Industrie Service

DDiag Online Manual

Software Version DDiag 1.3.0.119 and higher

DDIAG

The PC-Driven Pressure Diagnosis Method

Caution: Please do only start measurements using the DDiag after you have read this user manual and you are familiar with the following safety precautions!

General safety issues

The DDiag tool kit had been particularly developed for experts to conduct measurement, tests and recordings of hydraulic pressure and pressure patterns in the field. Please be aware that providing inspection services on pressurised systems goes along with a certain potential of safety risks. This manual does not generally or specifically describe the possible risks of conducting pressure tests, but concentrates to explain the available DDiag features. With regard to the general risks we assume, that experts conducting pressure tests have got the necessary training and experience, and they know and observe all applicable codes and standards.

We would like to explicitly refer to the safety precautions in chapter 3 of this manual. Every DDiag user has to fully understand the technical scope and the consequences of the application, and has to observe the existing work procedures. To prevent any risk that may be caused by the application of the DDiag, it is essential to read and understand the following chapters before starting to make pressure test using the DDiag. As a principle, the application of the DDiag tool kit is limited to the indented purposes.

Disposal of electrical devices

The TÜV SÜD Industry Services is a German producer registered in compliance with the Directive 2002/96/EC of the European Parliament on **waste electrical and electronic equipment** (WEEE). Electronic devices of, such as the DDiag dual pressure gauge, are considered “Monitoring and control instruments”, purely B2B products, as per category 9. The manufacturing process had been made in compliance with the European Directive 2002/95/EC (RoHS: Restriction of the use of certain hazardous substances in electrical and electronic equipment).

TÜV SÜD will take back gauges and dispose them in compliance with the technical state of the art.

Do not dispose old or defective electronic DDiag gauges in domestic garbage.

Please do strictly observe any electronic waste disposal laws and requirements of your country.

Any user of DDiag is entitled to return the DDiag gauges to the TÜV SÜD, who will dispose of all parts at its own expenses.

Industrie Service

Table of Contents

This manual describes all the essential software functions of the DDiag program.

The user must not expect that the manual is exhaustive. The software is subject to an ongoing further development and adaptation to new customer needs. Consequently, newly developed modules may show differences in the effective software function and the explanation in this manual.

All users will obtain the latest update version of the software whenever the transducer is returned to TÜV Industry Service, Muinich for re-calibration.

1 DDiag • General issues

The TÜV Industry Service is an international inspection and certification body, involved in various fields of safety inspections. To enhance the competence of its own expert engineers conducting inspections and measurements on industrial plants and installations, TÜV SÜD developed own PC-driven measuring methods, among others the dual range DDiag pressure gauge that comes together with the DDiag software. DDiag is a universal tool not only for making measurements on pressure equipment such as boilers, pressure vessels, process industry, pipe lines, pumps, hydraulic systems, construction machines, etc. TÜV SÜD also makes available these tools to externals customers, both under DDiag name or under OEM name.

In general, any DDiag pressure gauge has 2 different measuring ranges, and it can be used both as a digital manometer as well as for the recording of pressure time relations. For making the recordings, you can select a most suitable sampling rate, as the program alternatively makes available 0.1, 1, 10, 100 or 1,000 Hz. For the evaluation and assessment of the measurements, DDiag provides universal and powerful tools. Thus, it is a contemporary method for recording and documentation of pressure measurements.

2 System requirements

The present 32 bit version of DDiag is compatible with any actual operation system of WINDOWS. Further minimum system requirements include:

- 64 MB RAM
- graphic mode 800x600, 16-bit or better
- the program requires about 2MB capacity on the hard disk and sufficient capacity for saving measuring results
- FTDI virtual COM port drivers for USB dual range transducer (is part of the delivery)

3 Safety instructions

Please observe all usual safety precautions when working at pressurized equipment. Wherever possible, use the quick coupling fitting to connect the transducer to the equipment. The included quick coupling is suitable for a direct connection under a pressure of 400 x 10^5 Pa [bar] respectively up to 630 x 10^5 Pa [bar] for hydraulic oil as well as other kinds of mineral oil.

Attention: Before you use the pressure transducer for the very first time, please read this manual carefully. For any damage that is caused by non-observance of the instructions of this manual, by inappropriate or wrongful use, the warranty is ceased, and no liability or compensation is taken for consequential loss.

Strictly observe all applicable safety regulations for the use of pressure gauges!

During the calibration of the transducer hydraulic oil has been used as a pressure fluid medium. In the cavity of the transducer you may find residual oil. As the gauge does not have a flush mounted diaphragm, the use in the food industry is of limited suitability.

Attention: Before making measurements of pressurized oxygen (or any food stuff) **you have to carefully degrease the transducer first, using a suitable solvent.**

4 Technical data

Presently, there are 2 different DDiag dual pressure gauges available for an application of pressure of up to 250 as well as 630 x 10^5 Pa [bar]. Every gauge can be alternatively used in a lower or in an upper measuring range.

The 630 bar gauge can be used for pressures of up to 1,000 x 10^5 Pa [bar], provided a suitable and approved fitting is in use. However, the calibration of this device is for 630 x 10^5 Pa [bar] only.

