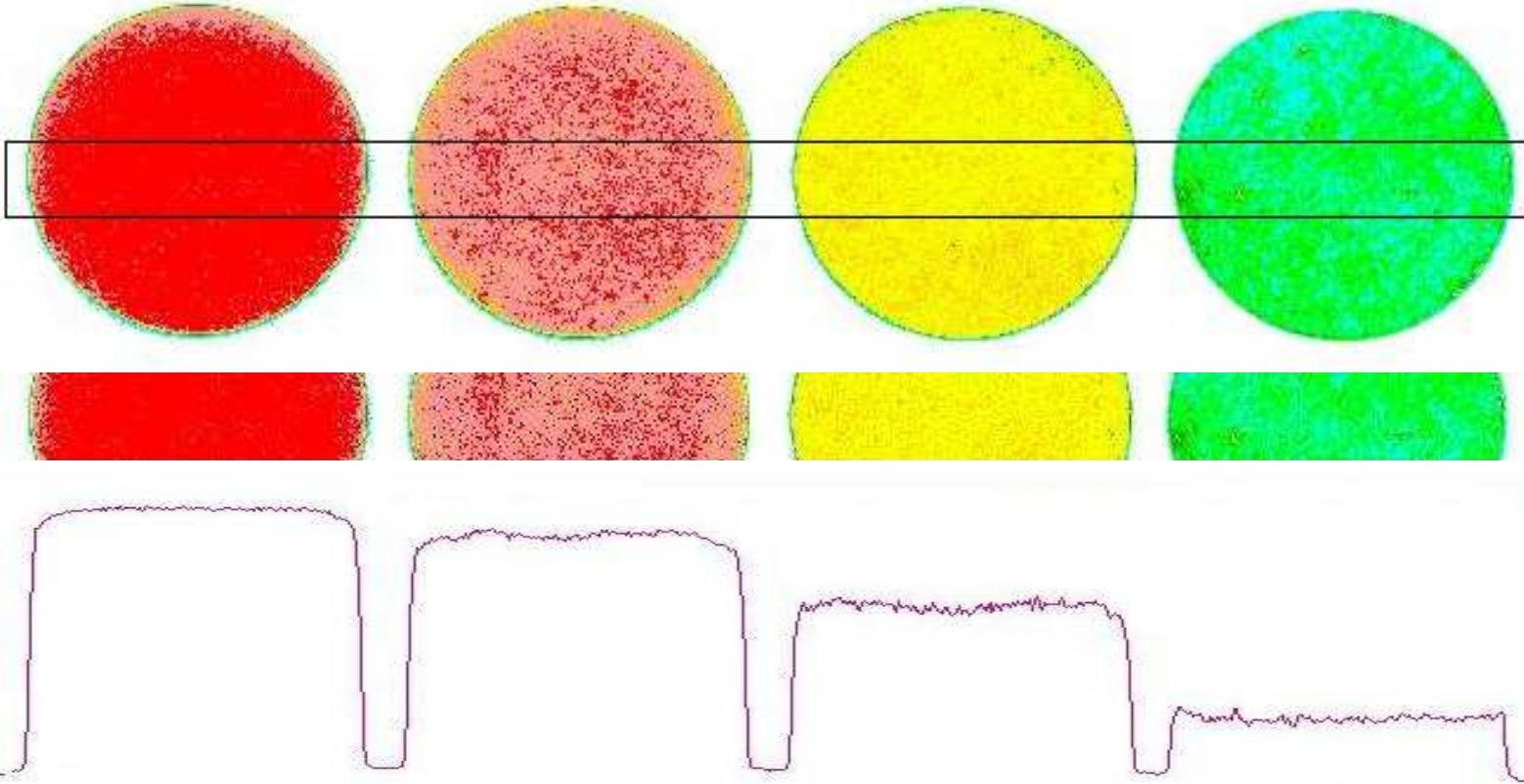


# Calibration & Analysis of Pressure Sensitive Films



**CALTEST System**

# CALTEST-System

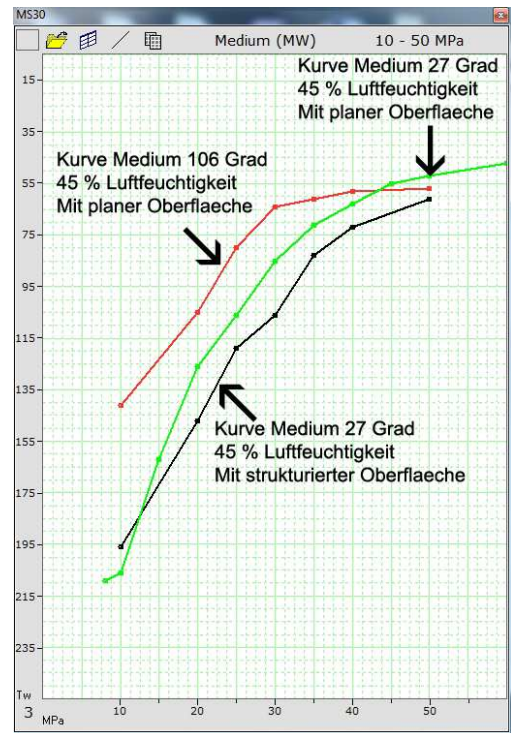
## Calibration and Evaluation of Prescale Films

FUJIFILM's pressure sensitive Prescale Film is an important tool for the determination of contact pressure. They are ideal for quick qualitative and quantitative checks.

However, the calibrations for quantitative evaluations specified by the manufacturer are only valid for smooth surfaces up to 35°C.

However, the behaviour of the pressure measuring foil under other conditions differs greatly from this. For the quantitative evaluation of surfaces with higher temperatures or structured surfaces (cardboard, grids, nubs, grooves, etc.), however, it is necessary to carry out control measurements and to create corresponding calibration curves from them.

To solve this problem, Tiedemann Instruments has developed CALTEST, a complete calibration and analysis system consisting of hardware and software.



### Calibration for Different Pressing Tasks



The Tiedemann calibration system is suitable both for calibrating smooth materials and for measuring surface pressures on structured materials such as grids or carpets. In such a case, the structure of the material appears on the film print. This is subjectively difficult to judge. Therefore, the pressure measuring foils should be placed between the materials to be compressed for calibration and then a calibration curve with defined surface pressures should be created. For high temperatures special tools are needed.

*Calibration System CALTEST with all tools*

## Design of the Calibration System

The calibration system includes all necessary tools.

The material samples to be pressed and the pressure-sensitive film are coaxially loaded with defined forces via two cylindrical, flat polished pistons each with a known end face of the calibration device. The load is applied in the Tiedemann load frame, which can be equipped individually with a ring force gauge.

