Graphical Tester for Otoplastics

With USB Control

User guide
V2.00

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1 GENERAL

1.1 Terms

A number of terms are used in these instructions that are briefly explained here.

Leak tester: the device to which the adapter and the otoplastic, using a hose, are connected, [also: tester, unit]

System: the physical whole consisting of the leak tester, air hose, adapter, otoplastic and auditory duct

Platform: personal computer (desktop, laptop), tablet or smartphone that hosts a USB port and will make a connection to the leak tester

Software: the software running on the platform that controls the leak tester [also: program, user-interface, controlling software]

USB: the cable, connectors and communication protocols between the platform and the leak tester.

Together, the leak 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 connection.
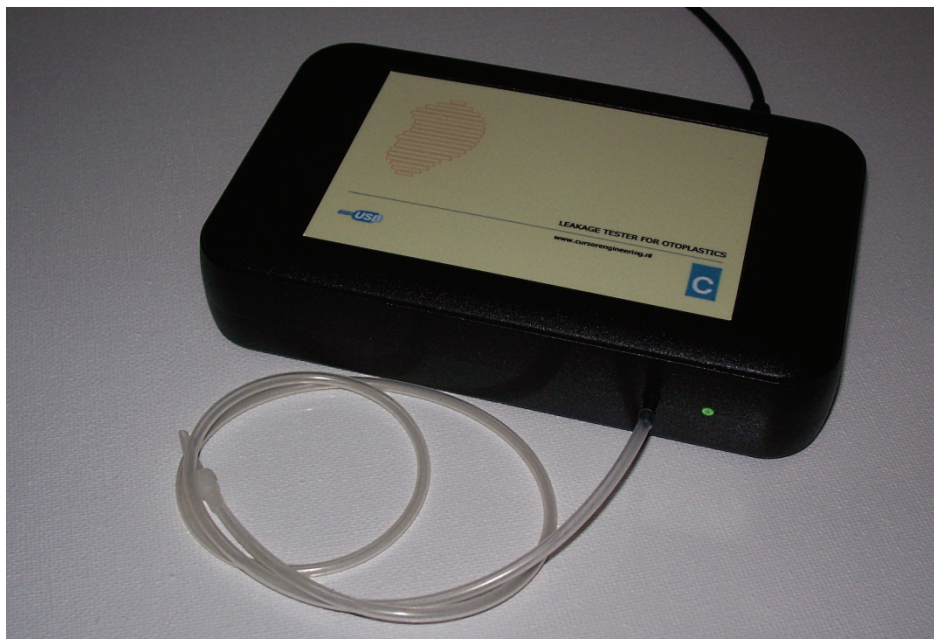

Photo 1.1.1: the leak tester, front

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 A. The tester is provided with a micro USB type AB receptacle (jack), so both micro USB type A and B can be applied.

Below is a photo (1.2.1.1) showing the USB cable with on the right the micro USB type A 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. The text A (B) or the USB logo is not a reliable indicator for the right orientation.

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

Photo 1.2.1.2: backside of the leak tester with micro USB cable

1.2.2 Led status indicator

The LED status-indicator turns red, orange or green.

Red:

- for an indefinite period during initialization while the tester is not jet 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 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

1.2.3 The leak tester

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

1.2.4 The control

The leak tester is controlled from a platform that can create a USB 2.0 or USB 3.0 connection. There are currently two platforms available:

- PC: Windows Vista, Windows 7 and Windows 8+8.1 (32-bit and 64-bit)
- Android: Tablet or Smartphone from Android 4.0.x (Ice Cream Sandwich, API level 14)

The maximum distance between the platform and the leak tester is limited by the length of the USB cable which is approx. 1.8m; application of a shorter or longer cable does not affect proper operation.

1.2.4.1 installing in Windows: desktop or laptop

It is assumed that the user can use a PC with a suitable Operating System and that the user can find and start the software. It is also assumed that the user can configure the USB environment.
For every Windows platform there is a separate user guide: site section (USB) "installation guides"

1.2.4.2 installing in Android: tablet or smartphone

For installing in Android platforms there is a special (additional) user guide that also discusses installation. You can find this document on the site, section (USB) "user guides".

