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emco **Elektronische Mess- u. Steuerungstechnik GmbH**

User Manual

emco IBT

Internal Bond Tester

Version 7.3



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1. Introduction

Testing the Internal Bond strength of paper or the splitting strength of a multiplex composite is only relevant for assessing material behaviour in the printing process and further processing if a dynamic measurement method is used.
The ***emco* IBT Internal Bond Tester** implements a dynamic measuring principle for determining the splitting strength of paper, cardboard and compound systems, while simultaneously taking into account the significant influences of sample preparation and climatic effects.

1.1. Applied standards

- TAPPI T 569 (revision and expansion UM 403 and T 833 om-94);
- ISO 16260:2025;
- DIN 51 222 (special requirements for pendulum impact testing machines).

1.2. Operating principle

The structure and functionality of the test method for determining the Internal Bond strength comply with TAPPI standard T569 and ISO 16260:2025, the Scott Bond method. A material sample is secured between the sample holder and the aluminium angle so that the sample is fixed on both sides using double-sided adhesive tape. The effective area is 25.4 mm x 25.4 mm (1 inch x 1 inch).
During the test, the sample holder is clamped pneumatically and the pendulum is released magnetically.
A pendulum with a defined working capacity strikes the vertical leg of the precision angle, the horizontal leg of which is bonded to the sample. When the pendulum strikes, the sample is split across its entire surface. The energy extracted from the pendulum correlates with the structural strength of the sample (Internal Bond).
The energy expended is measured using two methods:

- Measurement of the pendulum swing (potential energy)
- Measurement of the pendulum speed (kinetic energy)

Potential energy - traditional method

In this method, the angle of the pendulum swing is measured after the pendulum has been struck. The angle difference to the maximum swing of the pendulum during an empty stroke (zero measurement) is a measure of the energy required to split the sample.
It is important to note that friction losses and oscillations of the pendulum can lead to energy losses. The pendulum can be excited to oscillate, particularly during the impact. The energy losses that occur as a result are included in the measured value.

Kinetic energy – dynamic method

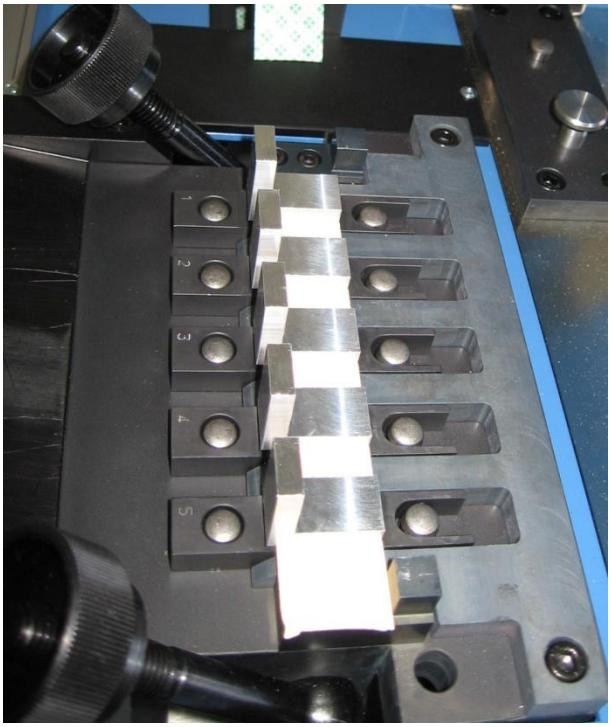
This method measures the pendulum speed. The change in pendulum speed before and after striking the test angle is measured and the energy required to split the sample is determined from the difference.
This minimizes the influence of friction moments and the natural oscillation of the pendulum.

Note: By changing the pendulum weight, the working capacity of the pendulum can be adjusted to the respective strength level of the sample material.
The test result always and exclusively refers to the respective working capacity of the pendulum (measuring range). It is therefore not possible to compare or convert test values that were determined in different measuring ranges.

1.3. Measuring range MR 4

Measuring ranges have been introduced to determine the Internal Bond strength in the approximately linear range. For the *emco* IBT, these are measuring ranges MR 0 to MR 3. These are achieved by attaching additional weights to the pendulum.
Practical experience has shown that measuring range MR 3 is sometimes insufficient for papers with very high Internal Bond strength.
The specified standards also allow the measurement area to be reduced in order to achieve higher Internal Bond strengths. The MR 4 measuring range was developed for a measuring area of 15.0 x 25.4 mm² with special accessories and is used, among other things, to determine the splitting strength in pre-impregnated materials.





Accessory case for measuring range MB4 for high internal bond strength; sample preparation with reduced measuring area

1.4. Device check

The entire pendulum impact mechanism is subject to high mechanical stress and must therefore be checked regularly. The pendulum impact causes material fatigue and wear, particularly in the precision angle and sample holder (anvil).
The use of precision angles, which must be identical in terms of their geometry and weight, is crucial for measurement accuracy and the dispersion of measured values. Equally important are the measuring surfaces of the precision angle and the sample holder, which must ensure that the sample is supported on a perfectly flat surface.
The preparation and striking surfaces must always be kept free of contamination.

Sample holder (anvils)
Check the measuring surface for nicks, burrs, and other contaminants. Damaged sample holders must be replaced.

Precision aluminium angles
Check the angle geometry (deformation), angle weight, and the measuring surface of the angle for damage (nicks, burrs on the edges, contaminants).
It is recommended to check the weights of the angles after approx. 300 measurement cycles. In general, the angles should be replaced after approx. 600 test cycles at the latest. It is recommended to replace the entire set.

1.5. Scope of delivery

- Internal Bond Tester ***emco* IBT**
- 3 pendulum weights
- 2 sets aluminium angles (5 pcs. each)
- 4 rolls of adhesive tape
- Collection tray
- Cutter knife with spare blades
- Allen key SW 2.5 for attaching the pendulum weights
- 1,5 m compressed air hose
- Accessory case
- Certificate
- power supply + mains cable
- Ethernet cable
- USB flash drive with software and instructions
- Transport packaging

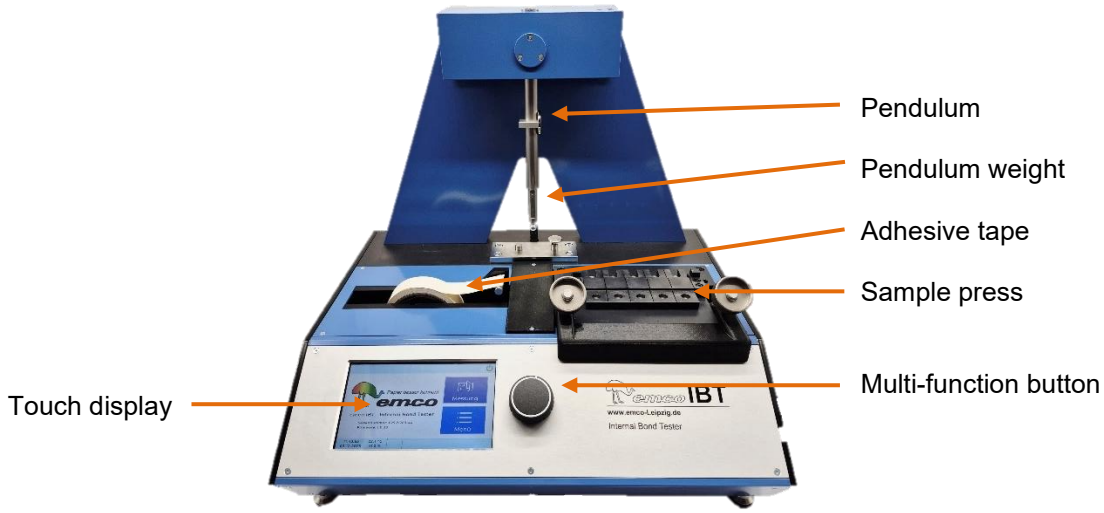
Optional: MR 4 measuring range extension:

- 1 set special anvils for MR 4 (5 pcs.)
- 2 sets special angles for MR 4 (5 pcs. each)
- Special angle holder for MR 4 (brace)
- Cutting guide für MR 4
- Accessory case for MR 4

1.6. Setup

The following illustrations show the most important components of the *emco* IBT.

Front view



Back view



1.7. Safety instructions

In accordance with the Machinery Directive 98/392 EEC and the templates for risk assessment of a hazard location according to DIN EN ISO 12100, no special protective measures are required for the *emco* IBT.

The pendulum impact tester has a maximum working capacity of < 2 J. The mechanical arrangement of the stand (rear wall) largely protects the pendulum's oscillation range.
The *emco* IBT is designed for use in test laboratories, i.e., the device may only be operated by specially trained and instructed employees who are familiar with the operation of pendulum impact testers.



Caution! The pendulum may only be suspended immediately before the measurement, i.e., brought into the starting position (see section 7.3).
The measurement must then be performed using the "Start" function key.

1.8. Information about the user manual

Explanations regarding the manual:



These sections are particularly important, as the *emco* IBT will not function properly if these passages are not observed.



The sections marked with an „**i**" explain technical details and are not essential for operation or function.

2. Commissioning and transport

2.1. Transport packaging

Before commissioning, remove the transport lock from the pendulum.

! The pendulum must be secured with particular care during transport. To do this, always remove the additional weight from the pendulum. The pendulum must be fixed to the stand to prevent uncontrolled oscillations.

