PT 2500

Electronic force gauge for the measurement of tensile forces, primarily on cable-crimp connections or cable-weld connections

Operation Manual
English
Version 1.0.0

Quality Management
Environmental Management
ISO 9001
ISO 14001
www.dekra-seal.com

Made by:	03/2026 L. S.		Version:	1.0.0
Changed by:			Checked by:	M. Egginger
Datei:	BA_PT2500_EN			

Content

Please study this handbook carefully before initial use of the equipment. Keep this handbook at the working place, where you can easily find it and hand it over with the equipment to other persons.

1 Safety Regulations for Electrical Machines in Industrial Use

Danger

This electrical machine is an equipment for use in industrial plants. During operation of the machine dangers may arise through rotating parts and/or high voltage. In case of improper use of the machine during commissioning, operation and maintenance **severe injuries to persons and damage of property** may arise. The machine may only be used under the provisions stated in the instruction manual, additionally the local working conditions should be considered.

Warning

- Transportation, installation, commissioning, electrical connection, operation and maintenance may only be carried out by authorized and qualified specialist staff.
- Knowledge of the regulations for the prevention of industrial accidents and first aid measures is a prerequisite for safe and trouble-free operation of this system.
- This instruction manual contains the most important notes for operation of the system in accordance with safety requirements.
- This instruction manual and especially the safety notes contained herein must be observed by all the persons working with the system.
- **Non-observance is a safety risk!**
  Our “general sales and supply conditions” always apply as these are available to the user under www.cable-tec.net at any time. Any claims for warranty or liability in case of personal injury or property damage are excluded, if they can be traced back to one or several of the following causes.
    - The equipment was not used according to the intended purpose.
    - Improper installation, commissioning, operation, and maintenance of the equipment.
    - Operation of the equipment with defective safety devices or with improperly mounted or non-functional safety and protection devices.
    - Non-observance of the information in the operating instructions concerning installation, commissioning, operation and maintenance of the equipment.
    - Unauthorized modifications of the equipment.
    - Repair work performed improperly (no original spare parts) by unauthorized personnel.
    - Events caused by the effect of foreign bodies and force majeure.

Hotline

In case of breakdown of the machine or in case of danger please call our service hotline:
Tel. +49 (0) 8554 94 23 9-0, Fax + 49 (0) 8554 94 23 9-20, eMail info@cable-tec.net

i	Please be aware that the Pulltester PT 2500 is a high precision gauge. Handle it with care and provide a clean working environment.

2 Function of the equipment

The Pulltester PT 2500 is an electromechanical measuring device for destructive testing of crimp or weld connections in electrical cable connections. During the test, a test specimen is pulled uniformly until a predefined limit is reached or until the connection point (weak point) loosens. By means of high-precision sensor technology, the force curve and the distance covered are precisely recorded and stored until the next measurement. Due to this precise sensor technology, the finest deviations can be detected immediately.
The result of the tensile test can be shown on the display either as a maximum force value or as a progression curve. It is also possible for the test result to be automatically compared with a table of standard values stored in the device, so that a decision on the test result can be made as OK or NOK can be made by the device. The result values can be transferred to a PC via various interfaces for further archiving. On the PC, the force values can be displayed either with the C-tec PT Viewer software or by means of Microsoft Excel. The device also offers a connection for a small printer (receipt printer with real paper), on which the most important result data can be printed out in small format.
The Pulltester is calibrated before delivery with high quality measuring equipment approved according to the specifications of the German Accreditation Service (DAkkS). This calibration should be repeated annually.

3 Intended use

The Pulltester PT 2500 has been developed for testing the holding force of electrical crimp connectors. The device can be used to perform pull tests up to a force of 2500 N and with a maximum pull speed of 350 mm/min. Via various interfaces it is possible to transfer the measurement results to a PC or to print them out.

The requirements for temperature and humidity have to be carefully observed. Ignoring these rules can cause accidents or damages. Other use as described in this manual is not allowed and can lead to the loss of warranty claims and liability exclusion of the supplier. Any unauthorized modification of the equipment carried out by user will invalidate the manufacturer's liability to any resulting damage or injury to personnel. This statement also applies for any changes or conversions of the device.

4 Technical specification

Type	Pulltester PT 2500
Power supply	100 – 240 VAC 50/60 Hz
Power consumption	max. 320 VA
Device fuse protection	Micro fuse 4 AT
Interfaces	RS 232, USB 2.0, Ethernet, digital I/O
Force range	50 – 2500 N
Speed range	25 - 350 mm/min., variable in steps of 1mm/min
Pull stroke	140 mm
Resolution force measurement	0.01 N
Resolution path measurement	0.02 mm
Measurement accuracy	50 – 500 N: +/- 1.5 N, 500 – 2500 N +/- 12.5 N
Min. cable length of sample	200 mm
Recommended room temperature	22°C +/- 5°
Protection class (against foreign substances)	IP 40
Dimensions (W x D x H)	790 mm x 350 mm x 340 mm
Weight	50 kg

5 Scope of delivery

Standard delivery must include:

- Main unit Pulltester PT 2500
- Clamping crown for samples
- Wheel clamp for cable clamping
- Power cable EU standard, 2 m
- USB cable USB 2.0 type-A to USB 2.0 type-Mini-B, 2 m
- Operation manual for download
- ISO factory calibration certificate

Optional available accessories:

- PC Software PT Viewer for analysis of measuring results on PC
- Receipt printer EPSON M188D

6 Packing

The device is fitted in special transport packaging.
According to the packaging law, we are obliged to take back empty packaging free of charge. We comply with this obligation as a matter of course. Returned packaging will be reused or recycled as far as possible.
Please contact us regarding the specific procedure for taking back old electrical equipment, batteries and packaging.
Alternatively, you can reuse this packaging or send it for recycling via your recycling collection point.

7 Transportation

The transportation of the unit must be free of vibration and shock. The normal packaging is not seaworthy and cannot be used for water carriage. The packing does not protect against wet conditions. Tumbling of the unit during transportation is not allowed.
Handle with care! Throwing or falling down of the packed unit can cause damages or total demolition.

8 Storing

The device has to be stored in a dry and well-tempered room. The optimum storage temperature is at 20°C. Too high humidity can cause corrosion on important precision parts.

9 Set-up

The Pulltester PT 2500 has to be set up in a dry, dust free and well-tempered room. It must be protected from improper environment conditions like high or low temperature, direct sun light, vibrations and other mechanical influences, electromagnetic or magnetic fields, humidity or dust.
A stable, undamaged work table should be used as a base. The unit is equipped with screw feet, it is not necessary to screw it to the table top. The assembly instructions in the operating manual of the PT 2500 must be observed.
If any defects, improper functions, damages or problems occur, which cannot be solved by the instructions in this handbook, please set the device out of operation and contact C-tec for support.

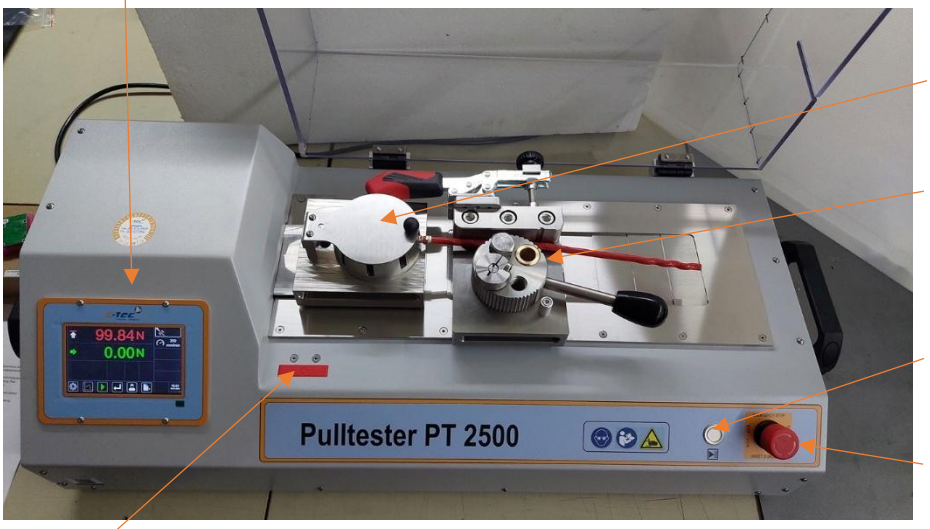
DANGER TO LIFE: For safety reasons, only operate the device at grounded power connections or sockets. Before opening the device, disconnect the device from the power supply. Never open the device during operation.

10 Start-up

10.1 Parts and operating controls

Front side

Touch colour display



Clamping crown for crimp terminals

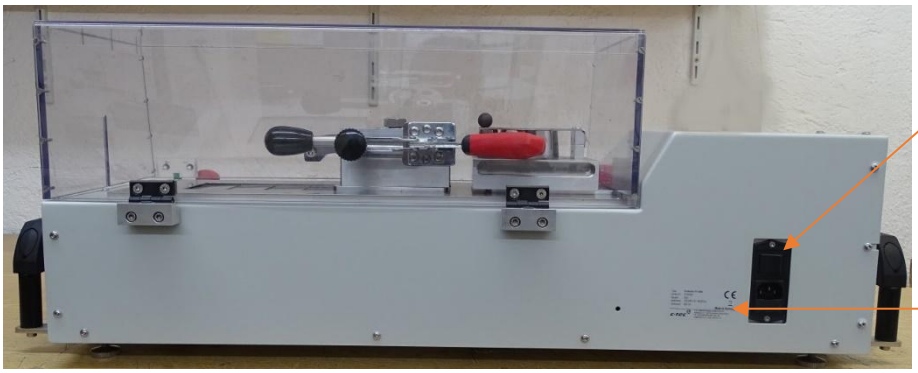
Quick clamping device for cable (wheel clamp)

Push button for start / stop of measurement

Emergency stop switch

Safety switch for safety cover

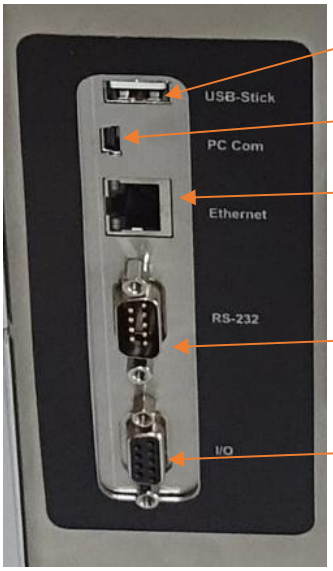
Back side



Main switch and main fuse (4AT)

Type label

Left side view



USB 2.0 type-A interface

USB 2.0 type-B interface

Ethernet interface (LAN)

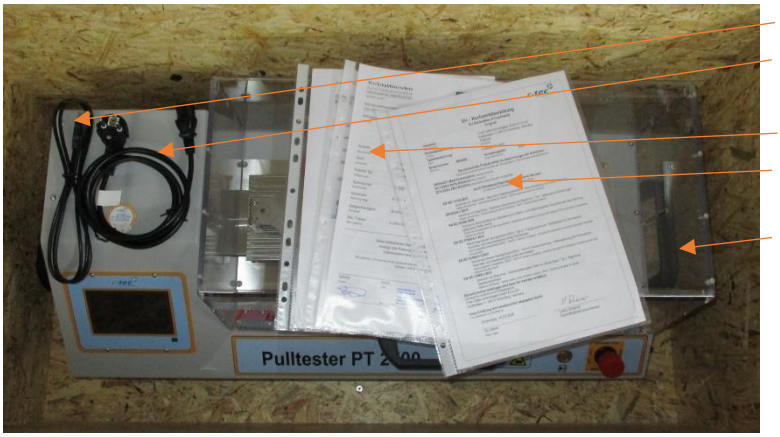
RS 232 interface

Interface for digital inputs and outputs

10.2 Preparations

Remove the PT 2500 pulltester from the transport packaging.
Please proceed in the following order:

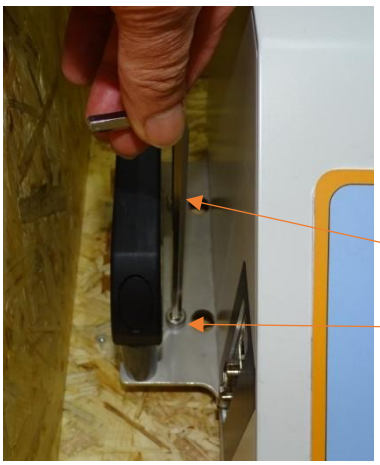
Place the packaging box with the arrows pointing upwards and remove the cover screws.



USB interface cable
Mains connection cable

Factory calibration certificates
CE declaration

Pulltester PT 2500



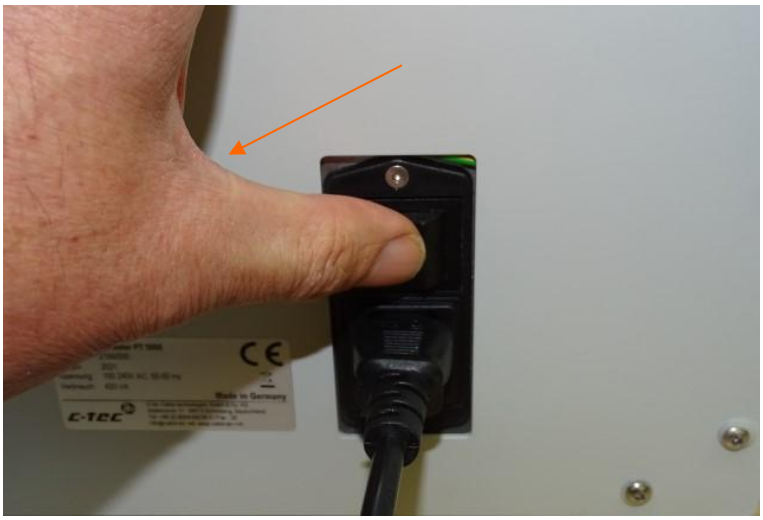
Take out the accessories

Remove the M6 transport fixing screws (4 pcs.)

Two people are required to take the PT 2500 out of the transport box. One person grips the left and the other one the right handle and lifts the device at the same time.
Caution: Ensure that you are in a back-friendly position (back straight and press upwards with the legs).
Optionally, a chain hoist can also be used for removal.

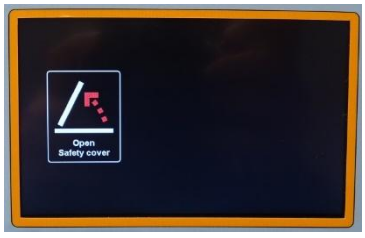
Lifting out with chain hoist.

Put the Pulltester PT 2500 on **a stable work desk**.

