

Graphical Tester for Otoplastics

With USB interface

General User's Manual

2021

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1 GENERAL

1.1 Terms

This manual uses a number of **terms** that are briefly described here.

- leak tester:** the device, to which the adapter and the otoplastic, by means of an air hose, are connected [also: tester, leakage tester, unit, device]
- system:** the physical whole consisting of leakage tester, air hose, adapter, otoplastic and ear canal (meatus)
- platform:** personal computer (desktop, laptop), tablet or smartphone that hosts a USB port and will make an interface connection to the leak tester
- software:** the software (*app*) running on the platform that controls the leak tester [also: *app*, program, user-interface, controlling software]
- USB:** the cable, connectors and communication protocols between the platform and the leak tester.

Together, the leakage tester, platform, software and USB interface form the "graphical tester for otoplastics".

Below is a photo of the tester showing the LED status-indicator (§1.2.2) and air hose.



Photo 1.1.1: the USB leakage tester, front and silicon hose with standard adapter

1.2 Bringing into operation

1.2.1 Power

When connecting platform and leak tester with the provided USB cable the tester is automatically activated; there is no on/off switch. The provided cable has two plugs: at the platform side a USB type A and on the tester side a micro USB type B. The tester is provided with a micro USB type AB receptacle (jack), so both micro USB type A and B can be applied. The tester works with both USB 2.0 and USB 3.0 connections.

Below is a photo (1.2.1.1) showing the USB cable with on the right the micro USB type B which should be connected to the rear of the leak tester (photo 1.2.1.2). Pay attention to the position: the two tiny ridges on top, the plane side on the bottom. Attn.: the text A(B) or the USB logo on the plastic part of the plug is not a reliable indicator for the right orientation.



Photo 1.2.1.1: interface cable USB type A (left) to micro USB type B



Photo 1.2.1.2: backside of the leak tester with USB cable

1.2.2 USB cable selection

1.2.2.1 General

The tester comes with a standard USB cable (A > micro-B, 1.8m). The length of the cable can be a limitation. Shorter cables may always be used, but when choosing a longer cable, it should not be more than 5m, and then preferably with a filter on the micro-B side.

As mentioned, the tester does not have an on/off switch: it is switched on and off with the desktop, laptop etc. If you want to disconnect the tester from the USB cable every time after use, do this preferably with the USB-A side of the cable, because this is a more robust connector. Another consideration to limit the forces on the micro-B connector is to use a magnetic (or zero-force) coupling: the connector stays in the micro-B socket on the unit and the cable can be pulled out without force. A tested example can be seen below.



Photo 1.2.2.1: backside of tester with "zero-force" connector

1.2.2.2 Cable for Android tablet or smartphone

If you want to use the tester in combination with an *Android* platform, there are various options to get from the micro-B on the unit to the socket on the *Android* machine, e.g.:

an attachment for the USB-A side of the standard cable, this can be USB micro B or C, or a special cable USB micro-B / C (Android) to micro-B. Both options have been tested and work fine.

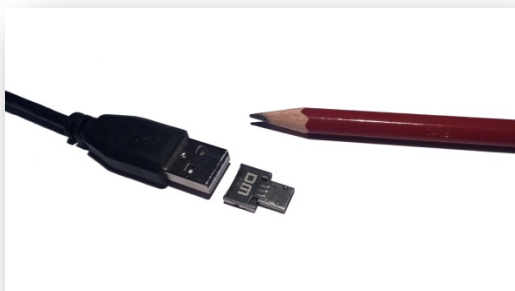


Photo 1.2.2.2: attachment for USB-A > micro-B



Photo 1.2.2.3: USB micro-C (left) > micro-B

1.2.3 LED status indicator

The tricolour LED status-indicator can turn to red, orange or green.

Red:

- for an indefinite period during initialization while the tester is not yet recognized by the operating system of the platform (led is blinking)
- during approx. ten seconds right after connecting the tester to the platform (during this period the tester is set and the offset determined. Do not touch the tester during this period, because of this it is good practice to connect the USB cable to the tester first and only then to the platform)
- up to five seconds after a fault condition during a measurement (§2.3.3)

Orange:

- after set up has been completed (and a stable offset established), tester waits for the controlling software launch
- immediately after every start of a measurement until completion
- after entering *sleep* mode for screen and/or PC
- after program closure

Green:

- there is contact between the controlling software and the tester
- a measurement has been carried out, the leak tester is ready for a new test

1.2.4 The leakage tester

Connect an air hose (PVC or silicon) of about 1.2 meters long to the connector (spout) intended for it at the front. Before use, check the air hose for damages, dirt, kinks, discolouration, etc. Only use the prescribed air hose and adapter.

