Haftprüfgerät
Pull-off Tester

DYNA Z / DYNA Z...E

Bedienungsanleitung

Operating Instructions

ISO 9001

proceq

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Änderungen vorbehalten
Subject to change

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Contents

1 Safety

1.1 General Information

Please read through these operating instructions carefully before initial startup. They contain important information about safety, use and maintenance of the pull-off tester and its components.

1.2 Liability

Our "General Terms and Conditions of Sale and Delivery" apply in all cases. Warranty and liability claims arising from personal injury and damage to property cannot be upheld if they are due to one or more of the following causes:

- Failure to use the pull-off tester and its components in accordance with its designated use
- Incorrect performance check, operation and maintenance of the pull-off tester and its components
- Failure to adhere to the sections of the operating instructions dealing with the performance check, operation and maintenance of the pull-off tester and its components
- Unauthorized structural modifications to the pull-off tester and its components
- Serious damage resulting from the effects of foreign bodies, accidents, vandalism and force majeure

1.3 Safety Regulations

1.3.1 General Information

- Perform the prescribed maintenance work on schedule.
- Carry out a performance check once the maintenance work has been completed.
- Handle and dispose of lubricants and cleaning agents responsibly.

1.3.2 Unauthorized Operators

The pull-off tester and its components are not allowed to be operated by children and anyone under the influence of alcohol, drugs or medication.

Anyone who is not familiar with the operating instructions must not use the pull-off tester and its components or must be supervised when using it.

1.3.3 Safety Icons

The following icons are used in conjunction with all important safety notes in these operating instructions.

Danger!
This note indicates a risk of serious or fatal injury should certain rules of behavior be disregarded.

Warning!
This note warns you about the risk of material damage, financial loss and legal penalties (e.g. loss of warranty rights, liability cases, etc.).

This denotes important information.

1.4 Designated Use

The pull-off tester is a mechanical device which serves to check the quality of adhesion and adhesive strength of different materials (concrete, plaster work, coatings, color, etc.) depending on customer specifications.

Warning!
The device is to be used solely on the surfaces to be tested (see chapter 2.1).

1.5 Standards and Regulations Applied

- ISO 4624	International
- BS 1881 part 207	Great Britain
- DIN 1048 part 2	Germany
- ZTV SIB 90	Germany
- SIA 2002	Switzerland
- NF P 18-853	France
- ASTM D 4541-85	USA
- ACI 503-30	USA
- EN 1015-12	Europe (for mortan)
- EN 1348	Europe

2 Product Description

2.1 Field of Application

The DYNA pull-off tester is a mobile and versatile device with the following fields of application:

Measuring the adhesive strength of applied coatings:
This includes, for example, plastic coatings, concrete coats, mortars and plasters, bituminous coats as well as paint finishes and coatings of metals.

Determining the surface strength of concrete and other materials:
The surface strength is tested directly on the component. Any measuring point can be used and there is no need to embed the sample in the concrete first.

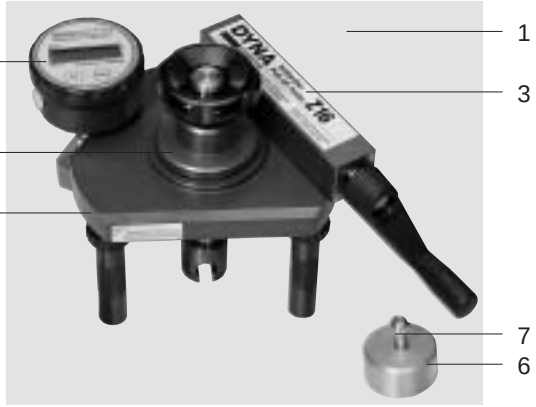
The legs can be moved and/or extended on all models and the measuring procedure can be perfectly adapted to the test situation.

All measurements can be carried out using test discs with different diameters.

The standard diameter of a test disc is Ø 50 mm.
Test discs with other diameters can be ordered directly from PROCEQ or authorized agencies (see chapter 7.2, Accessories).

All pictures of the pull-off tester (1) are refering to the model Z16(E).

2.2 DYNA Z Pull-Off Tester, with Digital Manometer



1 Pull-off tester
2 Digital manometer
3 Hydraulic pump
4 Piston
5 Device plate
6 Draw bolts
7 Test disc

Fig. 2.1 DYNA Z Pull-off tester, with digital manometer

The DYNA Z pull-off tester (1) is fitted with a digital manometer (2) to indicate the tension (or, as an option, the force).

The DYNA Z model can perform the following functions:
- Measurement and display of the current value
- Measurement and display of the peak value

2.3 DYNA Z...E Pull-Off Tester, with Display Unit, DYNAMETER

1 Pull-off tester
3 Hydraulic pump
5 Device plate
6 Test disc
7 Draw bolt
8 Electronic measuring cell
9 Display unit DYNAMETER
10 Keyboard
11 Display

Fig. 2.2 DYNA Z...E Pull-off tester, with display unit, DYNAMETER

The DYNA Z...E pull-off tester, (1) is equipped with an electronic measuring cell (8) and a display unit, DYNAMETER (9) with keyboard (10) and display (11). The DYNA Z...E model has the following functions:

- Measurement of the adhesive strength and adhesion
- Display of the peak value and current value: The values can either be indicated as force or tension (surface load) in different units depending on individual specifications
- Input and indication of the sample number and sample dimension
- Specification of the speed of load application
- Storage of up to 1000 measured values
- Transferring the measured data directly to a connected printer or PC
- Online display possible on a PC or laptop with special software

3 Startup

3.1 DYNA Z Pull-Off Tester, with Digital Manometer

3.1.1 Starting up the Digital Manometer

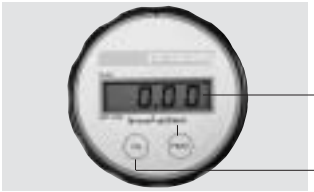


Fig. 3.1 Display of the digital manometer

- Press the **"ON"** key to switch on the digital manometer (2).