Measuring range:		
(lower range)	**0 - 100 x 10^5 Pa [bar]**	**0 - 400 x 10^5 Pa [bar]**
(upper range)	**0 - 250 x 10^5 Pa [bar]**	**0 - 630 x 10^5 Pa [bar]**
(other ranges on request)		
Over range limit	**500 x 10^5 Pa [bar]**	**1500 x 10^5 Pa [bar]**
Burst pressure	**1200 x 10^5 Pa [bar]**	**3000 x 10^5 Pa [bar]**

Measuring rate (alternatively)	1000 Hz, 100 Hz, 10 Hz, 1 Hz, 0,1 Hz
Precision class	**0,50%**
Linearity deviation for max. pressure	**< 0,2 %**
Hysteresis	**< 0,1 % of full range**
Stability per year	**< 0,2 % of full range**
Measuring principle	**thin film device**
Pressurized medium contact	**CrNi steel (1.4571 / 1.4542)**
Permissible temperature range for pressure medium *)	**- 40 up to +100 °C**
Compensated temperature range of the transducer	**- 40 up to +100 °C**
Working- / ambient temperature	**0 up to 70 °C**
Fitting	**G1/4"** according to **DIN 3852**
Calibration	works calibration certificates are stored in electronic data plate; system integrated control of measuring devices
Power supply of sensor	from PC via USB port (complying with USB specification)
Mass	**150 g**
Maintenance	no specific maintenance required

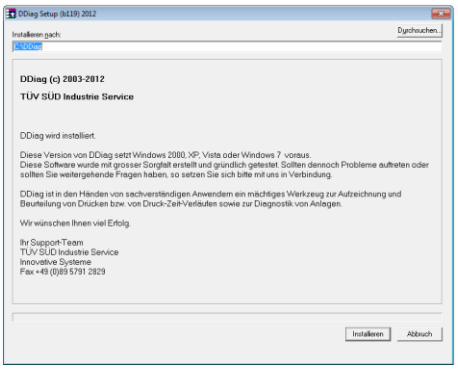
*) a higher process temperature is possible if a temperature isolator is used

5 Software installation

DDiag requires any actual version of Windows.

The DDiag software including the user manual is made available for downloading from a specified TUV SUD web site. The provided information (https-link, user ID and password) gives access to the web server. There you find a choice between a complete installation and an update, of both a German (iDDiag**D**.*) or an English (iDDiag**E**.*) version. In case of an initial installation of the DDiag software to the PC use the complete installation.

Please download the zipped program file to your PC, or directly open the file from the TÜV SÜD SharePoint server.



Install the English version by double clicking to the **iDDiagE.exe** file. Then click onto **Install** to proceed. The installation process is rather fast; it copies the software onto the hard disk and generates an icon on the desktop, to easily start DDiag.

Alternatively, the DDiag is available in other language versions, provided a file DDiagXXX.DLL exists. Example: DDiagDEU.DLL stands for the German Version.

To call up the German version extend the command line to:
DDIAG \resource DDIAGDEU.DLL

In case, there is no appropriate device driver installed, start the file **CDM20814_Setup.exe** in the subdirectory \DDiag\driver.

If still in the pressure gauge will not be detected in the senor test (see chapter 6.5.1), please install manually another driver which is provided in subdirectory \DDiag\driver.

Follow the instructions of the „Found New Hardware Wizard“.

As soon as the wizard has finished installing the software, click **Finish** to close the wizard.

After finishing the installation of the device drivers DDiag is ready for use. Start the program by double clicking the DDiag icon on the desktop, or on the file DDIAG.EXE in the directory C:\DDiag.

The **DDiag-User-Manual** and other useful information are made available in the folder DDiag\Infos.

6 The software programs

DDiag is a typical Windows program.

6.1 Menu item **File**

The menu starts with **File** and has got typical sub menus such as “Open”, “Save” or “Export data” that you know from other programs as well.

DDiag is using so called wizards, giving you a simple online explanation of the next steps coming up. Every single wizard can be switched off by ticking the field **Do not show this page again**.

It is recommended that users before they gain experience keep the wizard switched on.

6.2 Menu item **Edit**

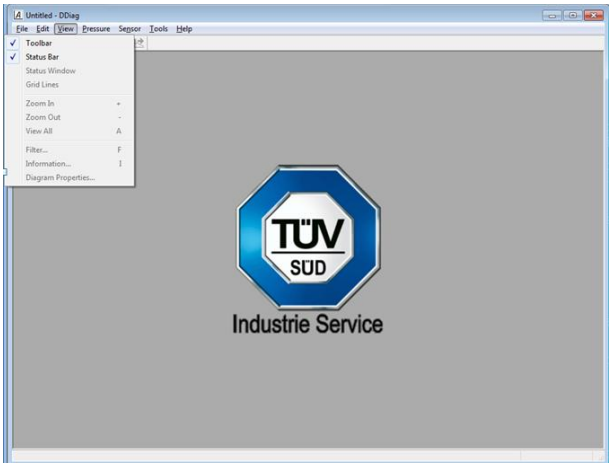
In the **Edit** menu you will find 3 programs:

Copy copies the selected diagram to the clipboard.

