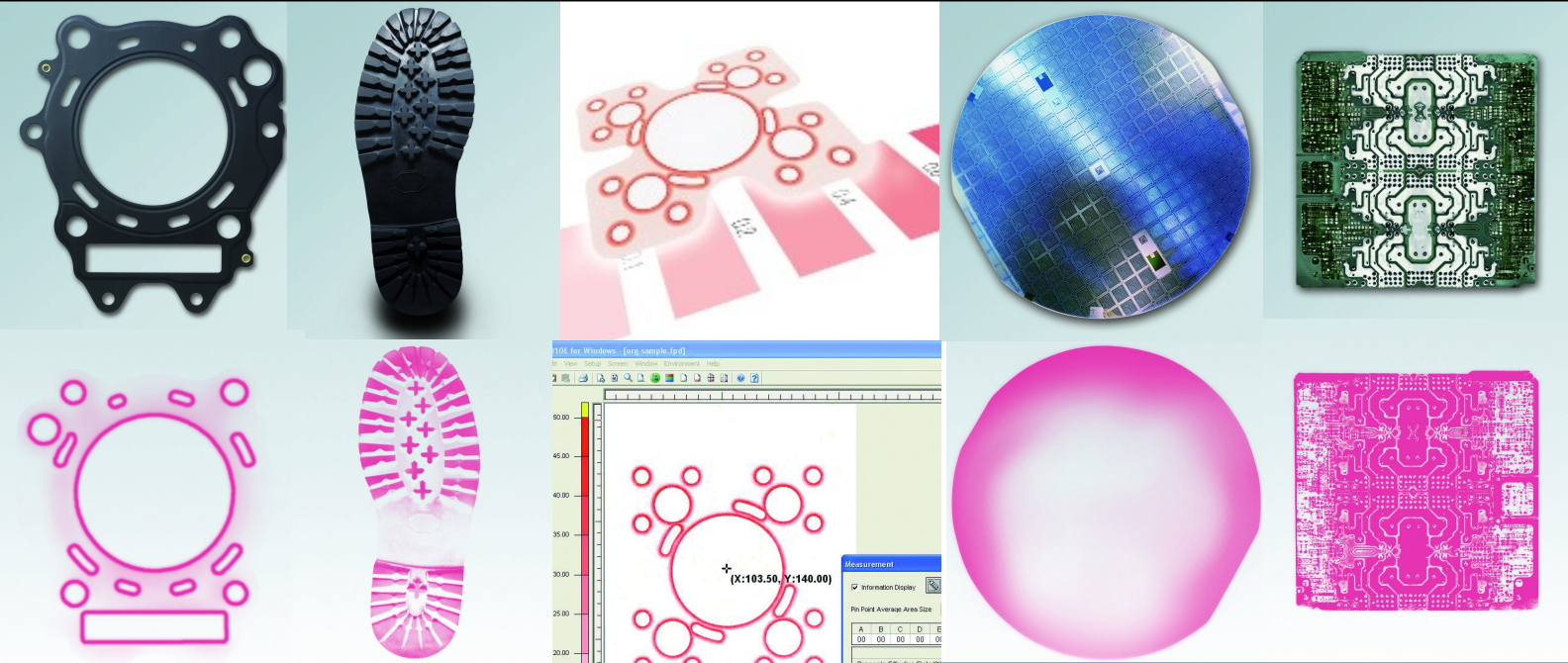
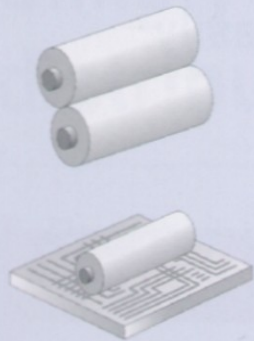


# Surface Pressures Simply Measured



**Prescale Film**

**TIEDEMANN**



# FUJIFILM PRESCALE

## Easy Made Surface Pressure Evaluation

The ability to measure surface pressures and pressure distributions with the unique Fuji pressure sensitive film has been available for more than 30 years. The measurement range covers surface pressures from 0.006 to 300 MPa.

The measurement method is quite simple: the films are placed between the components to be measured. After loading a red imprint of the image will appear on the film, where the colour intensity is a measure of the surface pressure.