1.2.5 Control

The USB leakage tester is can only be controlled from a platform that can create USB 2.0 or USB 3.0 connections. There are currently three platforms available:

- PC / laptop: Windows 7 and Windows 10 (for 32-bit and 64-bit) **and** UWP (Universal Windows Platform), as part of Windows 10 (also Microsoft Surface platforms)
- Android: Tablet or Smartphone as of Android 4.1.x (Jelly Bean, API level 16), with USB OTG Host Mode facility (USB *On-The-Go*)

1.2.6 Acquisition, installation and use of the *app*

There is a separate *app* for each of the three platforms. Each time, a description is given of where the *app* can be *downloaded* and how it should then be *installed*. For each *app* it is also indicated where documentation about the *use* of the *app* can be found.

1.2.6.1 Windows 7 and 10: classic app for desktop or laptop

Is chosen for the *classic* control *app* then all is covered in **this General User Manual**, because the use of the USB leakage tester is explained with reference to this *app*. The *app* can only be obtained by downloading it from our site, URL: <https://www.cursorengineering.nl/en/software-win-usb-en/>.

It is a **.zip** file named `OtoTestUSB_EN` and also contains logo and installation instructions.

The `OtoTestUSB.exe` *app* and the supporting files can be placed in any existing or newly created directory or folder. When unpacking (extracting) the `.zip` file, the desired folder name can be entered directly, e.g. `C:\USBleaktester`, even if the folder does not exist yet. However, if the `.zip` file is unpacked in the same location where the file is currently located, then automatically a subdirectory will be created by the Windows OS. Optionally, create a shortcut to the desktop.

1.2.6.2 Windows 10: UWP app for desktop, laptop or tablet

There is a separate manual that describes the procedure for applying an *app* on the **Universal Windows Platform**, it is named `USBmanUWP_EN` and can be downloaded from our website under (USB) "Documentation (USB)", URL: <https://www.cursorengineering.nl/en/documentation-usb/>

1.2.6.3 Android: app for tablet or smartphone

For application of an *app* for Android platforms, there is a special guide. You can find this document on the website, section (USB) "Documentation", named `USBmanAndroid_EN` and, as mentioned before, the URL reads: <https://www.cursorengineering.nl/en/documentation-usb/>.

1.3 Environment

The leakage tester consists of precision components and therefore must be handled with care and not exposed to extreme or sudden changes in temperature, moisture and/or air pressure. The environment in which the tester will be used must meet the following requirements:

- Normal relative air humidity (30...70%RH)
- Constant temperature (+10°C...+30°C)
- Stable environmental pressure (e.g. do not open/close doors during sessions)
- No direct sunlight (on the body of the tester)
- Low in dust and of course smoke-free

Allow the tester to acclimatize for some time after changing spatial conditions.

In case of major changes, disconnect and reconnect the tester (*zero-point* recalibration).

The work surface should be flat and solid. Maintain space around the tester, so that the air hose does not become kinked or trapped. If the air does not have free access, measurement errors can occur.

During the measurements, do not press or deform the housing or hose.

1.4 Maintenance

The tester requires no specific maintenance. The housing can be cleaned with a soft, if required, slightly moistened cloth. The housing is made of PMMA (acrylic) therefore do not use solvents to clean it. **No regular calibration is required**, the pressure sensor is *LASER* calibrated and has an extremely short drift over time. Before each measurement, check that the end of the air tubing is free from foreign matter and lies loose. Regularly check the air hose for permanent kinks and damages. If considered necessary, replace the air hose with one of the prescribed type.

Occasionally take a measurement with the end of the air hose closed to check that the tester itself is still airtight. Do not lose the rubber feet and store the leakage tester whenever possible, and certainly when it is being transported, in a suitable storage system.

2 MEASUREMENTS

2.1 Getting started

Connect the tester and wait until the LED indicator turns **orange**.

In this example we assume the use of the classic Windows app (OtoTestUSB). Activate the *app* (OtoTestUSB.exe) and the following window will be displayed: the measurement window. The leakage tester will make an audible beep and the LED will turn to **green**. If more than one USB testers are connected, the system chooses whoever responds first (from v2.25).