Use the **Comments...** menu to add any supplement information to be saved together with the curve.

Select **Parameters** to enter of modify specific data of the test, such as equipment number, rated pressure, etc.

The menus **Copy** and **Parameter** are only available if a diagram is displayed.



6.3 Menu item **View**

The **View** menu provides several features to modify the information displayed on the screen.

On the **Tool bar** (top) all icons for tools are displayed, which are currently available. Most icons are only visible, if a diagram is also displayed at the same time. The functions “Zoom in”, “Zoom out”, “View all”, “Filter”, “Information...” and “Diagram properties” are also accessible via the pull down menu “**View**”.

The **Status bar** (bottom line) provides brief information, especially if a diagram is displayed.

If the **Status window** is activated, it displays essential data of the current diagram.

Under certain conditions not all menu items can be activated.

Grid lines can only be switched on or off, if at the same time the auto-scale function is deactivated.

6.4 Pressure (Execution of measurements)

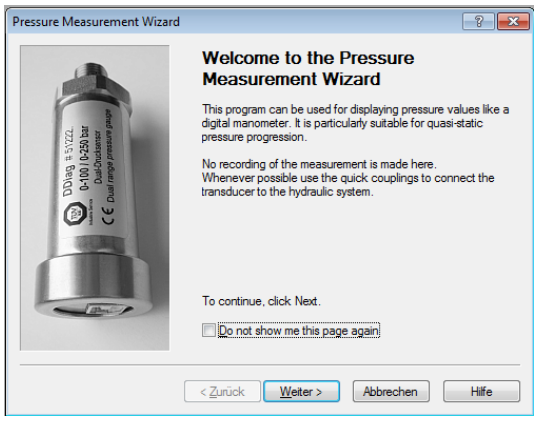
Select the **Pressure** menu if you want to conduct any kind of measurement with the DDiag dual range pressure gauge on pressurized mediums.

You can alternatively display the current pressure [**Display…]** like a digital manometer
or
record a pressure versus time measurement [**P=f(t)]**

If no pressure gauge had been connected to the PC before, a Sensor → Test... is required (see 6.5.1)

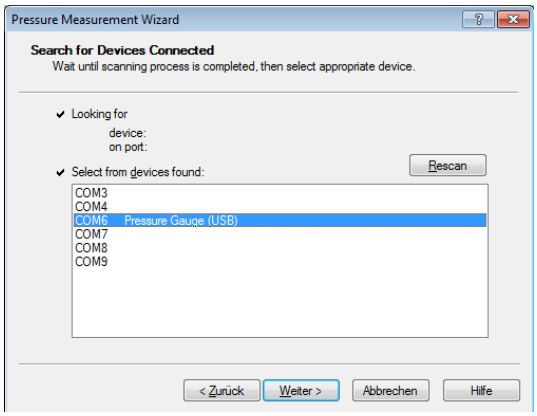
The **Safety valve** function requires specific hardware.

6.4.1 Pressure → Display…



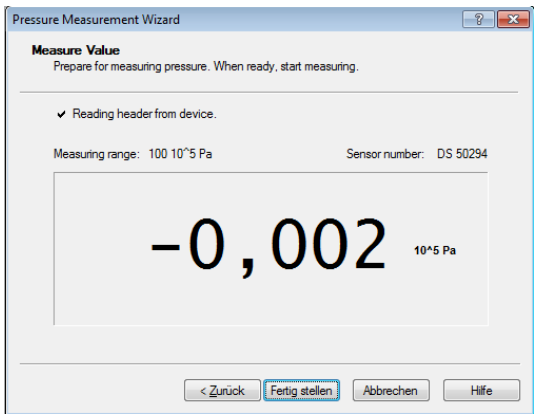
This program enables you to measure the pressure of the gauge and display it on the screen like a digital manometer. It is especially suitable for displaying a static or quasi-static process.

It is recommended to connect always the transducer to the pressurized equipment via the quick coupling.



Like during the sensor test, the program starts a scanning process, to identify the pressure gauge connected.

Click onto **Rescan** if no sensor has been detected.



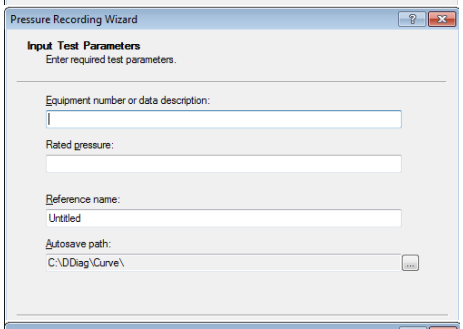
The result of the measurement is displayed like a digital manometer.

In case you want to record a pressure time diagram, select the menu **Pressure → P=f(t)**.