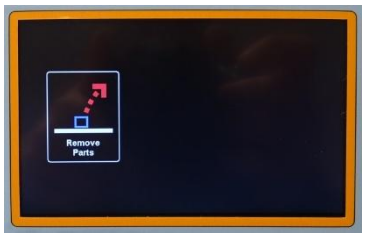


Plug the supplied power cable into the back of the device and connect it to the factory power supply.
The factory power supply must be properly grounded (green/yellow protective conductor).
The device can be supplied with voltages from 100V AC to 240V AC 50/60Hz.

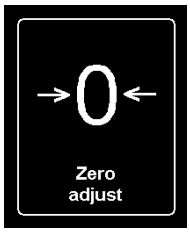
Switch on the main switch.



The touch colour display now alternately shows the messages "Remove parts" and "Press START".



After ensuring that the cable clamp and the holder for the contact elements are free, the safety cover can be closed again.



The unit now automatically performs a short reference run and then shows these two pictograms in the display.

After a successful reference run, the Pulltester is ready for measurement.

11 Display and Operation

Display field for maximum force
Display of test mode
Display of test speed
Display of force threshold value as per schedule

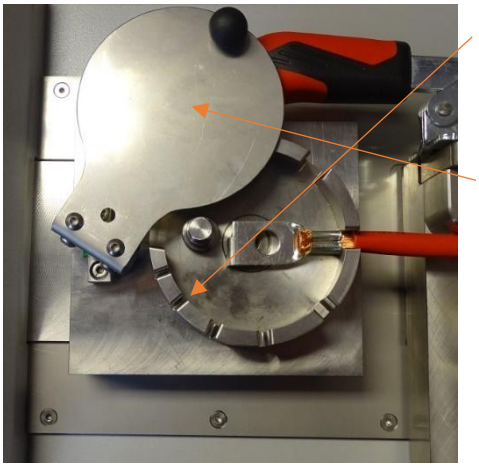
Display field for actual force
Counter for OK, NOK and total
Display CpK for serial measurement

Display time and date
Display process status
Touch button for output options
User level (Operator/Supervisor)
Display for return drive option
Touch button Start/Stop
Display switch numeric / graph
Touch button for system parameter

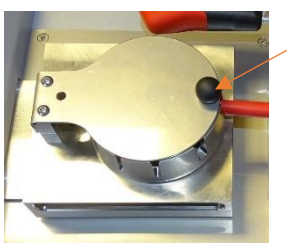
12 Prepare a pull test

Before a pull test is started, this symbol should be shown in the display. The "green house symbol" indicates that the pull tester is in home position. If this is not the case, the start button must be pressed first.

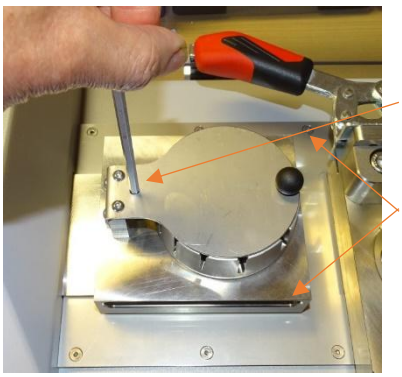
12.1 Clamping crown



The clamping crown is provided with circularly arranged slots, each of which is adapted to different cable diameters. The rotatable bearing allows the matching opening to be rotated in the direction of pull. The clamping crown cover can be swiveled and must be rotated again before the test procedure so that the clamping crown is closed.



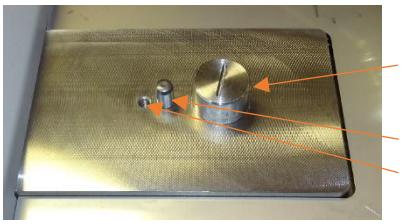
Removing the clamping crown holder



Removing the clamping crown holder

Handles

Hold the clamping crown holder at the front and back and pull it vertically upwards. The holder must be removable by hand.

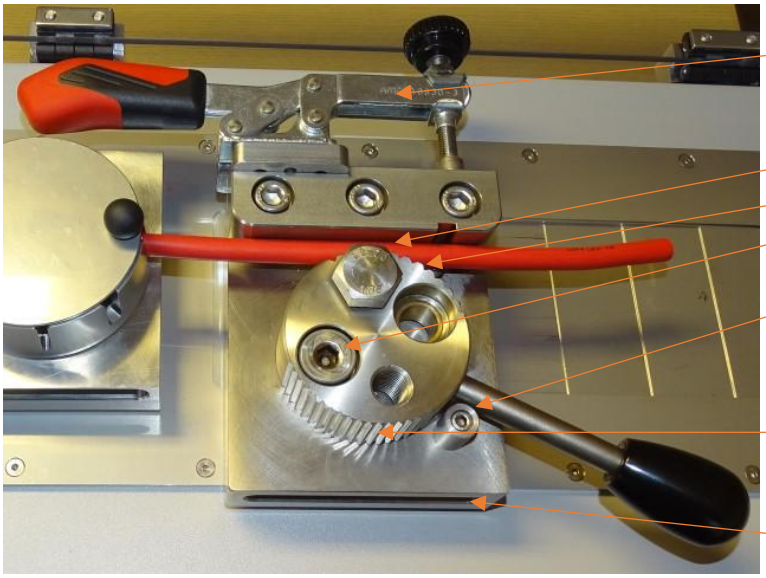


Tension bolt

Anti-rotation bolt

Thread for transport locking screw

12.2 Cable clamping system



Additional clamping device for sensitive cables

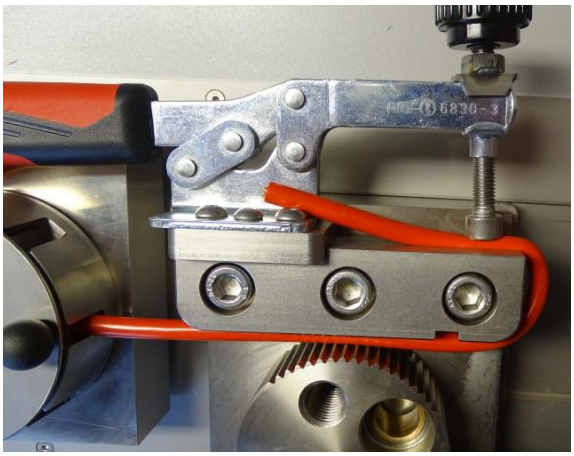
Main clamping point
Coarse toothing
Hinge screw (Attention: left-hand thread)
Limitation for opening dimension

Fine toothing

Handle

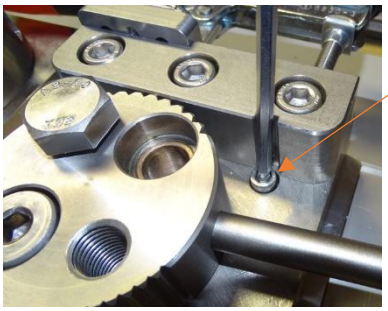
The cable tensioning system can be converted to fine toothing by removing the handle and the joint screw and reinstalling the clamping wheel rotated by 180°.

Cable tensioning system converted to fine toothing

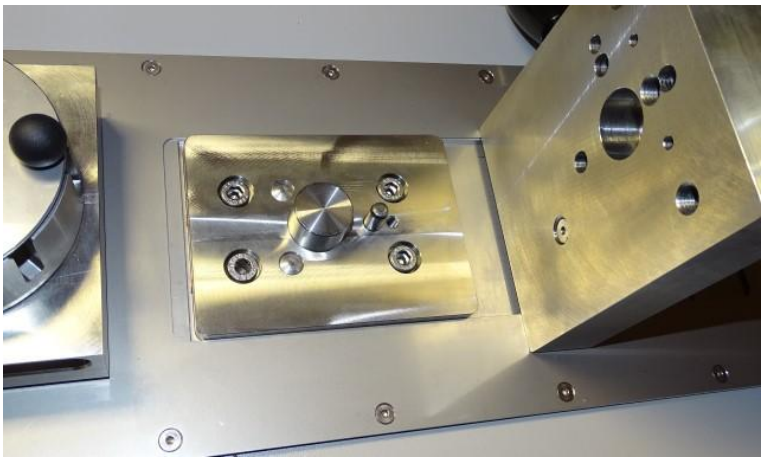


Cable tensioning with additional clamping device

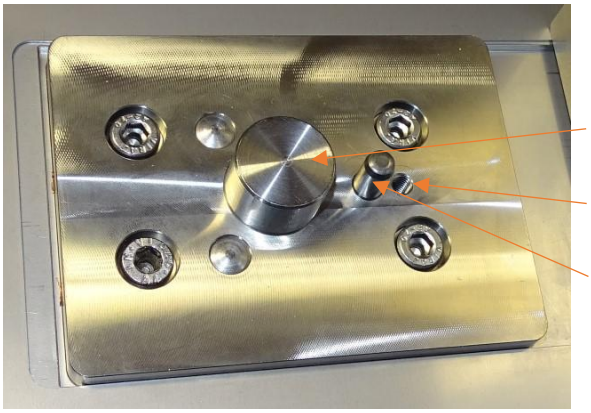
Removing the cable clamping system



Remove the transport securing screw (M6)



Hold the cable clamping system by the handles at the front and rear and pull it up vertically. It must be possible to remove the holder by hand.



Tension bolt

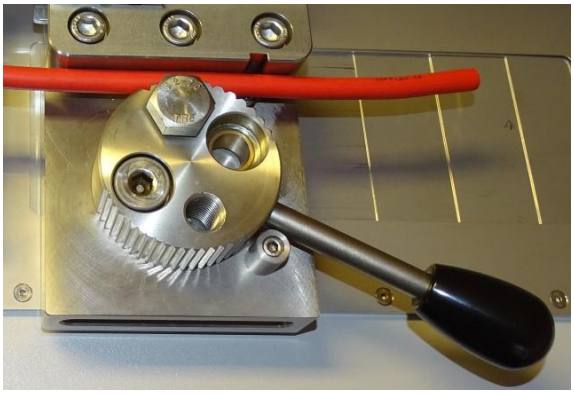
Thread for transport securing screw

Anti-rotation bolt

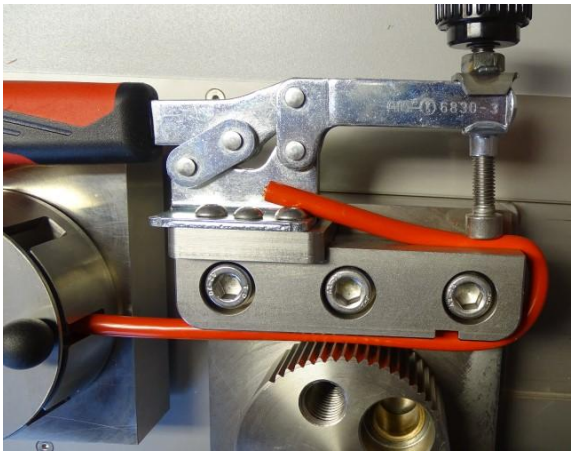
It is not mandatory to screw in the transport securing screw when reassembling the holder.

12.3 Clamping of the test specimen

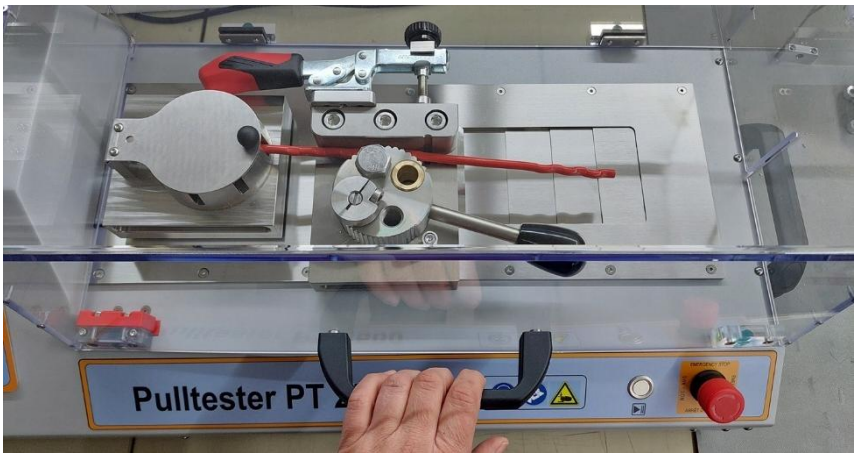
Insert the contact element into the appropriate opening on the clamping crown.
Close the clamping crown cover again.



Insert the cable side of the test cable into the clamping element and release the handle. The clamping element closes automatically as soon as the cable is pulled.



If necessary, also use the additional clamping device for sensitive cables.
It may also be necessary to convert to fine toothing.



Close safety cover

12.4 Choose a test routine

Sign Test mode shows the chosen test routine

By pressing on the framed field **Test mode** a menu to select the different test routines opens.

Possible test routines:

Pull Test: The test specimen is pulled until it tears.

Setpoint Test: Pull test in connection with nominal values for cross section and holding force.

Hold force and pull: A determined force is held for a certain time. Then the force is increased until the test specimen tears.

Hold force: Pull till defined force and hold it for a target time, then release.

Pull to force: A predetermined force is built up and then immediately released.

12.4.1 Pull Test

In the Pull test mode, the pull tester pulls the clamped test specimen until it tears.

Press on **Pull Test**.

Test mode Pull test is set

12.4.2 Setpoint Test

In the test mode setpoint test, the Pulltester works in the pull test mode. However, the actual force values are compared with a nominal value, resulting in an OK / NOK decision. The results are furthermore subject to statistical analysis.

Press on **Setpoint Test**.

A table with ascending cable cross-sections and the corresponding force values opens.

With the display slider or the arrow keys the values in the lower table area can be displayed.

By pressing the cross section value to be tested and the green confirmation key, the corresponding force value is loaded into the working memory.

The test mode target value test and the cross section of the test specimen (10.00 mm²) are set.

The minimum required holding force (380 N) of the test specimen is selected.

OK-, NOK- and total counter are active.
Statistical calculation of the results is activated.

Setpoint check without cross-section specification

By pressing again on a previously selected field, it is deselected again. If the green confirmation key is then pressed, a setpoint test without cross-section selection is loaded into the working memory.

Test mode Setpoint Test without cable cross section is selected.

12.4.3 Hold force and pull

Press on **Hold force and pull**.

The test mode Hold force and pull is set.

Minimum target holding force before tear-off

Holding force for the predetermined time period.

Predetermined time period

Note: The test parameters can only be changed by a supervisor (password) (see chapter 15.1).

12.4.4 Hold force

Press on **Hold force** .

The test mode Hold force is set.