"0.00" is displayed (see Fig. 3.1).

If no display appears, replace the batteries.

- Press the **"ON"** key again to switch off the digital manometer (2).

The digital manometer switches off automatically after approx. 10 minutes to save power. The battery capacity is sufficient for approx. 120 operating hours.

Two hours before the battery is drained and stops operating, the warning symbol "⌐" appears in the left of the display to indicate that the battery capacity is too low.

3.1.2 Replacing the Battery

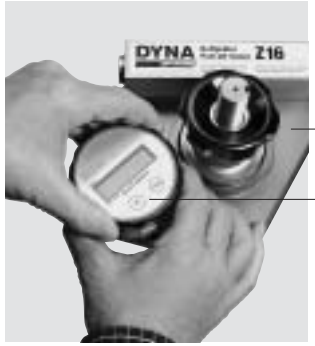


Fig. 3.2 Replacing the battery

Warning!
When opening the cover, ensure that the wires between the cover and the pressure sensor in the housing are not torn off.

- Turn the cover of the digital manometer (2) counterclockwise and carefully pull the cover upwards at the same time (see Fig. 3.2).
- Loosen the screw of the battery fastening and replace the battery.

Only use 9 volt monobloc batteries (AM6/6LR61).

- Install the battery in reverse order.
- Then turn the cover clockwise until it reaches its initial position (see Fig. 3.2).

3.2 DYNA Z...E Pull-Off Tester, with Display Unit, DYNAMETER

3.2.1 Connecting Devices

21 Input socket for power supply unit/external battery
22 Input socket for PC/printer
23 Input socket for pull-off tester
24 not active

Fig. 3.3 Input sockets of the DYNAMETER

- Connect the connection cable of the pull-off tester to the **INPUT A** (23) socket of the DYNAMETER.
- If you want to connect the DYNAMETER to a printer or PC, connect the transmission cable to the **INTERFACE RS 232** (22) socket.

3.2.2 Starting up the DYNAMETER

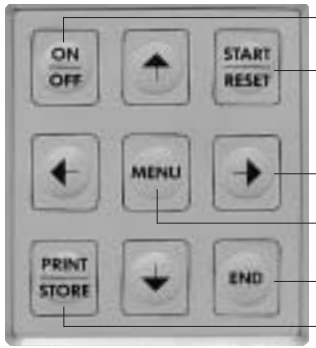


Fig. 3.4 Keyboard (10) of the DYNAMETER

- Press the **"ON/OFF"** key for one second.

If nothing appears on the display, replace the batteries.

The following information is displayed briefly:
- Serial number of the DYNAMETER

Warning!
Check to see if the serial number of the DYNAMETER matches the serial number of the pull-off tester (located on the side of the device plate, 5).
You will only receive correct measuring results if the two serial numbers are identical.

English

- Installed software version
- Confirmation of the automatic self-test (**"Test o.k."**)
- Expected remaining battery life

Then the display automatically switches to the following measuring display (without the values shown in the example):

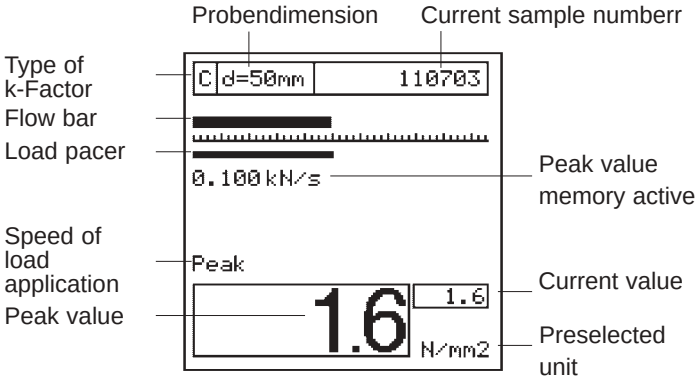


Fig. 3.5 Measuring display in the display (11) of the DYNAMETER

*The **settings** of the last measurement are maintained even after the device is switched off. They are indicated when the device is switched on again (see Fig. 3.5). The* **values** *of the last measurement are **no longer** displayed.*

The display unit is now ready for operation.

All parameters can be changed with the menu options in the main menu (see chapter 4).

- Press the **"ON/OFF"** key again to switch off the DYNAMETER.

3.2.3 Replacing the Batteries

- Open the cover at the bottom of the DYNAMETER.
- Disconnect the electric connection and replace the batteries (6 round cells, type 1.5 volt LR6)

Wrap adhesive tape around the battery holder and the batteries before installing them so they cannot become jammed in the battery compartment when they are replaced.

- Close the cover.

4 Settings

4.1 Menu Options in the Main Menu

The DYNAMETER has a menu with user navigation. Please follow the instructions in the displayed menu.

Warning!
The settings may vary depending on the measurement. Check the settings of the DYNAMETER prior to every new measurement!

- After starting up the DYNAMETER (see chapter 3.2.2), press the **"MENU"** key on the keyboard.