### **Applications**

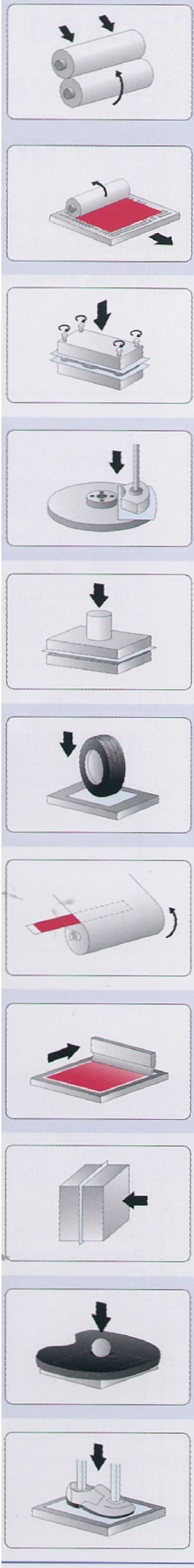
The FujiFilm Prescale can be used almost in all sorts of measurements of surface pressure, or simply to show the pressure distribution. The films may be used both in air and in water. The tests usually have two different objectives: to check the uniformity of surface pressure or measure the pressure at dedicated points.



**PRESCALE  
PRESCALE**

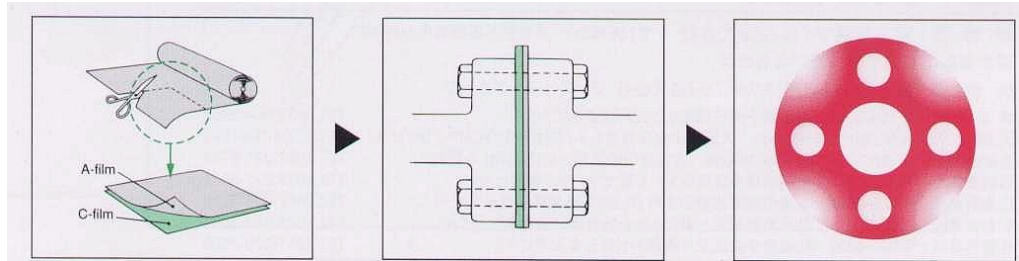
The following list provides only a preliminary overview of the versatility of the films and helps to identify similarities to specific measurements.

- Pressure distribution between pressed surfaces, valves, gears, pumps, hydraulic cylinders for the design of seals, gaskets or to verify the machine assembly
- Pressure distribution under heavy equipment and supports or the test of tyre profiles
- Pressure contacts and pressure patterns on brakes, clutches, injection moulds, roll pressure or rollers in print machines
- Quality control of sealings like sterile packagings, blisters or bags and cartons in the food industry
- Impact pressure on fracture testing of packaging
- Medical applications for the determination of footprints, or pressure distributions on the seat in wheelchairs

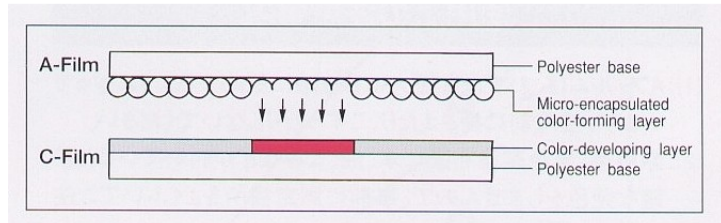


## Principle

The Prescale films are produced as a 1 – and/or 2-layer film. The 2-layer types have micro-capsules applied on one foil and on the other film is the developer layer. To measure the matte layer side of the film are facing each other - the shiny side of the polyester film has to show to the outside. Each of the two films has a thickness of about 90 microns and can be cut with scissors to the desired size.



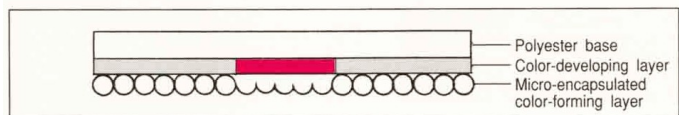
With increasing load, no reaction will appear in any given film type and then if the load increases and the first micro-capsules burst, the developer layer at the 2-layer film become slightly reddish. With further load increase, more micro-capsules will burst.



This continues until all the capsules have burst, which leads then to a dark red colour of the developer layer. The intensity of the red colour thus provides a measure of the surface pressure.

Since the microcapsule layer is no longer needed after the measurement, the developer layer provides a non-erasable document.

At the 1-layer film the colour forming micro-capsules and the developer are on the same slide.



Under a defined pressure load, the capsules burst and discolour the film proportional to the load. Thus, you only have to put a single film with thickness 0.11 mm between the components to be investigated, which leads to measurements that are more accurate over the 2-layer type.

However, at risk of pollution (oil, chemicals or moisture), an enclosed second crystal-clear film should be used to cover the dull side of the film. The advantage of the 1-layer, however, is then suspended.