Holding force for a predetermined time period

Predetermined time period

Note: The test parameters can only be changed by a supervisor (password) (see chapter 15.1).

12.4.5 Pull to force

Press on **Pull to force**.

The test mode Pull to force is set.

Force, up to which is pulled

Note: The test parameters can only be changed by a supervisor (password) (see chapter 15.1).

12.5 Further settings

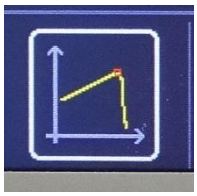
Shift key Force display

Start/stop measurement

Automatic return after end of measurement on/off

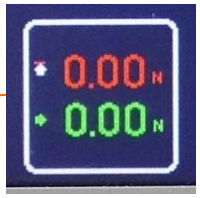
Changing access level (supervisor or admin)

12.5.1 Force display



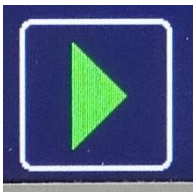
Press on **Force display**.

The touch colour display switches to the graphical representation of the tear-off curve.



By pressing the Force display symbol again, the display switches back to the numeric force representation.

12.5.2 Start/stop pulling process



Press the **Start** button for approx. 1 second.
Note: The time delay of 1 second is built in for safety reasons, so that a start is not triggered by accidental "wiping" across the keypad.

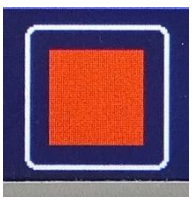
Or:

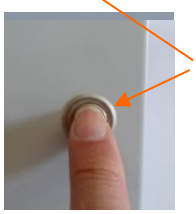
The start/stop process can also be initiated by pressing the mechanical button. Here is only a short "touch" necessary.

The pull test starts.

The red value shows the previous maximum value of this measurement.
The green value shows the currently measured force value.

Rotating arrows indicate that a measuring process is in progress.





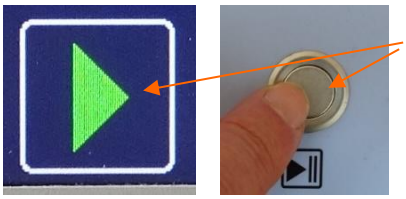
By briefly touching the red stop field or the mechanical start/stop button, the device can be stopped at any time and the measuring process will be aborted.

If the currently measured force drops by a predetermined value from the maximum value, the pull tester stops the measuring process automatically.

The red value now shows the highest force value which has been reached during the measuring process.

The target flag symbol shows that the device has reached the test end position, but is not in the start position for a new measurement.

Return to the start position for a new measurement.



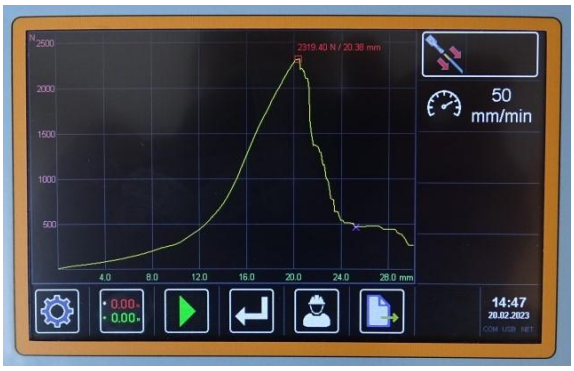
Return travel is initiated by pressing the green **start** field for approx. 1 second or by briefly pressing the mechanical start button.

The inverted arrow symbolises that the Pulltester returns to the start position.

The maximum measured force value remains in the display until a new measurement is started, another test mode is selected or the device is switched off and on again.

The "green house" symbolises that the pull tester is now in the start position again.

Note: Also after the pull force test has been completed, the display can be switched between showing the tear-off curve and the numerical values by pressing the field **Force display**.



Display switched to graphic display of the tear-off curve.

Zoom out or zoom in

In a similar way to a smartphone, the Pulltester can also be used to zoom in or out (two fingers) and move (one finger) the curve.

Shift

By pressing twice in the center of the graphic display (double-click), the tear-off curve is optimally fitted again.

12.5.3 Automatic return to start position

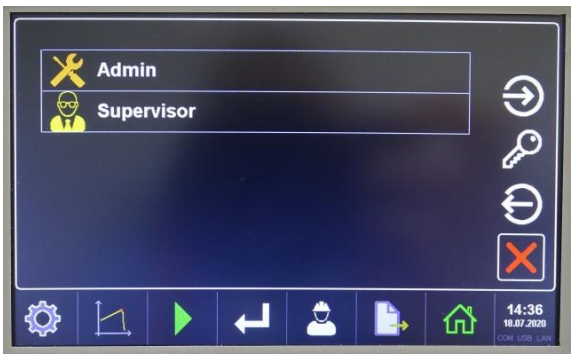
By pressing the "Return" field, it will be highlighted in light blue.

If the "Return" field is highlighted in light blue, the Pulltester will immediately return to the start position after the measurement is completed.

Note: To reduce the risk of injury, the return travel is also monitored.

12.5.4 Access control

You can switch to a higher access level by pressing the "Operator" field.



The level supervisor or administrator can be selected (password required).
For more information, see chapters 15 and 16.

12.5.5 Data export

Press on field **Data export**

If a measurement has been performed completely (force has reached a maximum value and then dropped), the Data Export button is framed and thus activated.

By pressing the Data export button, a selection menu opens.

Close selection menu

Save force curve in CSV format (Excel) on a USB stick

Save force curve as image (BMP) on a USB stick

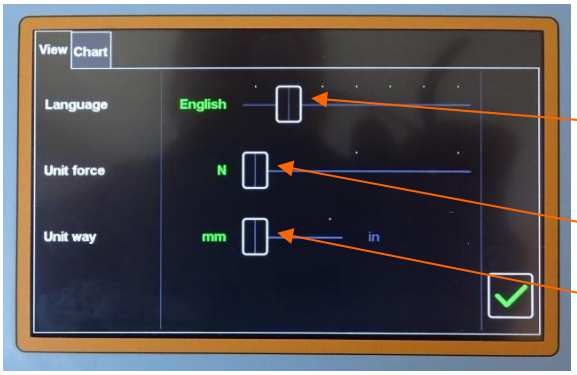
Print result values

12.5.6 System setup

The button can only be activated if you are logged in as Supervisor or Admin.
For explanations see chapter 15 and 16.

System settings for users

Register View

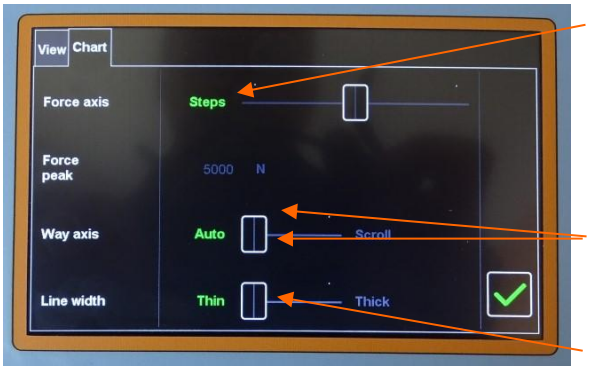


Selections are made by moving the sliders to the right or left.
Available **languages**: German, English, Italian, French, Spanish, Romanian and Portuguese

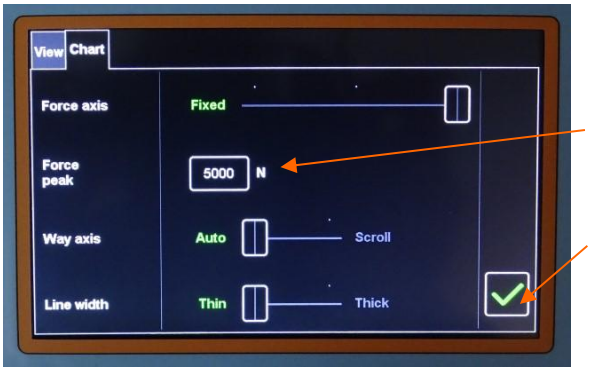
Force display in: N, kgf and lbf

Way display in: mm or inch

Register Chart (settings for graphical curve display)



Force axis:
Auto = force axis scales based on the current force reached
Steps = force axis scales in steps
Fixed = force axis can be set to a fixed value (setting for **Force peak** see fig. below)
Way axis:
Auto = scale division adapts itself
Scroll = scale division is fixed
Line width of the force curve



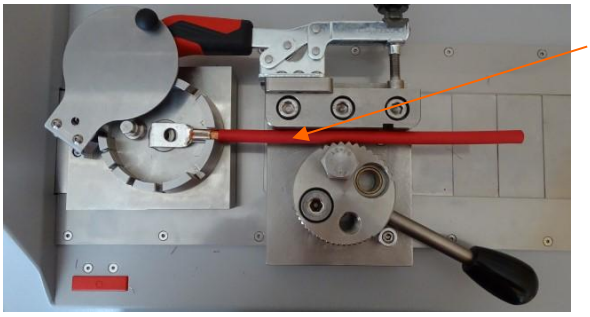
Input option for scaling the force axis

By pressing the confirmation field, the entries are accepted and the program is terminated.

13 Performing the tests

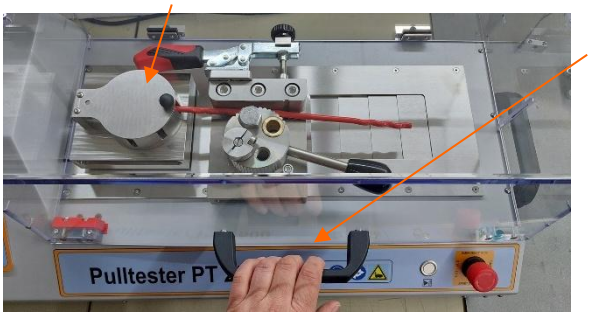
13.1 Performing a Pull test

Select **Pull Test mode** (see 12.4 / 12.4.1)

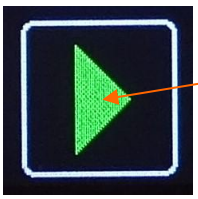


Insert the cable as shown in the picture.

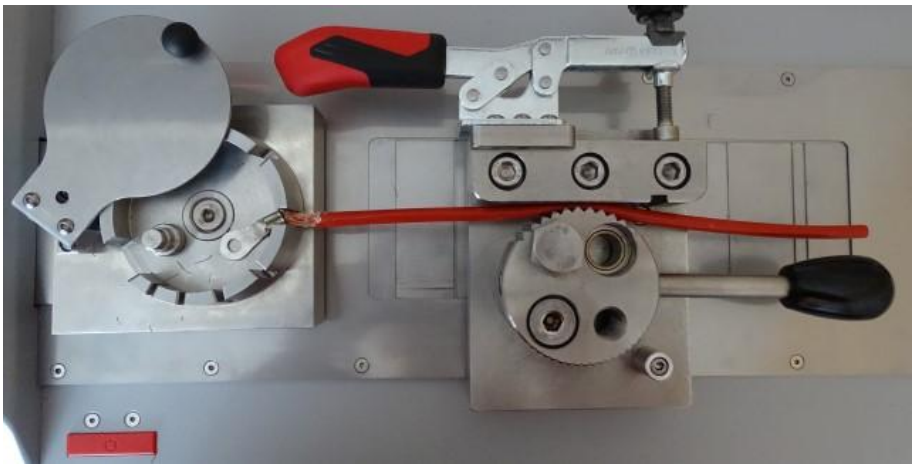
Close the clamping crown cover



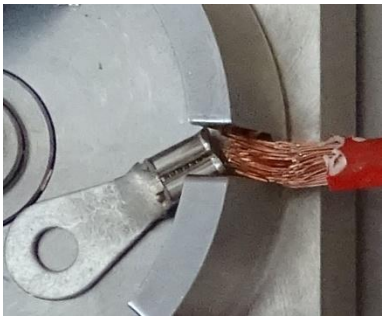
Close safety cover



Press one of the Start buttons

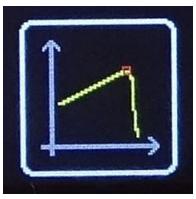


The Pulltester pulls on the cable until the crimp connection breaks.



The maximum holding force of the crimp connection is shown.
The display can be switched to curve representation by pressing the force display field.

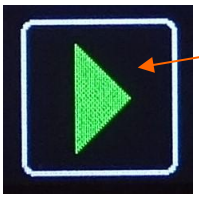
The target flag symbol indicates that the measurement is complete.



Display of the force curve with maximum value, pulling distance to the maximum value and position of the maximum value on the force curve.

Highly enlarged tear-off area due to two-finger pinch zoom

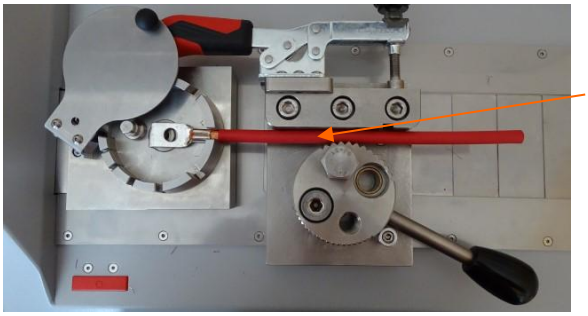
If the function “Automatic return to start position” is deselected (see 12.5.3), the start button must be pressed again to activate the return movement.



Press one of the Start buttons

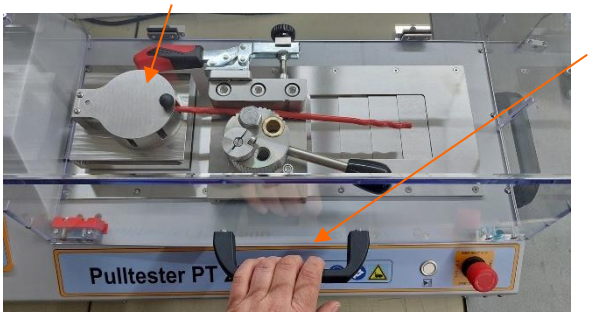
13.2 Perform a Setpoint test

Select test mode **Setpoint Test** and select the suitable cable cross section or determine a target force value (see 12.4 / 12.4.2)

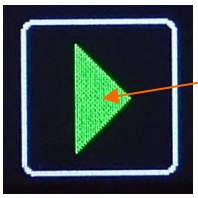


Insert the cable as shown in the picture.