If the device needs to be shipped, always use the transport packaging supplied. Turn the adjustable feet as far as possible into the housing, secure the pendulum to the stand, and pad the device with transport packaging. It is recommended that the box be shipped on a pallet.

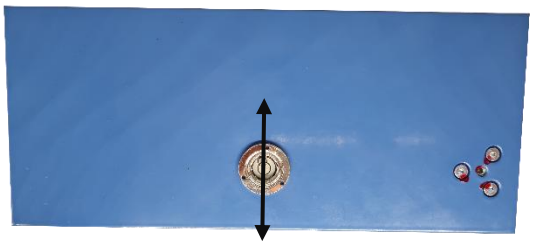
2.2. Setting up and aligning the *emco* IBT

In accordance with the requirements of DIN 51 222, the device must be set up on a level, stable surface free of vibrations. For pendulum impact testers with a working capacity of < 4 J, free installation on a stable work table is generally sufficient.

! Shelf brackets or normal tables are not suitable as installation locations.

! The device is designed for use in a climate-controlled room! During installation and before commissioning, wait until the temperature has adjusted to the room climate by ±3 K.

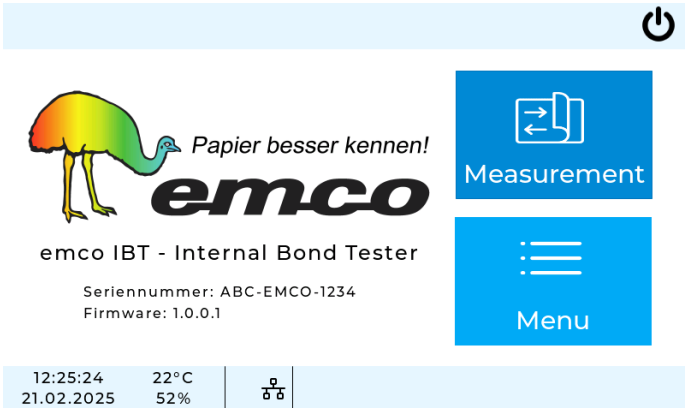
The device must be aligned at the installation site to ensure error-free operation of the pendulum impact tester. The pendulum axis is aligned using the adjustable feet and the bubble level built into the stand.
In the plane of oscillation (direction of impact), the *emco* IBT is fine-tuned again using the software (see section 4.1.).



Once the compressed air and power supply have been connected, the device can be switched on using the switch on the rear and prepared for testing.

! **Before switching on, ensure that the pendulum is in the zero position.**

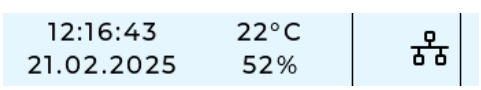
3. Menu levels



Switch on the device.
The serial number of the device and the firmware version appear on the display.

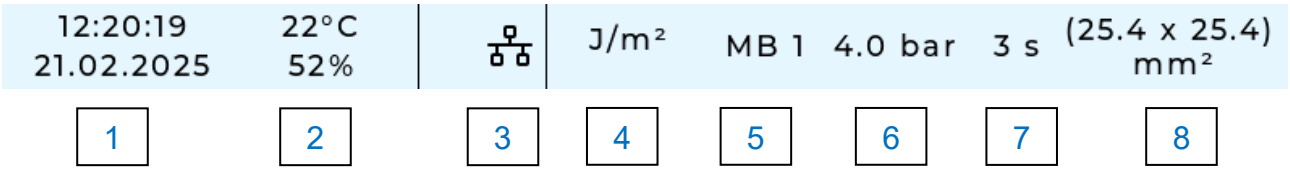
Using the selection fields, you can start a measurement directly or access the menu.

	- Create a measurement job and - Perform the measurement For further information, see section 7.
	- Measurement settings - Device settings - Overview of measurement jobs - Check - Templates - Information

	The device goes into standby mode. It can be reactivated using the multifunction button.
	Home button, home screen appears
	Back button
	The status bar shows the date and time, climate (temperature and relative humidity), connections such as USB and network. Other screens also display the measurement settings.

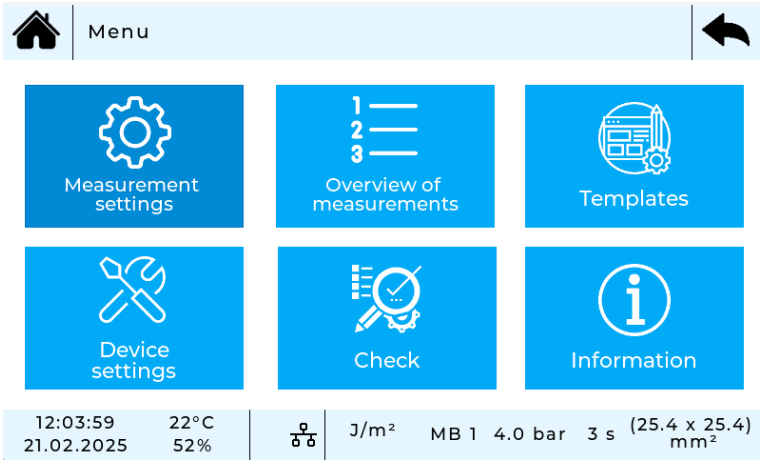
3.1. Status bar

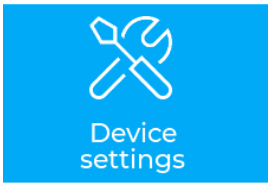
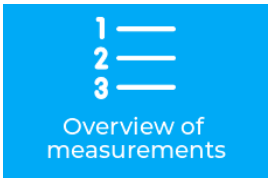
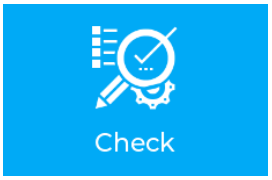
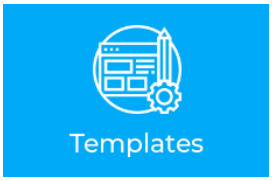
The status bar displays the date and time, the climate (temperature and relative humidity), connections such as USB and network, and, in certain menus, the current settings for measurement.



1	Time Date
2	Temperature Rel. humidity
3	USB, Network
4	Unit Internal Bond strength
5	Measuring range (MR 1, MR 2, MR 3 or MR 4)
6	Pressure (in bar, psi or kPa)
7	Pressure time (in seconds)
8	Area of the angle

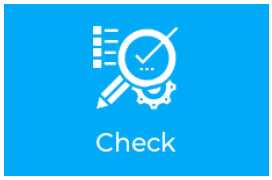
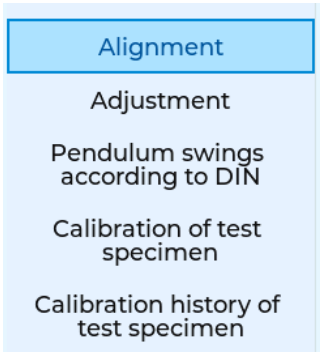
3.2. Menu



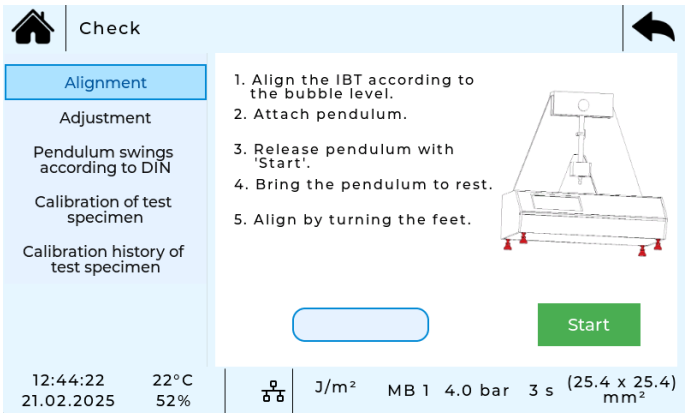
	Measurement settings, such as measuring range, press parameters, result output (energy Internal Bond strength), number of measurements per series, operator, adhesive tape
	Device settings, such as units of measurement, date, time, language, display and network
	Overview of measurement jobs
	Inspection of the *emco* IBT, alignment, adjustment, pendulum swings according to DIN, calibration test specimen, calibration test specimen history
	Overview and creation of new templates for quick creation of measurement jobs
	Device and system information, updates and licence

4. Check

Due to the dynamic measuring principle, the pendulum impact tester is subject to high mechanical stress. The pendulum geometry and low-friction bearings are essential for high reproducible measuring accuracy.
The alignment of the device, the pendulum function and the calibration should be checked and renewed regularly.

	Select **Check** from the menu.
	Select the appropriate function from the submenu on the left-hand side.

4.1. Alignment



Select the *Alignment* option under **Check** and follow the instructions on the display.
Press the "**Start**" button to activate the pendulum.