1.3 Environment

The leak tester is made from 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 space in which the tester will be used must meet the following requirements:

- Normal air humidity (30...75%RH)
- Constant temperature (+10°C...+35°C)
- Stable environmental pressure (e.g. do not open/close doors while measuring)
- No direct sunlight (on the tester)
- Be relatively dust free and of course smoke free

Ensure that if the conditions in the room change that the tester is given some time to acclimatise. 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. Prior to every measurement, check that end of the air hose is free from obstruction and that the hose is free of kinks or constrictions. Regularly check the air hose for permanent kinks and damage. 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 leak tester whenever possible, and certainly when it is being transported, in the supplied storage system.

2 MEASUREMENTS

2.1 Getting started

Connect the tester and wait until the LED indicator turns orange. Then activate the software program (OtoTesterUSB) and the following window will be displayed: the measurement window.
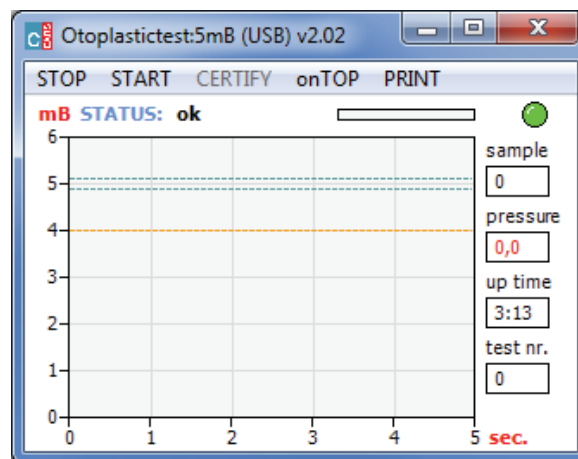The leak tester will make an audible beep and the LED will turn to green.

Figure 2.1.1: The 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, the air pump in the tester will raise the pressure in the tester in a few seconds 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 (for instance) 4mB is adhered to. The figure below shows a possible result of a measurement.
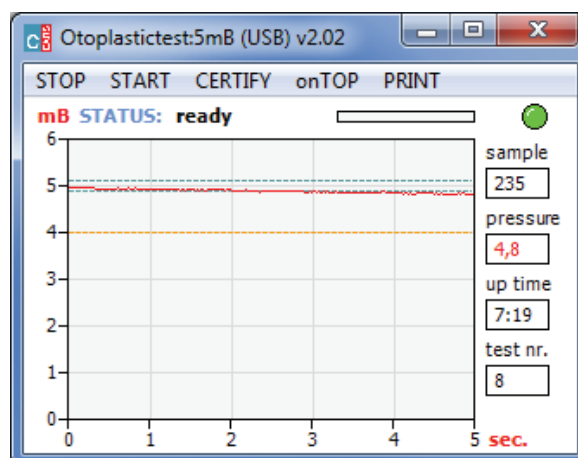

Figure 2.2.1: A measurement result

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 (5mB ± 0.1mB). SI unit for pressure: Pascal [Pa] (5mB ≡ 500Pa).
- **sec.:** the x-axis shows the total measurement time in seconds. The measurement time can only start when the initial pressure (of for instance 5mB) is 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 of which 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 chapter 3, "Additional information and error messages".

2.3.4 Information panel

Details are displayed to the right of the graph that provide information about the progress of a measurement:

- **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 At the end

The tester will not automatically switch off. It is good practice, once all of the measurements have been taken, to first stop the software (to ensure proper termination of the USB connection) and after that remove the USB cable.
Make a habit of immediately removing an otoplastic and to lay out the air hose.
Store the leak tester whenever possible, and certainly when it is being transported, in the supplied storage system.

3 ADDITIONAL INFORMATION AND ERROR MESSAGES

3.1 Communication

Immediately after activating the software, 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 Leak 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 set time; check the environment (hose unblocked? etc.)

N.B.: after starting a measurement, the LED light will be red until the unit once more has the "ready" status (§2.3.3).

3.2.2 More status messages

§2.3.3 mentions a number of conditions that require more explanation.

1. pressure low:

   - The system looses 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.