The following main menu appears in the display (11):

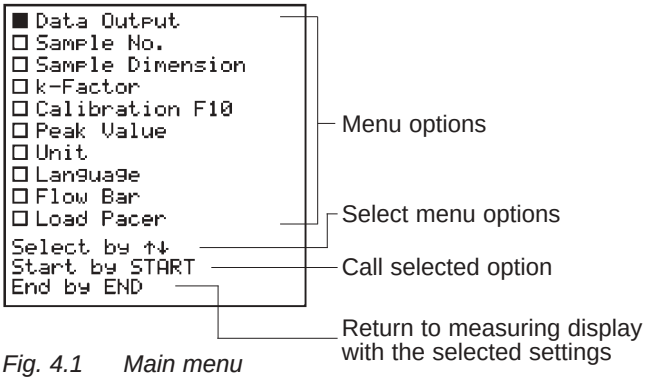


Fig. 4.1 Main menu

The menu options of the main menu point to submenus, or directly to certain setting options.

The individual menu options are always selected and set using the arrow keys on the keyboard:

- Select the corresponding menu option in the main menu with the arrow keys ↑↓.
- Press the **"START/RESET"** key.

Then the respective submenu appears in the display.

- Make the desired settings (positions and values) using the arrow keys ↑↓ ←→.

*Press the **"MENU"** key to return to the main menu (see Fig. 4.1).*
*Press the **"END"** key to return to the measuring display (see Fig. 3.5).*

4.2 Functions of the Menu Options

In this chapter you will become familiar with the functions of the individual menu options.
The titles of the chapters correspond to the menu options of the main menu.

4.2.1 Data Output

With this menu option you can select the type of data output or delete data after the measurement is finished.

English

• Select the menu option **"Data Output"**.

The following submenu appears in the display (11):

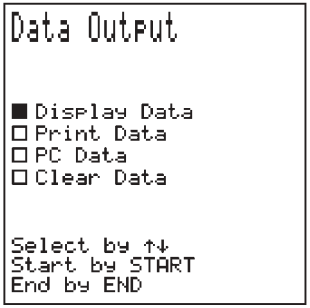


Fig. 4.2 Data Output

Display Data

• Select the menu option **"Display Data"**.

The data of the last measurement are displayed.

• Press the ↑↓ arrow keys to scroll to previous/following data.

If you keep one of the two arrow keys ↑↓ pressed you will automatically scroll in the desired direction.

Print Data

Requirements for data transmission:

- Printer connection:
  serial interface
- Printer:
  EPSON compatible, recommendation:
  Martel MCP 9800
- Printer cable:
  Art. no. 330 00 460
- Data format of the printer:
  9600 baud; 8 data bit, 1 stop bit; no parity

• Prepare the printer for operation in accordance with the manufacturer´s operating instructions.

• Connect the printer cable to the **Interface RS 232** socket (see chapter 3.2.1).

• Select the menu option **"Print Data"**.

• Press the **"START/RESET"** key to start data transmission.

All data in the memory are now transmitted to the printer.

Selective data transmission to the printer is not possible.
Direct data transmission during measuring is not possible.

Data to the PC

A transfer cable (Art. no. 330 00 456) is necessary to connect the display unit to a PC (IBM-PC or compatible PC).

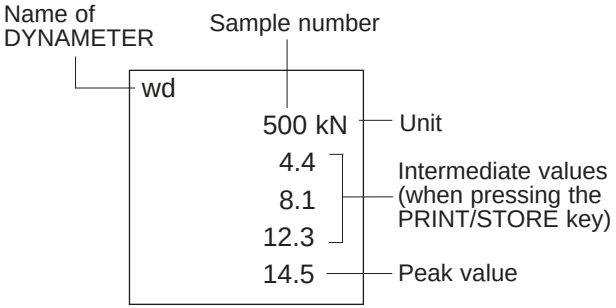
- Connect the transfer cable to the **Interface RS 232** socket (see chapter 3.2.1).
- Prepare the PC for operation in accordance with the manufacturer´s operating instructions.

Please refer to the enclosed information leaflet "Data Transfer to the PC" for further information on data transmission.

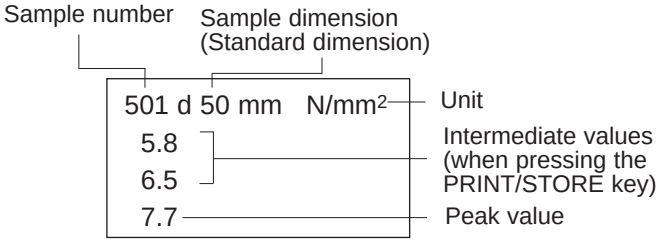
- Select the menu option **"PC Data"**.
- Press the **"START/RESET"** key to start data transmission.

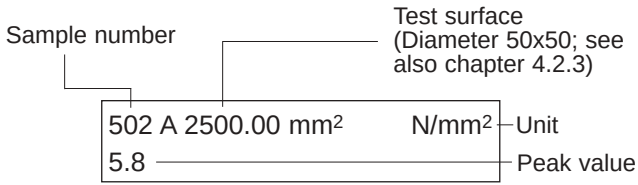
The data are transmitted in the following order (the examples below correspond to how they are displayed on the monitor of your PC):

Example with force measurement:



Examples with surface load:





English

Clear Data

- Select the menu option **"Clear Data"**.

The message **"Clear Data?"** appears on the display.

Warning!
Data cannot be cleared individually. Clearing data always means that the entire memory is deleted.

- Press the **"START/RESET"** key to delete the entire memory.

4.2.2 Sample No.

A sample number is assigned to every new measuring procedure; the number is shown in the measuring display (Fig. 3.5).