6.3 Pressure Diagram

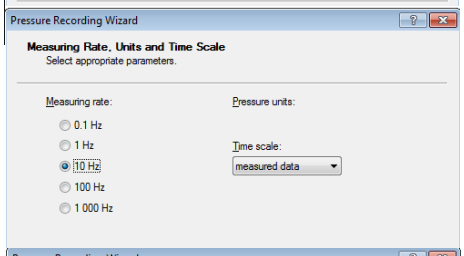
With this program you can make recordings of dynamic pressure versus time relations as well as complex evaluations of the findings.

It is recommended to connect always the pressure gauge to the pressurized equipment via the quick coupling.



Use this entry mask to include all relevant equipment information that later will become a part of the documentation.

Specify here also the file name to save this measurement.

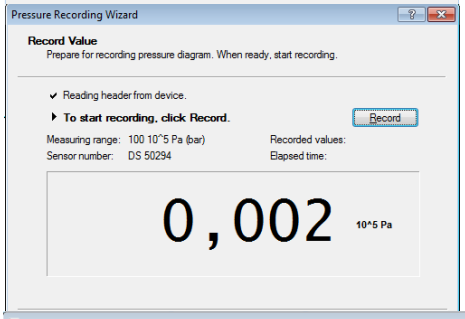


Now select the required sampling rate.

If you are uncertain what is the most suitable rate choose a higher rate, as you can always compress the diagram if necessary.

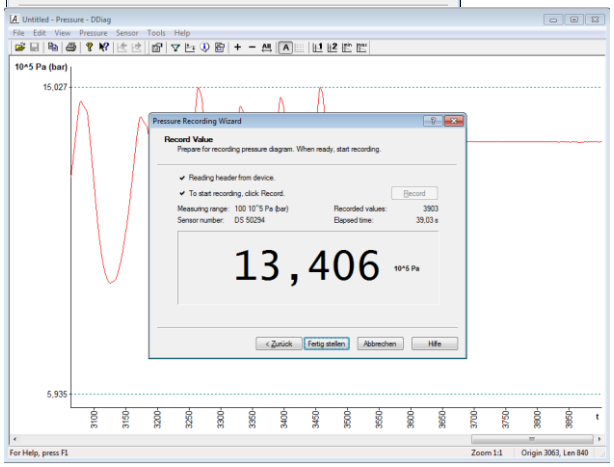
The length of the recording is just limited by the capacity of the hard disk.

Press **Continue** to proceed to the next screen.



Before recording is started, the selected measuring range, the serial number of the transducer and the actual pressure are displayed.

Click onto **Recording** to start.



After starting measurement the “Pressure Recording Wizard” displays the actual pressure, the number of measurements already and the time lapsed.

Behind the wizard the pressure-versus-time curve is displayed in red colour.

To finish recording click onto **Finish**.

6.4.3 Safety valve

For this kind of measurement a specific gauge is required. The relevant chapter of the user manual will be supplied together with the gauge.

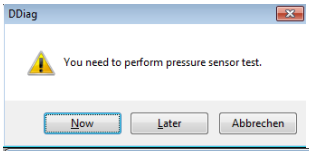
6.5 Sensor

Under this program item the acuracy / offset behavior of the transducer can be verified by Test…

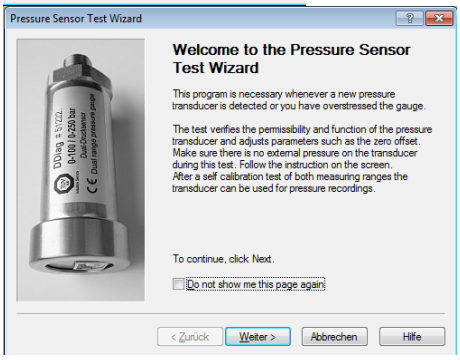
Furthermore, the **Calibration certificate** saved in the memory of the gauge can be displayed or printed.

For advanced remote control an **Export/Import Header…** feature is available.

6.5.1 Sensor → Test…



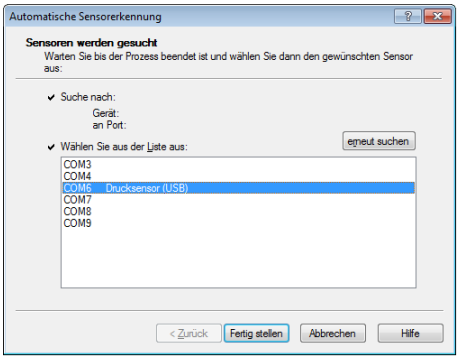
In case you are using the DDiag software for the very first time, and if no sensor test had been called up before, you will be asked to start the **Sensor test**. However, you can also start this test later again.



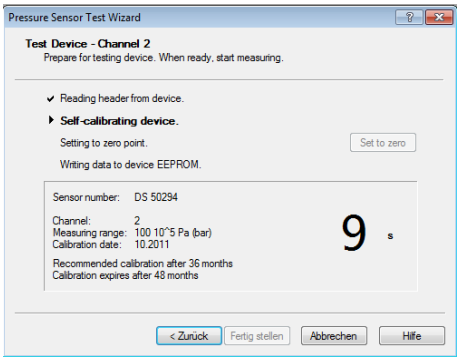
The Wizard will guide you through the program. Just follow the instructions.

Now connect the transducer with the PC via the USB transmission cable.