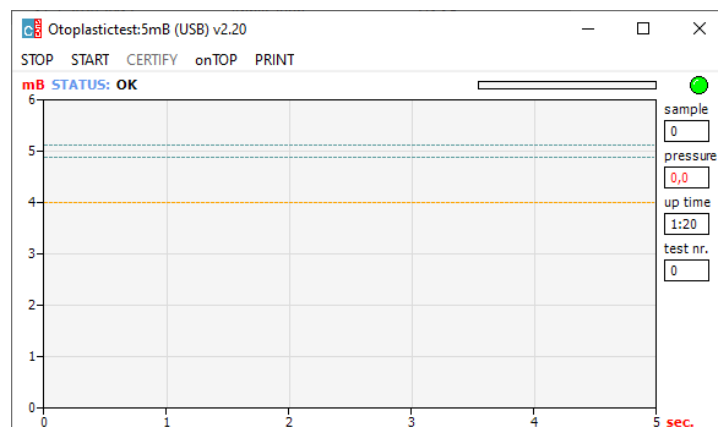


Figure 2.1.1: The *classic* measurement window

2.2 Standard measurement

Measurements can start when the measurement window is visible and the adapter and the otoplastic are correctly connected. Use the mouse to click START (or F5), the air pump in the tester will raise the pressure in the tester in a few moments to 5mB. The actual leak measurement will take five seconds. In this period, ideally the pressure must remain at 5mB, but a lower limit of (arbitrary.) 4mB (the orange line) is adhered to. The figure below shows a possible result of a measurement.

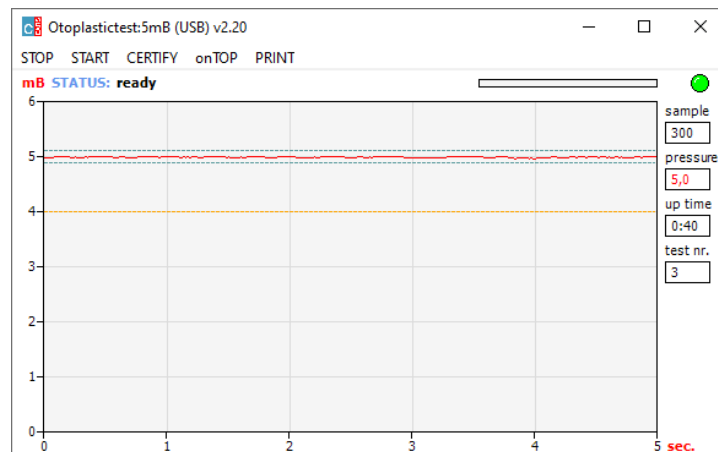


Figure 2.2.1: A measurement result

2.3 Screen legend

2.3.1 Menu

- **STOP or [F4]:** a measurement that is in progress will be interrupted, if no measurement is being taken the program will be terminated
- **START or [F5]:** a new measurement will start
- **CERTIFY or [F6]:** if the result of the measurement is within the norm, a certificate can be generated. Only available on PC platforms
- **onTOP or [F7]:** when onTOP is clicked, the measurement window will always be displayed on top of all of the other windows, this can be handy when filling in spreadsheets etc., onTOP will be replaced by offTOP!
- **PRINT or [F8]:** generate a hardcopy of the measurement result with a date/time stamp.

2.3.2 Graph

- **mB:** the y-axis shows the relative pressure in millibar [mB] with respect to the ambient air pressure, in the example, the measurement is will be made at a pressure of 5mB. The dashed lines above and below the measured value show the upper and lower extreme limits within which a perfect measurement result is or will be achieved ($5\text{mB} \pm 0.1\text{mB}$). SI unit for pressure: Pascal [Pa] ($5\text{mB} \equiv 500\text{Pa}$).
- **sec.:** the x-axis shows the total measurement time in seconds. The measurement time can only start when an *initial* pressure of 5mB has been reached.

2.3.3 Status

The status of the leak tester is shown to the right of 'STATUS' on the status line (which is displayed immediately above the graph). Further to the right is a status bar that shows the duration (a maximum of five seconds) for a changed status, therefore, at the transition to another status. The leak tester has a number of states, the most important (in OtoTestUSB) ones are shown below.