The optional and helpful accessory package includes punching tools for the thicker pressing materials and cutting tools for thin material and the pressure measuring foils with the respective defined diameters of the calibration\_device.

### **Calibration Plunger Device KV**

The KV Calibration Plunger is the main device of the whole calibration system. The four different plungers have four defined circular piston areas from 200 to 2000 mm<sup>2</sup>.

Together with the right choice for dynamometer many pressure ranges can be reached. For higher accuracy, the bigger plunger should be used.

Because the maximum load of the compression device is limited to 10 kN, you may use the calibration plunger in your own press as well.



|                                   | <b>Calibration Plunger Devices KV</b> |         |        |        |
|-----------------------------------|---------------------------------------|---------|--------|--------|
| <b>Characteristics of KV</b>      | KV0.5                                 | KV1     | KV2    | KV5    |
| Plunger diameter (mm)             | 50.46                                 | 35.68   | 25.23  | 15.95  |
| Plunger area (mm <sup>2</sup> )   | 2000.00                               | 1000.00 | 500.00 | 200.00 |
| 1 kN load: surface pressure (MPa) | 0.5                                   | 1       | 2      | 5      |

## Compression Device BELV

In the Compression Device BELV, the Calibration Plunger can be loaded up to a compressive force of 10 kN.

The measurement of the force can be made by different dynamometers built in the compression device.

The ideal calibration for the FujiFilm Prescale type LLLLW is made with the KVO.5 calibration plunger with the Tiedemann DT05 dynamometer (500 N).

The film LW requires a combination of the KV1 calibration plunger and the DT10 dynamometer (max 10 kN measurement range). For higher pressure own devices must be used.

All combinations are shown in the table on page 3.