Please observe that the transducer is not pressurized when making this test.



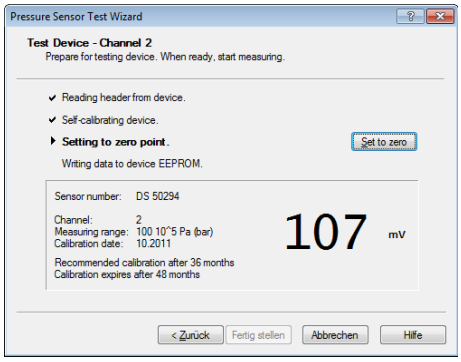
Transducers connected to the PC will be automatically identified and the particular (virtual) serial port is selected for being used with DDiag.



After clicking on **Continue** a detailed verification of the transducer's function is initiated.

First, the sensor's electronic data plate of is read and displayed. Then the verification of calibration is started. This takes some 10 seconds for each range, beginning with the upper one.

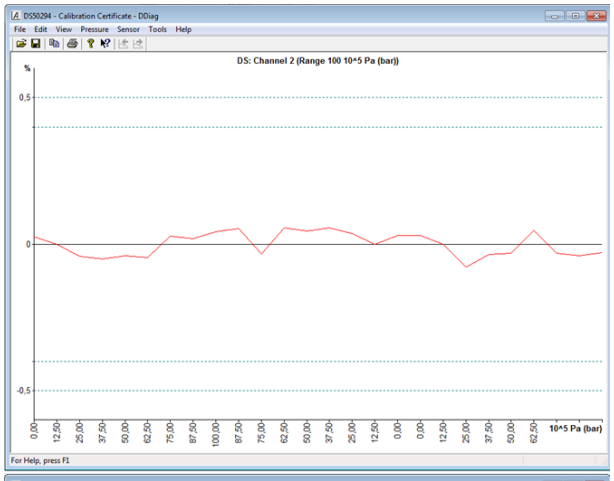
This device test displays month and year of the last calibration, the recommended validity of calibration as well as the expiry time.



Finally, the transducer's zero offset will be set and saved for future measurements using this transducer.

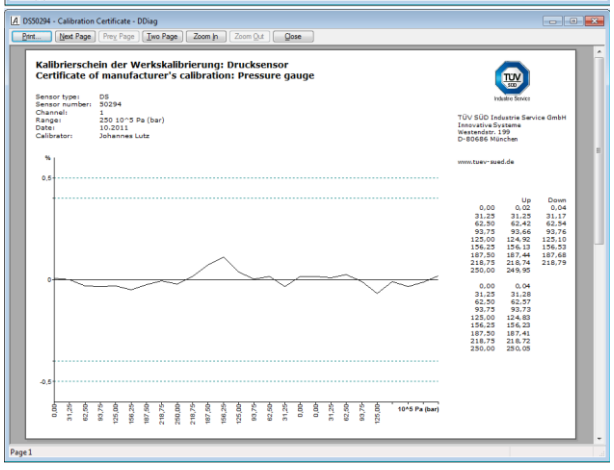
Press the **Set to zero** button and repeat that test for the second measuring range accordingly.

6.5.2 Calibration certificate



The findings of the last factory calibration are saved in a non-volatile memory of the transducer. Diagrams can be displayed or printed.

Once you confirm the connected sensor by „Next", a diagram appears with the deviations for the upper measuring range. With the Enter-key you can proceed to the lower pressure range.



The program item **File → Print preview** displays the available information as Certificate of Manufacturer's Calibration, which can printed out here.

For calibration see chapter 8.

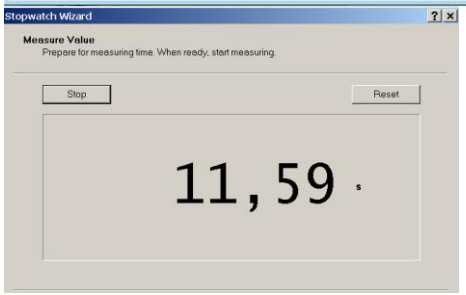
6.5.3 Export/Import Header

This function is reserved for specific applications and is not commonly available for users.

6.6 Tools

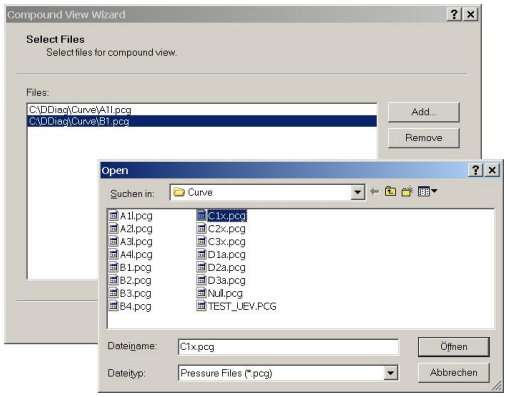
Further auxiliary programs are made available under the **Tools** menu.