With this menu option you can assign individual consecutive sample numbers for different measurement series. For example, measurement series A could start with "001000" whereas measurement series B starts with "002000". In this way you can organize your measuring results systematically and adapt them to different measured objects.

- Select the menu option **"Sample No."**.

The following submenu appears in the display (11) (without the values shown in the example):

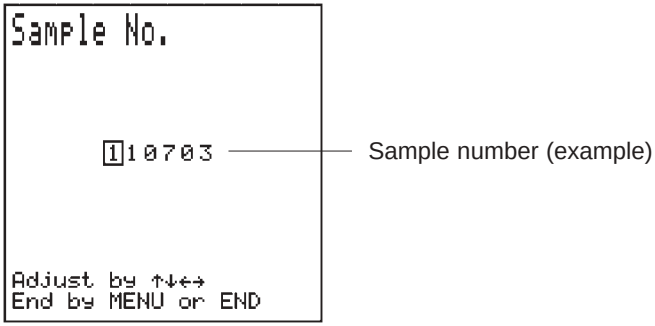


Fig. 4.3 Sample No.

- Set the desired sample number using the arrow keys ↑↓ ←→

4.2.3 Sample Dimension

Measuring procedures can be carried out using test discs with different diameters. In order for the measuring results to be calculated accordingly, the surface of the test disc must be entered via this menu option.

*Settings in this menu option depend on the setting **"Unit"** (see chapter 4.2.7)*

No settings are required for measurements with a value for the **tensile force** (**kN**, **kg**, **10^3 kg** or **kip).**

The following settings must be performed for measurements with a value for the **surface load** (**N/mm²**, **MPa**, **kg/cm²** or **psi**):

- Select the menu option **"Sample Dimension"**.

The following submenu appears in the display (11):

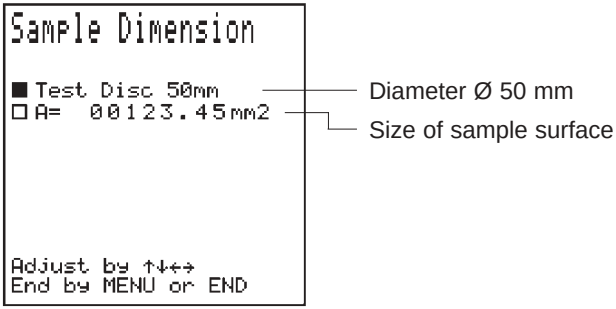


Fig. 4.4 Sample Dimension

- If you use a test disc with the diameter Ø 50 mm, select **"Test Disc 50mm"**.

The tensile force is converted into the tension with a surface area of 1963 mm2 and shown in the measuring display.

- If you use another test disc, select **"A="**.
- Set the required surface area in mm² using the arrow keys ←→.

The sample dimension can only be entered in mm². If you use another unit of measurement (e.g. inch), you have to convert the surface area into mm² accordingly.

4.2.4 k-Factor

The k-Factor serves for converting the electric signal emitted by the measuring cell (8, see Fig. 2.2) of the pull-off tester into the unit of the indicated measured value (force or tension).

To achieve maximum precision of the measured values, the pull-off tester with the DYNAMETER display unit is calibrated with ten load levels at our factory. These values are indicated in the menu option, **"Calibration F10"** (see chapter 4.2.5, Fig. 4.6).

- Check to see if the serial number of the DYNAMETER matches the serial number of the pull-off tester (see chapter 3.2.2).
- Select the menu option **"k-Factor"**.

English

The following submenu appears in the display (11):

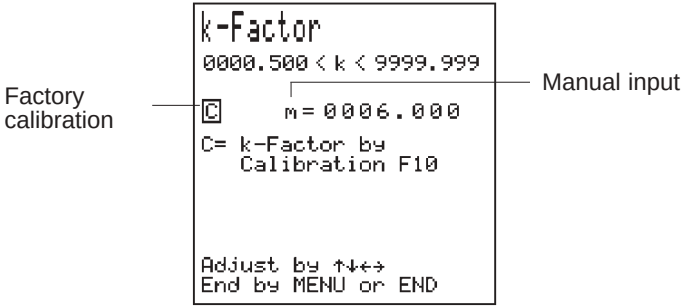


Fig. 4.5 k-Factor

- Select position **C**.

The pull-off tester uses the k-Factor values of the factory calibration for operation (see chapter 4.2.5).

- If you want to use the display unit with a different pull-off tester, select position **m**.
- Set the k-Factor of the pull-off tester using the arrow keys ↑↓ ←→.

Specifications for the k-Factor can be found in the calibration certificate or on the type plate of the pull-off tester, depending on the model.

The measured values are calculated over the entire force area with the same k-Factor. This means that the displayed values deviate slightly more (approx.1.5%) from the actual value (due to the non-linearity of the sensor).

Only use the pull-off tester with factory calibration for tests, in accordance with the relevant standards.
***For this purpose always** select position **C** (F10 calibration, see also chapter 4.2.5).*

4.2.5 Calibration F10

The k-Factors determined during the factory setting are displayed for your information in the **"Calibration F10"** menu option (see Fig 4.6). Calibration is done in steps of 10% over the entire load area (10% - 100% of the nominal load).

- Select the menu option **"Calibration F10"**.