*Compression device BELV with Tiedemann dynamometer*

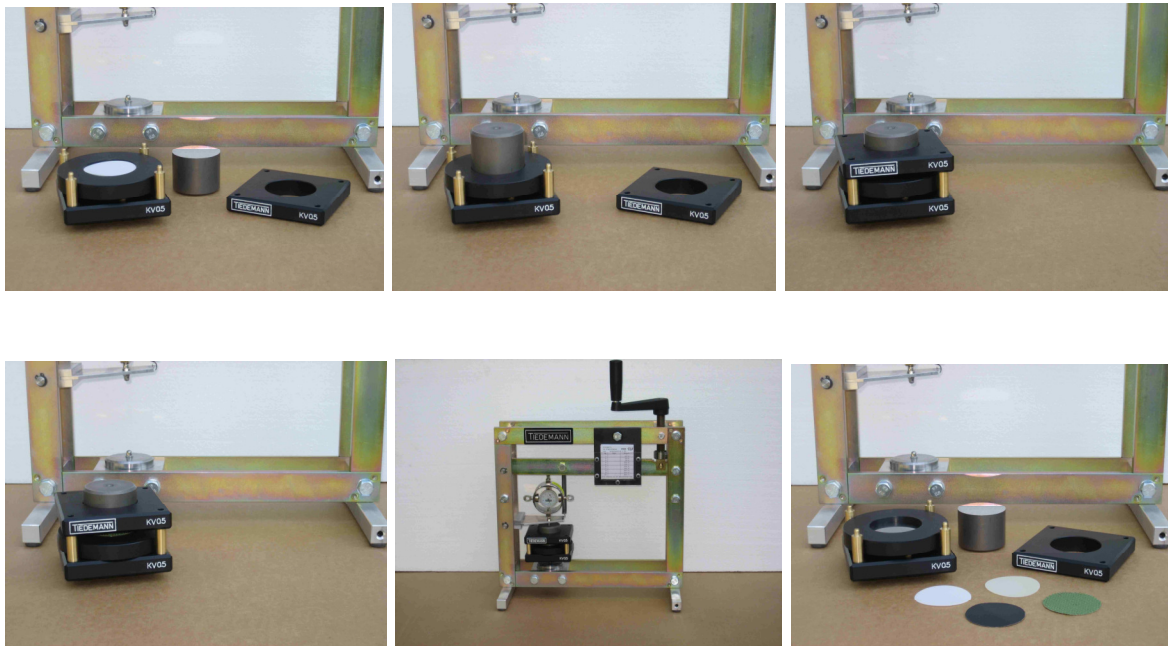
## Cutting and Punching Tools

The optional tools for hand cutting SV are helpful to cut circular areas out of the pressure sensitive film or other thin materials. These circular areas fit exactly to the size of the plunger.



PV Punching Tools are also available to cut thicker materials for the right diameters. For punching the Compression Device BELV may be used as well as your own presses.

## Course of Calibration Action



## Find the Right Combination of Tools

The following overview shows the ideal combinations of all tools. A basic configuration for surface compressions up to 50 MPa is the Compression Device BELV. Further, you choose the right Tiedemann dynamometer, the KV Calibration Plunger device plus optional the SV Hand Cutter tool.

Whether a PV Punching Tool is recommended depends on the ambient structural materials.

At surface pressures above 50 MPa, we must refer to your own press.

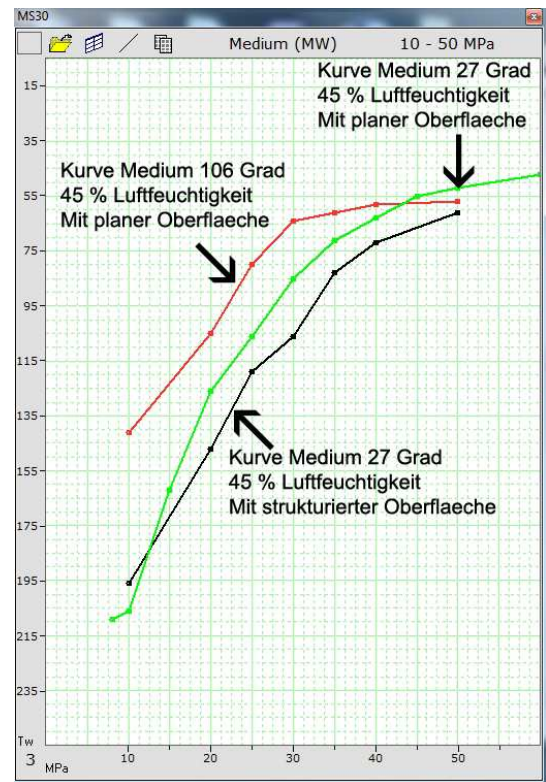
| Film Type | Film Name       | Pressure Range | Compression Device | Tiedemann Dynamometer | Calibration Plunger | Cutting Device | Punching Device |
|-----------|-----------------|----------------|--------------------|-----------------------|---------------------|----------------|-----------------|
| 4LW       | Extreme Low     | 0,05 - 0,2 MPa | BELV               | 500 N (DT05)          | KV0.5               | SV0.5          | PV0.5           |
| 3LW       | Ultra Super Low | 0,2 - 0,6 MPa  | BELV               | 5 kN (DT5)            | KV0.5               | SV0.5          | PV0.5           |
| LLW       | Super Low       | 0,5 - 2,5 MPa  | BELV               | 5 kN (DT5)            | KV1                 | SV1            | PV1             |
| LW        | Low             | 2,5 - 10 MPa   | BELV               | 10 kN (DT10)          | KV2                 | SV2            | PV2             |
| MW        | Medium          | 10 - 50 MPa    | BELV               | 10 kN (DT10)          | KV5                 | SV5            | PV5             |
| HS        | High            | 50 - 130 MPa   | own press          | own press             | KV5                 | SV5            | PV5             |
| HHS       | Super High      | 130 - 300 MPa  | own press          | own press             | KV5                 | SV5            | PV5             |