6.6.1 Stop-watch



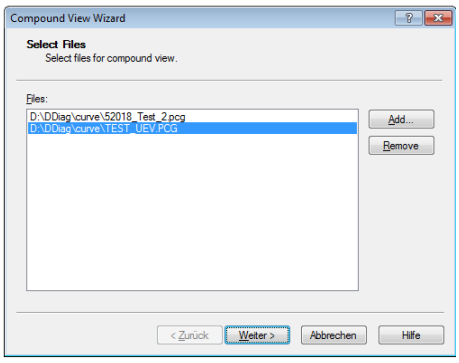
With the **Stop-watch** feature the PC works like an ordinary stop-watch, having a resolution of 0.01 s and is to be controlled with the keyboard.

6.6.2 Compound view



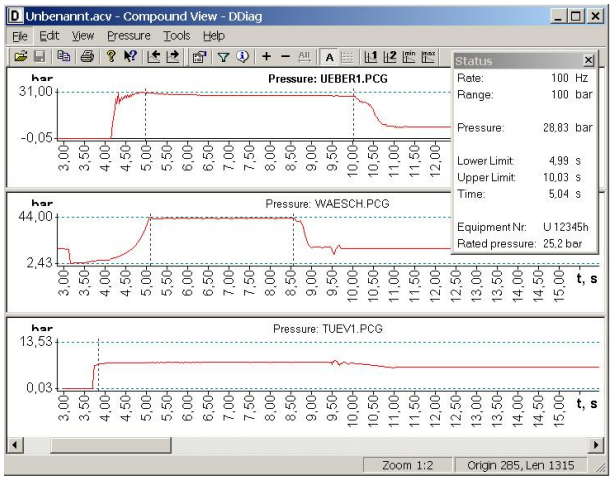
The menu **Compound view** enables you to select several diagrams (that already had been saved to the hard disk) and display these curves one above the other on one screen in order to compare them against one another.

This function is mainly addressing experienced users.

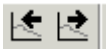


First, select the files that you wish to display at the screen at the same time.

On the next screen you can specify for each diagram an individual offset value. (We only recommended this feature for particular cases.) If necessary you can also adjust the individual offset value with the program **Compound view offset…**.

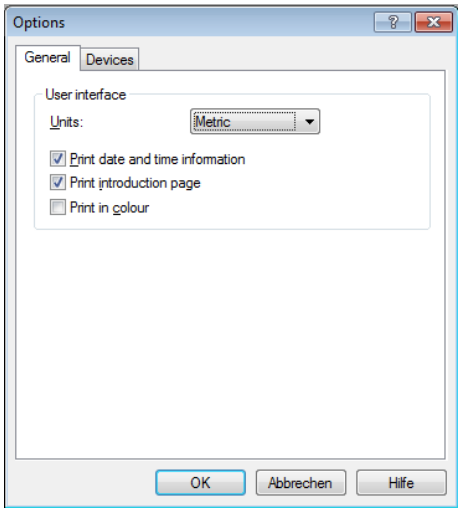


All selected diagrams are displayed together on the screen. To activate one of the diagrams just click on it. The head line then appears in bold letters and all features (cursor, filter, results in the status window, etc.) only refer to this activated diagram.

The icons  shift the zero offset values. If you keep in addition the [Shift] button pressed, you are in the slow mode, and respectively if you keep the [Strg] button pressed you are in a fast shifting mode.

6.6.3 Options

You can specify here required parameters for making measurements or displaying findings.

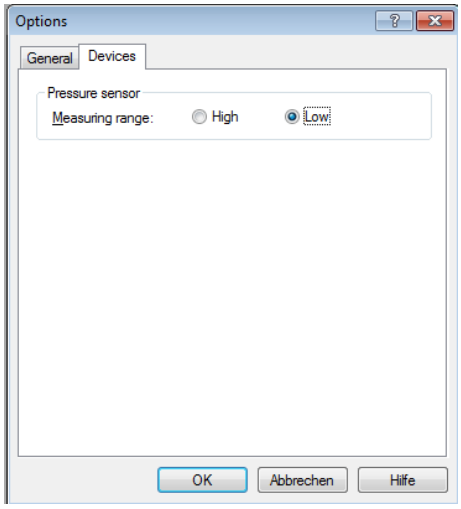


Use the menu **Options - General** to select various parameters, such as the use of metric or imperial pressure units (bar, kPa, mmWS or PSI), or the units of the diagram's time scale (number of measuring points, seconds of minutes).

Print date and time in diagram specifies, if these data become a part of the print out.

Tick **Print introduction page** if you want to use that as a part of your documentation.