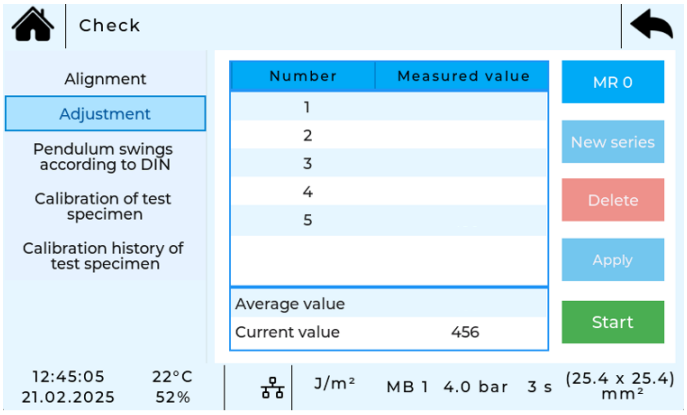
Once the pendulum has come to a standstill, align the device using the adjustable feet. You can carefully slow down the pendulum by hand.
The deviation displayed must not exceed ± 0.09° *).

*) **Depending on the device version, the resolution of the pendulum movement can range from 0.04° to 0.09°.**

! During precise alignment, the bubble level may change slightly in the direction of oscillation. Electronic alignment is crucial for measurement accuracy!
Ensure that the device remains correctly aligned in the transverse direction (see section 2.2).

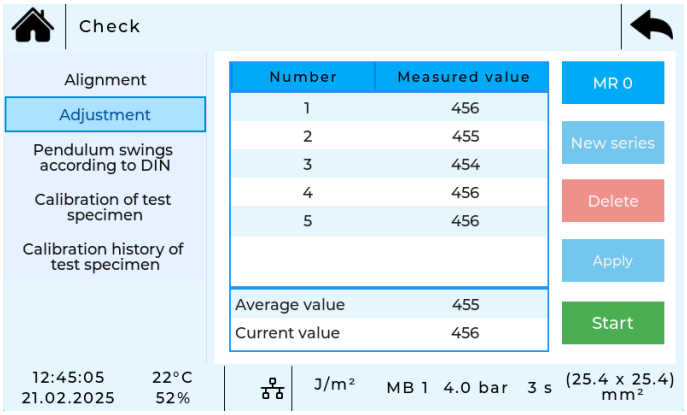
4.2. Adjustment

The work or energy required to split a sample is measured using two methods: calculation of the potential energy (pendulum swing) and kinetic energy (pendulum speed). The maximum pendulum swing of an empty measurement and the velocity characteristic curve of the pendulum, both **without a sample**, are essential for accurate calculation.
These parameters are determined in the form of self-calibration by measuring and comparing the current frictional resistances and the velocity curve of the pendulum. For each of the measuring ranges MR 0 to MR 3, five empty measurements are performed and the values are stored.



Select *Adjustment* from the **Check** submenu.
Important: The respective measuring range must be selected before adjustment using the button 

to scroll through and must correspond to the pendulum weight.



Press the "**Start**" button to trigger the five measurements (zero measurements).

Once the adjustment is complete, select "**Apply**" to save the new adjustment values.

! If the measurement series contains one or more obvious outliers, these can be removed from the measurement series using the "**Delete**" button and the measurement can be repeated.
The adjustment can be cancelled at any time by leaving the page.

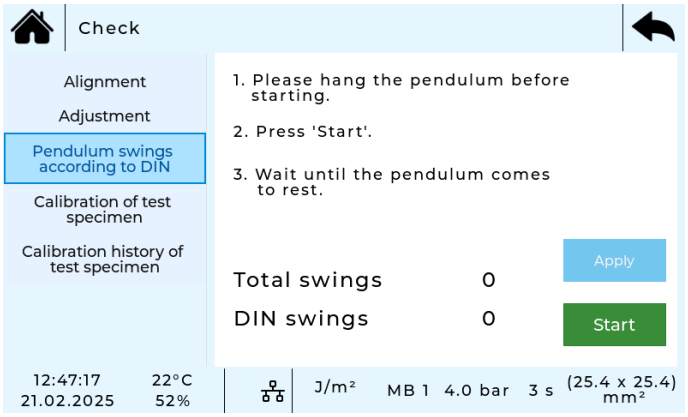
! The displayed adjustment value (mean value) must not fall below the minimum permissible splitting capacity specified in the factory certificate.
If this is nevertheless the case, the alignment of the *emco* IBT must be checked.

4.3. Pendulum swings according to DIN

The pendulum properties are tested in accordance with DIN 51 222 – Special requirements for pendulum impact testers.

DIN 51 222 refers specifically to the pendulum impact testers with a nominal working capacity of ≤ 50 J for metallic materials.
The present scope of application of the *emco* IBT for pendulums with a nominal working capacity of < 2 J (approx. 0.25 to 1.5 J) is the limit range of this standard.

For pendulums with a nominal working capacity ≥ 0.5 J (MR 2 and 3 – medium and large weight), at least 50 oscillation periods must be achieved; below this working capacity, approx. 25 oscillations.



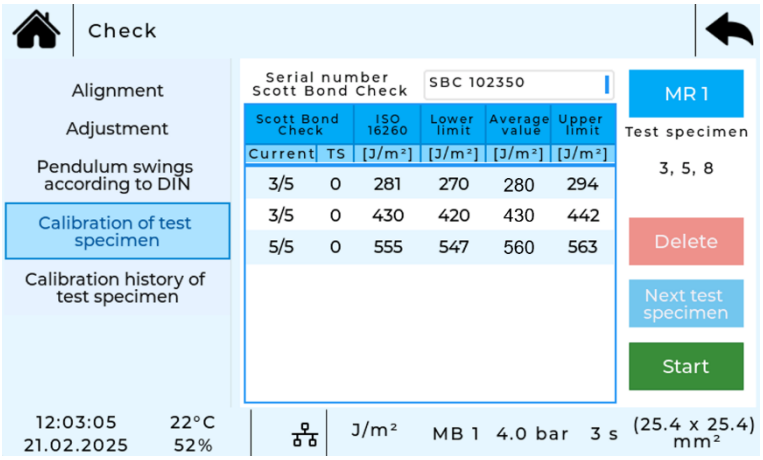
Select the menu item *Pendulum swings according to DIN*, follow the instructions on the display and then press "**Start**".

From a pendulum deflection of less than 5°, the number of oscillations until the pendulum comes to rest is counted (DIN swings).

The number of oscillations provides information about the condition of the pendulum.

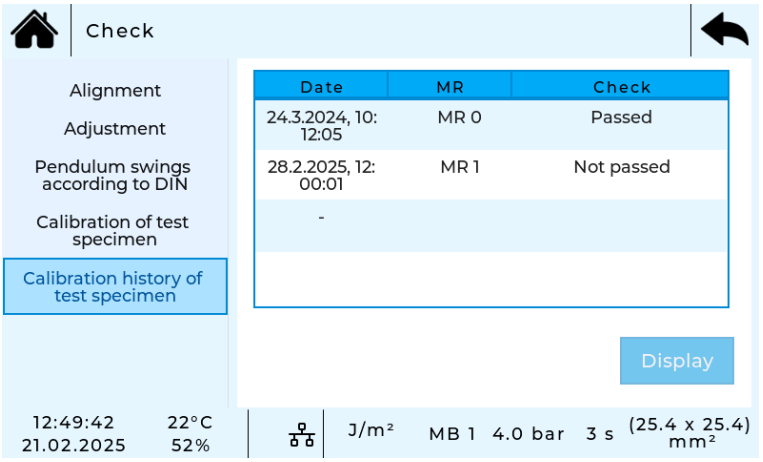
4.4. Calibration of test specimen

The **Internal Bond Pendulum Check** test case from *emco* is required for *Calibration of test specimen*.
Measuring ranges MR 1 and MR 2 ('Scott Bond low' and 'Scott Bond high') can be checked using the test specimens (TS). The user is guided through the menu.
Each test specimen is struck 5 times. The measurement is triggered by pressing "**Start**".
The mean value is displayed. Mean values outside the tolerance range appear in red.
At the end, the display shows whether the test has been passed.

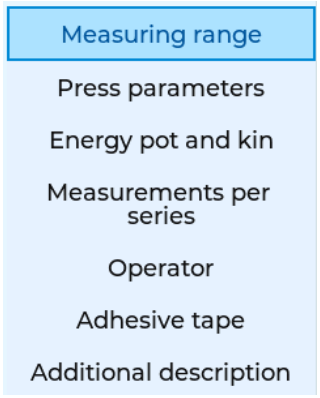


4.5. Calibration history of test specimen

The history records the date, measurement range and whether the test specimen passed or failed the test.
You can view the details by selecting and pressing the "**Display**" button.

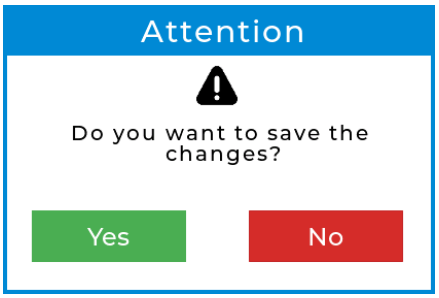


5. Measurement settings

	Select **Measurement Settings** from the menu.
	Select the appropriate function from the submenu on the left-hand side.

!