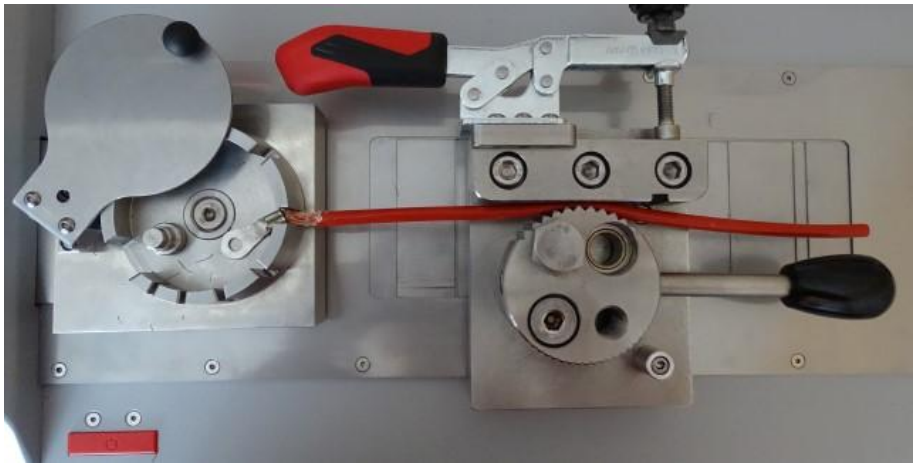
Close the clamping crown cover



Close safety cover



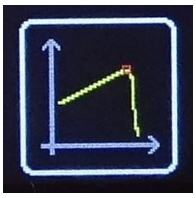
Press one of the Start buttons



The Pulltester pulls on the cable until the crimp connection breaks.

The maximum holding force of the crimp connection is displayed (actual value).
Display of the minimum target value, which is necessary according to the table.
The target/actual value comparison has shown that the test sample is OK.
The counting module shows that one “OK measurement” was made out of a total number of one measurement.
The CPK value appears after the 3rd measurement.

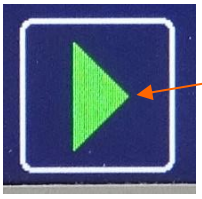
The target flag symbol indicates that the measurement is complete.

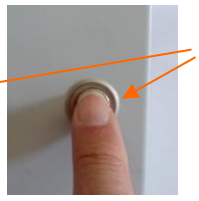


The display can be switched to curve representation by pressing the Force Display field.

Display of the force curve with maximum value, pulling distance to the maximum value and the position of the maximum value on the force curve.

If the function “Automatic return to start position” is deselected (see 12.5.3), the start button must be pressed again to activate the return movement.





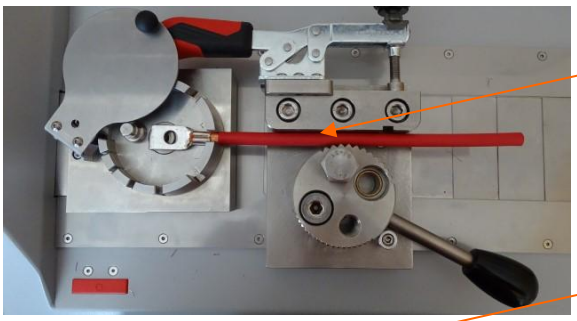
Press one of the Start buttons

13.3 Perform a test with test routine Hold force and pull

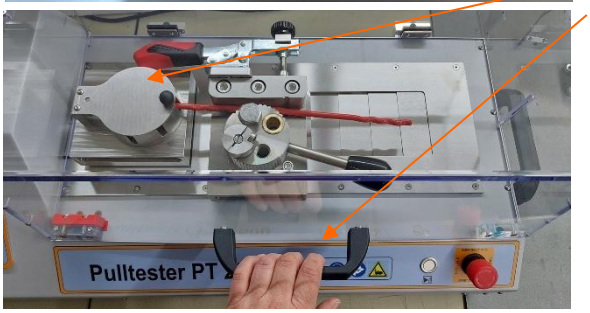
Choose test mode **Hold force and pull** (see 12.4 / 12.4.3).

The following test parameters are selected:
The sample must have at least 1500 N holding force before it tears.
The test sample is preloaded with 1000 N for 30 sec.

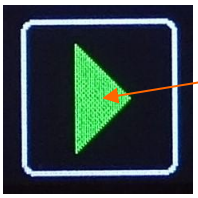
Note: The test parameters can only be changed by a supervisor (password) (see chapter 15.1).



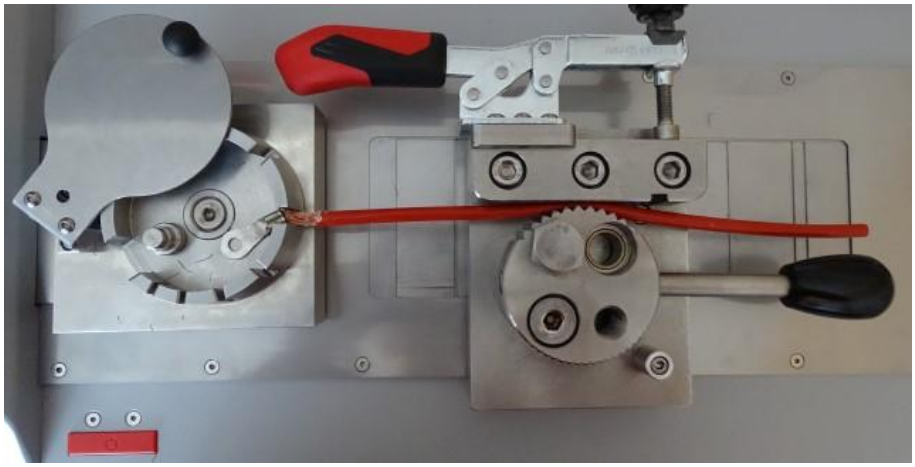
Insert the cable as shown in the picture.



Close the clamping crown cover
Close safety cover



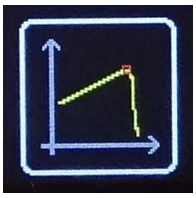
Press one of the Start buttons



The Pulltester pulls on the cable until the crimp connection breaks.

The device pulls up to 1000 N after the start and maintains the pulling force for the predefined time.

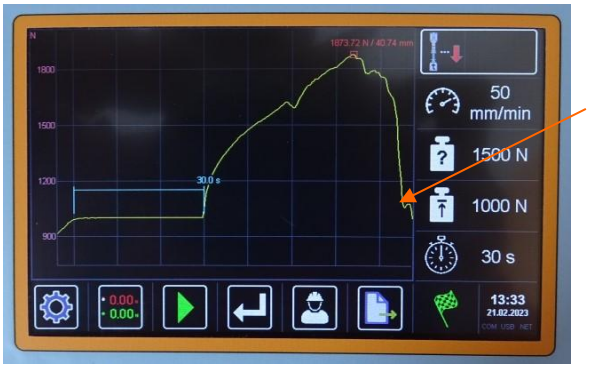
Previous highest force value
Actual force value
Timer for the test time



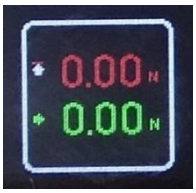
The display can be switched to curve representation by pressing the Force Display field

The graph shows how the controller maintains the force value over the specified time.

After the preload time has expired, the tensile force is increased again until the connection breaks. The maximum holding force is shown.



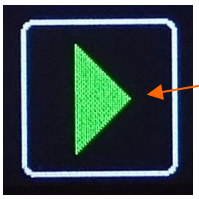
Highly enlarged tear-off area due to two-finger pinch zoom



The display can be switched to numeric representation by pressing the Force Display field.

Symbol for force test passed

If the function “Automatic return to start position” is deselected (see 12.5.3), the start button must be pressed again to activate the return movement.



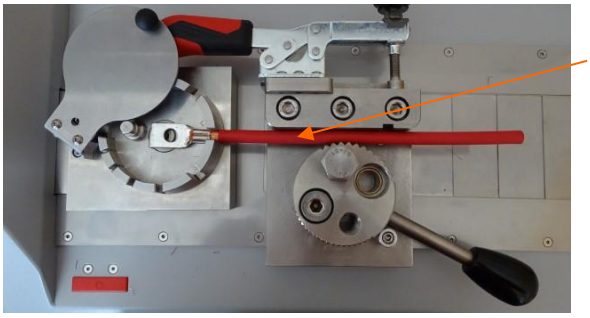
Press one of the Start buttons

13.4 Perform a test with test routine Hold force

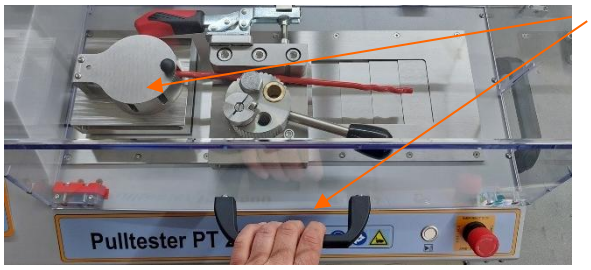
Choose test mode **Hold force** (see 12.4 / 12.4.4).

The following test criteria are selected:
The test sample is preloaded with 1000 N for 30 sec.

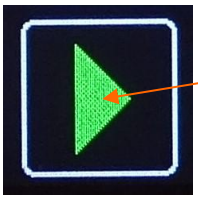
Note: The test parameters can only be changed by a supervisor (password) (see chapter 15.1).



Insert the cable as shown in the picture.



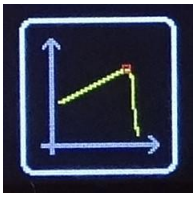
Close the clamping crown cover
Close safety cover



Press one of the Start buttons

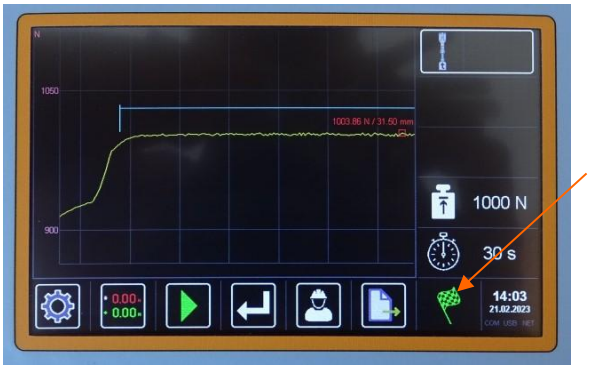
After starting, the device pulls to 1000 N and maintains the pulling force for the predefined time.

Previous highest force value
Actual force value
Timer for the test time



The display can be switched to curve representation by pressing the Force Display field.

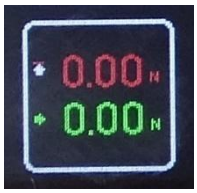
The graph shows how the controller maintains the force value over the specified time.



Highly enlarged tear-off area due to two-finger pinch zoom

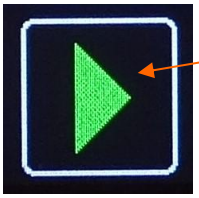
After the loading time has elapsed, the test sample is unloaded again.
The test is completed.

The test specimen should not be torn during the test!



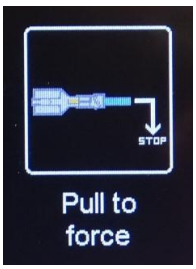
The display can be switched to numeric representation by pressing the Force Display field.

If the function “Automatic return to start position” is deselected (see 12.5.3), the start button must be pressed again to activate the return movement.



Press one of the Start buttons

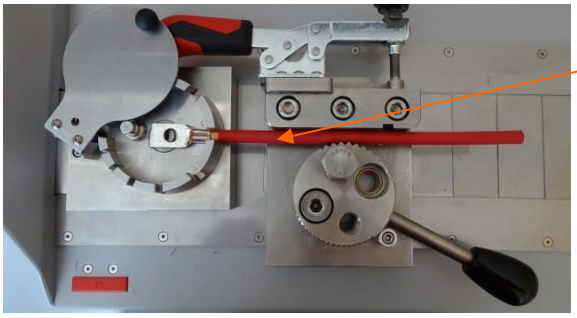
13.5 Perform a test with test routine Pull to force



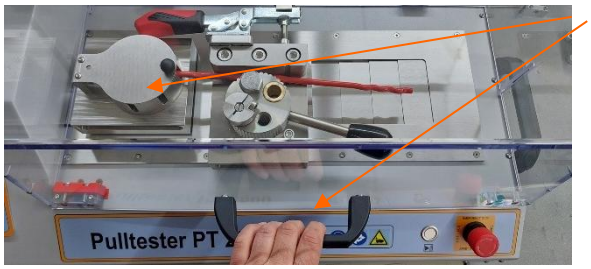
Select test mode **Pull to force** (see 12.4 / 12.4.5).

The following test criteria are selected:
The test sample is loaded up to 1000 N and immediately unloaded again.

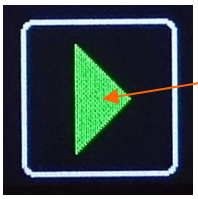
Note: The test parameters can only be changed by a supervisor (password) (see chapter 15.1).



Insert the cable as shown in the picture.



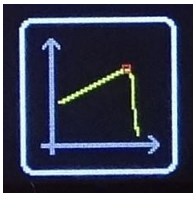
Close the clamping crown cover
Close safety cover



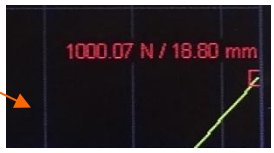
Press one of the Start buttons

In this example the cable was loaded with 1000 N.

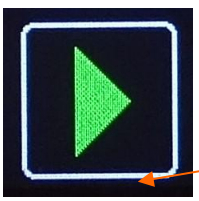
The test specimen should not be torn during the test!



The display can be switched to curve representation by pressing the Force Display field.



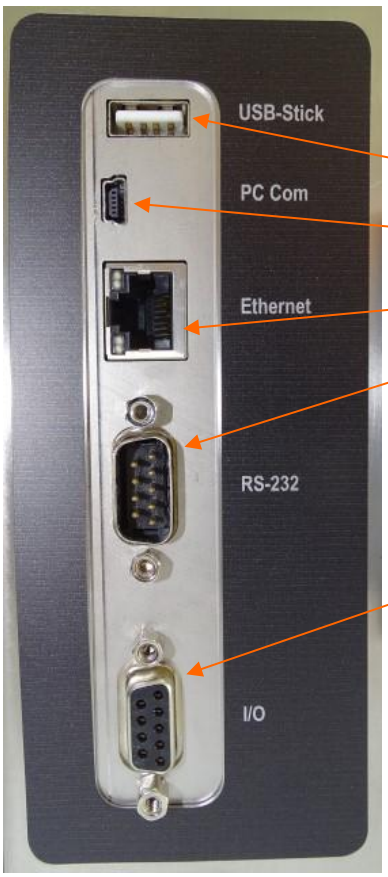
The graph shows the increase in tensile force up to the set limit value.



