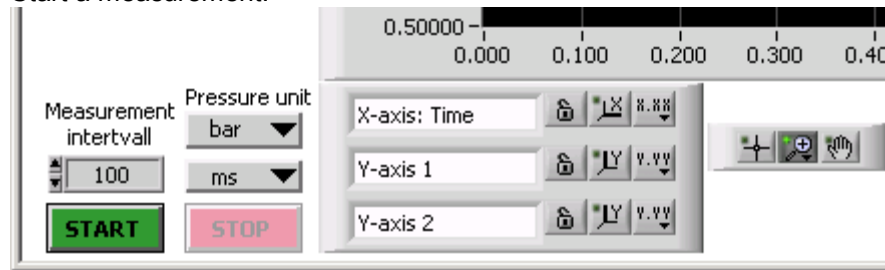
By pressing **start**, already performed recordings are dropped! Be sure to save these recordings to disk before starting a new measurement.

While a recording is ongoing the menu and measurement interval are inactive to not disturb the recording.

1.3   Scaling of the graph

The graph owns extensive possibilities to customize the scaling. A detailed description cannot be provided at this position. Only an overview is given. The user has to try himself how a setting affects the display. All Settings do not affect the recording and the stored data itself.

Instrument palette:

cross hairs:	cursor-instrument
lense:	zoom-instrument
hand:	allows to directly move the graph (click-and-drag)

axes palette:
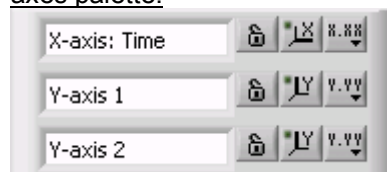
open latch:		: no autoscale
closed latch:		: permanent autoscale
click on the following symbol:		: one-time autoscale
pull-down menu:		: different settings for the axes

Graph legend
Right-click on a line in the legend to pop-up a pull-down menu. With these settings customize each recorded line individually (e.g. color, appearance, ...)

1.4   Save recorded data

The recorded data can be stored to disk for later review and use for further calculation and documentation.
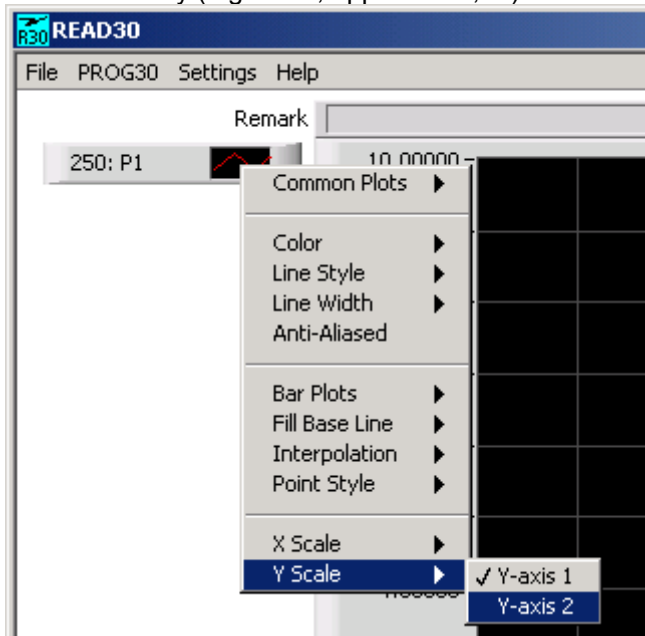Two data format are supported:

.rrd   binary. This is a compact data-format where the values are stored directly with their binary representation. It can only be read with READ30.
Call it from the menu: *File -> save as...*

.txt   plain text. Use this format if you intend to use the data for further calculation in Excel or Matlab. The datapoints are stored in plaintext, tabulator separated.
Each column represents a measurement line, whereas the first column is the timestamp. Each row represents a timestamp.
Call if from the menu: *File -> export...*

By calling *File -> open...* in the menu one can read saved „.rrd"-files to retrieve the data and display them the same way as it was just recorded.

It is advised to save the data in the .rrd-format. This ensures that they can be read back from READ30 at a later stage. A conversion to tab-separated text can be performed at any time (also from data that was read from disk).

2   PROG30, customize your digital-transmitter

As the digital-transmitter from KELLER contains a microcontroller it allows a bunch of different data-recording variations. Changes to the actual configuration of a digital-transmitter can be performed with the READ30 module.