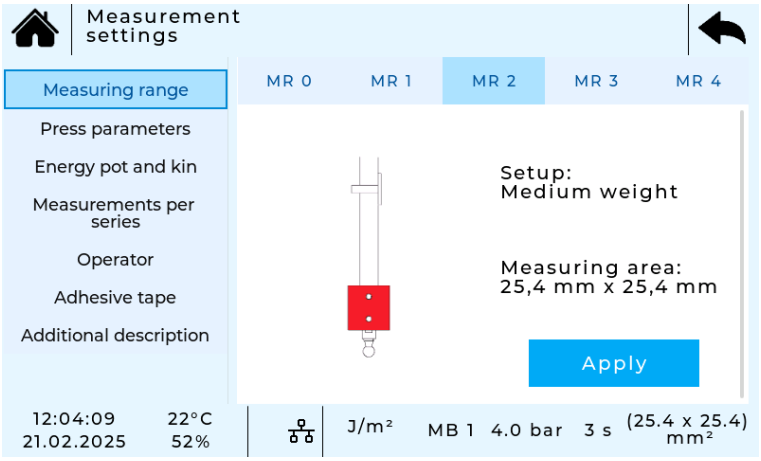
The changes will be saved as soon as you leave the settings and answer Yes to the prompt to save.



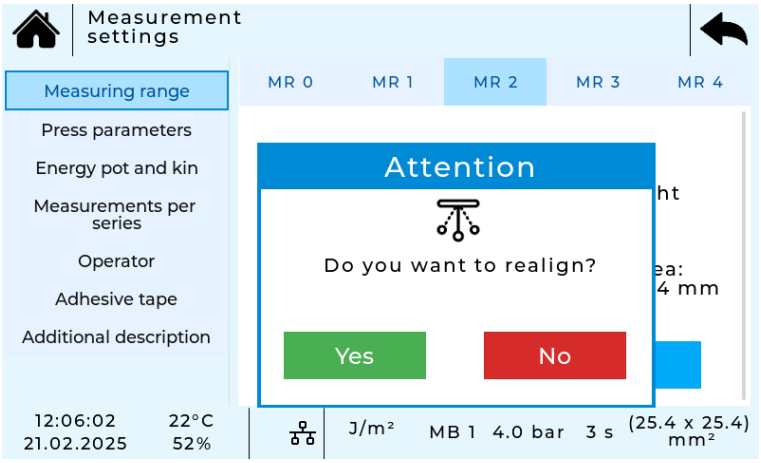
The settings remain in place until the next change is made, even if the device is switched off.

5.1. Measuring range

Under *Menu – Measurement Settings – Measurement range*, the measurement range is set using the tabs MR 0, MR 1, MR 2, MR 3 and MR 4.
Press the "**Apply**" button to confirm your selection and update the status bar.
The image shows the weight that must be mounted on the pendulum and the corresponding surface area.
Special accessories are required for MR 4; the measuring surface is **15.0 mm x 25.4 mm**.



When changing the measuring range, it is recommended to align the device.
Confirming with *Yes* takes you to the menu item *Check – Alignment*.



! **The selected measuring range must correspond to the additional weight installed!**

! The screws on the weights must be tightened evenly and not too tightly so as not to alter the pendulum geometry.
The upper edge of the weight must rest against the upper stop of the pendulum and the grub screws must face the operator.

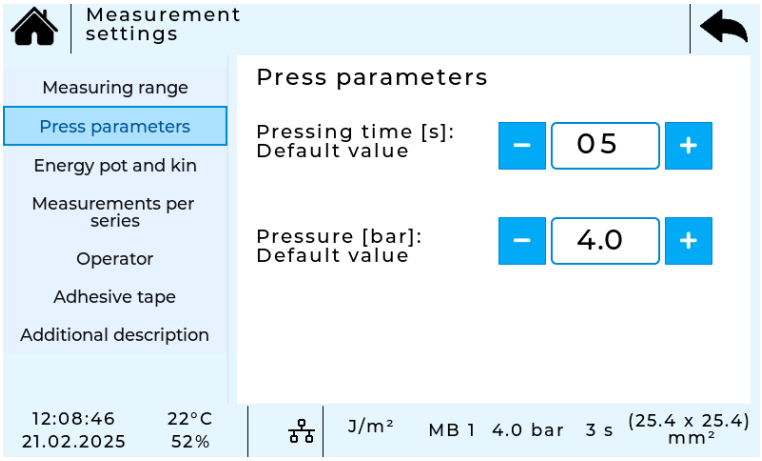
The measuring ranges are assigned as follows:

• **Range 0**	pendulum only	**50**	J/m²	bis	**400**	J/m²
	(**without** weight)	**24**	10^{-3} ft-lb/sq.in.		**190**	10^{-3} ft-lb/sq.in.
		32	mJ/sq.in.		**258**	mJ/sq.in.
• **Range 1**	weight no. 1	**100**	J/m²	bis	**600**	J/m²
	(small weight)	**48**	10^{-3} ft-lb/sq.in.		**286**	10^{-3} ft-lb/sq.in.
		65	mJ/sq.in.		**387**	mJ/sq.in.
• **Range 2**	weight no. 2	**300**	J/m²	bis	**1200**	J/m²
	(medium weight)	**143**	10^{-3} ft-lb/sq.in.		**571**	10^{-3} ft-lb/sq.in.
		193	mJ/sq.in.		**774**	mJ/sq.in.
• **Range 3**	weight no. 3	**600**	J/m²	bis	**2400**	J/m²
	(large weight)	**286**	10^{-3} ft-lb/sq.in.		**1142**	10^{-3} ft-lb/sq.in.
		387	mJ/sq.in.		**1548**	mJ/sq.in.
OPTION with additional accessories						
• **Range 4**	weight no. 3	**1050**	J/m²	bis	**4000**	J/m²
	(large weight)	**500**	10^{-3} ft-lb/sq.in.		**1903**	10^{-3} ft-lb/sq.in.
	small area	**677**	mJ/sq.in.		**2581**	mJ/sq.in.

Range limits are adjusted to the working capacity of the pendulum. The maximum working capacity of a measuring range is determined by calibration (empty stroke) in accordance with section 4.2.

5.2. Press parameters – pressing time and pressure

The pressing time and pressure are adjustable.



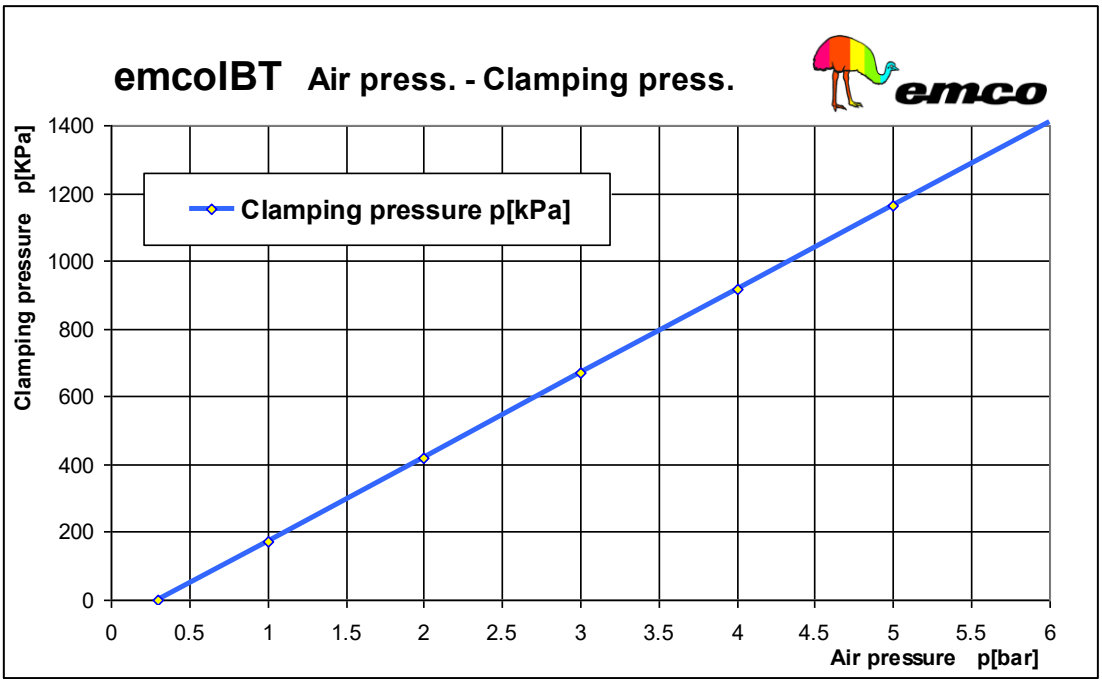
The pressing time can be selected within a range of 1 to 60 seconds, with a step size of one second.
The effective contact pressure is adjusted via the air pressure from 2 bar to 6 bar, with a step size of 0.1 bar (see table Air pressure – contact pressure).
The pressure can be displayed in bar, psi or kPa.
For the standardised measuring surface of 25.4 mm × 25.4 mm, a maximum contact pressure of approx. 1385 kPa is achieved at an air pressure of 6 bar.

All five samples are pressed simultaneously, with a separate pneumatic cylinder being used for each sample. The air pressure is controlled electronically.

! Due to the smaller measuring area (15.0 x 25.4 mm²), different force-pressure ratios apply for the MR 4 measuring range extension. The setting is made in bar as usual. The pressing force is output in bar in the same way as for the large measuring area.

