



Polygraphische  
innovative  
Technik Leipzig

# Operating Manual

## Separating Force Measuring Device PEEL CONTROL

### Application Areas

- Separating force measurements can be made with the PEEL CONTROL. This force can be determined in many areas for packaging, sealing, laminating, bonding, etc.
- The PEEL CONTROL is designed as a hand-held measuring device. It can be used anywhere where diverse meaningful tensile force properties (average, MIN, MAX ...) need to be quickly and easily made, either as a single measurement or with multiple measurements.  
These can be opening forces for packages or separating forces of materials that have been stuck, heat sealed or laminated together, such as adhesive tapes, textiles, foils, etc. If required, the measured values can be exported to a PC, making it possible to immediately create measurement protocols with the measurement results and charts. The software is provided on the supplied USB stick.

### Device Design

- The PEEL CONTROL consists of the hand-held unit (Figure 1) and the measuring head connected with a cable (Figure 2).
- On the hand-held unit, there are push buttons for operating the device, a display for reading the measured values and diagram curves as well as for entering parameters and menu information.  
A battery chamber is also located in the device and holds 4 AA Mignon batteries for the power supply.
- The measuring head has a handle for applying the tensile force by hand and a clamping device for clamping the material to be tested.  
In the clamping device, materials with a thickness of up to several millimetres can be clamped in place.  
The clamping device is 20 mm wide and materials of any width can be used.  
On the top of the measuring head, there are coloured LEDs for optically monitoring the set point of the measuring head angle and for warning when the maximum permissible tensile force is exceeded.



Figure 1: Hand-held unit

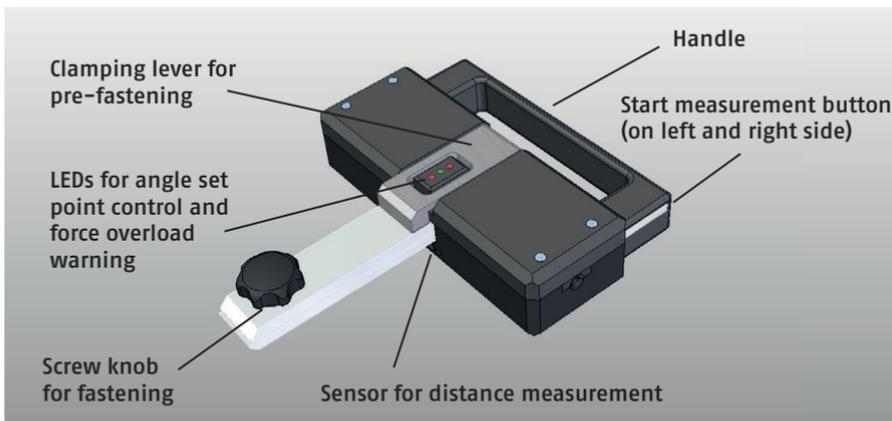


Figure 2: Measuring head

## Measurement Principle and Special Characteristics

- A force sensor is built into the measuring head and registers the tensile force acting on the clamping device.

**Attention:**  
**The maximum force the device can measure is 60 N. Exceeding the maximum force is indicated by the simultaneous flashing of all control LEDs on the measuring head. In this event, the applied force must be reduced immediately.**  
**The clamping device may only have a pulling force applied to it. Compressive or lateral forces can lead to incorrect measurement values or can damage the sensor. This is particularly important to consider when securing the object to be measured.**
- An integrated inclination sensor makes it possible to measure and display the permanent angular position of the measuring head angle.  
 The tensile force measurement can then be made with a defined measuring head angle. In this way, the influence of the angle on the force values can be checked and any angle requirements given from a testing specification can be conformed to. Defined angle set points can be optically controlled by means of a red or green LED. Simultaneously, the angle generates the basis of a permanent automatic zero point so that a general zero positioning of the reading before every measurement is spared.  
**This means that no matter which angle the measuring head has, the reading without a load is always zero.**
- Testing distance information either by a target distance or by distance measurement:  
 The device concept needs to have testing distance information in order to make calculations for the testing speed, meaning the speed of the hand-guided measuring head during the measurement. In this way, the influence of the speed on the force values can be examined and any possible speed requirements given from a testing specification can be conformed to.  
 The distance information makes it possible to also show force values related to the distance in a measurement protocol chart as well as the selection and display of the clipping edges in the measurement histogram which may need to be disregarded during the analysis.