Call this module from the menu: *PROG30 -> PROG30...*
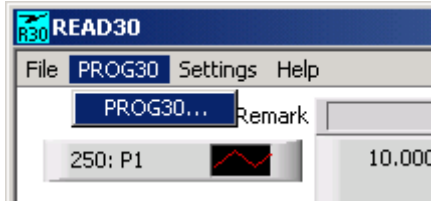
A call of this module brings up a new window:
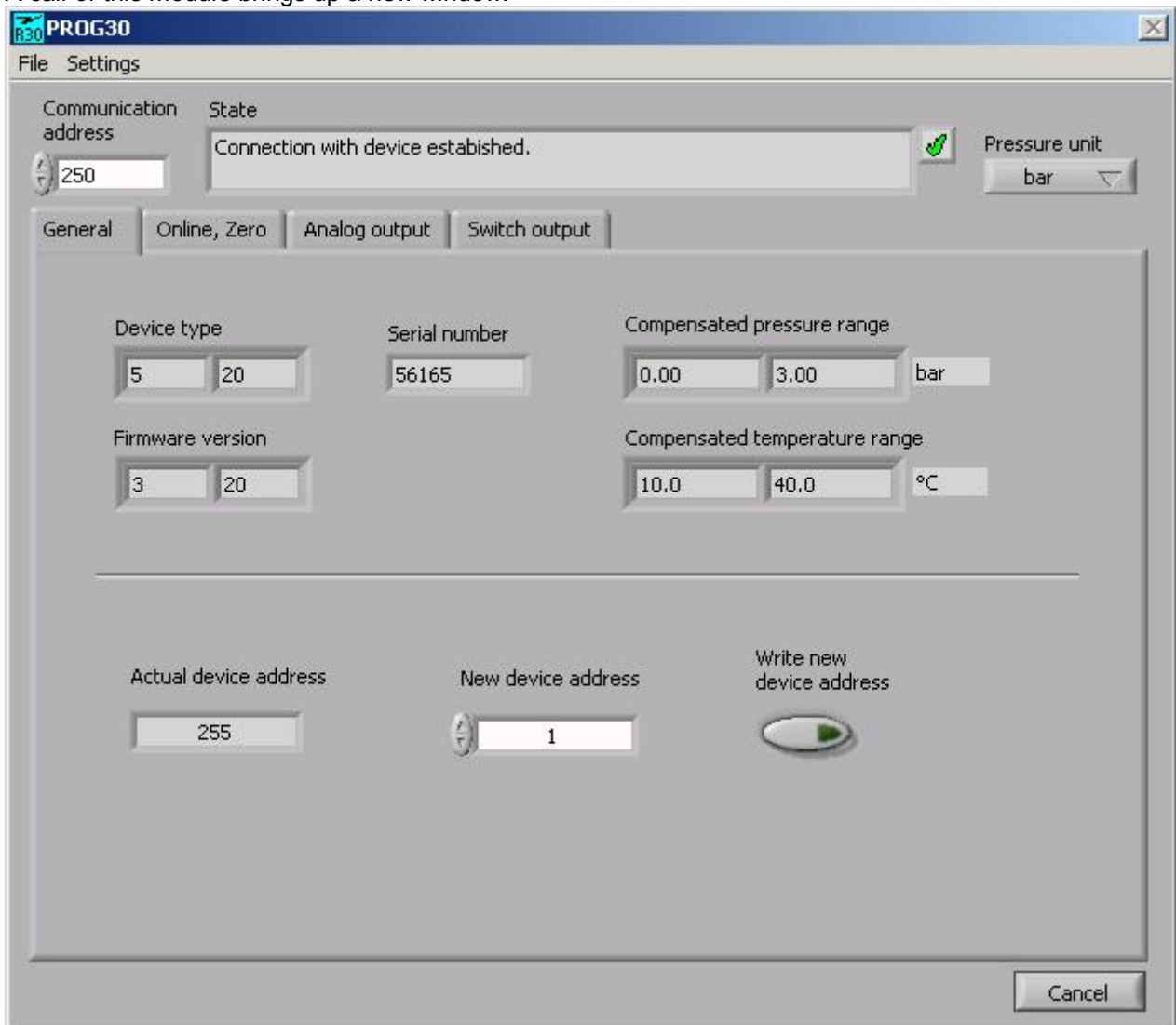
The new window is organized in two parts. The upper one shows the connection status, in the lower part one can review and modify various settings of the digital-transmitter, divided in up to five tabs.

2.1 Communication

In **Communication address** set the RS-485 address of the desired digital-transmitter. Address 250 should only be used, if only one transmitter is connected on the RS-485 bus. As all digital-transmitter from KELLER respond on address 250 a use of it in a bus with more than one participant will occur in a collision, because all transmitter respond to commands.

The field **State** displays informations about the connection state.

With the control **Pressure unit** set the global display unit for the PROG30. It is not a communication element but related to the global display in the module. This control doesn't affect the configuration in the transmitter.

2.2 Tab „General"

This tab shows general informations about the transmitter.

Also in this tab set the device-specific communication address with **New device address** and **Write new device address**.

2.3 Tab „Online, Zero"

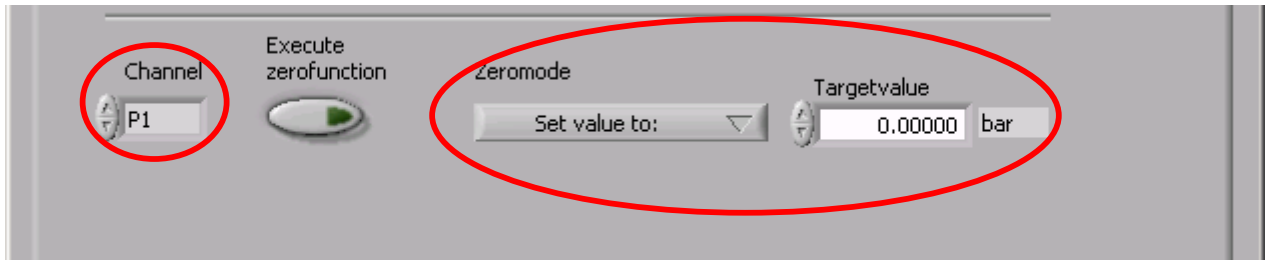In the upper part of this tab, actual measurements of the digital-transmitter are shown. Depending on the programming 1 to 5 values are shown. Additionally up to two LED (**Switch 1** and **Switch 2**) might show up displaying the state of the switch-output.

In the lower part one can modify offset of the measurements. It is called „zeroing". Use this option to set the zero-point of the scale at your whish.

First select the **Channel** and then **Zeromode**. You have 3 possibilities:

- Zero   The zero-point is set the way that the actual measured value shows „=0".
- Set value to: The zero-point is set the way that the actual measured value shows the value in
                                Targetvalue.
- Set default value   The offset is set back to factory default

2.4   Tab „Analog output"
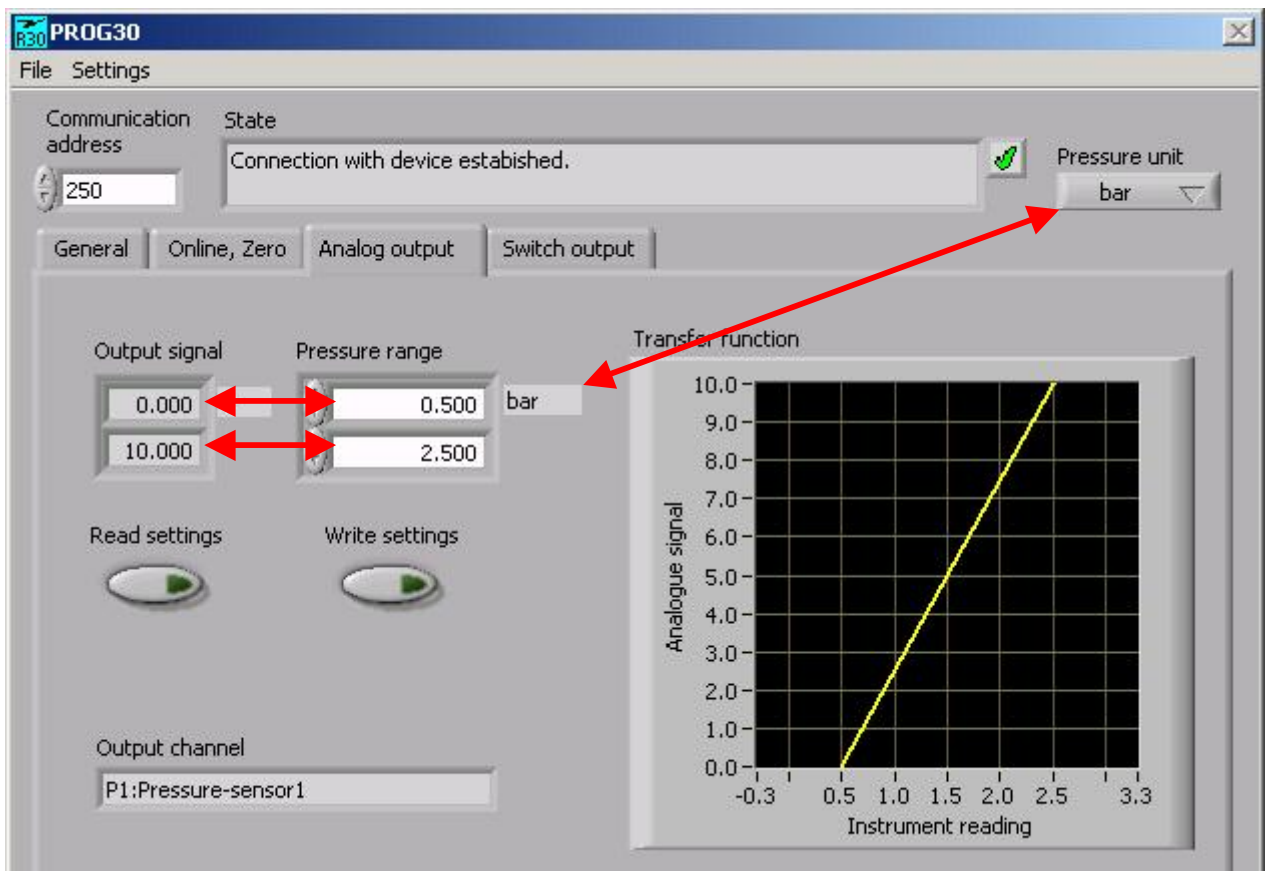
Does the digital-transmitter possess an analog output, set here it's span independently of the digital values. Thanks to the built-in signal-processor it is easy to change the output span without having to recalibrate the digital-transmitter. Just set the values in **Pressure range** according your wishes, one for the minimum output signal (here 0V) and one for full-scale signal (here 10V).

The range of the values in **Pressure range** is set with the **Pressure unit** (see chapter Communication). The unit itself is not stored in the digital-transmitter, but the scaling is calculated the way that the output Signal (V or mA) can be interpreted correctly by the user without further calculation.

2.5   Tab „Switch- Output"
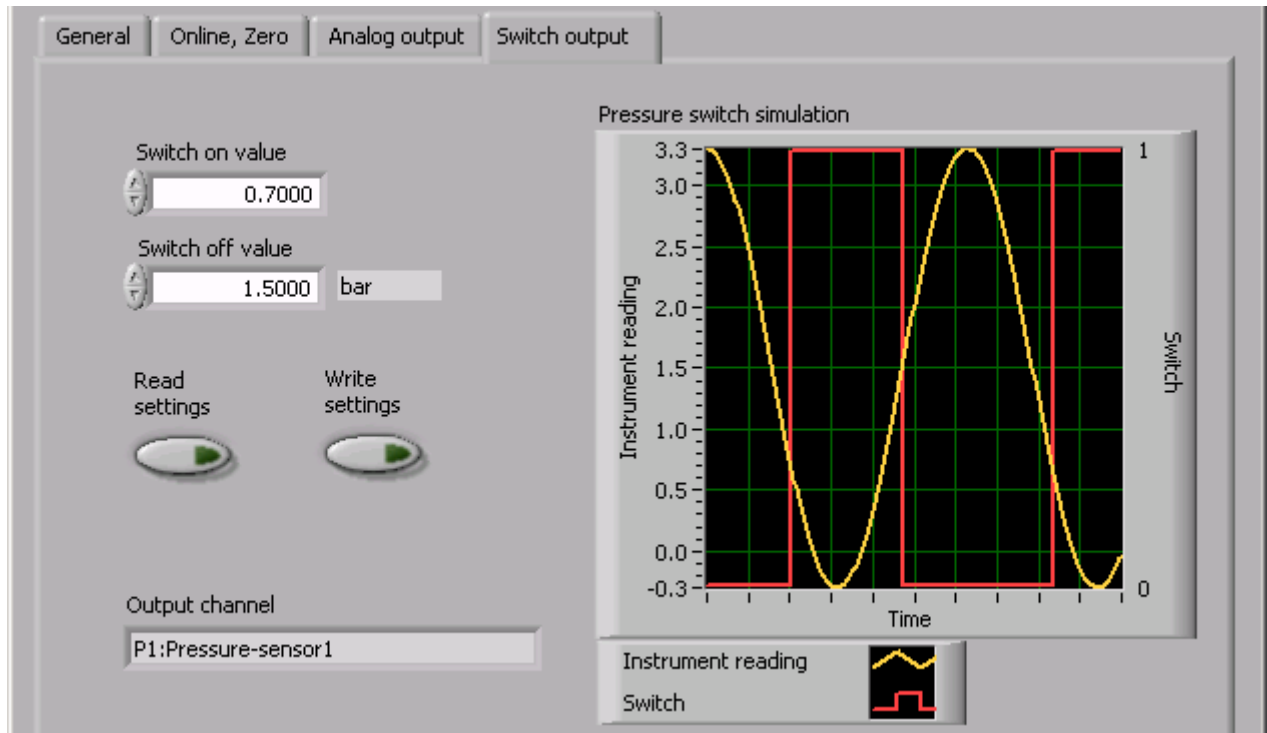
Does the digital-transmitter possess an on/off output and it is enables, set its property here. The graph shows a simulation of a measured signal and the response of the on/off output. Be sure to choose a difference of 0.05% of full scale between **Switch on value** and **Switch off value**.

2.6   Tab „Special"

Normally this tab is not visible. It contains settings for the digital-transmitter that usually don't need to be changed. Be sure to understand the functionality of the digital-transmitter when changing these settings.
To reveal this tab select in the menu: *Settings -> Special*. A dialog box pops-up prompting for a password.

Password: 1268

Baudrate:
Change communication speed of the digital-transmitter. You have the option between 9600 and 115200 baud.

Alert: Not all RS486 converters support a communication speed of 115200 baud. If you change this value in the digital-transmitter but the converter doesn't support it, there is no way to set this value back to the old value!

To change the baudrate follow these steps:
1. Assure yourself that the RS485 converter supports the desired baudrate
2. Change the baudrate of the digital-transmitter in PROG30. Writing the new value changes only the ROM of the digital-transmitter. The UART still holds the old value. At this point a change can be reverted.
3. Switch the digital-transmitter off, then on again. Now the UART uses the new baudrate.
4. Change the baudrate of the PROG30 from the menu: *Settings -> Interface...*

Temperature interval:
The built-in temperature compensation of the digital-transmitter measures the temperature of the pressure-cell in a certain interval. Set here the interval in seconds (**Temperature measure interval**) in which the temperature is measured and how many measurements are taken in account (**Temperature compensation interval**) to calculate the compensation coefficients. Here: 2 × 5sec = 10 seconds – means coefficients are calculated every 10 seconds based on two temperature measurements.

ADC-settings:
Settings for the analog to digital converter
Also for the analog to digital conversion a certain amount of measurement are averaged to reduce noise and raise the accuracy. The same goal has the **Elementary conversion time** in milliseconds.
While change in **Amount of samples per averaging** doesn't affect the characteristic of the analog to digital conversion a change of **Elementary conversion time** requires a new calibration of the digital-transmitter. It is preferable only to change the amount of averaged samples.

Filters:
The controller firmware-versions *5.20-4.1* and earlier supports differet signal-filters:
- - **Lowpass-Filter**:
  This is a lowpass for the pressure channels P1 and P2 (if P2 exists). The formula is given as:

$$P_{n+1} = \frac{(2^{LowpassFilter} - 1) * P_{n-1} + P_n}{2^{LowpassFilter}} \quad \text{where:}$$

  P_{n+1}: new filtered value
  P_n: actual measured value
  P_{n-1}: old filtered value
- **Press. filter**:
  This is an adaptive Filter for the pressure-channels. It reduce noise but is very fast on pressure changes. Therefore the filter-characteristic is adaptive.
- **Temp. filter**:
  Lowpass Filter for the Temperature channels T, TOB1 and TOB2.

$$T = \frac{3 * T_{n-1} + T_n}{4}$$

ADC-gain:
There one can change the gain of the digital measurements. This configuration is only visible when the Tab **Special** is enabled (password)

Channels CH0, P1 and P2 of the digital-transmitter have a linear gain and an offset:
digital value = GAIN × raw digital value + OFFSET

Gain and offset can be set separately. Default values are: offset = 0, gain = 1.

While the offset is all time changeable with **Zeromode** and **Targetvalue** the gain should not be changed at free will. It is intended only for calibration purposes. A change of the digital measurement values to a different unit (e.g. change from bar to psi) should always be done on client side or by using the analog output (see chapter: Tab „Analog-output").