Table: Air pressure – contact pressure for MR 0 to MR 3

Air pressure [bar]	Pressing force [N]	Pressure [kPa]	Pressure [psi]
2	254	394	57
3	414	642	93
4	574	890	129
5	734	1138	165
6	894	1385	201



5.3. Result output

Under *Measurement Settings – Result Output,* select the display of the calculated energy, potential energy (E_{pot}) or kinetic energy (E_{kin}):

Result output

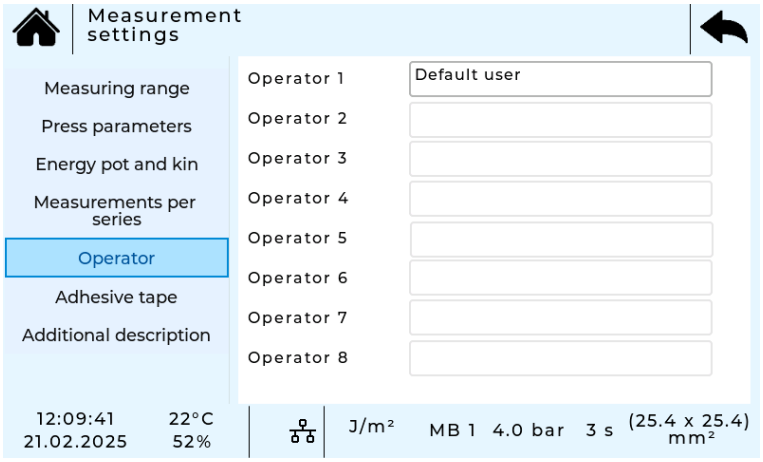
- Potential energy (E_{pot})
- Kinetic energy (E_{kin})
- E_{pot} and E_{kin}

5.4. Measurements per series

Five or ten measurements can be combined into a series.
The mean value and standard deviation are determined across the series.

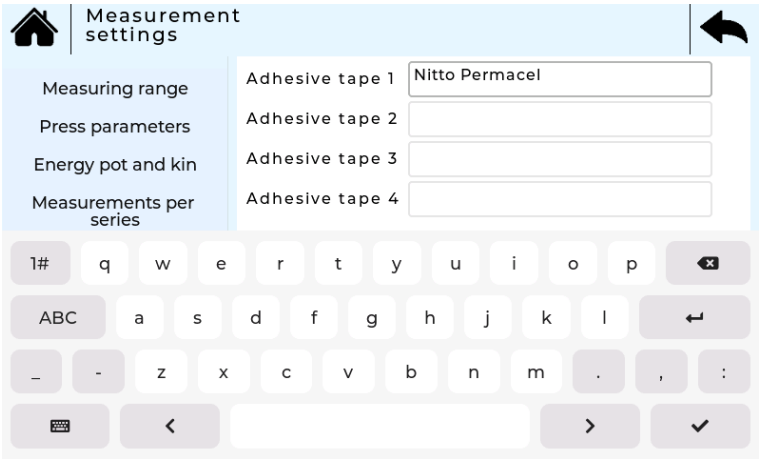
5.5. Operator

Up to eight operators can be preselected.
These can be assigned to the respective measurement job under *Operator* when creating a measurement task.



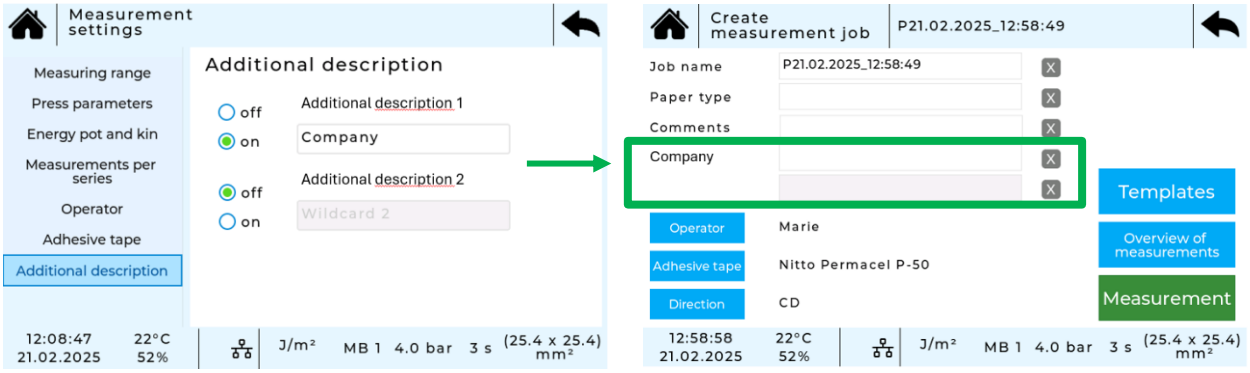
5.6. Adhesive tape

Four different types of adhesive tape can be created.
These can be assigned to the respective measurement job under *Adhesive tape* when creating a measurement task.

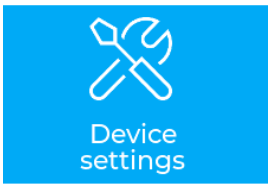
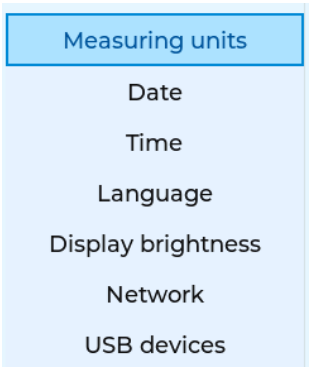


5.7. Additional decription

The menu item *Additional description* allows you to add one or two fields for further description of the measurement order.
The input fields can be activated (on) or deactivated (off).
A description can be entered using the keyboard.
If the fields are activated, they appear in the measurement job under the “Comments” field.



6. Device settings

	Select **Device settings** from the menu.
	Select the appropriate function from the submenu on the left-hand side.

!

The changes are saved as soon as you click *Yes* to the save prompt when exiting the settings.

The settings remain in place until the next change is made, even if the device is switched off.

6.1. Measuring units

Under *Device Settings – Measurement unit,* you can select the display units for Internal Bond strength, temperature and pressure:

Result display Internal Bond strength	• J/m² • m ft lb/in² • mJ/in²
Temperature display	• Degrees Celsius °C • Degrees Fahrenheit °F
Pressure display	• bar • psi • kPa

The units are updated in the status bar.

6.2. Date

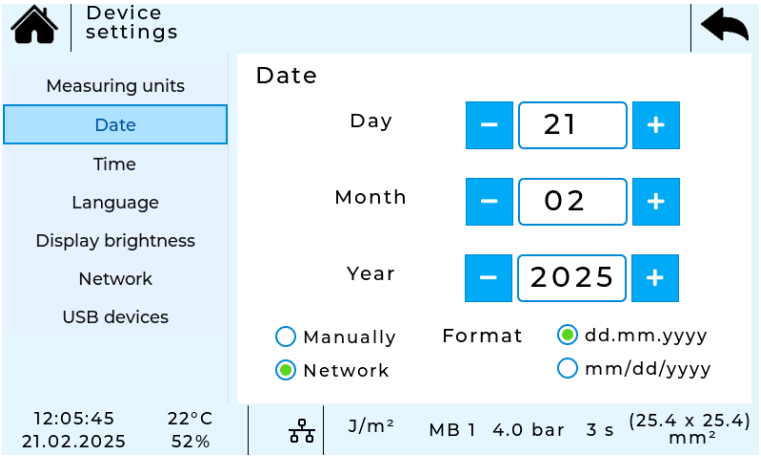
The date can be set manually or via the network using this menu item.
If you select 'manual', the day, month and year can be set using the – and + buttons.



The date format display can be selected as follows:

- dd.mm.yyyy
- mm/dd/yyyy

The date is displayed in the status bar.



6.3. Time

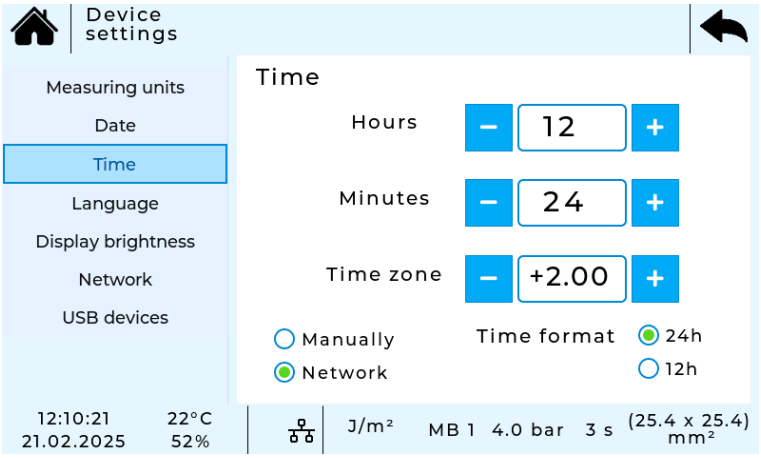
The time can be set manually or via the network using this menu item.
If you select ‘manual’, you can set the hours, minutes and time zone (UTC) using the – and + buttons.



Selecting the time format will display the corresponding format:

- 24 h
- 12 h

The time is displayed in the status bar.
The time should be checked from time to time and adjusted if necessary.