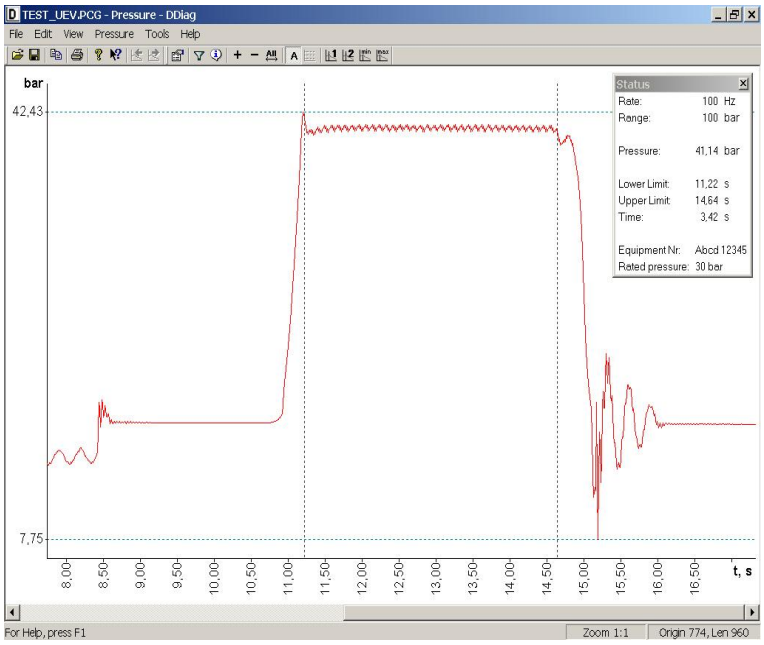
Tick **Print in colour** only in case you are using a colour printer.



Select the measuring range of the dual gauge that you want to use for the next measurement in the **Options - Devices** menu.

It is recommended that you make use of the full range of the gauge, if possible. You cannot overstress the gauge in the lower range, if the actual pressure will not exceed the upper range.

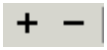
7 Evaluating test results



Immediately after you finish recording the findings will be displayed in a diagram and you can start analyzing the measurement by setting boundary lines.

Extensive assessment functions and a wide variety of graphic representations are a part of the program.

In particular, you will find several icons on the symbol bar to modify the diagram:

Use  to compress or expand the curve displayed.

Usually, the so-called auto-scale modus is activated. In this mode, both the minimum and maximum values are scaled to the optimal size displayed on the screen. If you want to compare different diagrams with each other, you may display the gauges full measuring range. In such as case click on to  deactivate the auto-scale function.

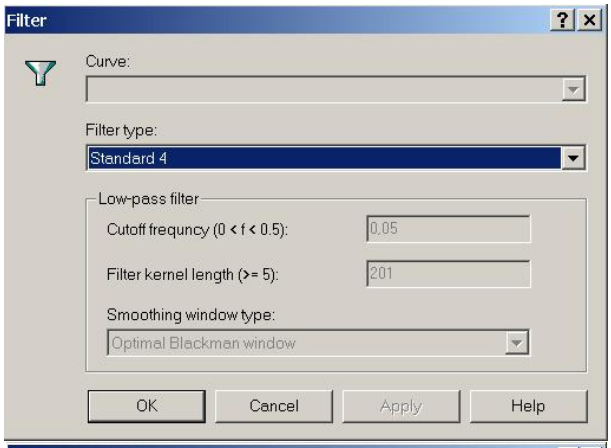
Very often you will have to analyze just a part of the diagram. Press the icons  to set and activate cursor lines, which form the boundaries of the part of diagram.

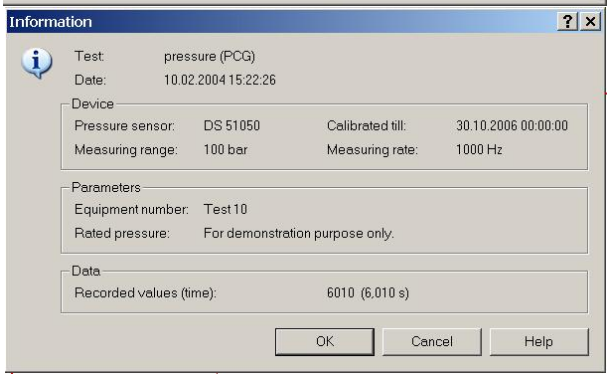
When activating a cursor the icon becomes shaded and a dotted vertical line appears in the diagram. You can shift this line, alternatively using the mouse and keeping the left button fixed or with the cursor keys. Shifting the boundaries by only the cursor keys is considered the default mode, if in addition you keep the [Shift] button pressed you are in the slow mode respectively if you keep also the [Strg] button pressed you are in a fast shifting mode.

The status window does not only summarize the results but states also the measuring parameters **Sampling rate** and **Measuring range**. The result **Pressure** is the average value between both boundaries. **Lower limit** is the time lapsed since the beginning of the recording until Cursor1, **Upper limit** correspondingly until the position of Cursor2. **Time** means the time period between both cursors.

The icons  automatically position the boundary lines to the minimum / maximum value of the measurement, and at the same time position the curve most conveniently. In order to shift the whole diagram you can use the arrow keys or [Page up /down] (in case no boundary is activated) or by moving the mouse on the "Verschiebebalken" at the lower edge of the screen.

When the  icon is clicked, all measuring results will be displayed on exactly one screen only.