Distance information from a pre-defined target distance:  
 Simplest alternative needing no extra preparation. By using the known geometric design of the object to be tested, the testing distance is pre-defined and can be entered in the device as the measurement parameter "Target dist".  
 The distance/time chart will be assumed to be linear in this case and is even more realistic when there is a uniform pulling movement during the measurement.

Distance information from a distance measurement:  
 Alternative requiring extra preparation with regards to the surface of the object being tested. Possible deviations from the linear distance/time chart could be recorded. A distance sensor built into the measuring head (triangulation, infrared measurement principle) makes it possible to make a contactless measurement of the testing distance, meaning the distance between the hand-guided measuring head and the surface of the object to be tested. The measurement is restricted to a peeling angle of between

90° and 135° due to the sensor point of impact at the bend of the bracket opening. Since most surfaces are usually reflective, the extra preparation pertains to covering a part of the test object surface with non-reflective material, e.g. masking tape, in order to avoid incorrect measurements.

The more uniform the pulling movement is, the more linear the distance/time chart will be, which results in a greater agreement with the distance information from the distance measurement and the defined target distance.

- Clipping edges can be defined for the measured values of the tensile force. Undesired variations during the course of the measurement at the beginning and at the end of the measurement can be excluded from the analysis by entering a distance value for the left and right edges.
- A force threshold makes it possible to automatically begin as well as automatically end the measurement.  
The force threshold can be set and can be adjusted for the different resistances of the testing objects. Recording the measurement values takes place for a maximum of 30 seconds at a recording rate of 500 Hz.  
A yellow/red LED signals the "Measure" and "Measurement running" device status.
- The values and charts of a measurement stay saved/visible in the device until they are replaced with new measured values by pressing the measurement start button and beginning the pulling movement.
- The data can be exported to a PC for permanent storage, summarising the single measurements and creating protocols (wirelessly or via USB, see evaluation software PeelControl.exe).

## Menus Shown in the Graphic Display:

### Parameter 1 Menu

|   |                                     |
|---|-------------------------------------|
| Set the <b>target angle set point</b> of the measuring head (steps) | 0 ... 180 degrees (5 degree steps)  |
| Set the <b>target angle set point tolerance</b>                     | ±2 ... ±20 degrees (1 degree steps) |
| Optical set point control on the measuring head via LEDs            |                                     |
| ● Reduce measuring head angle                                       |                                     |
| ● Measuring head angle is within the tolerance                      |                                     |
| ● Increase measuring head angle                                     |                                     |
| Set the <b>starting threshold</b> for beginning the measurement     | 0.5 ... 10 N (0.5 N steps)          |
| Activate wireless   | Yes / No                            |

### Parameter 2 Menu

|                               |  |
|-------------------------------|--|
| Activate distance measurement | Yes / No   |
| Set target distance           | 25 ... 250 mm (--- for Measure dist Yes, 1 mm steps) |
| Set left clipping edge        | 0 ... 50 mm (1 mm steps)                             |
| Set right clipping edge       | 0 ... 50 mm (1 mm steps)                             |

### Device Ready Menu

|   |   |
|---|---|
| Online display of the force acting on the clamping device | 0 ... 60 N (>60 N for measurement range exceeded) |
| Online display of the measuring head angle                | 0 ... 180 degrees                                 |
| Online display of the testing distance                    | for Measure dist Yes                              |
| Display: "Press start button"                             |   |

### Results Menu

|           |   |            |
|-----------|---|------------|
| Display 1 | Force: MIN Average MAX                    | in N       |
| Display 2 | graphical force progression over time     | Chart      |
| Display 3 | graphical distance progression over time  | Chart      |
| Display 4 | graphical force progression over distance | Chart      |
| Display 5 | Angle: Average                            | in degrees |
|           | Speed: Average                            | in mm/s    |

## Operational Readiness

- The PEEL CONTROL is ready to use after pressing the on/off button (approx. 2 sec).
- Switching off the device is also done by pressing the on/off button (approx. 2 sec) or the device automatically switches off after approx. 10 min.