6.4. Language

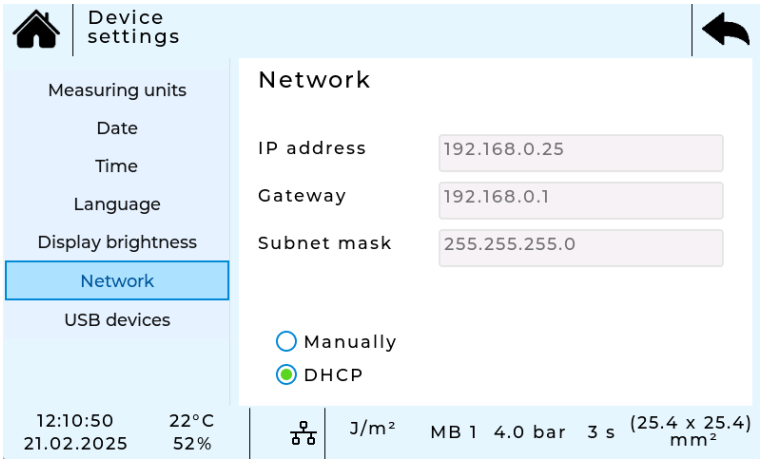
The language version of the menu control can be selected from German, English, French, Italian, Spanish, Slovenian, Polish and Czech. Extensions for other languages are available as an option.

6.5. Display brightness

The brightness of the display can be adjusted using the bar.

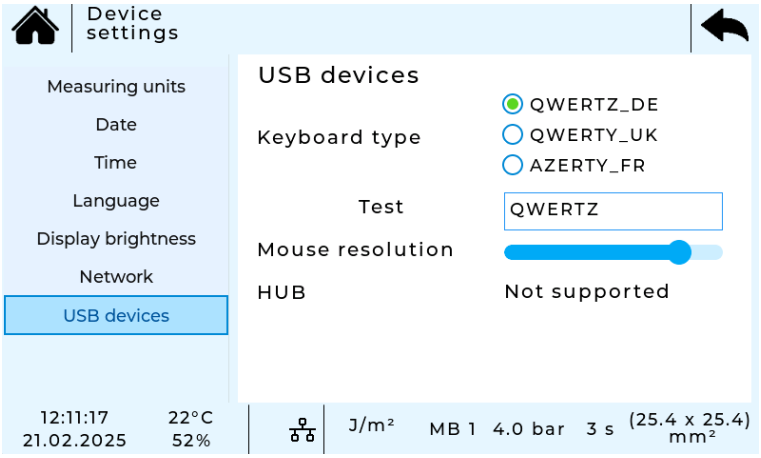
6.6. Network

Under Network, you can enter the IP address, gateway and subnet mask to establish a connection to a PC.
You can select ‘Manual’ or ‘DHCP’.

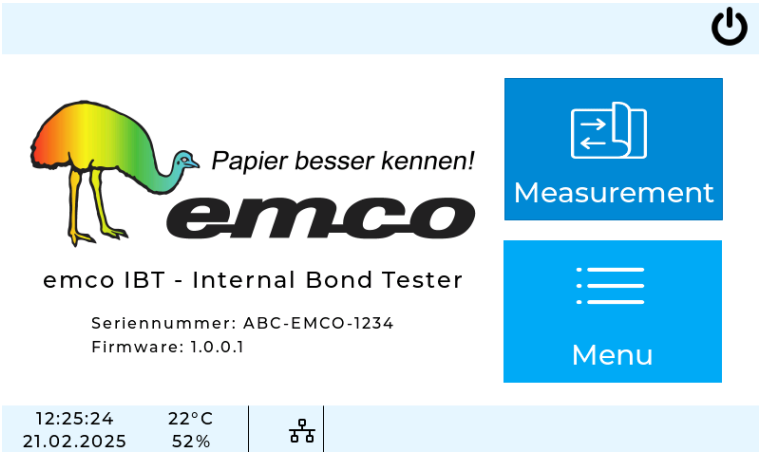


6.7. USB devices

It is possible to connect a keyboard or mouse in addition to the on-screen keyboard.
The keyboard display and mouse resolution can be set here.
The connected storage medium is displayed under *Storage*.



7. Measurement



After switching on the device, the serial number of the device and the firmware version appear on the display.

On the right, select the **Measurement** option.

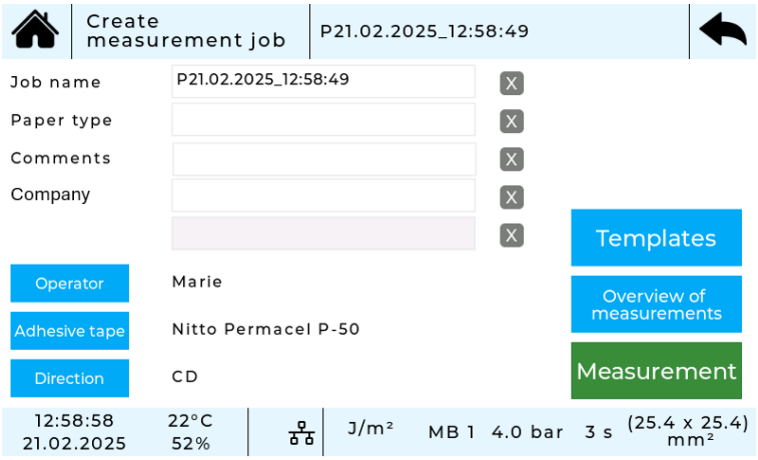
7.1. Create measurement job

A name can be assigned under *Create measurement*.
The measurement is saved with the date and time in the following format as a preselection: Dd.mm.yyyy_hh:mm:ss

Please note that the name must **not** contain any special characters that are not supported by the operating system. Otherwise, data transfer will not be possible.

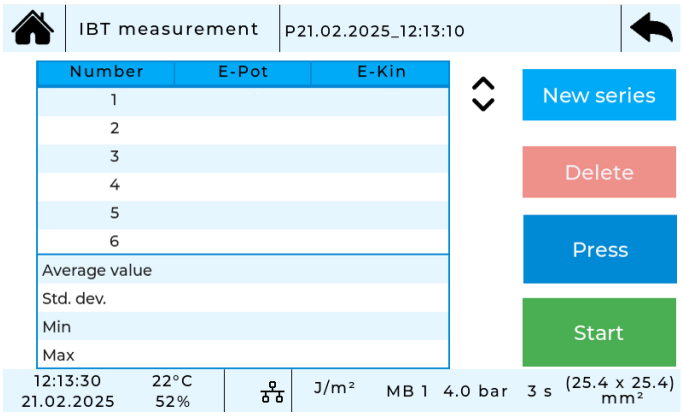
Freely selectable text fields are Name, Type, Comments and, optionally, two additional designations (can be set under *Measurement settings – Additional description*).

Entries in the text fields can be deleted using the X -button.

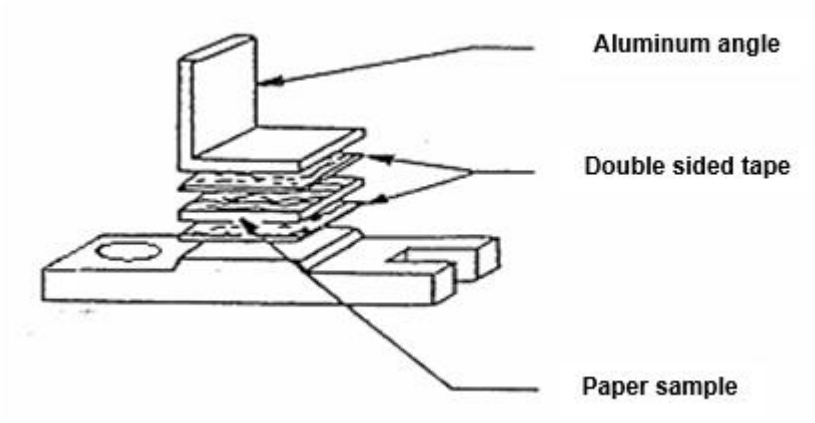


You can scroll through the operator, adhesive tape and alignment by clicking the buttons.

Operator	Operators from 1 to 8, adjustable under *'Measurement settings – Operators'*
Adhesive tape	Adhesive tape from 1 to 4, adjustable under *'Measurement settings – Adhesive tape'*
Direction	- MD - CD - unknown

Templates	Leads to the template overview. A template can be selected and the settings are adopted from the template.
Overview of measurements	Leads to the overview of measurement jobs.
Measurement	The measurement window is displayed and the measurements can be carried out. 

The sample is prepared in accordance with TAPPI T 569 and ISO 16260. A material sample is secured between the sample holder and the aluminium angle so that the sample is fixed on both sides using double-sided adhesive tape.

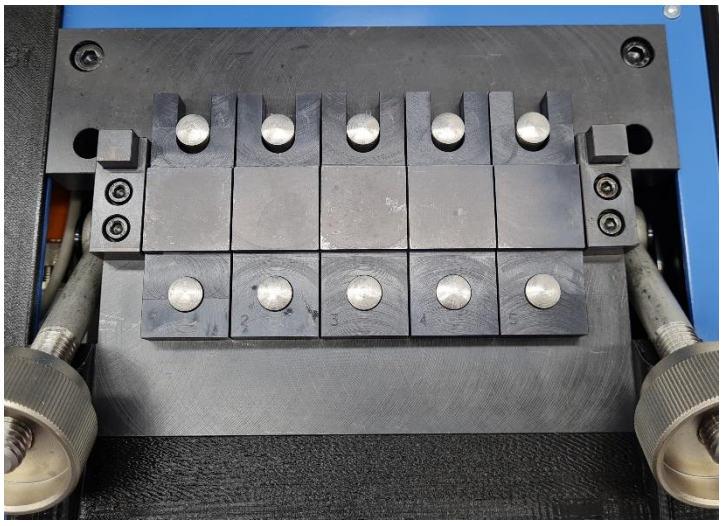


Setup of a sample after sample preparation

! Please pay attention to the numbering of the sample carriers and aluminium angles!