The following submenu appears in the display (11):

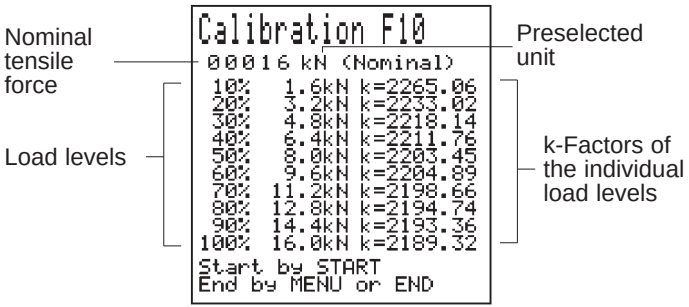


Fig. 4.6 Calibration F10

Warning!
The pull-off testers are available as a calibrated unit (pull-off tester - DYNAMETER display unit). The ***nominal tensile force*** *in the display (see Fig. 4.6) must be equivalent to the* ***nominal value of the pull-off tester****. The* ***nominal load*** *and displayed* ***k-Factor values of the individual load levels*** *must not be changed by the user. The values are only displayed for information purposes.*

For new calibration procedures, PROCEQ offers separate calibration instructions to the testing authority.

4.2.6 Peak Value

With the menu option **"Peak Value"** you can set how values are to be displayed and stored.

- Select the menu option **"Peak Value"**.

The following submenu appears in the display (11):

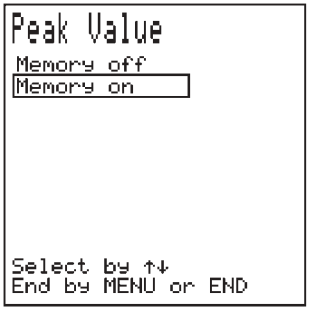


Fig. 4.7 Peak Value

- Select the desired position using the arrow keys ↑↓.

DYNAMETER offers two basic possibilities for **the display** and **storage of values**:

If you select **"Memory on"**, the DYNAMETER automatically stores the peak value after the force has significantly decreased by approx. 1% of the nominal value during a measuring procedure (if the sample breaks or in the case of manual relief).

If you select **"Memory off"**, you can perform measuring procedures with loads up to the specified test force. In this case the data of the current measurement must be stored manually.

To document that the test force has been reached proceed as follows:

- When the specified test force has been reached press the **"PRINT/STORE"** key on the keyboard to store the current value.

4.2.7 Unit

With the menu option **"Unit"** you can select the units below, depending on the specifications:

- the unit for the force: **kN**, **kg**, **10³ kg**, **kip** or
- the unit for the tension (force per surface unit): **N/mm²**, **MPa**, **kg/cm²**, **psi**

to be displayed in the measuring display.

• Select the menu option **"Unit"**.

The following submenu appears in the display (11):

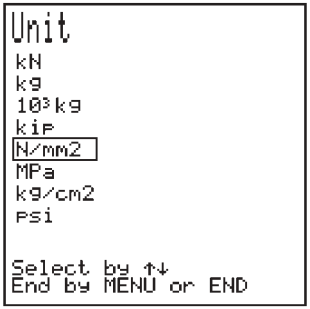


Fig. 4.8 Unit

• Select the desired unit.

The measured values are converted into the corresponding unit and shown in the measuring display.

When you select a unit for the tension (**N/mm²**, **MPa**, **kg/cm²**, **psi**), you need to ascertain and enter the value for the test surface (see chapter 4.2.3).

4.2.8 Language

• Select the menu option **"Language"**.
The following submenu appears in the display (11):

Fig. 4.9 Language

• Select the desired dialog language.

4.2.9 Flow Bar

The flow bar indicates the tendency of the load increase or decrease which is influenced with the crank of the pull-off tester.

With the menu option **"Flow Bar"** you can control the **display speed** of the bar movement. This setting also influences the **display speed** of the bar movement of the **load pacer** (see chapter 4.2.10).

This will not influence the speed of load application and the duration of the measuring procedure, which is determined by means of the load pacer (see chapter 4.2.10).

- Select the menu option **"Flow Bar"**.

The following submenu appears in the display (11):

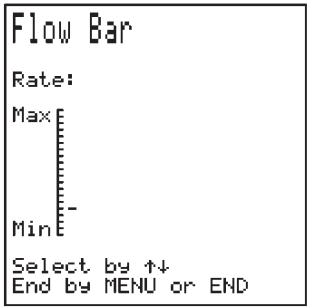


Fig. 4.10 Flow Bar

- Use the arrow keys ↑↓ to set the display speed.

Example of possible settings:

- k-Factor: Position **C** (see chapter 4.2.4)
- Specified speed of load application: **0.1kN/sec** (see chapter 4.2.10)
- Test disc: Ø 50 mm (see chapter 4.2.3)
- Sample breaks at: **2N/mm²** (**= 3.9kN**)

With these values set, the measuring procedure takes approx. **40 s**.

- Select approx. 2/3 of the maximum speed for the flow bar.

If this speed is set, the flow bar and the load pacer bar move across the measuring display **once** from left to right.

During longer measuring procedures, the flow bar and the load pacer bar might move across the measuring display from left to right **several** times.

This avoids the display speed being too low.

*You can change the **display speed** according to your requirements. The display speed is also influenced inversely proportional to the specified **speed of load application** (see chapter 4.2.10).*

English

4.2.10 Load Pacer

With the menu option **"Load Pacer"** you can specify the speed of load application prescribed by the relevant standards.

While the measuring procedure is performed, the bar movement of the load pacer determines the flow bar´s speed of movement (see chapter 4.2.9).

The unit for the preselection must always be **"kN / s"** even if another unit had been selected for the display.

- Select the menu option **"Load Pacer"**.