# CALTEST Calibration and Analysis Program

The Tiedemann Calibration and Measurement Program CALTEST is an intuitive Windows compatible program that generates calibration curves from the results of the calibration device and offers analysis using these curves.

In addition, the program already includes calibration curves for smooth surfaces at room temperature and various humidity levels for a special DIN A3 scanner defined by us. The calibration curves are valid for 1 min press duration.

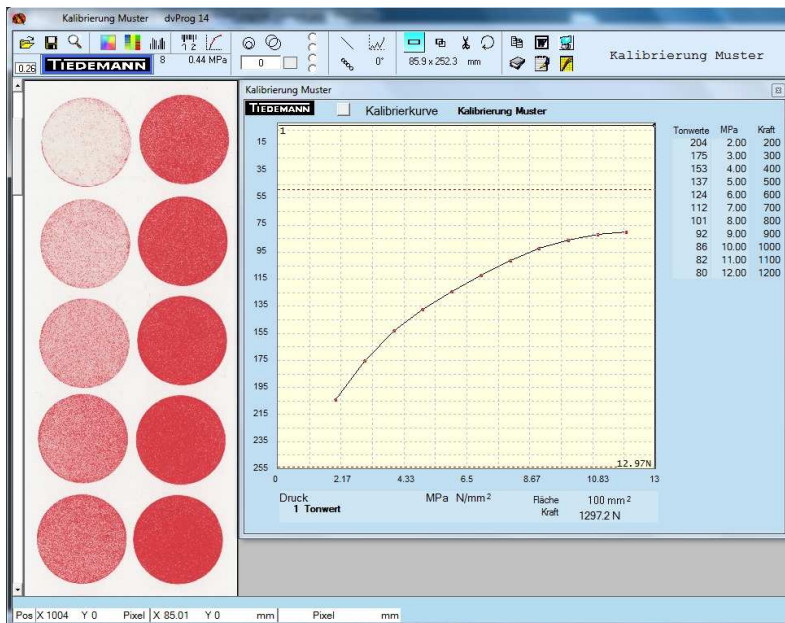
Individual calibration curves for quantitative measurements at longer or shorter press durations, higher temperatures or on structured surfaces such as cardboard, lattice surfaces, nub structure or fabric structures differ significantly from those of smooth surfaces and must be created by the user.



## Creating the calibration curves

To create the calibration curves, appropriate impressions are made with the tools from above, which are subject to the same conditions as in the subsequent measuring process.

The results are recorded by the flatbed scanner and coupled with the mechanical pressure values to a calibration curve. Various parameters are included in the calibration curve, the pressure, the humidity, the temperature, the surface and the contact time. A suitable name can be assigned to the calibration curve to be stored.