7.2. Preparation of samples

1. Cut strips measuring 25.4 mm (1 inch) in width and approx. 150 mm in length from the test material.
2. Insert the five sample holders (also known as anvils) correctly into the press station.

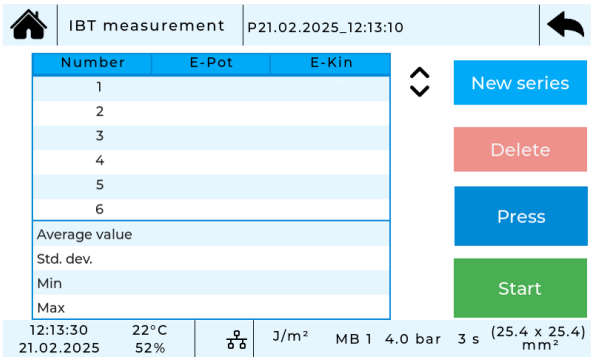


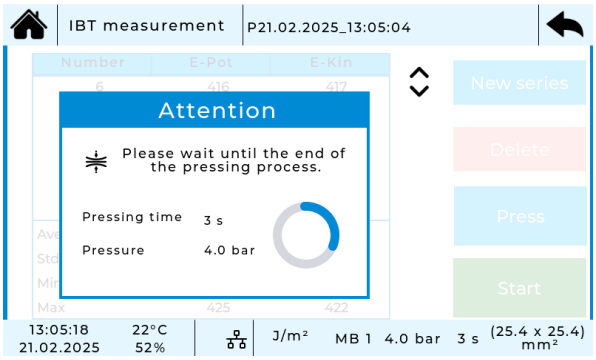
Press station with correctly inserted sample carriers

3. Then stick the double-sided adhesive tape onto the sample carriers.
4. Remove the backing film from the adhesive tape and stick the sample onto it.
5. Stick another strip of double-sided adhesive tape onto the test piece and remove the backing film.
6. Fit the brace equipped with five precision angles.

Ensure that the angles are correctly oriented and numbered!

7. Fold up the two side-adjustable screws and tighten the knurled nuts **by hand without applying pressure**.
8. Click the "**Press**" button.



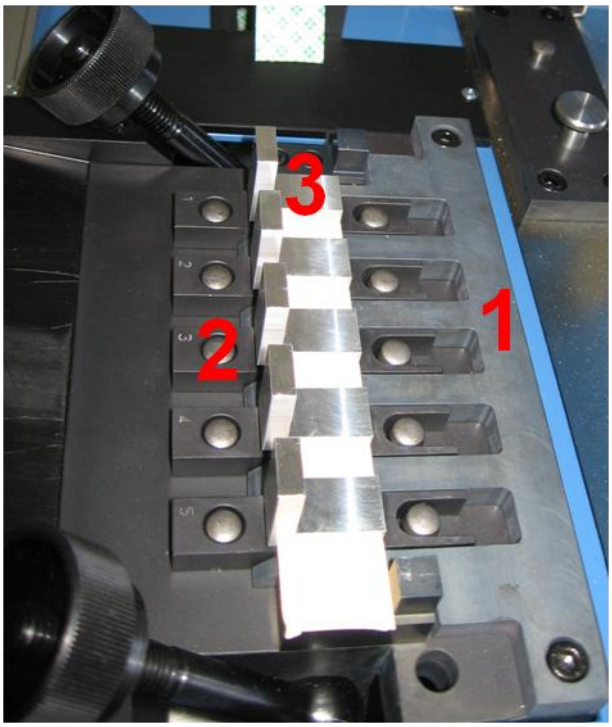


9. Once the set pressing time has elapsed, open the pressing device.
10. Lift off the brace so that the anvils remain in place with the angles.
11. Use the cutter knife to cut the samples apart. Make sure that the protruding ends on the right and left are also cut off cleanly.

A clean and sharp cutter knife should be used to separate the samples in order to prevent the adhesive tape from forming 'bridges' across the sample at the cut points.

12. The anvils can now be inserted into the sample holder one after the other.

Sample preparation Special version Measuring surface 15.0 x 25.4 mm²:
The accessories listed under 1.5 Scope of delivery are required for the MR 4 measuring range extension option. Follow the points listed above and use the special materials for preparation: brace, anvils (2) and angles (3).



Press station with special accessories for measuring surface 15.0 x 25.4 mm²

0. Attach the cutting guide (1) using the knurled screws. Please ensure that the special anvils can be used with symmetrical and evenly distributed spacing.

…

13. Remove the remaining adhesive tape strips from the cutting guide. These are not required for the measurement.

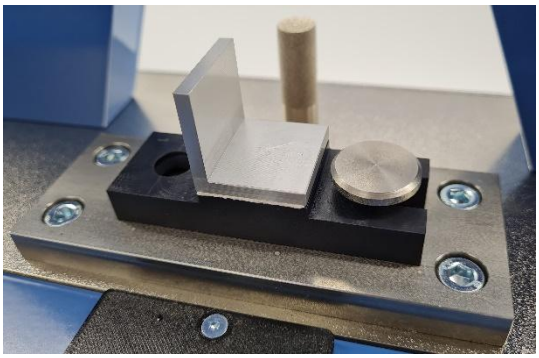
! For successful testing of samples with high internal bond strength, a suitable adhesive tape with very high adhesion to steel and aluminium must be selected! The pressure and time may need to be adjusted.

7.3. Performing the measurement

Select the measuring range suitable for the sample (see section 5.1) and prepare the sample (see section 7.2).

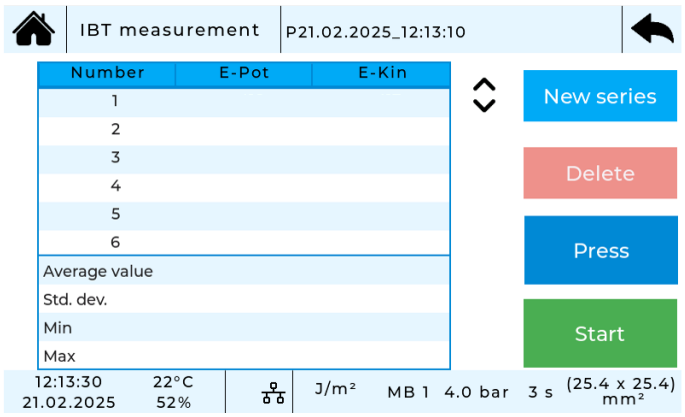
! Check that the measuring range corresponds to the pendulum weight installed!

The pendulum is moved to the horizontal starting position (90°) just before each measurement. The pendulum is held magnetically in this position.



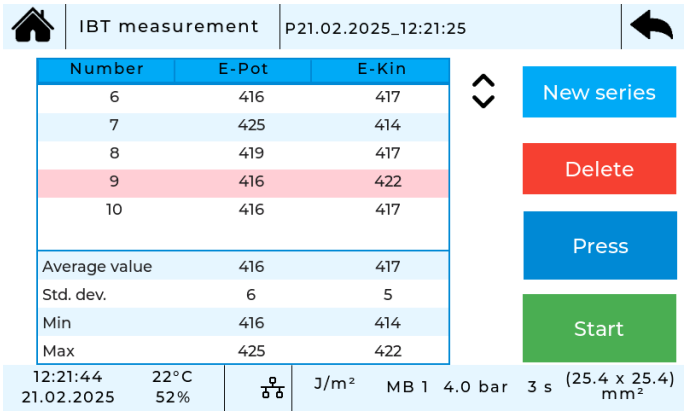
Sample holder with sample carrier

Insert the prepared sample carrier into the holder.



When the "**Start**" button is pressed, the sample holder (anvil) is locked pneumatically and the pendulum is released.

The process is repeated for 5 or 10 measurements.



The "**Delete**" button can be used to eliminate individual measured values (e.g., outliers).
To delete, select the respective line. Click on ⇕ to scroll through the results.

Before starting a new series of measurements, select "**New series**."

The status bar displays the energy unit of measurement, the measuring range, the sample press settings (pressure and time), and the current climate data.

! If the pendulum does not release after pressing the start button, it must be realigned under *Check – Alignment* (see section 4.1).

! Perform the necessary repeat measurements until the standard deviation is stable.
Due to the smaller measuring area (15.0 x 25.4 mm²), a double determination may be necessary for this.

7.4. Basis for calculation

Five or ten individual measurements can be combined into a series. The mean value, standard deviation (Std. Dev.), minimum, and maximum are shown on the display below the individual measurements.