- **ok:** the leak tester is ready for the first measurement
- **air in:** the air pump will try to pressurise the system
- **pressure low:** the system pressure cannot be reached*
- **stabilizing:** the pressure has been reached and the system will check for a short time whether it is stable enough
- **measuring:** the actual measurement starts, the graph will be drawn
- **ok, air out:** the measurement has been taken and the system will be depressurised
- **blocked?:** the air cannot leave or only with difficulty leave the system*
- **terminate!:** displayed if STOP is clicked during the measurement
- **connecting:** the software is trying to establish a connection with the leak tester
- **ready:** the measurement has been correctly completed, the leak tester is ready to take a new measurement

* condition is discussed in more detail in paragraph 3.2.2, "More status messages".

2.3.4 Information panel

Details are displayed at the right of the graph and provide information about the progress of a session:

- **LED lamp:** [green]: last measurement completed, result within specification
[orange]: last measurement completed, but result does not meet specification
[red]: measurement started, but not completed
- **sample:** the number of measurement moments during the entire measuring time
- **pressure:** the measured pressure, or the last measured pressure (in mB)
- **up time:** the time (mm:ss) elapsed since the program was started (max. one hour)
- **test nr.:** number of completed measurements since the program was started

2.4 After use

It is good practice, once all of the measurements have been taken, to exit the software first (to ensure proper termination of the USB connection) and although the energy use is low, after that remove the USB cable (see also §1.2.2 USB cable selection).

Make a habit of immediately removing the otoplastic and to lay the hose down loosely.

Store the leakage tester whenever possible, and certainly when it is being transported, in a suitable storage system.

3 ADDITIONAL INFORMATION AND ERROR MESSAGES

3.1 Communication

Immediately after activating the *app*, the platform tries to establish a USB connection with the tester. Problems that occur during this phase are shown in a separate window; these problems nearly always lead to the program being terminated after "OK" is clicked. The program must be restarted and/or the tester reconnected.

An overview of the most important error messages:

1. *No leak tester detected (USB)*
 - The software cannot detect a leak tester on any USB port.
Check whether the tester is properly connected.
2. *Erroneously received operating settings (Leak Tester USBxxxx)*
 - The tester with s/n USBxxxx has not received or processed operating settings correctly.
3. *Cannot connect to Leak Tester USBxxxx*
 - The tester is present, but the software has not received a proper response from the tester within the set time
4. *Processing error in Leak Tester USBxxxx*
 - The status information (§2.3.3) from the tester cannot be received or is received with errors.
5. *Cannot connect to leak tester(USB)*
 - Tester appears not to be present anymore, the USB communication seems down.
Check whether there is another instance of the controlling software already running.
6. *Connection with Leak Test USBxxxx lost*
 - When starting a new measurement, it seems that the connection has been broken: status report "connecting". Check whether the tester is still connected.
7. *Missing USB driver on your computer*
 - A system driver file is missing on your computer; the USB port cannot control the leak tester. Please consult the installation guide Chapter 3 and try to uninstall the drivers and start the installation process again.

3.2 Leakage tester

3.2.1 Switching on

After connection with the provided USB cable the tester, as mentioned, becomes active. The LED in the front will initially shine red and then become orange when the unit is ready for the activation of the operating software; a short beep will be audible. Problem indications can be:

1. the red LED does not light or lights very briefly:
 - the platform is not able to provide sufficient power to the tester, or platform is not able to act as USB-host
2. the red LED keeps blinking:
 - the installation procedure did not finish yet (the system did not recognize the tester, or the tester is mistakenly connected to a USB *power adapter*)
3. the red LED did not turn to orange within approx. ten seconds after power up:
 - the pressure in the system does not become stable enough within the available time; check the environment (hose unblocked? etc.)

N.B.: after starting a session, the LED will be red until the unit has the "ready" status (§2.3.3) again.

3.2.2 More status messages

A number of states were mentioned in paragraph 2.3.3, some are explained in more detail here.

1. pressure low:
 - The system loses so much air that the pressure cannot be raised sufficiently. Before drawing any conclusions, the system should always be checked for leaks without an otoplastic. Also check whether the air pump operates and if the otoplastic fits correctly.
2. blocked?:
 - After several measurements, the air will be released from the system until the overpressure is more or less 0mB. If the message disappears when the otoplastic is disconnected or the message "stabilizing" remains displayed for a relatively long time, this could indicate a defective valve or a blockage in the internal filters (bear this in mind in dusty, damp conditions). This problem cannot be solved by the user, service is required.