The following submenu appears in the display (11):

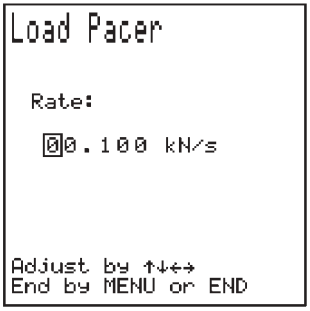


Fig. 4.11 Load Pacer

- Set the required speed of load application in **"kN / s"** using the arrow keys ↑↓ ←→.
- If necessary, convert the existing data into kN/s.

Conversion example:

The speed of the load increase (in accordance with EN 1015-12, chapter 8) is between 0.003 and 0.100 N/(mm² x s).

For a medium speed of 0.050 N/(mm²xs) and a test disc with a diameter of Ø 50 mm, the speed is as follows in kN/s:

0.050 x 1963 x 0.001 ~ 0.10 kN/s

Mean velocity	Surface of test disc (Ø 50 mm) in mm²	Conversion from N to kN

5 Measuring Process

Warning!
Before performing a measuring procedure, read through the relevant chapters for the required settings (see chapter 4). Incorrect settings will result in wrong measuring results!

Warning!
Observe the relevant standards and regulations when performing preparatory work or settings for a measuring procedure (e.g., making cores).

5.1 Preparing the Measuring Procedure

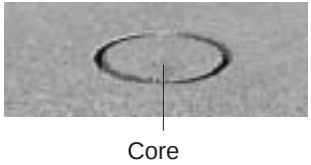


Fig. 5.1 Preparing the test surface

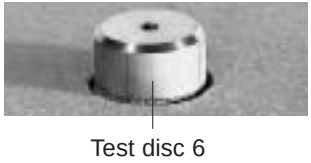
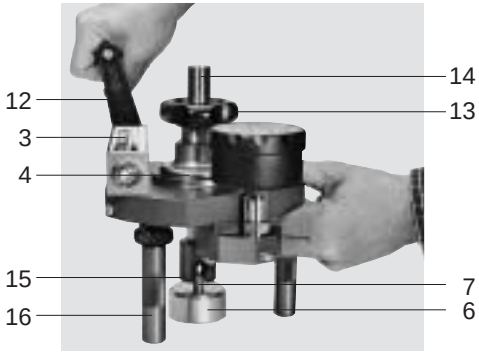


Fig. 5.2 Test surface with stuck on test disc

- Cut into the test surface with a core drill (if necessary) so that the break can occur over the defined circular surface (see Fig. 5.1).
- Attach the test disc (6) to the test surface using an adequate adhesive (see chapter 8, Appendix).
- Wait until the required adhesive strength is reached.



3 Hydraulic pump
4 Piston
6 Test disc
7 Draw bolt
12 Crank
13 Wheel
14 Draw spindle
15 Coupling
16 Legs

Fig. 5.3 Preparing the pull-off tester

If the pull-off tester is to be stored for a longer period of time (2-3 months), move the piston (4) up and down 2-3 times by turning the crank (12) of the hydraulic pump (3) in a clockwise and counterclockwise direction. This reduces friction losses caused by the piston seals.

Warning!
*Avoid hasty, jerky movements, particularly when the piston is in **its initial and end position**, because otherwise the piston might jam (see also chapter 6.2.1, page 24).*

English

- Turn the crank (12) back to its initial position in a counterclockwise direction until slight resistance is encountered (see Fig. 5.3).
- Then turn the crank (12) once in a clockwise direction (to relieve the hydraulic system).

This ensures that the full piston stroke is available during the measuring procedure.

- Connect the coupling (15) of the draw spindle (14) to the draw bolt of the test disc (6).
- Turn the wheel (13) clockwise until slight resistance is encountered.
- Position the pull-off tester in such a way (1) that the tensile force is applied perpendicular to the test surface: To achieve this, adjust the legs (16) of the pull-off tester (1) until no "pulling at a slant" can occur.

"Pulling at a slant" during measuring will falsify the measuring result and cause increased wear of the pull-off tester. Premature repair or new calibration might become necessary!

- After alignment, slightly release the draw spindle (14) with the wheel.

5.2 Measuring with the Digital Manometer

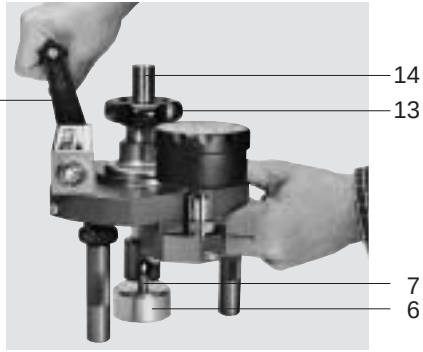
Fig. 5.4 Display of the digital manometer

- Ensure that the pull-off tester (1) is prepared in accordance with chapter 5.1.
- Ensure that the digital manometer (2) is switched off or switch it off.
- Then press the **"ON"** key to switch on the digital manometer (2).

The pull-off tester is now ready for measuring. The current value is displayed.

- Press the "PEAK" key if the digital manometer (2) is to indicate the peak value.

If the digital manometer is not under load and switched on in PEAK mode, the peak value may increase slowly to approx. 20 digits. This will not influence the measuring result.



6 Test disc
7 Draw bolt
12 Crank
13 Wheel
14 Draw spindle

Fig. 5.5 Measuring Procedure

- Turn the crank (12) steadily clockwise until the specified test force is reached, or until the test surface breaks.
- **Always** press the **"ON"** key after the measurement is complete to switch off the device or perform a new measuring procedure.
- After each measurement, turn the crank (12) back counterclockwise until slight resistance is encountered.
- Then turn the crank (12) maximum one turn in a clockwise direction.