Average value (AVG):

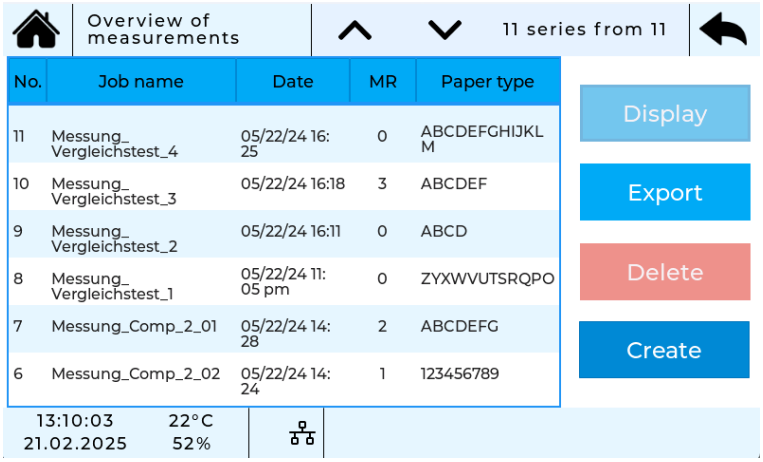
$$AVG = \frac{x_1 + x_2 + ...x_n}{n}$$

Standard deviation (DEV):

$$DEV = \sqrt{\frac{n\sum x^2 - (\sum x)^2}{n(n-1)}}$$

8. Overview of measurements

In the *Overview of measurements* menu item, you can view, export, or delete saved measurement orders.
After selecting the measurement order(s) by highlighting the respective line, you can edit, delete, or apply them.
You can scroll through the measurement orders by clicking on
The "**Create**" button takes you to the *Create measurement job* screen. From there, you can perform a new measurement using the "**Measurement**" button.
A maximum of 50 entries can be saved. After that, the measurement orders must be transferred to a storage medium and/or deleted using the "**Export**" button in order to be able to save new measurements on the device.

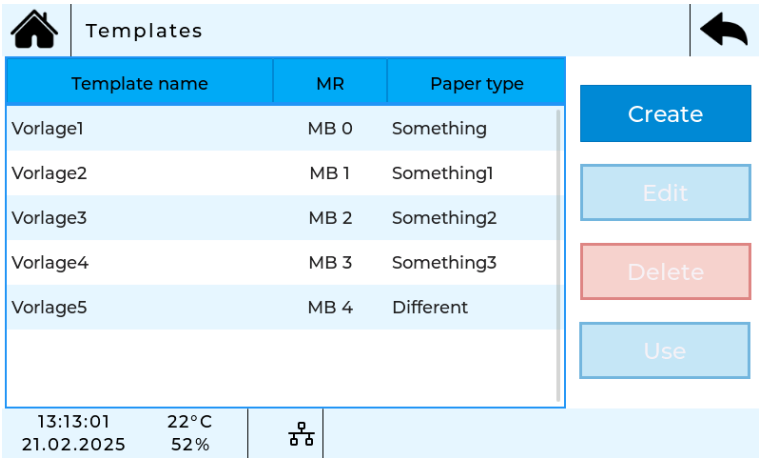


Display	"**Display**" leads to a detailed view of the respective measurement order. The Comment field can be edited.
Export	The measurement jobs can be transferred to a USB flash drive or via the network. After exporting, all measurement jobs can be deleted.
Delete	The selected measurement tasks are deleted.
Create	You can start a new measurement job. You will be taken to the *Create measurement job* screen, where you can perform the measurements.

9. Templates

You have the option of configuring and saving settings for *Create measurement job*.

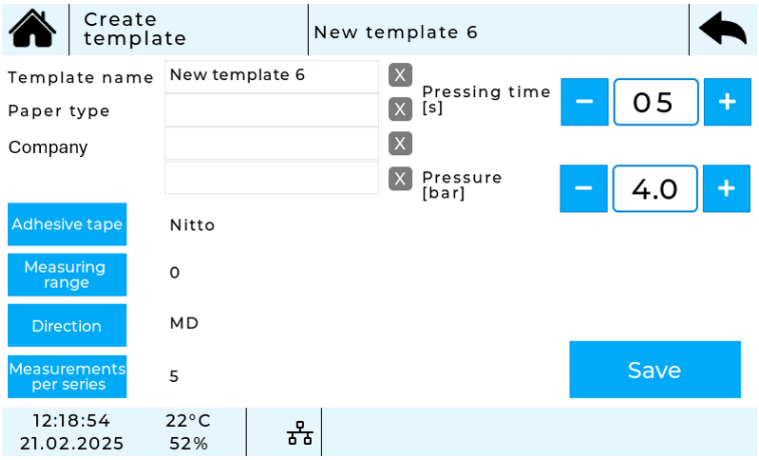
Under **Templates**, you will find a tabular overview of the saved templates. The template name, measurement range, and paper type are displayed.
After selecting the template by clicking on the template name, it can be edited, deleted, or applied.
"**Use**" leads to *Create measurement job* with the saved settings. "**Create**" creates a new template.



Create	A new template can be created.
Edit	A selected template can be edited and the settings adjusted.
Delete	The selected templates are deleted.
Use	The selected template is used.

9.1. Create templates

A new template can be created from the template overview by clicking "**Create**."
A maximum of 6 templates can be saved.



The following settings can be saved as a template for the measurement job.

Adhesive tape	Adhesive tape from 1 – 4 (default settings under *Measurement settings – Adhesive tape*)
Measuring range	MR 0, MR 1, MR 2, MR 3 or MR 4
Direction	MD, CD or unknown
Measurements per series	Selection of 5 or 10 measurements per series
Pressing time [s] − 05 +	Pressure time in seconds, selectable from 1 – 60 seconds
Pressure [bar] − 4.0 +	Pressure in bar, psi or kPa
Save	Saves the template. The template appears in the template overview.

10. Information

10.1. Device information

Information about the device, hardware, and software versions can be found here.

10.2. System status

The status of the installed components is displayed. If the status is “not OK,” please contact *emco* GmbH support.

The “**Reset counter**” button resets the sample counter to 0.

10.3. Update Status

The current status of available updates and versions is displayed.
If an update is available, you can install it by clicking “**Update**”.
To install a new software version on the Internal Bond Tester, the current version (.bin file) must be transferred to the device via USB flash drive or the User Tool.

- **Export settings:** Here, the current device settings can be saved as a jsn file on a USB flash drive.
- **Import settings:** New device settings or backups can be loaded from a USB flash drive onto the device.
- **USB flash drive:** Save the three individual files to an empty *emco* USB flash drive. Connect the stick to the device. You will be automatically directed to the *Update Status* menu item. Wait until the data has been read in and click on “**Confirm**”. Press the “**Update**” button to install the update.

  ! Please ensure that the pendulum is in the 0° position, as it will be released during the update process!

- **User Tool:** Once the connection has been successfully established, select the blue *Firmware File1* field in the Status tab. The file explorer will open. Navigate to the location where the update files received from *emco* GmbH are stored. Select it and press *Open*. Repeat the process for *Firmware File2* and *Firmware File Images*. Once the update files have been loaded correctly, a tick will appear in the window. The update can now be started by pressing the “**Firmware Update**” button. For further information, please refer to the User Tool manual.

10.4. Contact

If you have any questions or technical problems, please contact your *emco* GmbH service partner or contact us directly at:



emco Elektronische Mess- und Steuerungstechnik GmbH
Mommsenstraße 2
D-04329 Leipzig
Germany

Phone: +49 341 27146-0
E-Mail: emco@emco-Leipzig.de
Web: www.emco-Leipzig.de

10.5. Licence information

The programmes and licences used can be found under *licence information*.

11. Annex

11.1. Technical Data *)

Measuring range:	4 ranges – 400 J/m²/ 600 J/m²/ 1200 J/m²/ 2400 J/m² (pendulum from approx. 0.25 J to 1.5 J working capacity) (option MR 4 up to 4000 J/m²)
Repeatability:	< ± 2 % (calibration see section 3.3.)
Angular resolution:	0.04°/ 0.09° (depending on the device version)
Dimension:	25.4 mm x 25.4 mm (1.0 inch x 1.0 inch)
Number of samples:	5 pieces
Pressure:	max. 1385 kPa (at 6 bar compressed air, 0.1 bar step size, electronically controlled)
Pressing time:	1 to 60 seconds (1 s – step size)
Dimensions (BxHxT)**:**	500 mm x 400 mm x 520 mm
Weight:	approx. 35 kg
Power supply:	INPUT: 100 V – 240 V AC; 1.1 A OUTPUT: 24 V DC 1.25 A
Compressed air:	6 bar, filtered, oil-free according to ISO 8573-1:2001 purity class 6-3-4
Ambient conditions:	standard climate according to DIN EN ISO 20187 23 °C, 50 % rH Condensation-free

*) ***emco* GmbH reserves the right to make technical changes.**

11.2. Spare parts

Expendable items:	Adhesive tape type 3M™ – 410 Adhesive tape type Permacel, P-50, nitto denko Adhesive tape type tesafix 4961
Measuring equipment:	Precision aluminium angles Sample carrier (anvil)

11.3. Accessories – optional

Sample strip cutter:	*emco* MSS – Multi Sample Slitter 25.4 mm (1.0 inch) *emco* PZS – Sample Cutter 25.4 mm (1.0 inch)
***emco* Internal Bond Pendulum Check:**	Tappi T 569 compliant test case for checking the condition of an Internal Bond Tester
IBT Measuring range extension MB4:	Measuring range extension for very high Internal Bond strength with smaller measuring area (25.4 x 15.0 mm²)

11.4. Disclaimer

emco GmbH accepts no liability or claims for incorrect measurements, incorrect handling, misinterpretation of the results or misinterpretation of the text in the operating instructions.

You will find a serial number and warranty seal on every device. If either of these is broken, no warranty claims can be made.
In the event of a defective device, please return your device to *emco* GmbH with a brief description of the fault.