After measuring the 1-layer film has to be is protected against inadvertent load.

## Measurement Range

There are eight types of films with their specific ranges available to cover the measurement range of 0.006 to 300 MPa. The latest types "Ultra Extreme Low" covers the range from 0.06 to 0.5 bar, LLW-HT is ideal for Heat Seal in a range of 180-220°C.

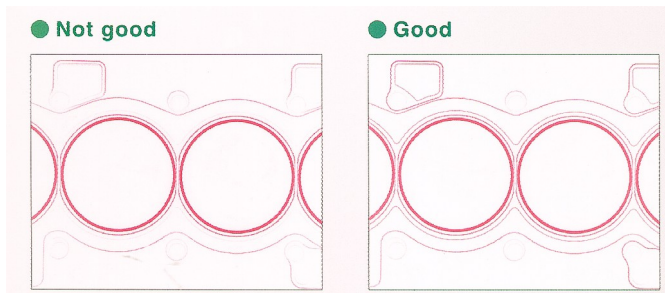
Type	Name	Layers	Range	Size
5LW	Ultra Extreme Low	2 Layers	0.006 - 0.05 MPa	310 mm x 2 m
4LW	Extreme Low	2 layers	0.05 – 0.2 MPa	310 mm x 3 m
3LW	Ultra Super Low	2 layers	0.2 – 0.6 MPa	270 mm x 5 m
LLW	Super Low	2 layers	0.5 – 2.5 MPa	270 mm x 6 m
LLW-HT	Super Low	2 layers	0.5 – 2.5 MPa	270 mm x 6 m
LW	Low	2 layers	2.5 - 10 MPa	270 mm x 10 m
MW	Medium	2 layers	10 - 50 MPa	270 mm x 10 m
MS	Medium	1 layer	10 - 50 MPa	270 mm x 10 m
HS	High	1 layer	50 - 130 MPa	270 mm x 10 m
HHS	Super High	1 layer	130 - 300 MPa	270 mm x 10 m

All slides are supplied in reels of 27 cm and 31 cm respectively. The length of the role depends on the sensitivity and starts at 2 m for "Extreme Low" up to 10 m for the less sensitive films.

If the expected pressure distribution can not be covered by using only one film, more film types can be superimposed to expand the range.

## Qualitative Evaluation

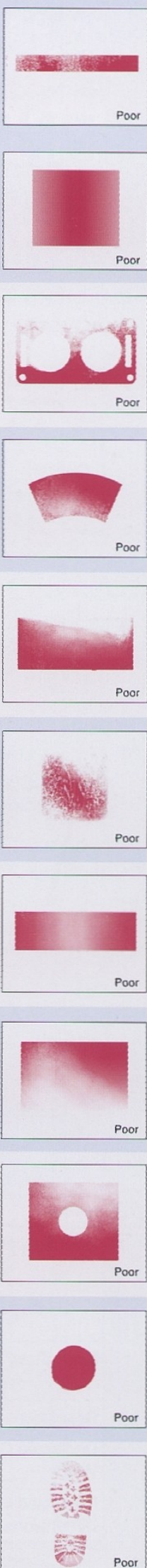
A qualitative overview of the pressure distribution is already given by inspection of the printed image. The areas with high intensity of red indicate a high surface pressure, while the areas with little or no red colour indicate a lower pressure. For many applications, this qualitative statement is sufficient.



## Quantitative Measurement

A quantification of the pressure from the printed images is possible at different levels of accuracy.

The user manual that accompanies each package of Fuji Prescale Film presents two different calibration curves for different types of load cycles – short load contact and continuous load. One is for a 5 seconds load cycle only, the other for constant pressure for 2 minutes. These are examples of applications for short-term and in long-term applications.



The different colours at continuous load and short-term exposure is due to the continuous rupture and to a small extent when the micro-capsules are at constant load, so that the same load at a longer period of action leads to a slightly darker result. Fuji guarantees an accuracy of about 10%.

### Read the Surface Pressure out of the Manual

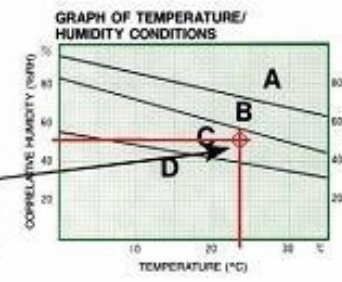
The values of temperature and humidity affect the sensitivity of the films. In the first step, it is therefore intended, to indicate the area, which leads to curves as A, B, C, etc. for the next step.