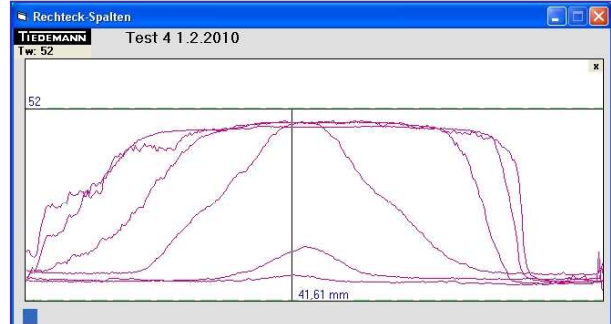
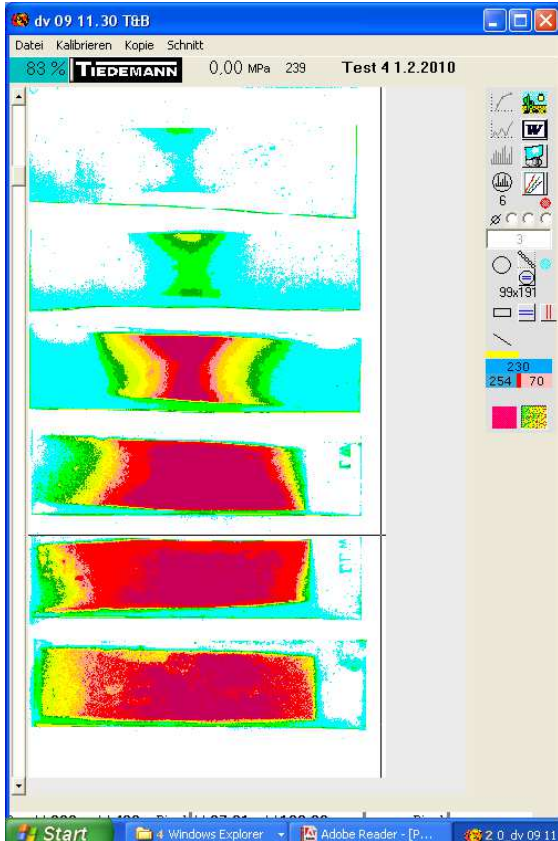


To create a calibration curve, at least five measuring points should be available, each at the edges of the measuring range of a film and three further equidistant points over the measuring range. However, further points increase the accuracy.

As soon as the calibration curve has been created, it can be used for the evaluations.

## Extension of the measuring range

If the expected pressure distribution cannot be covered by the measuring range of a film, several types of film can be superimposed in order to increase the measuring range. The following evaluation shows a simultaneous pressing of several pressure measuring foils for different measuring ranges, which were superimposed.