If the function “Automatic return to start position” is deselected (see 12.5.3), the start button must be pressed again to activate the return movement.

Press one of the Start buttons

14 Transmitting test results



For the export of the test results, different interfaces are available on the rear side of the device.

Slot for USB data carrier (stick)

Communication port for PC transmission

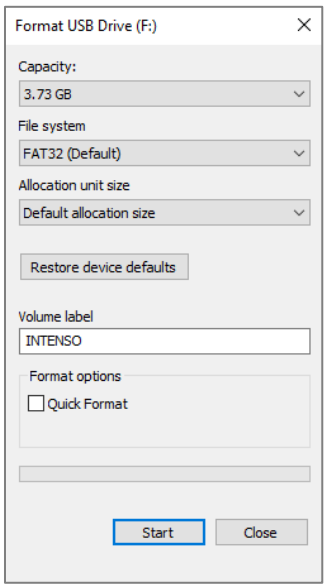
LAN connection via Ethernet connector

RS 232 interface for (receipt) printers

Digital interface:
4 inputs, opto-decoupled
4 outputs, potential-free relay contacts

14.1 Data output to a USB stick

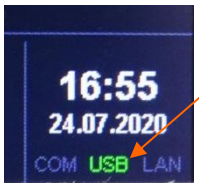
For data storage on the Pulltester, only USB 2.0 sticks are currently permitted!



Before using the device, the USB stick must be formatted to the FAT32 file system (data storage devices supplied by C-tec are already formatted).
Attention: All data on the stick will be deleted during formatting!

Proceed as follows:
Plug the stick into the USB port of a PC. In Windows Explorer, click on the USB stick with the right mouse button. Then click on Format, select **FAT32** from the drop-down menu for File System, **deselect** Quick Formatting and select **standard size** for Size of Assignment. Click on Start.
The stick is reformatted.

Insert the USB stick into the Pulltester



The ready-for-use stick is indicated by the green "USB" in the Time/Date field.

Perform the pull test.

It is not relevant for the transmission of the measurement which test mode is selected. The data for the measurement are transferred according to the selection.

Press field Data export

By pressing "CSV" a file with the extension .csv (Excel) is saved to the USB stick.
Pressing "bmp" saves an image with the extension .bmp to the USB stick.

If you press **X**, the selection menu closes.

The files are stored on the USB stick.

Content of file:

	A	B
1	s in mm	F in N
2	0	10,45
3	0,02	11,43
4	0,04	12,51
5	0,06	13,2
6	0,08	13,95
7	0,1	14,48
8	0,12	14,92
9	0,14	15,23
10	0,16	15,66
11	0,18	15,81
12	0,2	15,85
13	0,22	16,21
14	0,24	16,67
15	0,26	17,09
16	0,28	17,98
17	0,3	19,03
18	0,32	19,98
19	0,34	20,53
20	0,36	21,73
21	0,38	23,2
22	0,4	25,21
23	0,42	26,94
24	0,44	28,82
25	0,46	30,08
26	0,48	31,46
27	0,5	32,4
28	0,52	33,28
29	0,54	33,88
30	0,56	34,39

Screenshot of the pull test

Column A for measured pull stroke

Column B for measured tensile force

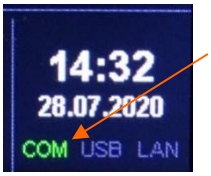
The data on the USB stick can then be transferred to a PC or opened from the stick on a PC.

14.2 Direct data transfer to a PC (with PT Viewer PC software installed)

Note: PT Viewer PC software is not included in the standard scope of delivery.

Connect the supplied USB cable with the USB 2.0 type Mini-B side to the pulltester at the PC Com port.

If the device is connected to a PC, the lettering COM is displayed in light blue.

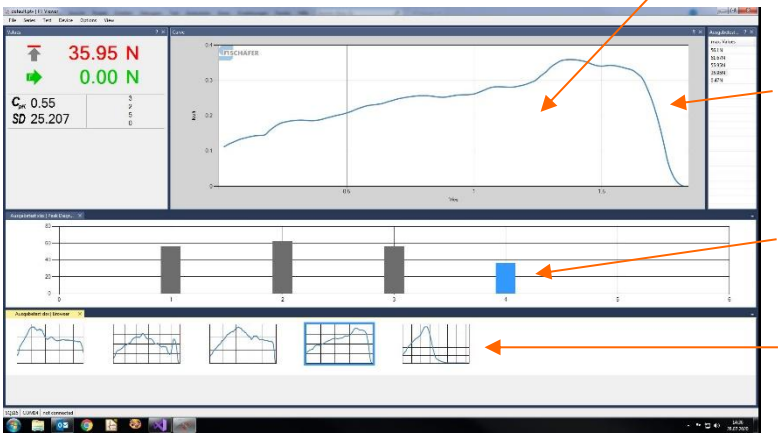


If the PT Viewer PC software is ready to communicate with the device, the COM label turns green.

Perform a tensile test.
For the transmission of the measurement, it is irrelevant which test mode is selected. The data for the measurement is transferred in the correct form according to the selection.

Already during the measurement, the curve values are automatically transferred to the PC.

PC software PT Viewer



Pull curve

Bar graph of the last measurements (maximum value)

Last measurements with curve preview

For further information, see PT Viewer operating manual.

14.3 LAN connection of the pulltester

If the pulltester is connected to the company's internal LAN, the LEDs on the port will start flashing.

When LAN communication is active, the LAN label turns green.

Note: Application programs for LAN communication are still under development. Individual customer wishes can be implemented here!

14.4 Printer connection

Only a few printers are suitable for connection to the pull tester. A tested and approved device ist the model EPSON, type M188D for cash register rolls 76mm wide plain paper and with serial data connection.

The printer is optionally available as an accessory.

Connect the serial printer cable to the RS232 input.

The correct connection of the printer is not shown in the display of the pulltester, because only one-way communication is possible here.

The secure connection is only shown when the printer responds after the print command.

Perform a tensile test.

For the transmission of the result to the printer, it is irrelevant which test mode was selected. The printout is standardized in the view.

Press field Data export

Pressing the printer symbol starts a printout

Pressing **X** closes the selection menu.

<u>Example for a printout:</u>

```
----------------------------------------
          P A S S
     Peakforce: 127.10 N
----------------------------------------
User: Operator
Time: 14:51:52
Date: 02.08.2020

Testname : 1.00 mm²

Pullspeed: 100 mm/min
Limit    : 108 N

Cpk  : not available
PASS : 1
FAIL : 0
Total: 1
----------------------------------------
```

PASS or FAIL describe whether the result was above the limit or below.

Peakforce is the largest measured tensile force during the test.

Operator level, time and date

Cross section tested

Tensile speed (constant)

Limit value for the selected cross section

Process capability index for a series of measurements

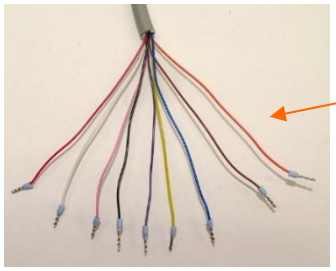
Counter for OK, NOK and total tests

14.5 Connection to machine control

Communication connections to higher-level machine controls are also possible via the serial RS 232 interface.
Alternatively, communication to other controls can also be realized via the USB 2.0 interface (PC Com).

Communication with fully automatic cable processing machines can be mentioned here as an example.

14.6 Digital inputs and outputs



4 digital inputs and 2 digital outputs can be connected to the 9-pin I/O connector.
The inputs have 24 V +/- 10% level and are optically decoupled.
The outputs are relay contacts, approved for 24 V AC/DC and a switching current of max. 1 A.

Assignment of the 9-pin I/O connector (female)

Pin	Name	Function	Color
1	IN - GND	Ground for inputs	black
2	OUT 2 - NO	Output 2 - switch contact	red
3	OUT 2 - COM	Output 2 - relay input	brown
4	OUT 1 - NO	Output 1 - switch contact	orange
5	OUT 1 - COM	Output 1 - relay input	white
6	IN4	Input 4 +24V	blue
7	IN3	Input 3 +24V	purple
8	IN2	Input 2 +24V	yellow
9	IN1	Input 1 +24V	pink

15 Changing the user level

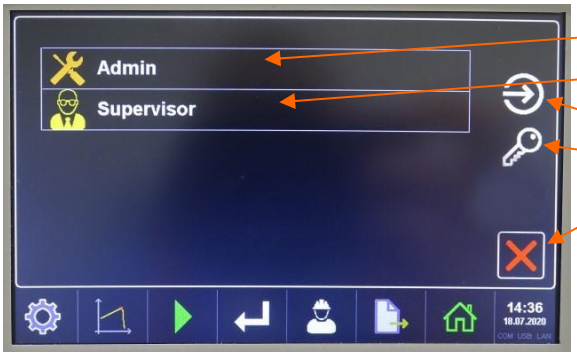
There are 3 access levels available for device operation.

- Level 1: Operator level; no password is required.
- Level 2: Supervisor level; the initial password is **password**
- Level 3: Admin(istrator)-level; the initial password is **access**

To change the user level, please proceed as follows:

Touch the **User level** field.

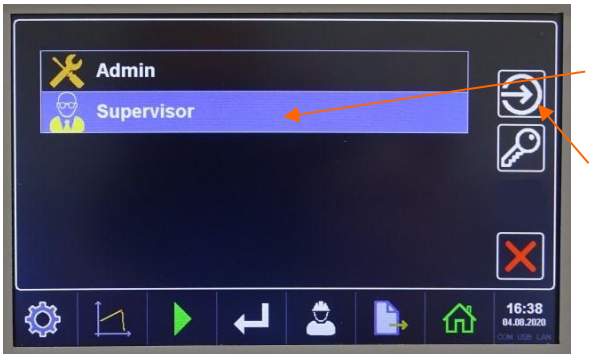
A selection menu for higher access shares opens.



Touch field for admin level
Touch field for supervisor level
Touch field for level login
Button for password change

Press **X** to close the menu

15.1 Selecting the supervisor level

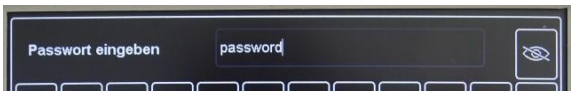


Activate the Supervisor field by touching it.

Touch the field **Login User Level**

The window for entering the password opens.

By pressing on the **Eye symbol** the entered password becomes visible.



Enter the password for the supervisor level and confirm it with the green check mark.

The icon shows that supervisor level is logged in.

Setting functions Pulling speed, maximum holding force, preload force and holding time can now be set.

To exit the supervisor level, press this symbol.

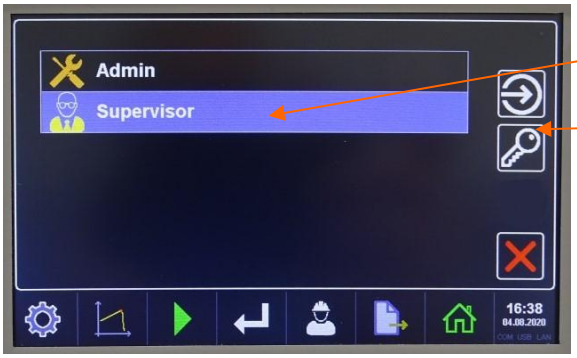
The device is back in the operator level.

15.2 Change Supervisor password

To change the password, please proceed as follows:

Important: Start from operator level!

Press the **User Level** field.

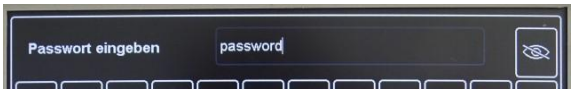


Activate the Supervisor by touching it.

Press onto the field with the key symbol.

The window for password entry opens.

By pressing on the **Eye symbol** the entered password becomes visible.



Enter the (old) password for the Supervisor level and confirm with the green tick.

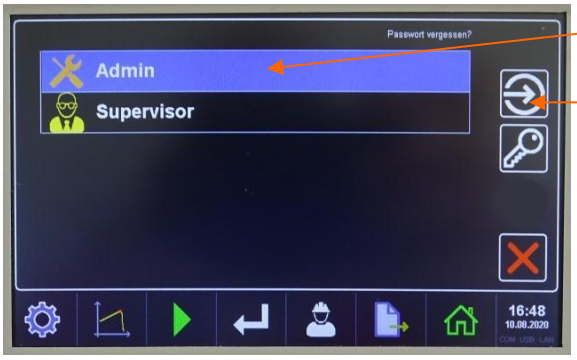
Enter the new password (**at least 6 digits**) and confirm with the green tick.

Attention: Choose a password which you can remember easily!

Enter the newly selected password again for confirmation and confirm with the green tick.

The new password is active from now on and the old one is deleted.

15.3 Select Admin level



Activate the Admin field by touching it.

Touch the field **Login User Level**

The window for entering the password opens.

By pressing on the **Eye symbol** the entered password becomes visible.

Enter the password for the admin level and confirm it with the green tick.

Icon indicates that the admin level is logged in.

To exit the admin level, press this icon.

Device is again at operator level.

15.4 Forgot Admin password

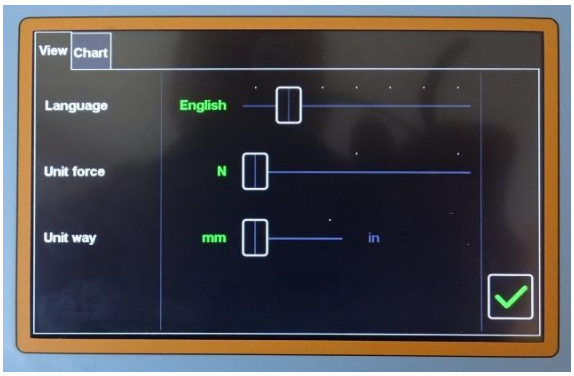
Press on the text "Forgot your password?"

A menu for password entry opens.

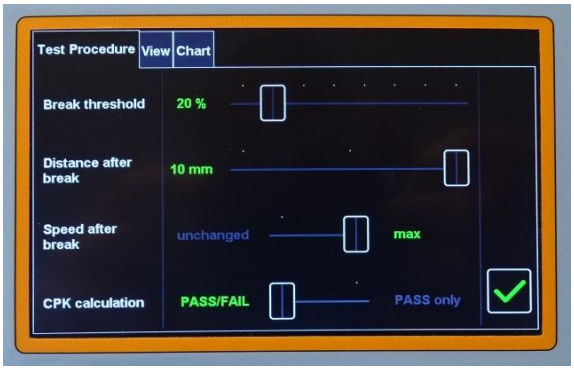
A "Password Reset Code" can be requested from the supplier of the device, which must be entered here. The device is then reset to the initial password.