## Measurement Procedure and Handling

The measurement procedure and handling does not significantly change for the type of measurement being done, i.e. peelable packaging, on adhesions, etc., and as a result the measurement procedure for any material is summarised here.

Measurement procedures and handling are separately described below depending on if the testing distance information from the pre-defined target distance (Alternative 1) or the distance measurement (Alternative 2) is being used (see Measurement Principle and Special Characteristics). The determination of the main measurement parameter tensile force takes place identically for both alternatives.

The application of the tensile force on the measuring head generally takes place by hand and it is important to ensure a uniform pulling movement for both alternatives. Alternative 1 is preferably used (especially for large sample quantities) because no extra preparation of the test object surface is needed.

A reason for using Alternative 2 with the distance measurement can be made in spite of the necessary extra preparation if the exact distance for the tensile force values are of special concern but the pulling movement cannot be made uniformly.

### Alternative 1) Determining the opening forces of peelable packaging, separating forces of adhesives, etc. (Testing distance information taken from pre-defined target distance)

#### Extra preparation due to test object surface: None

- Turn on the PEEL CONTROL (see Operational Readiness).
- The Parameter 1 menu is shown in the display. Here you can verify if the measurement parameters of the intended measurement are correct or need to be changed. By pressing the Select button (middle button), the measurement parameters begin to blink one after the other. Each blinking measurement parameter can be changed to the necessary value by pressing the Change button (right button).
- The Parameter 2 menu is shown by pressing the Next button (left button). The measurement parameters to be changed are carried out in the same manner.
- **For "Measure dist" choose No, for "Target dist", the pre-defined testing distance which has been measured on the test object is entered.**
- For bonded material, it is recommended to enter a clipping edge for the left and right edges in order to achieve separating force values free from fluctuations at the beginning and end of the testing distance.
- In order to achieve comparability of the results, make sure that the same measurement parameters are entered for the same test object.
- The piece to be clamped on the test object (lid opening tab, adhesive tape, etc.) is placed inside the slit of the clamping device while pressing the clamping lever and is pre-fastened when the clamping lever is released.
- The test object is fastened in place by tightening the thumb nut until snug.
- In the "Device Ready" menu, the online values for the tensile force and angle are shown in the display.
- The measuring head with the test object fixed in place is to be grasped by hand on the handle and oriented so that the green angle set point LED is lit (corresponding to the target set point and set point tolerance entered in the Parameter 1 menu).
- The other hand is free to hold the base of the test object and to support the pulling movement at the same time. The base can also be fixed in place elsewhere.
- The start of the measurement begins with the start measurement button (the Measure menu is shown in the display, the yellow/red LED shines yellow).
- The pulling movement can begin (the Measure menu shows: "Measurement running", the yellow/red LED shines red).

Care must be taken to ensure that

- the pulling movement is as uniform as possible,
- the hand-held measuring head is guided in the direction of the measurement path,
- the measuring head angle is maintained and
- any possible force overloads, as indicated by the flashing of all LEDs on the measuring head, are minimized.

- When the starting force threshold has been exceeded the measurement begins and then ends when the force falls under the threshold. The Results menu (see above) is shown in the graphic display and reports all of the results and charts in 5 display screens. (The result MAX > 60 N informs that the measurement range has been exceeded.)
- The proceeding display screen is shown by repeatedly pressing the Next button (left button), meaning that the screens will repeat after pressing the button a fifth time. Special attention for adhesives: The average separating force over the test object length is generally related to the test object width. This ratio is called peeling resistance. Example: With an average separating force of 25 N and a test object width of 25 mm the results is a adhesive peeling resistance of 25 N/25 mm = 1 N/mm.
- Measured values and charts are saved/displayed in the hand-held unit until they are replaced by new values after pressing the start button (the Measure menu is shown in the display) and beginning the pulling movement for a new measurement.
- The data can be exported to a PC for permanent storage, summarising single measurements and creating protocols (under Parameter 1 choose Yes for "wireless" or connect via USB, see evaluation software PeelControl.exe).
- The test object is detached from the clamping device by loosening the thumb nut.
- Turn off the PEEL CONTROL (see Operational Readiness).