The pull-off tester is now ready for a new measuring procedure.

5.3 Measuring with the DYNAMETER

5.3.1 Preparing the DYNAMETER

- Check all settings in accordance with chapter 4.2.
- After checking the settings and if the pull-off tester is not under load, press the **"END"** key to return to the measuring display.
- Start the measuring procedure.

5.3.2 Carrying out the Measuring Procedure

- Ensure that the pull-off tester (1) is prepared in accordance with chapter 5.1.
- Press the **"START/RESET"** key.

*To avoid mistakes, press the **"START/RESET"** key before each new measuring procedure.*

English

Fig. 5.6 Measuring procedure

- Turn the crank (12) steadily clockwise to increase the force on the test surface.

The movement of the crank directly influences the speed of the flow bar in the measuring display (see chapter 4.2.9).

- Turn the crank (12) just enough for the flow bar to follow the speed of the load pacer flow bar.

Depending on the display speed (see chapter 4.2.9) and the value of the specified test force, it might be necessary to move the flow bar 2 or 3 times from left to right before the specified peak value is reached or the sample breaks.

Two **types of data storage** are now possible depending on the option you have selected (see chapter 4.2.6):

Measuring with the "Memory on" setting

After the force of the pull-off tester has dropped by approx. 1% of the nominal load, **"Peak" flashes** in the measuring display and the peak value is displayed and stored.

The DYNAMETER stores the data of

- **Peak value**
- Sample no.
- Test surface (if pre-selected, see chapter 4.2.3).

Measuring with the "Memory off" setting

- When the specified value has been reached press the **"PRINT/ STORE"** key:

The DYNAMETER stores the data of

- **Current value**
- Sample no.
- Test surface (if pre-selected, see chapter 4.2.3).

*The **"PRINT/STORE"** key can also be pressed several times during a measuring procedure (if sample changes, e.g. a fracture, occur). The values will then be stored in this order.*

- After every measurement, turn the crank (12) back counterclockwise until slight resistance is encountered.

- Then turn the crank (12) one turn in a clockwise direction.

If you want to carry out a new measuring procedure:

- Prepare the pull-off tester (1) according to the instructions (see chapter 5.1).
- Check all settings (see chapter 4.2).
- Press the **"START/RESET"** key.

The peak value in the measuring display is deleted and the sample number is increased by 1.

The pull-off tester (1) is now ready for a new measuring procedure.

5.3.3 Display of the Measured Values

After every measuring procedure the stored values can be displayed directly on the DYNAMETER (9):

- Select the menu option **"Data Output"** in the main menu (see chapter 4.2.1).
- Select **"Display Data"** in the submenu.
- Select the desired sample number using the arrow keys ↑↓.

5.3.4 Storage Capacity of the DYNAMETER

The memory capacity is 1000 groups. When the memory is full, no further values will be accepted.

For this reason it is important that you transmit the data to a printer or PC in time (see chapter 4.2.1).

Afterwards you can delete the memory (see chapter 4.2.1).

6 Maintenance, Storage and Care

6.1 Cleaning After Each Use

Warning!
Never immerse the DYNAMETER and pull-off tester in water or wash it under a running tap! Use neither abrasives nor solvents for cleaning!

6.1.1 Pull-Off Tester

- Clean the pull-off tester with a clean, dry cloth.
- If necessary, clean the gaps with a pneumatic pump (no compressed air!).

6.1.2 Display Units

- Clean the digital manometer or DYNAMETER with a clean, dry cloth after use.
- Clean dirty input sockets and connectors of the DYNAMETER with a clean, dry brush.

6.2 Performance Check Before Each Use

6.2.1 Pull-Off Tester

- Ensure that the pull-off tester is complete.
- Ensure that the coupling (15, see Fig. 5.3) is screwed in correctly.
- Fix the legs (16) in their basic position.
- Check to see if there are traces of oil on the pull-off tester.

Warning!
Oil is an indication of leaking seals. Check the oil level immediately!

Checking the oil level

H_A: Height of initial position

H_E: Height of end position

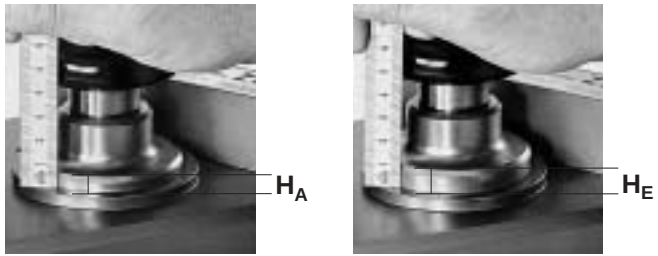


Fig. 6.1 Measuring the difference of level

- Turn the crank (12) back counterclockwise until slight resistance is encountered **(initial position)**.
- Measure the **distance H_A** (see Fig. 6.1) between the highest point of the device plate (5) and the outer top edge of the piston (4) in this position.
- Now turn the crank (12) clockwise until slight resistance is encountered **(end position)**.
- Measure the **distance H_E** (see Fig. 6.1) in this position.

The **difference of level ΔH** (**H_E - H_A**) between the initial and end position should be **3 - 4 mm**.

- Turn the crank (12) back counterclockwise until it reaches its initial position.
- Then turn the crank (12) one turn in a clockwise direction.

Warning!
If the difference of level is too small, the oil volume will not be sufficient. Immediately send the device to an authorized service center.

6.2.2 Display Units

- Check the cables for damage.
- Check the battery capacity (see chapter 3.2.2).

If a battery life of 4 to 6 hours is indicated on the DYNAMETER when it is started up, you should take a new set of batteries to the measuring site.