Note: The Password Reset Code can only be used once and is invalid afterwards.

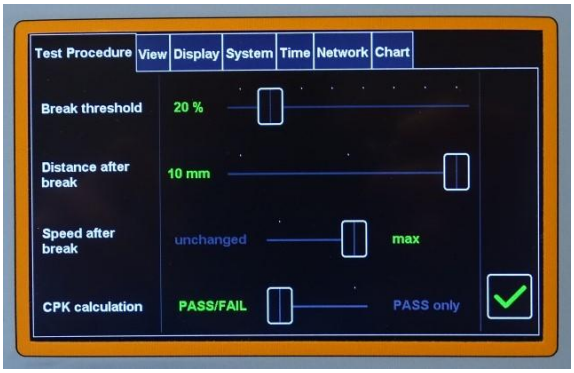
16 System parameter



Available registers in user level

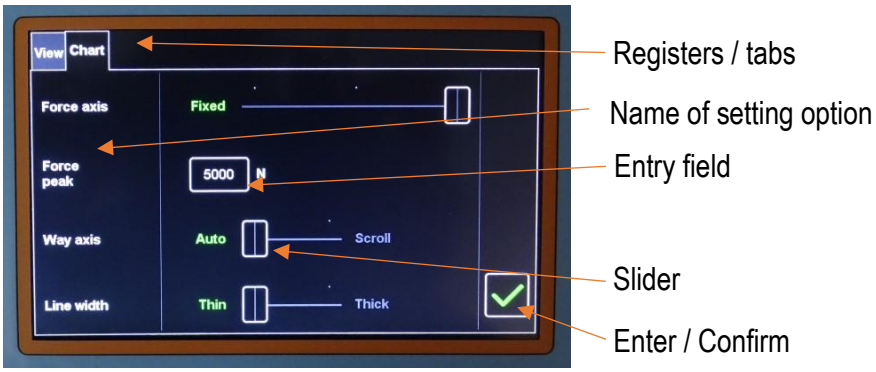


Available registers in supervisor level



Available registers in admin level

Structure of the menu



By touching the tabs at the top, you can switch between the different menus of the system settings. Changes that have already been made don't get lost.

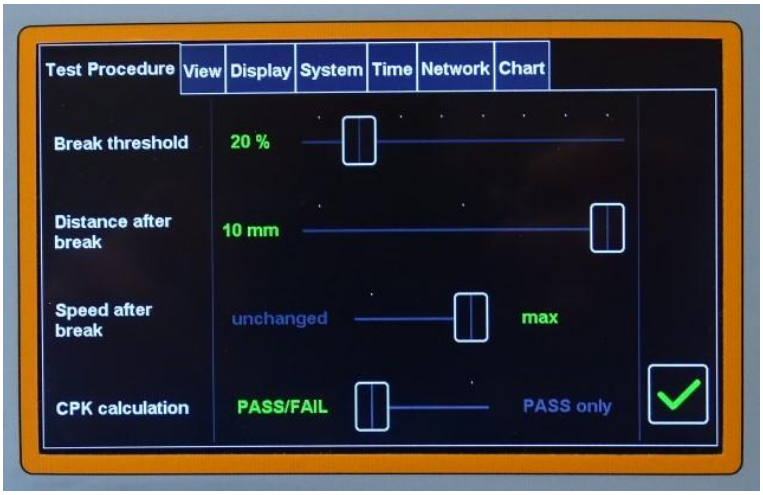
After pressing the "Enter" button ✔, the "System settings" window is closed and the changes are saved. This button is available in the same position in all menus.

In the left part of the menus, the setting options for the respective tab are displayed.

By dragging the slider (left / right) the corresponding setting can be changed. The selected value is highlighted in color.

Some values must be entered via the on-screen keyboard. In this case, an input field is displayed. After pressing the input field, the on-screen keyboard is displayed and the value can be entered.

16.1 Register “Test procedure“



Break threshold
Setting range: 10, 20, 30, 40, 50, 60, 70 and 80 %
Factory setting: 20 %
If the maximum force value falls below this value (20% of the peak value), a break in the test cable is certain.
Example: If the maximum value of the measured tensile force is 1000 N, the measured force must then fall below 200 N so that a break is reliably detected and the end of the measurement follows.

Distance after break
Settings: 0 mm, 5 mm, 10 mm
Factory setting: 10 mm

After the breakage has been detected, the test cable is pulled further by the set distance so that the breakage can also be clearly identified visually.

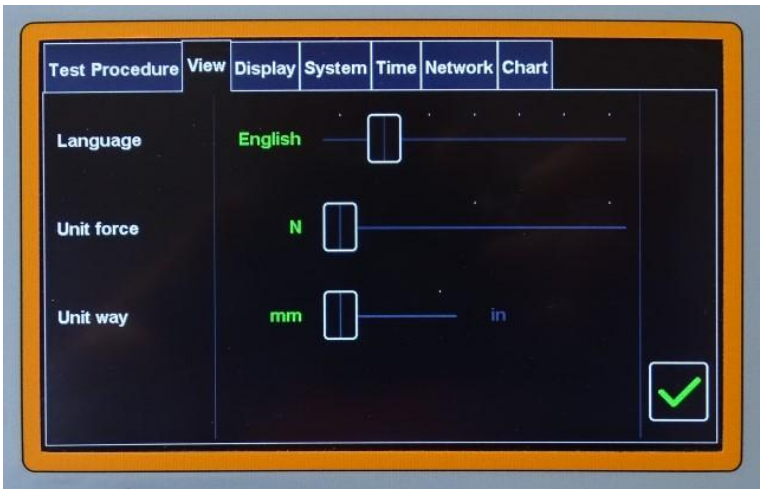
Speed after break
Settings: equal, max
Factory setting: max

The distance after break can be performed with the set test speed or with the maximum possible speed. Since this distance is unimportant for the test, max. is selected as the factory setting.

CPK calculation
Settings: PASS/FAIL, PASS only
Factory settings: PASS/FAIL

In the Setpoint test mode (12.4.2), a process capability index CpK is calculated by the device from the third measured value in succession. The setting can be used to select whether only the tests evaluated as OK (PASS only) or also the tests evaluated as not OK (PASS/FAIL) are to be included in the calculation.
A test is evaluated as OK if the measured peak value of the pull-off force is above the set nominal value. The CPK value is calculated according to statistical principles.

16.2 Register "View"

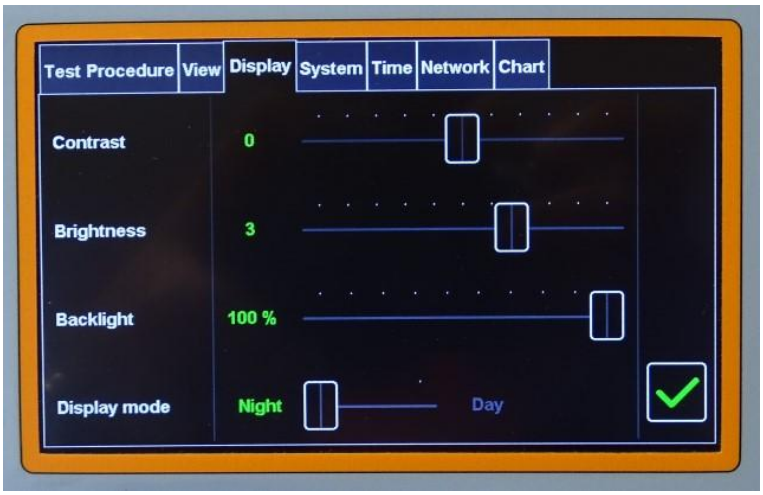


Language
Settings: Deutsch, English, Italiano, Français, Español, Romana
Factory setting: English
Setting of the system language.

Unit Force
Settings: N, kgf, lbf
Factory setting: N
Selection of the unit system for the force: Newton (N) / force kilogram (kgf) / force pound (lbf)

Unit way
Settings: mm, in
Factory setting: mm
Selection of the unit system for the length: millimeter (mm) / inch (in)

16.3 Register “Display”



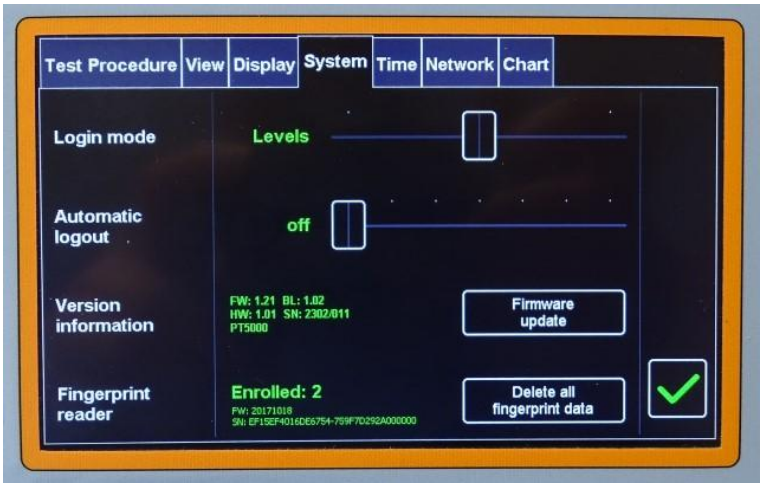
Contrast
Settings: -10 to +10
Factory setting: 0
Adjustment of the color contrast of the display.

Brightness
Settings: -10 to +10
Factory setting: 2
Adjustment of the brightness of the display.

Backlight
Settings: 10 % to 100 % (in steps of 1%)
Factory setting: 100 %
Setting of the intensity of the backlight of the display.

Display mode
Settings: night, day
Factory setting: night
With this setting, the color scheme of the display can be changed. Two different display modes are available:
Setting “night” → pleasant working indoors with artificial lighting.
Setting “day” → better readability in sunlight.

16.4 Register “System”



Login mode

Settings: off, levels, user

Factory setting: off

The operation options of the unit can be restricted for certain users if desired. In this case, the access level or the name of the user performing the check is noted on the printout and, if necessary, transmitted to the connected PC.

Setting “off”

In this mode, all unit functions, with the exception of user administration, are available without restriction. A password entry is not necessary.

Setting “Levels”

Three access levels are available for operating the unit:

	**User**	The "User" may select the test mode and perform deduction tests. He only has access to the menus "View" and "Chart". He cannot change any test settings such as setpoint or take-off speed. No password is required for the "User" level. After switching on, the unit starts in the "User" access level.
	**Supervisor**	The "Supervisor" also has access to all test settings, e.g., setpoint or pull-off speed, and to the "Test procedure" menu. The menus "System", "Time" and "Network" are not available to him. In the delivery state, the supervisor password is: **password**
	**Admin**	The "Administrator" has full access to all unit functions. In the delivery state, the administrator password is: **access**

Setting „User”

Up to 100 users can be created in the device. The following data can be entered individually for each user: Name, ID (e.g., personnel number), password, photo, access rights, signal color.

The management of users is described in Chapter 16.8 The "Users" menu.

After the login mode has been set to "User" and confirmed with the button, the login of a user with administrator rights is necessary. In the delivery state, this is the user "Admin" with the password "access". The "User" menu is then displayed in the device settings.

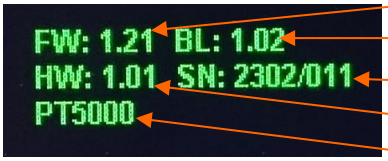
Users without administrator rights have no access to the "Users" menu.

The users "Admin" and "Supervisor" cannot be deleted, renamed or changed with regard to access rights. However, it is possible to change the password, signal color and photo. It is recommended to write down the administrator password and store it in a safe place.

Automatic logout

Settings: off, 1 min., 5 min., 10 min., 15 min., 30 min., 60 min.
Factory settings: off
In the login modes "Levels" and "User", it can be selected after which time of non-use the logged-in user should be automatically logged out.

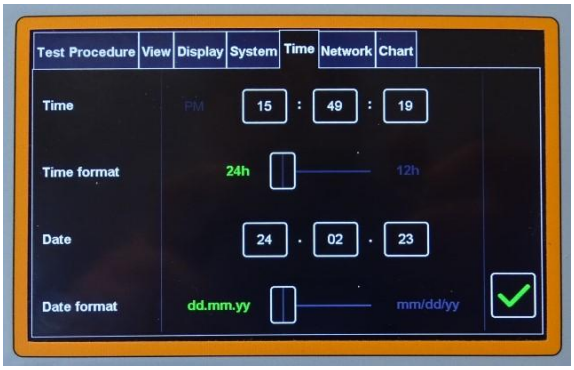
Version information



Version of device firmware
Version of boot loader
Serial number of the device
Version number of the electronics installed in the unit
Device type

To update the device firmware, press this button. Description in chapter 16.11

16.5 Register “Time”



Time and date settings are applied immediately after entry.

The unit's real-time clock is powered by a built-in battery so that the time and date settings are retained even without a power supply.

Time

The unit's system time can be set by pressing the corresponding buttons.
To set hours and minutes, the entry has to be made via the on-screen keyboard. The setting of the seconds is switched to 0 after touching the button.
If the "time format" has been set to "12h" the setting for the time of day is active. In this case, the setting switches between "AM" and "PM" after each touch of the button.

Time format

Settings: 24h, 12h
Factory setting: 24h
The time can be displayed either in 24-hour format or in 12-hour format with display of (AM/PM).

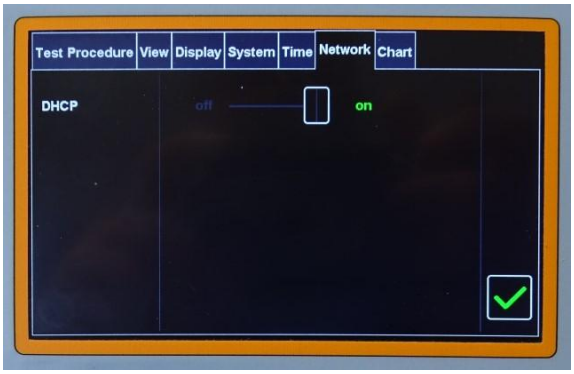
Date

The date can be set by pressing the corresponding buttons. The entry is made via the on-screen keyboard.
The year is to be entered in two digits (without the millennium), e.g., type 22 for the year 2022.

Date format

Settings: DD.MM.YY, MM/DD/YY
Factory setting: DD.MM.YY
The date can be displayed either in European format (DD.MM.YY) or in American format (MM/DD/YY).