Information: By shortly pressing the on/off button, it is possible to get back to the "Parameter 1" menu (ESCAPE function).

## Alternative 2) Determining the opening forces of peelable packaging, separating forces of adhesives, etc. (Testing distance information by means of distance measurement)

### Extra preparation due to test object surface:

In order to avoid incorrect measurements from the optical distance measurement sensor during the distance measurement, the surface of a test object must be covered with a non-reflective material, like masking tape, since most surfaces are usually reflective or transparent. For cup lids, the covering is best extended in the pulling direction out over the lid edge for several centimetres in order to avoid distance measurement errors at the lid edge.

Making this covering is difficult for adhesive tapes which will be tested for separating forces. The adhesive tape would be virtually stuck together with its underlayer or the strength of very thin adhesive tapes would be influenced by the covering.

In this case, a piece of non-reflective paper can be used which is placed on top of the adhesive tape and laid with an edge in the bend created by the clamped tape edge and the clamping device. The piece of paper will be slid backwards by the adhesive tape when the pulling movement begins. This can be used for further measurements.

- Turn on the PEEL CONTROL (see Operational Readiness).
- The Parameter 1 menu is shown in the display. Here you can verify if the measurement parameters of the intended measurement are correct or need to be changed. By pressing the Select button (middle button), the measurement parameters begin to blink one after the other. Each blinking measurement parameter can be changed to the necessary value by pressing the Change button (right button). The Parameter 2 menu is shown by pressing the Next button (left button). The measurement parameters to be changed are carried out in the same manner.

**For "Measure dist" choose Yes, for "Target dist" - - - is shown, no value can be entered since Yes was chosen for "Measure dist".**

For bonded material, it is recommended to enter a clipping edge for the left and right edges in order to achieve separating force values free from fluctuations at the beginning and end of the testing distance.

- In order to achieve comparability of the results, make sure that the same measurement parameters are entered for the same test object.
- The piece to be clamped on the test object (lid opening tab, adhesive tape, etc.) is placed inside the slit of the clamping device while pressing the clamping lever and is pre-fastened when the clamping lever is released.  
The test object is fastened in place by tightening the thumb nut until snug.
- In the "Device Ready" menu, the online values for the tensile force and angle are shown in the display.
- The measuring head with the test object fixed in place is to be grasped by hand on the handle and oriented so that the green angle set point LED is lit (corresponding to the target set point and set point tolerance entered in the Parameter 1 menu).  
The other hand is free to hold the base of the test object and to support the pulling movement at the same time. The base can also be fixed in place elsewhere.
- The start of the measurement begins with the start measurement button (the Measure menu is shown in the display, the yellow/red LED shines yellow).
- The pulling movement can begin (the Measure menu shows: "Measurement running", the yellow/red LED shines red).  
Care must be taken to ensure that
  - the pulling movement is as uniform as possible,
  - the hand-held measuring head is guided in the direction of the measurement path,
  - the measuring head angle is maintained and
  - any possible force overloads, as indicated by the flashing of all LEDs on the measuring head, are minimized.
- When the starting force threshold has been exceeded the measurement begins and then ends when the force falls under the threshold.
- The Results menu (see above) is shown in the graphic display and reports all of the results and charts in 5 display screens. (The result MAX > 60 N informs that the possible measurement range has been exceeded.)
- The next display screen is shown by repeatedly pressing the Next button (left button) (meaning that the display will repeat after pressing the button the fifth time).  
Special attention for adhesives: The average separating force over the test object length is generally related to the test object width. This ratio is called peeling resistance.  
Example: With an average separating force of 25 N and a test object width of 25 mm the results is a adhesive peeling resistance of  $25\text{N}/25\text{mm} = 1\text{N}/\text{mm}$ .
- Measured values and charts are saved/displayed in the hand-held unit until they are replaced by new values after pressing the start button (the Measure menu is shown in the display) and beginning the pulling movement for a new measurement.
- The data can be exported to a PC for permanent storage, summarising single measurements and creating protocols (under Parameter 1 choose Yes for "wireless" or connect via USB, see evaluation software PeelControl.exe).
- The test object is detached from the clamping device by loosening the thumb nut.
- Turn off the PEEL CONTROL (see Operational Readiness).  
Information: By shortly pressing the on/off button, it is possible to get back to the "Parameter 1" menu (ESCAPE function).