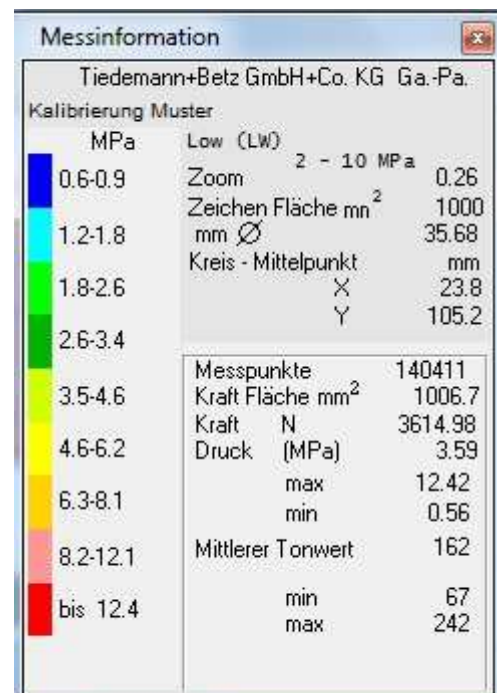


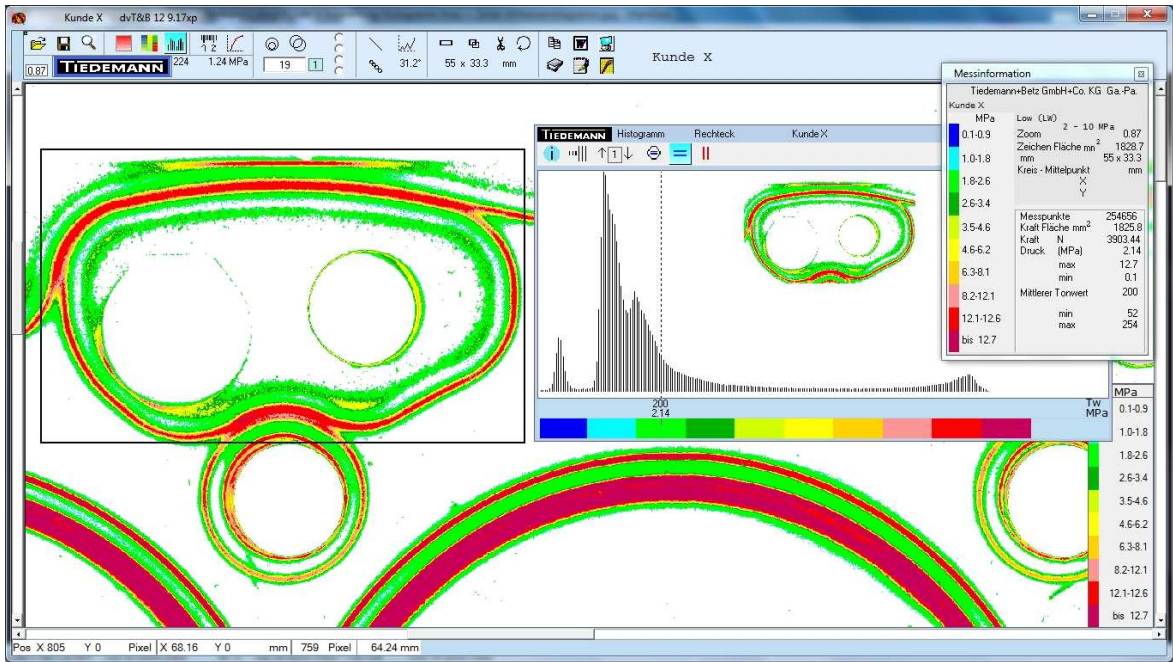
*Result of different superimposed pressure films*

## Evaluations with CALTEST

The analysis program offers all tools necessary for the evaluation. Individual points can be clicked with the mouse, areas can be zoomed in and sectional images can be created. The scans can be displayed in original colours or also in false colours for better differentiation. The corresponding calibration curve is used for quantitative evaluation.

The entire scan or parts of it can be analysed as a whole. Areas of interesting regions can be framed by given geometric shapes like circle or rectangle or as freehand curve. The values within the frame are listed as shown on the right.

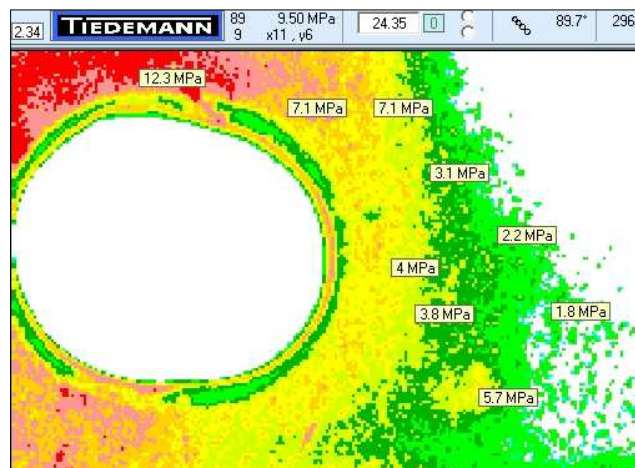




*Details of a cylinder gasket sealing*

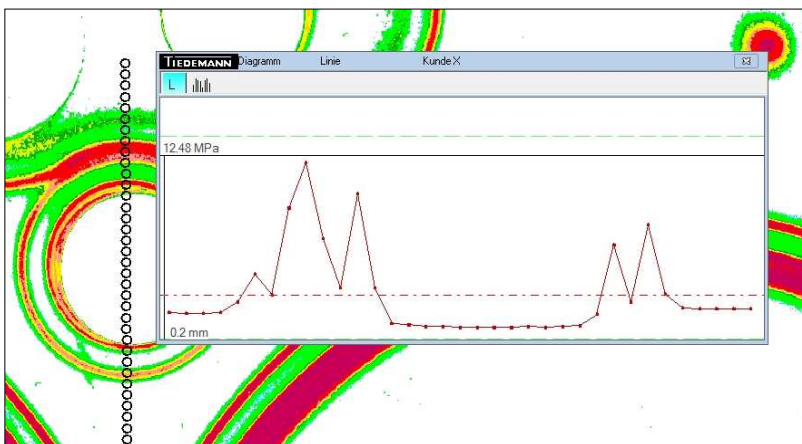
In addition to sections and the determination of the pressure values within the section, the surface pressure results can also be determined with pinpoint accuracy.

For this purpose, points can be selected with the mouse in the overall image or in the sections. The pressure value then appears directly next to the selected measuring point.