After comparing the red intensity of the real footprint to the standard colour samples – 2nd step - you go up to the corresponding calibration curves A, B, C, etc. to get the values for the surface pressure on the pressure axis – 3rd step.

#### STANDARD CONTINUOUS PRESSURE CHART

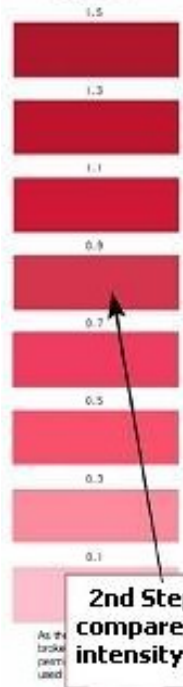
Measurement pressure range: 0.5–2.5MPa  
 • Pressure application conditions  
 • Time to reach the pressure to be measured: 2 min.  
 • Time of retention at the pressure: 2 min.

Check if the temperature and humidity the pressure is applied:  
 (For example, if the room temperature is 60%RH, acquire the pressure from the B curve in the standard chart.)

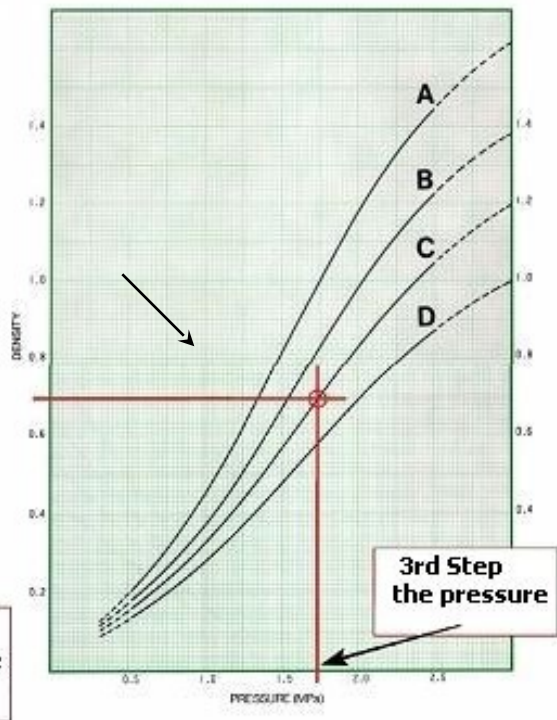


**1st Step  
check the  
climate**

#### STANDARD COLOR SAMPLE



**2nd Step  
compare the  
intensity**



**3rd Step  
the pressure**

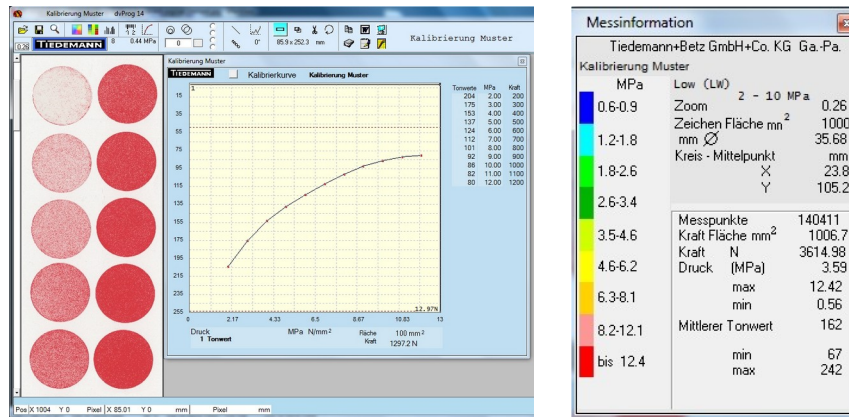
### Calibration

Measurements are more accurate when the films are calibrated initially under actual experimental conditions. This is especially advantageous on structured materials, different temperatures or pressure durations.

Tiedemann has developed for this purpose a complete calibration system. In this system, the film and the surrounding material are placed between two plane-parallel stamps with a known surface area and loaded coaxially with different forces.