### Information about the peelcontrol.exe Software

- The supplied storage device contains the peelcontrol.exe software and the operating instructions for the measurement device.
- To install the program, copy peelcontrol.exe to your PC and run it. The software installation then takes place automatically. Detailed information about the program as well as information about connecting the measurement device with the PC can be found in the start-up screen of the program.

### Calibration

- The PEEL CONTROL is calibrated by the manufacturer. A calibration by the end user is not necessary.

## Changing Batteries

- The PEEL CONTROL uses 4 x 1.5 V Mignon batteries (AA).  
When the message "Change batteries" is shown, a battery change is necessary.

## Maintenance, Repair, Service

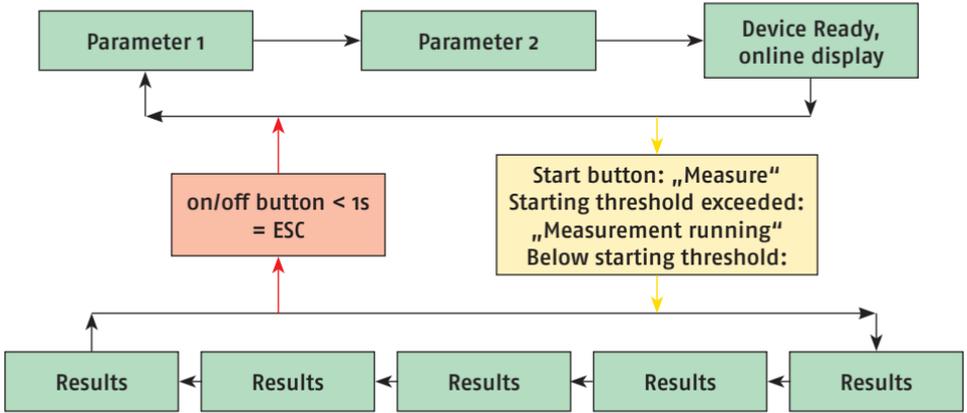
- Special maintenance before, during or after a measurement is not required. Possible adhesive residues on the clamping device due to contact with test objects can be removed with conventional cleaning agents.
- Repairs and service measures are only to be carried out by the manufacturer.

## Transport, Storage

- The PEEL CONTROL is to be protected from dust and moisture during operation and storage.
- Strong shocks or vibration impacts on the device are to be avoided.
- The delivered carrying case is to be used for safely and practically transporting the device. The hand-held unit, the measuring head and the operating manual can be placed inside.

## Technical Data

|                                 |   |
|---------------------------------|---|
| Tensile force measurement range | 0.0 ... 60.0 N  |
| Resolution                      | 0.1 N   |
| Measurement uncertainty         | ± 0.2 N   |
| Angle measurement range         | 0 ... 180 degrees   |
| Resolution                      | 1 degree  |
| Distance measurement range      | 0 ... 250 mm  |
| Resolution                      | 1 mm  |
| Hand-held unit dimensions       | 210 x 100 x 40 mm   |
| Measuring head dimensions       | 136 x 77 x 35 mm  |
| Hand-held unit weight           | 400 g   |
| Measuring head weight           | 360 g   |
| Operating temperature           | 15 °C ... 30 °C   |
| Power supply                    | 4 x 1.5 V Mignon batteries (AA)   |
| Battery control                 | Battery change indicated as "Change batteries"  |
| Included in delivery            | Hand-held unit incl. batteries and measuring head, evaluation software PeelControl.exe (on USB stick), operating manual German/English, carrying case |



**PITSID Polygraphische innovative  
Technik Leipzig GmbH**

D-04329 Leipzig

Mommssenstraße 2

Tel +49 (0)341 25942-0

Fax +49 (0)341 25942-99

info@pitsidleipzig.com

www.pitsidleipzig.com