6.3 Storage

- Store the DYNAMETER and pull-off tester in the original case in a clean, dust-free room.
- If the device is not used for a long period of time, remove the batteries from the DYNAMETER or digital manometer.

6.4 Maintenance

6.4.1 Pull-Off Tester and Display Units

We recommend performing a general check and new calibration of the pull-off tester and DYNAMETER every **two years**.

Warning!
Any warranty or liability claims will expire if maintenance work is carried out improperly. For this reason, always send the pull-off tester and its components to a service center authorized by PROCEQ.

7 Data

7.1 Form of Delivery

DYNA Pull-off tester Z16 / Z6 with digital manometer

Model Z with digital manometer

- Test disc Ø 50 mm
- Draw bolt with connection thread M8
- 1 battery for digital manometer 9V AM6/6LR61 (120h)
- Carrying case 300 x 280 x 240 mm
- Calibration Certificate
- Operating instructions

Weight of pull-off tester: 3.5 kg

Total weight: 6 kg

DYNA Pull-off tester Z16E / Z6E with DYNAMETER

Model Z...E with display unit DYNAMETER

DYNA Pull-off tester:

- Test disc Ø 50 mm
- Draw bolt with connection thread M8
- Carrying case 300 x 280 x 240 mm

Total weight: 6 kg

Display unit DYNAMETER

- Display unit
- Carrying strap
- 6 batteries LR, 1.5V (60h)
- Carrying case 320 x 295 x 105 mm
- Calibration Certificate
- Operating instructions

Total weight: 1.8 kg

7.2 Accessories

Test discs

Draw bolts

Electric drive

Article no.	Material	Dimensions	Quantity/	Thread	Used with devices			
Test discs Standard versions					**Z 6**	**Z 16**	**Z 25**	**Z 50**
345 08 001	Aluminum	Dia. 50 x 25 mm	10 pcs.	M 8	●	●		
345 08 002	Aluminum	Dia. 50 x 25 mm	10 pcs.	M12			●	●
Test discs Special versions								
345 00 782	Steel	Dia. 50 x 25 mm	10 pcs.	M 8	●	●		
345 08 051	Aluminum	50 x 50 x 25 mm	10 pcs.	M 8	●	●		
345 08 053	Aluminum	Dia. 100 x 25 mm	10 pcs.	M 8	●	●		
345 08 009	Aluminum	Dia. 20 x 20 mm	1 pcs.	M 8	●	●		
345 08 008	Aluminum	Dia. 100 x 25 mm	1 pcs.	M12			●	●
Draw bolt								
345 09 002	Steel			M 8	●	●		
345 10 002	Steel			M12			●	●
345 09 007	Electric drive, compl.	WAF 12				●	●	
345 12 007	Electric drive, compl.	WAF 14				●	●	

English

7.3 Technical Data

7.2.1 Pull-Off Tester Z with Digital Manometer

	Z6	Z16
Max. tensile force:	6 kN	16 kN
Thread of draw spindle:	M20 x 1	M20 x 1
Thread of draw bolt:	M8	M8
Permissible stroke (with pump):	4 mm	3.5 mm
Accuracy:	< 2 %	< 2 %
Resolution:	0.01 N/mm^2	0.01 N/mm^2

7.3.2 Pull-Off Tester Z...E with DYNAMETER

	Z6E	Z16E	Z25E	Z50E
Max. tensile force:	6 kN	16 kN	25 kN	50 kN
Thread of draw spindle:	M20 x 1	M20 x 1	M22 x 2	M24 x 2
Thread of draw bolt:	M8	M8	M12	M12
Permissible stroke (with pump):	4 mm	3.5 mm	5 mm	6 mm
Accuracy:	< 1 %	< 1 %	< 1 %	< 1 %
Resolution:	0.001kN	0.01kN	0.01kN	0.01kN

7.3.3 Display Unit DYNAMETER

- Non-volatile memory for 1000 measured values
- Display on 128 x 128 graphics LCD
- Interface RS 232 C
- Integrated software for the transmission of measured values to the printer and/or PC
- Temperature range: -10°C to +60°C
- Battery operation with 6 batteries for approx. 60 hours

Rapid adhesives for Pull-off Tester

3M Scotch-Weld DP 100/DP 110	3M (Schweiz) AG	CH-8803 Rüschlikon
Araldit Rapide	Ciba Spezialitätenchemie AG	CH-4057 Basel
Araldit 2012	Ciba Spezialitätenchemie AG	CH-4057 Basel
CHEMO-Resin EP-KL-11	Krämer Chemie GmbH	D-66130 Saarbrücken-Güdingen
MG Spezialkleber	Hannelore Moser	D-79183 Waldkirch 3
Sikadur 31 Normal/Rapid	Sika AG	CH-8048 Zürich
Silikal R I/21	Karl Ulrich & Co AG	D-63533 Mainhausen 1
Technovit 2190	Kulzer & Co. GmbH Alfred Klotz AG	D-61350 Bad Homburg CH-8040 Zürich
Tepicolle KB 60 G	Karl Bubenhofer AG	CH-9200 Gossau
X60	HBM Darmstadt Schenk AG	 CH-8606 Nänikon

for use on wet surfaces

Araldit AV 144 / 2-HV 997	Ciba Spezialitätenchemie AG	CH-4057 Basel
Araldit AV 2101-HV 2957	Ciba Spezialitätenchemie AG	CH-4057 Basel

for high environment temperature

Araldit AV 138M-Hv 998	Ciba Spezialitätenchemie AG	CH-4057 Basel