16.6 Register “Network”

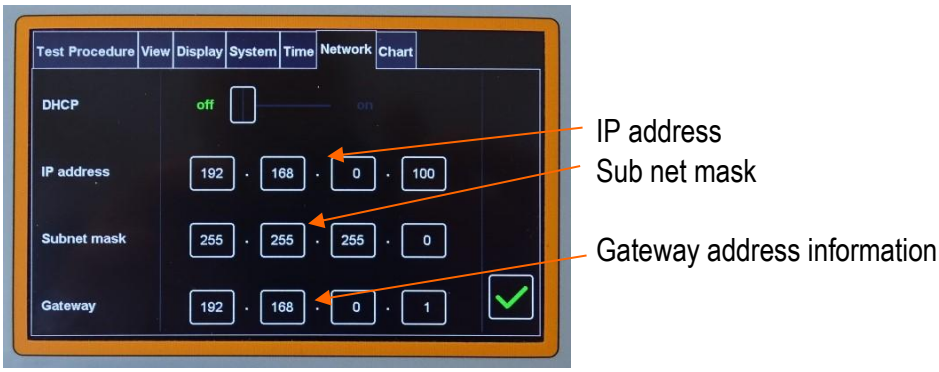


Network functions are offered on a customer-specific basis. If necessary, further information can be requested from the supplier of the device.
Before connecting the device to a network (LAN), the correct settings for the network configuration must be requested from the administrator of the network.

DHCP

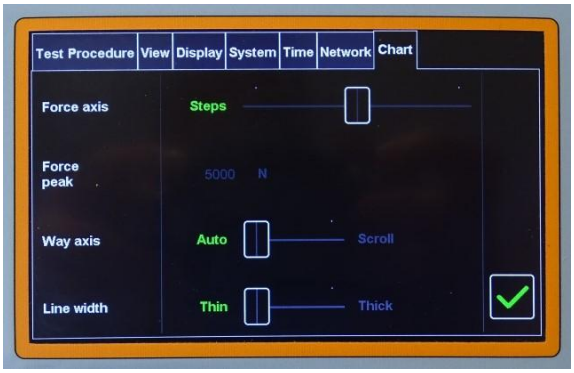
Setting “on”
If the unit is connected to a network with a DHCP server, it will automatically try to obtain the network configuration from the server after connecting the network cable.
After successful assignment of the configuration, it is automatically displayed.

Setting “off”
The network configuration can be entered manually.



The individual values can be changed by pressing the corresponding buttons.
The input is made via the on-screen keyboard.

16.7 Register “Chart”



Force axis

Settings: auto, steps, fixed
Force setting: steps
The type of scaling for the force axis in the graphic display can be set as follows:

Setting "Auto"
The force axis is always scaled so that the curve fills the entire image.

Setting “Steps”
The force axis is scaled in steps. If the peak value of the force exceeds the maximum value that can be displayed, the axis is switched to the next higher display range.

Setting "Fixed"
The maximum value of the force axis is set to the value set under "Force peak value". Automatic scaling does not take place.

Force Peak

The maximum value of the force axis for the "Fixed" setting can be entered here.

Way axis

Settings: Auto, Scroll
Factory setting: Auto

Setting “Auto”

The path axis is always scaled so that the curve fills the entire image.

Setting “Scroll”

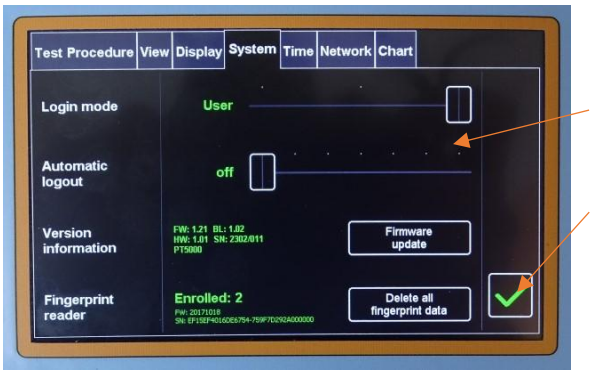
The scaling of the path axis is kept constant. The start and end values of the axis are carried along with the path of travel.

Line width

Settings: thin, thick
Factory setting: thin

The line width of the graph can be set in two steps.

16.8 Register “User”



The user menu is only visible after the "User" setting has been selected in the "System" menu under "Login mode" (see 16.4) and confirmed by pressing the enter button.

The Pulltester now immediately switches to log-in mode, i.e., the device can no longer be operated without logging in.

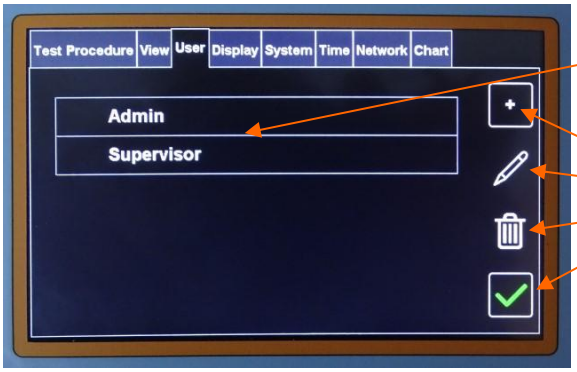
In the simplest case, the Pulltester could now be operated with the login as supervisor (PW: password) or as admin (PW: access). However, the actual purpose of these logon modes is to create a separate access with separate releases for each colleague working on the system.

Create, modify or delete a new user

Login as admin - password: access

Admin is displayed in the login touch button.

Touch the System setup area.

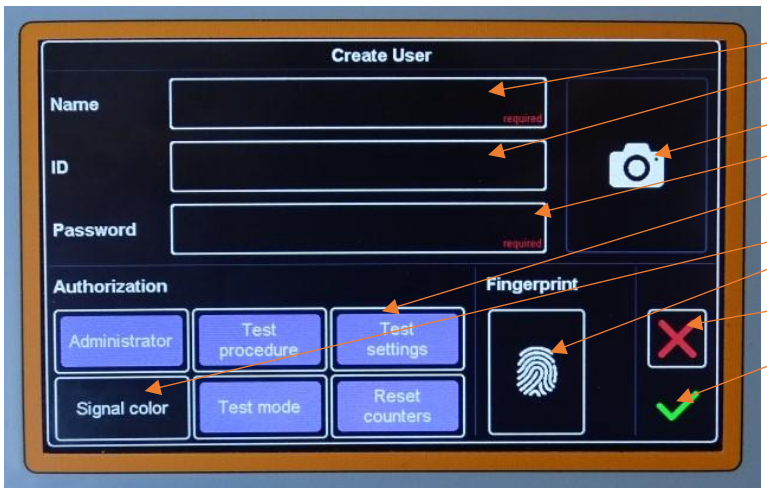


User list
Add new user
Change user data (edit)
Delete user
Confirm entries and exit

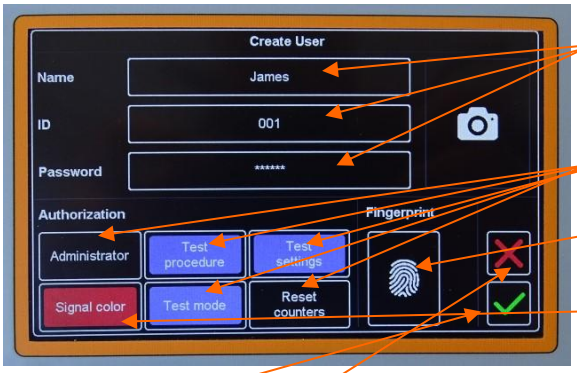
16.8.1 Creating a new user

Up to 100 users can be created.

Press the Create user button.



User name (required)
ID number (optional)
User photo (optional)
User password (required)
Access rights (required)
Personal display color (optional)
Fingerprint sensor (not in PT2500)
Reject / Exit
Confirm



Press the buttons next to Name, ID and Password to enter the required data using the on-screen keyboard that opens.
Select the access rights by pressing the buttons (blue = enabled, black = disabled).
Fingerprint sensor (not in PT2500)

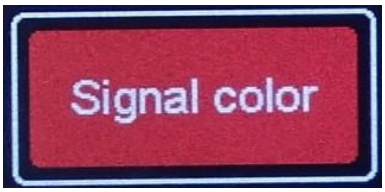
By pressing on the area, you can select from 5 different color patterns.

Confirm entry or cancel entry and discard data.

List of access rights

Button	Permissions
No user rights selected	• Starting trigger tests • Switching between numerical and graphic display • Switching on automatic return • Accessing the following pages of the main menu: View, Chart
Administrator	• Access to the following pages of the main menu: User, Display, System, Time, Network
Test procedure	• Access to the following page of the main menu: Test procedure
Test settings	• Access to setting of trigger speed, test force, holding force and holding time
Test mode	• Selection of the test mode
Reset counter	• Resetting the test counters and the process capability index CpK

Possible color patterns

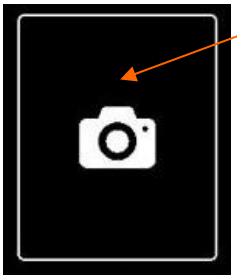


Red, yellow, orange or neutral

Save picture (optional)

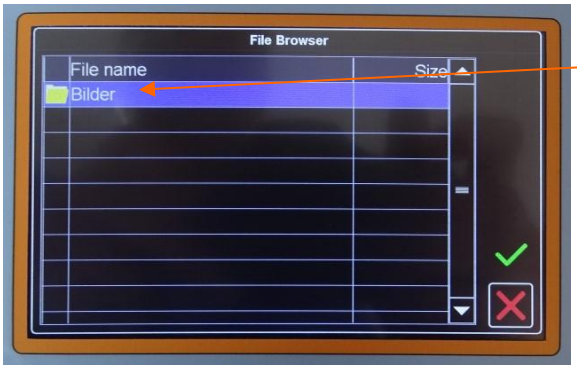
A photo can be saved in the device for each user. The photo is displayed instead of the user name in the user change button.

The "Photo" button only becomes active after a USB stick has been connected to the device and recognized. The USB stick must be formatted with the "FAT-32" file system and an image in .bmp format must be stored on it. While the image is being read in, it is reduced to a necessary size (pixel size). The loading process can therefore take longer (up to 60 sec.) for very large images. Images with a pixel size below 320 x 180 (50 kB) should not be used anymore.

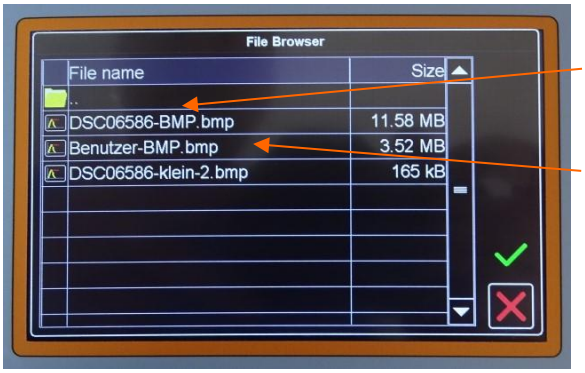


Touch the User Photo field

A file browser appears with directories or files that are on the USB stick and have the extension .bmp.



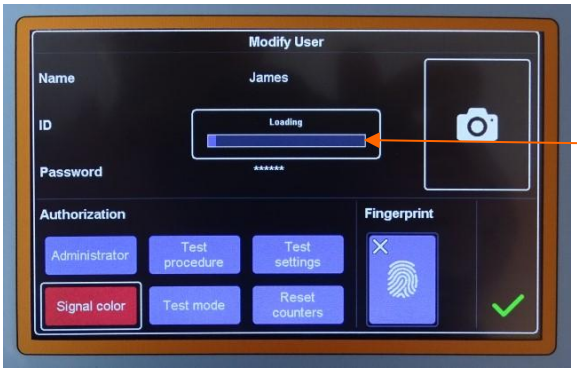
To open a directory, briefly touch the area with the directory name twice (double-click).



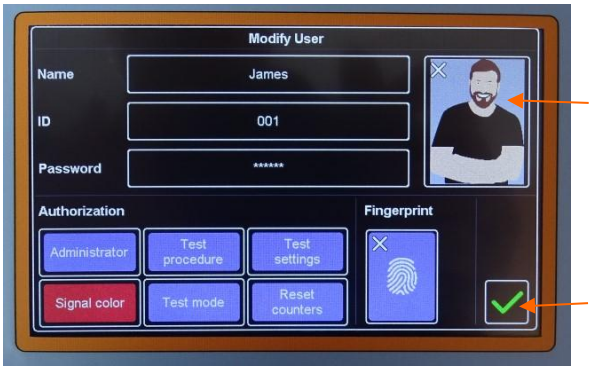
To return to the directory structure, briefly touch the area next to the file folder twice.

Touch the area with the desired image.

By pressing on the Confirm button, load the image into the Pulltester or
cancel the process.



The loading process is indicated by a progress bar



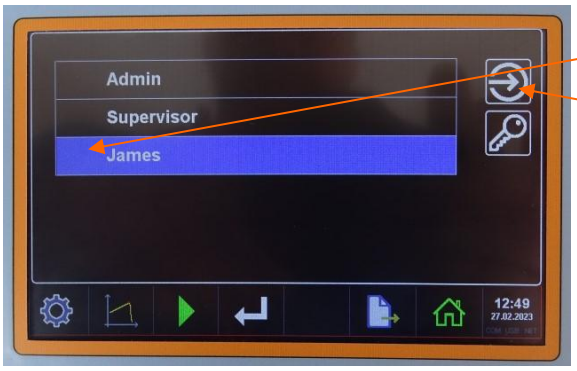
After the loading process, the image is displayed.

The image can be deleted again by pressing the User photo button again.

After pressing the Confirm button, the process is completed.

The USB stick can now be disconnected directly from the device (without "Safely eject hardware").

16.8.2 Login as a new user



Touch the field with the personal access.
Log in with the personal password

The user is greeted.

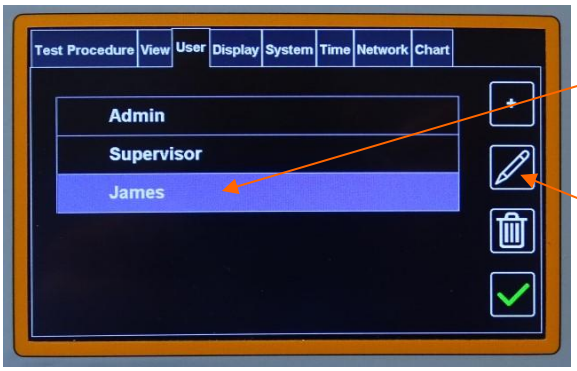
The user is logged in with his rights, personal color scheme and, if applicable, his picture.