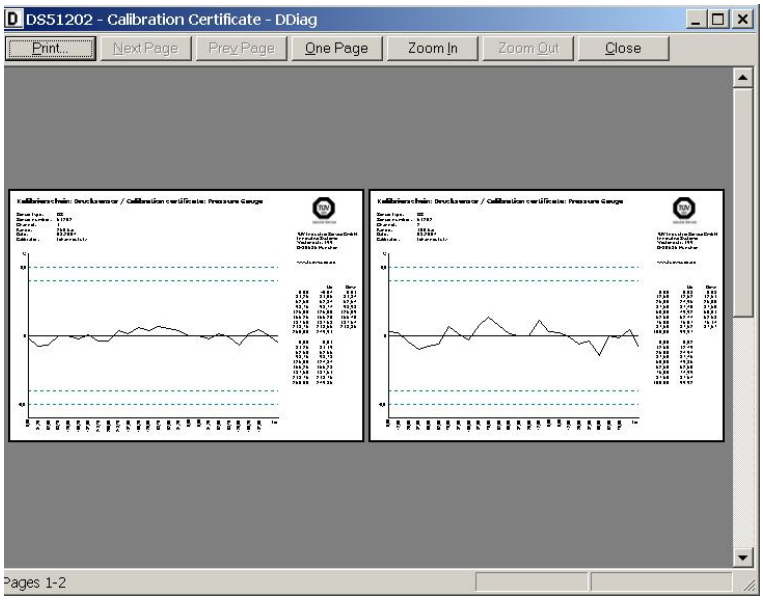


The  icon starts the **digital filter** functions. You can select among 4 pre-defined and 2 more custom-made filters for very special applications. These options are specifically made available for experienced users having particular know-how in that field. The filter function does neither influence the course of the curve nor the recorded data; that means the initial values are not changed and can be displayed later with other filter functions or without any filter again.

With  you open an **information** window which summarizes important data of the measurement as well as the pressure gauge used. Among other things you find here the time stamp of the recording and the expiry date of calibration, fact that are quite essential for documentation purposes.

8 Software-integrated automatic control of testing devices

The serial number, the calibration date, the calibration diagrams for both channels and other data are saved in the electronically data plate of the transducer.



The software has got the appropriate features to display both calibration diagrams (saved in the memory) under **Tools** – **Calibration certificate**.

Select **File – Print Preview** for making a printout of the diagrams.

Before any measurement is made the software verifies that the calibration of the transducer has not yet been expired. In case a new calibration is required the user will get a message in this regard. Thus, any further control of the calibration of the pressure gauge is not required.

The transducer should be re-calibrated once every 3 years at the latest. Without a re-calibration the use of the DDiag pressure gauge will expire after 4 years.

On request of the user shorter expiry of calibration periods can be implemented in the sensor.

All transducers delivered had been calibrated on the basis of guideline DAkkS DKD-R-6-1.

Periodic manufacturer's calibration service of the transducers is made by TÜV Industry Service at a nominal fee.

8 Scope of delivery

The scope of delivery consists of

1 pc. **Dual range pressure gauge DDiag**
with sensor direct coupling

1 pc. USB transmission cable (EMC) 5m

1 St. Sensor-hose-coupling

DDiag software, incl. User manual

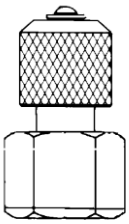
and, additional accessory parts when requested by customer (see chapter 10)

10 Accessory parts

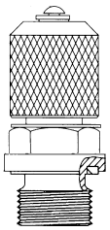
Direct transducer coupling

Transducer hose coupling

Adapter for testing gauge
(M20x1.5mm internal thread)
(Packing unit 25 pc)



EN adapter (external ½“ thread)
(Packing unit 25 pc)



USB transmission cable for DPT
5 m, with EMC protection

Active USB transmission cable
Extends the connection of the DPT to the PC for another 5 m (maximum transmission length is 15 m)

10 DDiag in brief

DDiag = 1 electronic dual pressure gauge + software + accessory parts

What is DDiag?

The contemporary PC-driven tool for the recording, analysis and documentation of any kind of pressure measurement on any kind of pressure equipment in industry and plant engineering

Ready for use hardware & software tool kit, including all required accessory parts

DDiag software for Windows, including an online help and manual

Communication from PC to pressure gauge via standard USB cable

Main features:

Transducer with 2 separate measuring ranges: 0 – 100 and 0 – 250 * 10^5 Pa (bar)

or: 0 – 400 and 0 – 630 * 10^5 Pa (bar)

(other measuring ranges on request)

Precision class 0.5%, 12 bit (internal resolution)

Measuring rates (alternatively): 1000 Hz, 100 Hz, 10 Hz, 1 Hz, 0.1 Hz for both short-time recordings of fast dynamic processes as well as long-term pressure monitoring

Excellent software tools for the evaluation and documentation of all test results, including extensive digital filter functions, compound view and multiple scaling features

Software-integrated automatic control of device calibration: The calibration certificates are stored in the device memory. A further usage of the transducer is rejected, if the calibration period has been expired. Thus, no further control of calibration of device is required.

Periodic recalibration of devices by TÜV SÜD Industry Services (for a nominal fee)

Manufacturer / supplier:

TÜV SÜD Industry Services
Innovative Systems
Westendstr. 199
D-80686 Munich / Germany

Fax: +49 - 89-5791 2989

E-Mail: ddiag@tuev-sued.de