*Precise determination of located pressure*

## Precise determination of pressures



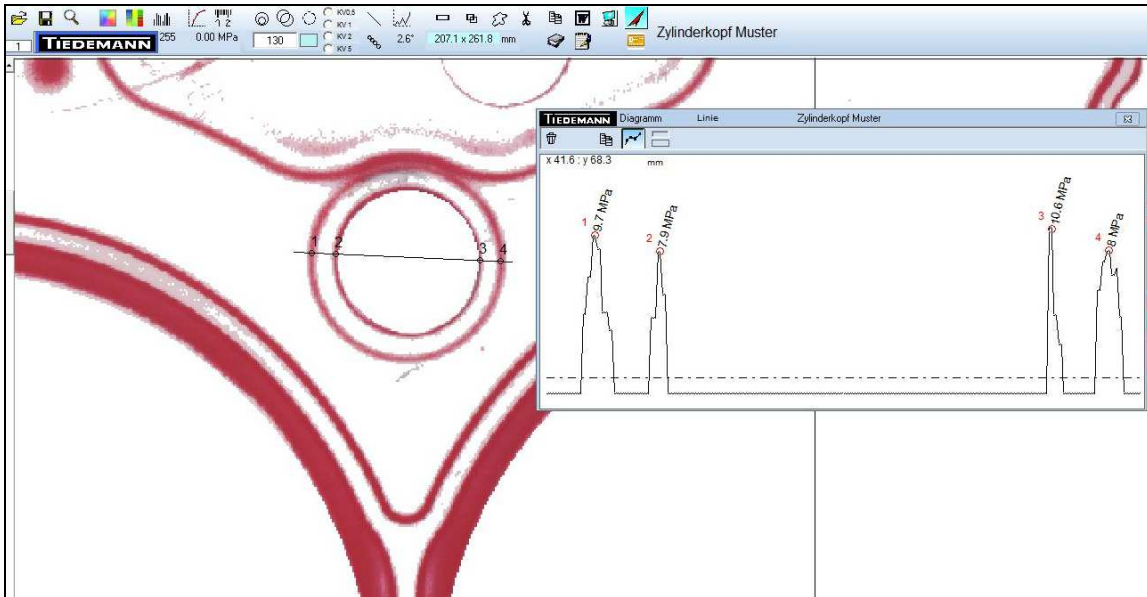
*Straight intersection line with chain filter*

A further analysis option is sectional views of the printed image.

CALTEST offers numerous variants for this purpose. In addition to the simple intersection line in all directions, there is the option for filtering the noise by a chain or rectangular line.

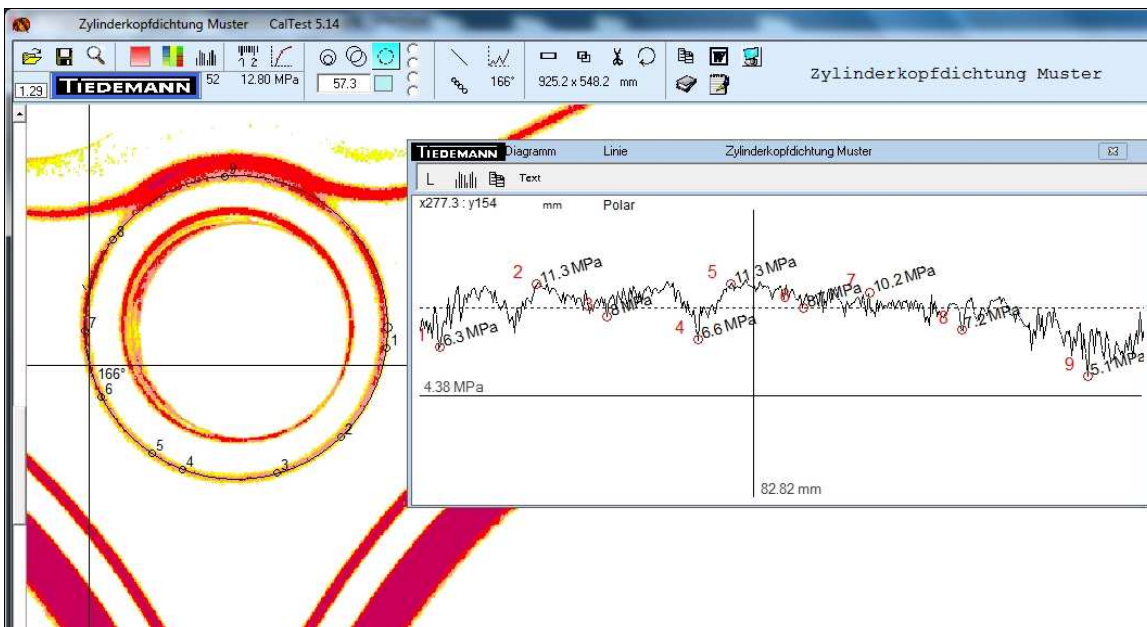


The straight line as cut is possible in any direction and results in an exact cut with the respective information about the respective peak pressures and lowest areas.



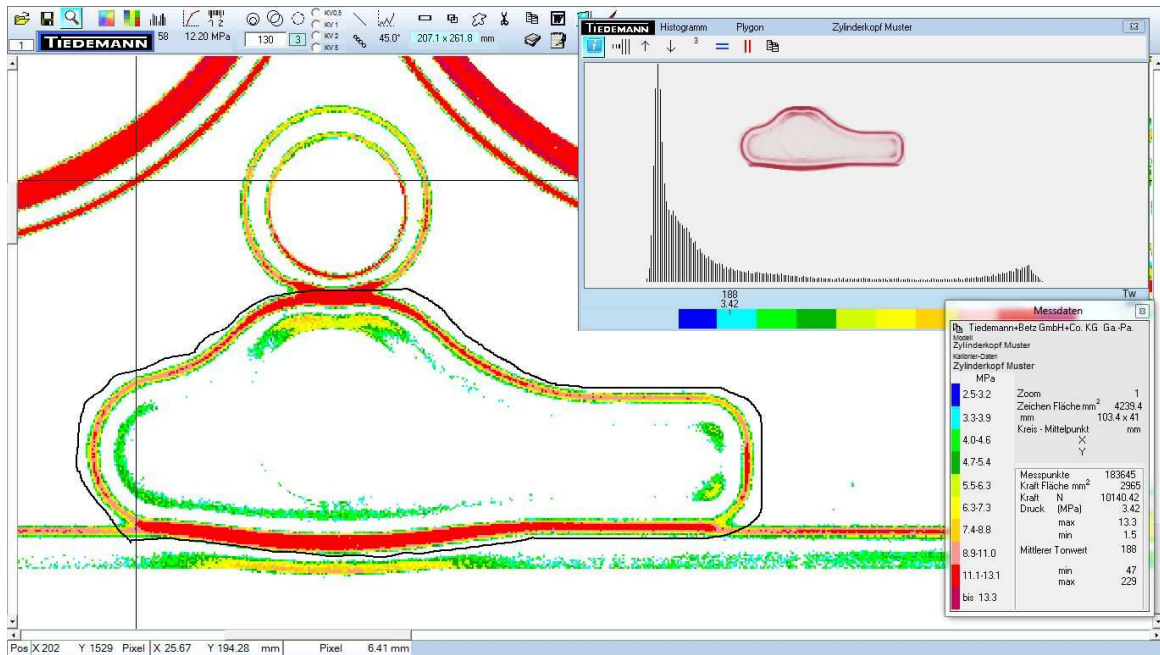
*Straight intersectional pressure distribution without filter*

For O-rings, flanges, etc., the CALTEST offers the possibility of evaluating the pressure curve along a circle line. To do this, define the starting point at any point, which is marked with a circle and no. 1. From there, the pressure curve is displayed clockwise. In addition to the quantitative representation of the pressure curve, the pressures can be precisely quantified at any 12 points.



*Circle intersection pressure distribution for e.g. O-rings*

In addition to many other applications, one should finally be mentioned, the freehand line. It is possible to cut out any areas of the impression, either to delete them or to evaluate only this area.



Pressurized free hand intersectional area

## Technical Data CALTEST Program

|                            |  |
|----------------------------|--|
| Operating systems:         | Windows XP, 7, 8, 10   |
| Stored calibration curves: | For all pressure measurement foils:<br>- Smooth surfaces<br>- Ambient temperature<br>- 40% and 60% humidity<br>- Contact time 60 s |
| Application:               | Pressure measuring Fujifilm Prescale   |
| Scanner:                   | All scanners;<br>Stored calibration curves are only valid for<br>Tiedemann scanner   |
| Updates:                   | Included in the license agreement  |
| Scope of delivery:         | Program CD, A3 scanner, 2 licences, manual   |
| Instruction:               | Strongly recommended   |



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