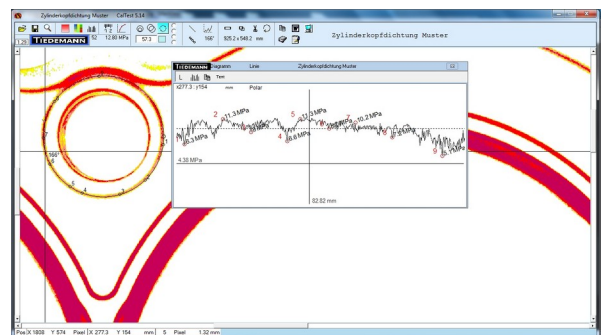
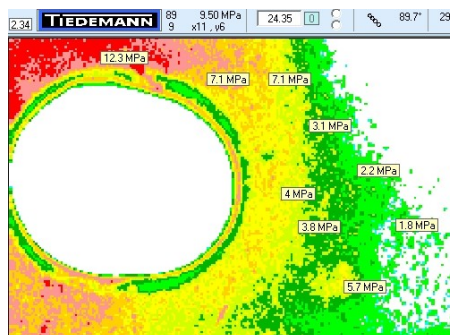
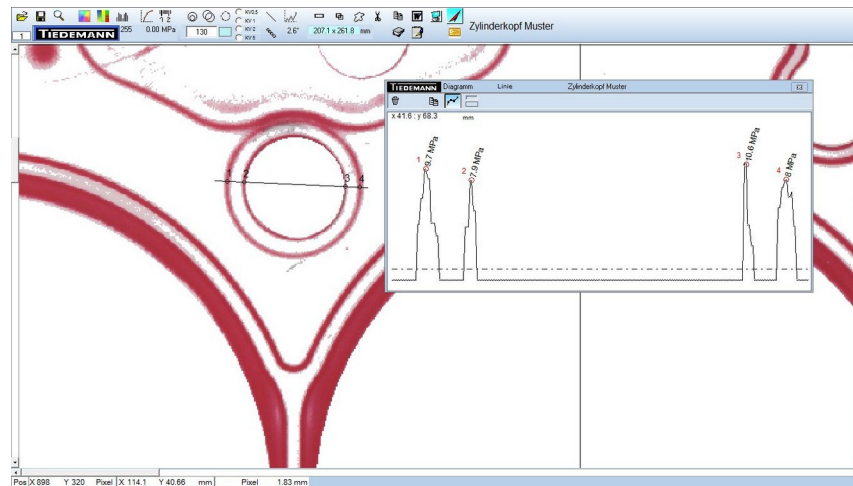
## Quantitative Analysis with CALTEST Program

The Tiedemann calibration and analysis software CALTEST provides a wide range of evaluation possibilities in conjunction with the A3 flatbed scanner. With this software highest accuracy can be reached.



The footprint images are scanned to measure the intensity of colour change. The program then returns to the calibration curve defined for each type of film for smooth surfaces at room temperature and specific humidity. If the measuring conditions deviate from this or if the surface is structured, calibration curves can be prepared in advance.

The measured values allow a point to point or two-dimensional image processing in original or false colours. Cross section patterns, circular path calculations (O-ring), etc. can be created.



By using CALTEST, the quantification and application possibilities of the FUJI pressure indicating films are significantly extended.

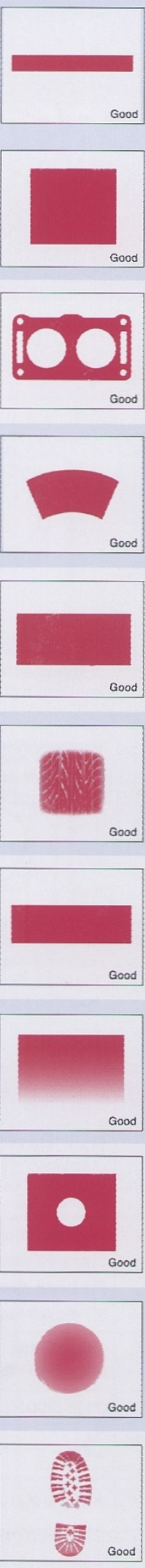
## Technical Data

### **FujiFilm Prescale Pressure Indicating Film:**

Standard Accuracy:	+/- 10% at 23°C, 65 % rel. Humidity (RH)
Spatial Resolution:	30 µm
Temperature of calibration curves:	20 °C to 35 °C; applications up to 300°C are possible
Recommended Humidity:	35 % RH to 80 % RH
Film Thickness:	1 layer type 90 µm, 2 layer type 110 µm

### **CALTEST Analysis Program:**

Operating system:	Windows XP, 7, 8, 10, 11
Languages:	german and english
Saved Calibration curves:	All pressure films, smooth surfaces, room temperature, 40% and 60% humidity, pressing duration 60 s
Scanner:	All scanners possible, saved calibration curves are valid for Tiedemann DIN A3 scanner only
Free Updates:	Covered by licence contract
Delivery:	Software-CD, A3 Scanner, 2 licences, manual recommended, at Tiedemann, customer side or by video conference
Training:	





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