16.8.3 Change user data

Login as admin - password: access

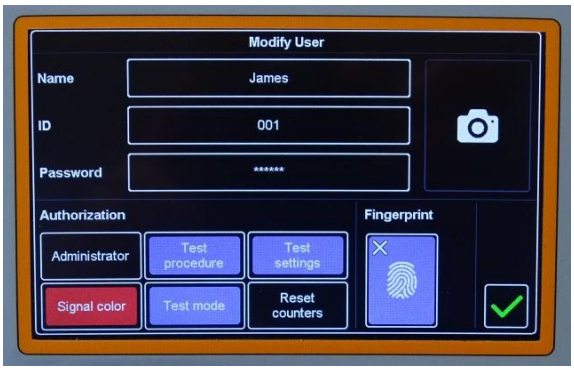
Admin is displayed in the login touch button.

Touch the System setup area.

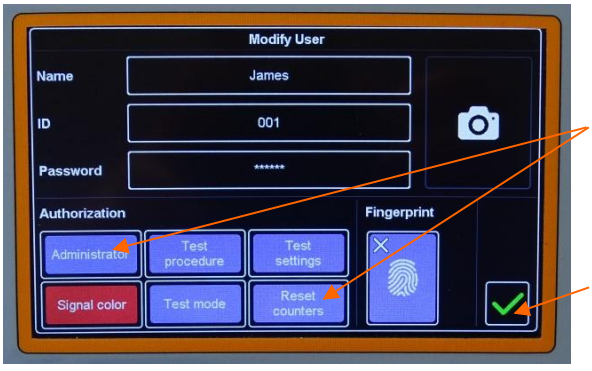


Activate the user to be changed by pressing on the area.

Press the pen (edit) on the surface.



The data sheet of the selected user is opened. Data or rights can now be changed.



The user has now been assigned additional administrator rights and the right to delete meters.

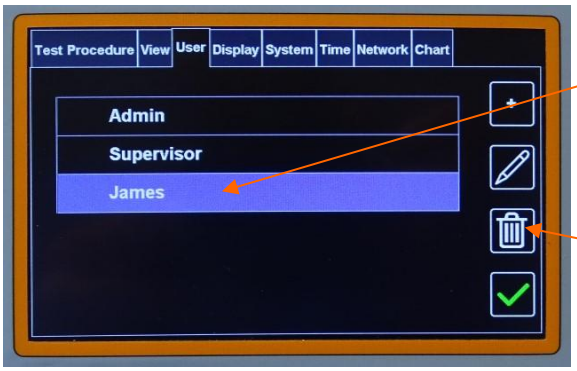
Accept the change by pressing the Confirm button.

16.8.4 Delete a user

Login as admin - password: access

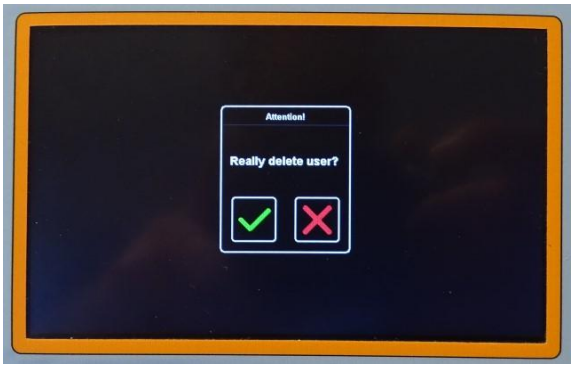
Admin is displayed in the login touch button.

Touch the System setup area.



Activate the user to be deleted by pressing on the area.
Admin und Supervisor cannot be deleted!

Press the Trash button.

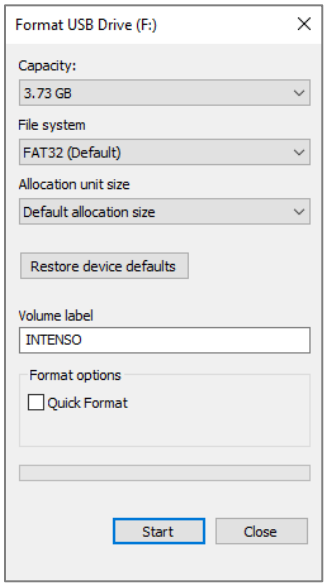


Press the Confirm button (confirmation prompt) to delete the user and all its data.

16.9 Firmware Update

The menu "System" with the button "Update Firmware" is only visible when the user administration is switched off, after a user with administrator rights has been logged in.

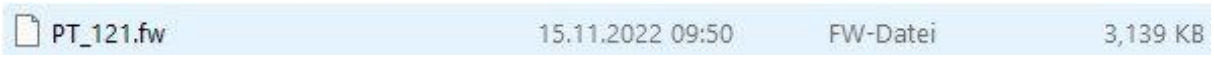
For firmware (control and display software) updates on the Pulltester only USB 2.0 sticks are allowed at the moment!



Before using the device, the USB stick must be formatted to the FAT32 file system (data storage devices supplied by C-tec are already formatted).
Attention: All data on the stick will deleted during formatting!

Proceed as follows:
Plug the stick into the USB port of a PC. In Windows Explorer, click on the USB stick with the right mouse button. Then click on Format, select **FAT32** from the drop-down menu for File System, **deselect** Quick Formatting and select **standard size** for Size of Assignment. Click on Start.
The stick is reformatted.

Copy the file with the new firmware on a PC to the USB drive.



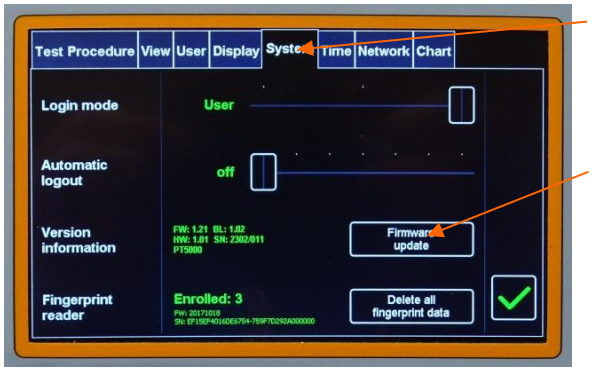
Then plug the USB stick into the Pulltester

The ready-for-use stick is indicated by the green "USB" in the Time/Date field

Login as admin - password: access

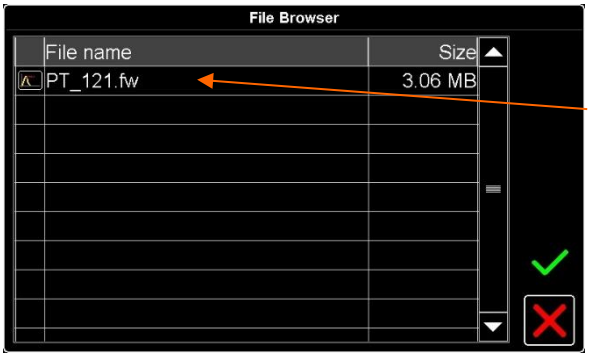
Admin is displayed in the login touch button.

Touch the System setup area.

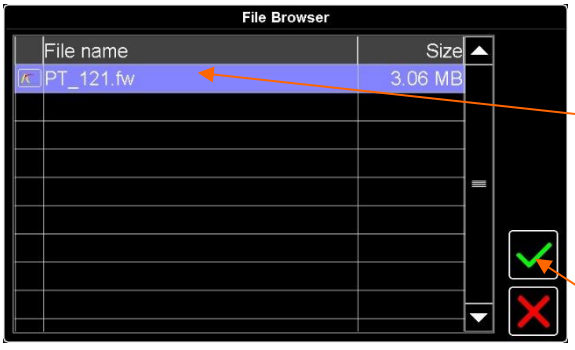


Choose the register “System”

Tip on **Firmware update**



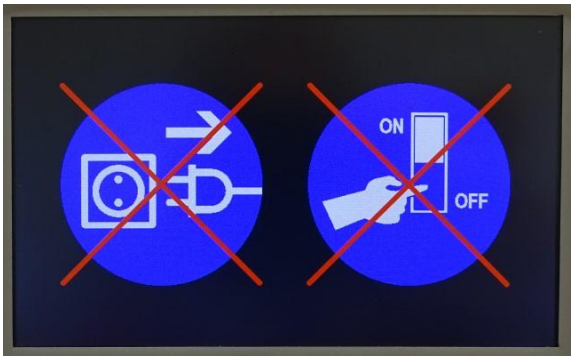
The table shows all files with “.fw” suffix stored on the stick.



Select the desired update file by touching it. The file extension .fw means Firmware. The number in front shows the version.

Confirm the selection by clicking on the green tick.

In the following step the selected file is transferred from the USB stick to the internal SD card.
Note: At this stage the update process can still be aborted by switching off the device without losing data.



If these two symbols are shown in the display, the actual firmware update is now running. At this stage the device must by no means be disconnected from the power supply anymore.
If this should happen, the device will start an emergency program after 1 minute when the power supply is restored. In this emergency program the update can be started again.

If you can read “UPDATE COMPLETE!“ in the progress bar, the process has been successfully completed.

17 Handling, Maintenance and Servicing

To keep the unit in a proper condition the following provisions have to be observed:

- Remove destroyed test samples properly (contact element and cable).
- If necessary, clean the touch color display only with a soft cloth.
- Do not use harsh cleaning agents or chemicals for cleaning.

Since no wearing components have been built into the pull tester, only minor maintenance work is required.

18 Periodical Inspections

The Pulltester is a high quality and precise measuring device used for quality control. It is therefore subject to a regular recurring calibration. An initial calibration is carried out before delivery of the device. Under normal use of the device, the recalibration should be done once a year. Calibration is performed exclusively by the manufacturer.

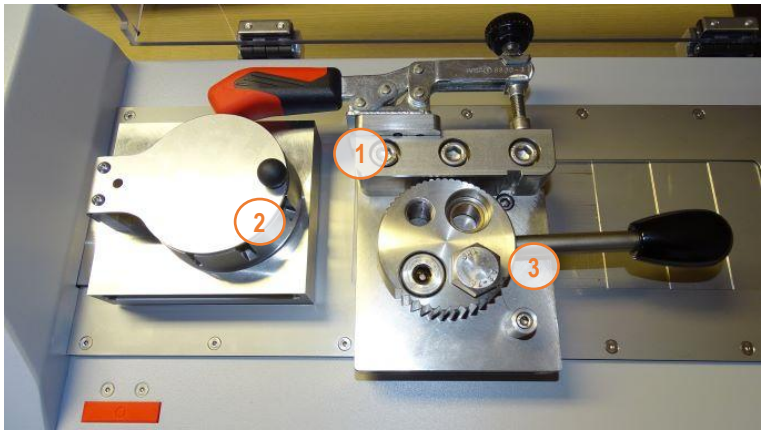
19 Decommissioning

Don’t dispose the unit with residual waste!

This unit is subject to the European Community Directive for used electrical and electronic devices and may not be disposed in regular household garbage.

After period of use the device can be returned to C-tec for duly recycling.

20 Spare parts



No	Article no.	Description
(1)		Toggle clamp for sensitive cables
(2)		Clamping crown complete
(3)		Quick clamping device complete
(4)		Bolt for quick clamping device
(5)		Tension bolt
(6)		Plexiglass safety cover with magnetic safety switch
(7)		5" TFT Color touch display
(8)		Clamping crown cover
(9)		Clamping crown insert

21 Possible failures and troubleshooting

Failure description	Possible reasons	Troubleshooting measures
The display remains dark after switching on.	1) The device needs about 5 seconds to initialize the display after switching on. During this time the display remains dark. 2) The power cable is not correctly connected to the mains or to the unit. 3) The mains voltage is not available because a protection device of the power supply has been triggered. 4) The fine-wire fuse of the machine has tripped.	1) Wait 5 seconds after switching on the machine until the display shows 2) Connect the power line first to the machine and then to the power socket. 3) Have the malfunction at the power supply system remedied by an authorized specialist. If the safety device should be triggered again when connecting or switching on the machine, disconnect the machine from the power supply immediately and contact the manufacturer's service department. 4) Contact the manufacturer's service department to solve the problem.
The display remains dark after a firmware update.	During the update the power supply was interrupted.	The device tries to restore the firmware. The process takes about 2 minutes. During this time the display remains dark. After the recovery, the device automatically starts with an older version of the firmware. The update must be repeated. If after 5 minutes no automatic restart has taken place, switch off the device for 1 minute and then switch it on again. The recovery process starts again. The display remains dark. If the device still does not start after the 2nd attempt, the manufacturer's service must be contacted.

Failure description	Possible reasons	Troubleshooting measures
The device stops during the return journey and immediately moves approx. 1mm in the opposite direction. In the status field the error sign for "Travel blocked" is displayed:  This happens, if during the return journey a) pressure is applied to the lower cable support or b) no movement of the feed is measured although the drive is running The short movement in the opposite direction serves to relieve the load in case a foreign body is jammed.	1) The sample item was clamped during the return travel and presses on the lower cable support. 2) A foreign object is located between the clamping crown or gripper and the lower cable support. 3) The drive or the travel is otherwise blocked.	1) Remove the test specimen and start the return travel again. 2) Remove the blockage. Afterwards the tester can be used again. 3) If the reason is not obvious, contact the manufacturer's service department.
Date and time settings are reset after power is removed or the unit is turned off.	The internal battery for operating the real-time clock is empty.	Contact the manufacturer's service department so that they can replace the battery.
A connected USB memory stick is not recognized (USB display under Date remains grey), or data is not correctly transferred to the USB memory stick.	1) The USB memory stick is not formatted with the FAT32 file system 2) A memory stick was used that does not comply with USB standard 1.0, 1.1 or 2.0. 3) There is not enough free space on the memory stick.	1) Format the memory stick with the FAT32 file system. Do not use quick formatting (see 14.1). 2) Do not use a USB memory stick with a higher standard than USB2.0. 3) Delete files from the memory stick to provide enough free memory.
A connected PC is not recognized (COM display under date remains grey).	1) The connected PC is not switched on. 2) The USB cable is defective. 3) The USB port of the PC does not provide any supply voltage or has no "USB host" function.	1) Switch on the PC. The COM display changes to blue. 2) Replace the USB cable. 3) Connect the machine to a PC with a functional USB port with "USB Host" function.

Failure description	Possible reasons	Troubleshooting measures
No connection is established with the "X-Scan" or "PT Viewer" software. The COM display does not change to green, but remains blue. The device is not recognized by the operating system as "STMicroelectronics Virtual COM Port".	No or a wrong USB driver is installed on the PC.	In newer operating system versions the correct driver is already included. Only in case of error the driver on the supplied USB stick should be used. The old version must be removed before a new installation.

Please consider your environmental responsibility before printing this document.

Version history:

Date	Version	Responsible	Amendment
17.03.2026	1.0.0	Marlene Egginger	Original state of English version

Notes: