Minneapolis Micro Leakage Meter

Airtightness testing of ventilation duct systems according to EN 12599
# Contents

## 1 Introduction

- 1.1 Scope of application of the Minneapolis Micro Leakage Meter ................................................................. 6
- 1.2 Using the Minneapolis Micro Leakage Meter for testing the airtightness of ventilation ductwork ......................................................... 7

## 2 Installation

- 2.1 System requirements ........................................................................................................................................ 8
- 2.2 Installing the TECLOG MLM Software ........................................................................................................... 9

## 3 Setting up the Minneapolis Micro Leakage Meter for testing the airtightness of ventilation ductwork 

- 3.1 Required BlowerDoor components .................................................................................................................. 10
- 3.2 Individual parts of the Minneapolis Micro Leakage Meter .................................................................................. 11
- 3.3 Mounting and Installing the Minneapolis Micro Leakage Meter ................................................................. 12
  - 3.3.1 Fitting the connecting hose to the ventilation duct ......................................................................................... 12
  - 3.3.2 Fitting the connecting hose to the DuctBlaster B fan ...................................................................................... 13
  - 3.3.3 Installing the Minneapolis Micro Leakage Meter .......................................................................................... 13
  - 3.3.4 Disks in the Minneapolis Micro Leakage Meter and changing the disks ........................................... 14
- 3.4 Installing and connecting the speed controller and the DG-700 .............................................................. 15
- 3.5 Connecting the DG-700 to the computer (laptop) .......................................................................................... 16
- 3.6 Tube connections .............................................................................................................................................. 16
  - 3.6.1 Connecting the transparent tube to the ventilation duct ........................................................................... 16
  - 3.6.2 Connecting the tubes to the Minneapolis Micro Leakage Meter ............................................................. 17
  - 3.6.3 Connecting the tubes to the DG-700 ............................................................................................................. 17
4 Computer-controlled measurements with TECLOG MLM ......................................................... 18
  4.1 Program structure of the TECLOG MLM Software................................................................. 18
    4.1.1 Overview .......................................................................................................................... 18
    4.1.2 Help ................................................................................................................................. 20
    4.1.3 Data export for the evaluation and drawing up a test report........................................... 20
  4.2 Preparation and software settings before starting the measurement................................. 21
    4.2.1 Default settings in TECLOG MLM ............................................................................... 21
    4.2.2 Display of the registered measuring devices................................................................. 23
    4.2.3 Overview of channel settings ......................................................................................... 25
    4.2.4 Setting up the pressure differential channels of the DG-700 ......................................... 26
  4.3 Starting, saving, and ending measurements ......................................................................... 27
  4.4 Data recording mode: Overview of the working window...................................................... 28
    4.4.1 Overview: Controlling the measuring device (DG-700) via the control panel ............. 29
    4.4.2 Overview: Live diagram with measuring curve ............................................................... 32
    4.4.3 Overview: File View ....................................................................................................... 34
  4.5 Conducting measurements according to German and European Industrial Standard DIN EN 12599 ............................................................................................................... 36
    4.5.1 Enter disk......................................................................................................................... 37
    4.5.2 Starting the target pressure adjustment ........................................................................... 38
    4.5.3 Starting a measuring period ............................................................................................ 38
    4.5.4 Ending measurements .................................................................................................... 39
    4.5.5 Exporting measuring data in order to create the test report........................................... 41

5 Creating a test report according to German and European Industrial Standard DIN EN 12599 .. 42
  5.1 Opening the test report template .......................................................................................... 42
  5.2 Loading the export file into the test report template ............................................................ 43
  5.3 Editing the test report ......................................................................................................... 44
Appendix A: Specifications of the Minneapolis MLM in combination with a DuctBlaster B fan as pressure generator .................................................................................................................. 45

Appendix B: Calibration .................................................................................................................. 46

Appendix C: Other Set-ups for Measurements with Micro Leakage Meter ....................................... 48

Our Service offer ............................................................................................................................ 51

Guarantee ........................................................................................................................................ 53
1 Introduction

The Minneapolis Micro Leakage Meter Measuring System has been designed to inspect the airtightness of the ductwork during the quality control of ventilation systems.

It allows you to conduct measurements with high pressure differentials (up to 250 Pascal) and small air flows of 0.17 to 78.5 m³/h.

You can also use the Minneapolis Micro Leakage Meter to check and measure the leakage rate of low-volume, very airtight rooms.

Measurements with the Minneapolis Micro Leakage Meter (MLM) require a BlowerDoor measuring fan DuctBlaster B, including a speed controller, a DG-700 pressure gauge, and a laptop (computer).

1.1 Scope of application of the Minneapolis Micro Leakage Meter

- Determination of airtightness or air permeability of ventilation ductwork according to the requirements of German and European Industrial Standard DIN EN 12599, and in order to establish the airtightness class of ductwork.
- Leakage detection during the construction phase for quality assurance purposes when installing ventilation ductwork.
- Functional test and detection of leakages in existing ventilation ductwork.
- Special measurements with small air flows, e.g., of clean rooms (operating theaters, labs), for fire protection (determining the hold time for extinguishing gas), etc.
- The Minneapolis Micro Leakage Meter Measuring System is also suitable for measuring individual building elements installed in different building structures (e.g., windows, doors, or electrical installation boxes). To this end, you’ll need to manually construct a test device around the building element.

Note:
For the measurement of ventilation ductwork, prevailing regulations must be complied with. The use of the TECLOG MLM software (version TECLOG3) and the test report does not provide exemption from knowledge of national regulations.
1.2 Using the Minneapolis Micro Leakage Meter for testing the airtightness of ventilation ductwork

Fig. 1.1: Set-up of the Minneapolis Micro Leakage Meter Measuring System when testing the airtightness of ventilation ductwork.
2 Installation

2.1 System requirements

Computer

The computer/notebook/laptop must meet the following requirements:

- Pentium 233-MHZ processor
- 512 MB RAM
- CD or DVD-ROM drive
- USB or RS232 port
- The connected computer must comply with IEC 60950-1 or equivalent standards on data port electrical safety isolation.

Operating system

TECLOG MLM software (version TECLOG3) runs on the full versions of the following operating systems:

- Windows XP
- Windows Vista
- Windows 7
- Windows 8
- Windows 10

Other programs

To generate a test report: Excel 2007 or newer
2.2 Installing the TECLOG MLM Software

Before installing TECLOG MLM (Version: TECLOG3), close all programs including the virus scanner on your computer. Then start installing the software by double-clicking on the installer file 
TECLOG3\VERSION\SETUP.EXE and following the installation instructions.

Unless you choose another path, TECLOG MLM (Version: TECLOG3) is saved in the following folder: C:/Program Files/Energy Conservatory/TECLOG3.

You can open TECLOG MLM (Version: TECLOG3) from the icon on your desktop, via the Windows Start Menu → START → ALL PROGRAMS → ENERGY CONSERVATORY → TECLOG3 or using the configuration file “CONFIG_MLM_DUCT-TEST.TECLOGCONFIG” (see Section 4.2.1).

We recommend establishing the default settings immediately following the installation. You will only have to select your default settings once (see Section 4.2.1). Also register the measuring devices in TECLOG3 and assign the channels (see Section 4.2.3).

**Note:**
Turn off the Bluetooth function of your laptop during the measurements with TECLOG3; otherwise, the communication between TECLOG3 and the measuring device may be interrupted.
3 Setting up the MLM Measuring System for testing the airtightness of ventilation ductwork

3.1 Required BlowerDoor components

For the use of the Minneapolis Micro Leakage Meter (MLM) you will need the following BlowerDoor components:

Fig. 3.1: DuctBlaster B fan  
Fig. 3.2: Speed controller  
Fig. 3.3: DG-700 pressure gauge

As illustrated in the set-up in Fig. 1.1, the Minneapolis MLM is connected to a supply or exhaust air valve in the ventilation ductwork.

A power supply (220-240 V) is required.
3.2 Individual parts of the Minneapolis Micro Leakage Meter

Minneapolis Micro Leakage Meter (MLM) including disks 1 to 4 in padded bag.

The Minneapolis Micro Leakage Meter and its disks are marked with a serial number MLM-#####. The calibration of the disks is only valid when conducted together with the respective Micro Leakage Meter.

Connecting hose (long, 3 m), four fittings including hose clamps, plus five foam rings for connecting the MLM to the ventilation duct.

Fig. 3.4: Minneapolis Micro Leakage Meter

Fig. 3.5

Fig. 3.6
Setting up the MLM Measuring System for testing the airtightness of ventilation ductwork

3.3 Mounting and Installing the Minneapolis Micro Leakage Meter

3.3.1 Fitting the connecting hose to the ventilation duct

The black connecting hose (long, 3 m; Fig. 3.5) with the adapter pieces (Fig. 3.6) is fitted to the ventilation duct to be tested. To make the installation easier, we recommend demounting the supply or exhaust air valve and using the fittings and foam rings to attach the connecting hose on the free duct end.

Fig. 3.7

Connection plate with connecting hose (short, 1 m)
for connecting the MLM to the DuctBlaster B measuring fan.
(For further applications, the shipment includes a second connection plate.)

Fig. 3.7

Abb. 3.8

Abb. 3.8
3.3.2  Fitting the connecting hose to the DuctBlaster B fan

Use the flexible connecting trim to fix the connection plate to the DuctBlaster B measuring fan. The profile encloses the edge of the fan as well as the edge of the connection plate.

The short connecting hose is preinstalled on the connection plate and fixed with a hose clamp.

⚠️ Take note of the direction of the air flow:
When conducting depressurization measurements, the connection plate is fitted on the motor side of the fan (with pressure sensor). Air is sucked out of the ventilation duct. For pressurization tests, the connection plate is installed on the fan side with the exhaust guard. Air is transported into the ventilation duct.

3.3.3  Installing the Minneapolis Micro Leakage Meter

The Minneapolis Micro Leakage Meter is installed between the two connecting hoses and fixed with hose clamps.

⚠️ Take note of the direction of the air flow:
When conducting depressurization tests, the arrow on the MLM points to the fan. When conducting pressurization tests, the arrow points to the ventilation duct.
3.3.4 Disks in the Minneapolis Micro Leak­age Meter and changing the disks

Each disk has a defined measuring range (see Appendix B): Disks 3 and 4 have only been calibrated for a testing pressure of 80 Pa. For measurements with pressure differentials of up to 250 Pa, select disks 1 and 2.

\[\text{Note:}\]
For any measurement, a disk must be installed!

If the desired target pressure cannot be achieved, the disk aperture is too small. Use a disk with a larger aperture.

If during a measurement with TECLOG3 the measurement value display under Flow (air flow) shows the warning Low (Fig. 3.12), the pressure differential at the disk is too low to perform an analysis.

The disk aperture is too large. A disk with a smaller aperture must be installed.

Changing the disks

To change the disks open the white screw terminal and the two halves of the MLM. Insert the right disk observing the flow direction:

The red and blue color markings on the disk must correspond to the markings on the MLM.

Close the MLM and affix it by slightly tightening the screw terminal.
3.4 Installing and connecting the speed controller and the DG-700

The speed controller of the measuring fan is installed on the laptop rack, for example. It is then connected to the DuctBlaster B measuring fan and the power supply.

![Fig. 3.14](image1)

⚠️ Make sure you have switched off the speed controller before connecting it to the power supply. The toggle switch of the controller must be at zero and the control knob turned counterclockwise to the minimum.

The DG-700 is installed next to the controller on the junction plate. On the back of the measuring device and on the junction plate, you can find Velcro tabs to secure the devices.

The DG-700 is then connected to the measuring fan controller using a jack cable.

![Fig. 3.15](image2)

![Fig. 3.16: Jack cable](image3)
3.5 Connecting the DG-700 to the computer (laptop)

For measurements with the TECLOG MLM Software (TECLOG3), the DG-700 must be connected to a laptop and to the speed controller. For detailed information, see also the BlowerDoor MiniFan reference guide.

**Left:** USB port for connection to the computer (laptop).

**Center:** 9-pole RS232 interface for connecting TEC WiFi Link or the DG-700 using a serial data cable.

**Right:** Jack cable for connecting to speed controller.

*Note:* If the TECLOG3 software does not recognize the DG-700, check the DG-700 connection settings (see Section 4.2.2).

3.6 Tube connections

3.6.1 Connecting the transparent tube to the ventilation duct

To record the internal pressure of the duct, the transparent tube is connected to the ventilation duct by means of a capillary tube. To do so, the ventilation duct is opened at one of the ventilation valves and the capillary tube is placed in the duct. With a rubber bladder, the duct is then closed again. The transparent tube leading to the DG-700 is connected at the outside end of the capillary tube.
3.6.2 Connecting the tubes to the Minneapolis Micro Leakage Meter

To determine the air flow, the red tube is connected to the slot on the Minneapolis Micro Leakage Meter marked in red. The blue tube is connected to the blue slot on the MLM.

Fig. 3.19

3.6.3 Connecting the tubes to the DG-700

Use the on/off button to turn the DG-700 measuring device on and off. Do not change the position of the DG-700 during the measurement.

Channel A: Recording the pressure differential in the ventilation ductwork

INPUT: Transparent tube
(for recording the internal pressure of the ventilation duct)

REF: Open
(for recording the outside pressure)

Channel B: Recording the MLM pressure differential

INPUT: red tube

REF: blue tube

Fig. 3.20
4 Computer-controlled measurements with TECLOG MLM

TECLOG MLM (version TECLOG3) allows you to control the DuctBlaster B measuring fan, to automatically adjust the target pressure in the duct system to be measured, and to record the complete measurement series.

The subsequent sections will only elaborate on the software components that are useful for, and relevant to, testing ventilation ductwork. Further functions of TECLOG3 necessary for measuring the airtightness of buildings and for conducting measurements with several measuring devices are explained in the BlowerDoor MultipleFan reference guide. (Please consult our website at www.blowerdoor.com and click the “Downloads and Information” button.)

Note:
When measuring ventilation ductwork, prevailing regulations must be complied with. The use of the TECLOG MLM software (version TECLOG3) and the test report does not provide exemption from knowledge of national regulations.

4.1 Program structure of the TECLOG MLM Software

4.1.1 Overview

TECLOG3 has three different operating modes:

- Inactive mode
- Data recording mode with a live diagram of the measuring curves and a digital display of the measurement values
- File view mode
Inactive mode (set-up mode)

Before starting the measurement, the measuring device DG-700 must be registered and the differential pressure channels assigned.

Menu: → **CONFIGURATION** → **SETTINGS**

For further information, consult Section 4.2.

---

Data recording mode (measuring mode)

In the data recording mode, all values measured by the DG-700 measuring device are digitally displayed in the form of measuring curves. At the same time, the measured data is recorded in a file and saved.

Above the diagram is the control panel for the measuring fan. We recommend only using the central controller **MASTER** at all times.

**Starting the data recording mode:**
Menu: → **RECORDING** → **START RECORDING**

**Ending the data recording mode:**
Menu: → **RECORDING** → **STOP RECORDING**

For further information, consult Section 4.4.
4.1.2 Help

The help file is available in English by selecting Menu → HELP → CONTENTS.

To shortcut to the help file, hit your computer’s F1 key. The help system requires the Windows program “winhelp.exe,” which is provided by Windows XP, Windows 8 and Windows 10. For Windows Vista and Windows 7, it can be downloaded online free of charge at: http://support.microsoft.com/?kbid=917607.

4.1.3 Data export for the evaluation and drawing up a test report

To draw up a test report, the measuring data is exported from the TECLOG3 Software as a text file (Section 4.5.5) and fed into the test report template included in the shipment (Section 5). All data necessary for drawing up a test report must be completed; you can then print the measurement protocol.
4.2 Preparation and software settings before starting the measurement

Before starting the measurement, complete the following in TECLOG3:

1. Configure the default settings for conducting measurements of ventilation ductwork.
2. Register your DG-700.

4.2.1 Default settings in TECLOG MLM

The software CD includes the file „CONFIG_MLM_DUCT-TEST.TECLOGConfig“, which contains the required default settings for testing ventilation ductwork according to German and European Industrial Standard DIN EN 12599.

Start TECLOG3 by double clicking on „CONFIG_MLM_DUCT-TEST.TECLOGConfig“.

Or, when the TECLOG3 software is already open, do the following:

Load the default settings by selecting:

Menu: \(\rightarrow\) File \(\rightarrow\) Load Configuration

Select the file „CONFIG_MLM_DUCT-TEST.TECLOGConfig“

Fig. 4.4: Load configuration

Overview of the parameters set

Open the Configuration Settings window (default settings):

Menu: \(\rightarrow\) Configuration \(\rightarrow\) Settings

Fig. 4.5: Open the Configuration Settings window
Fig. 4.6: Configuration Settings window

Under **FAN-ON POR** (POR = period of record) in the group field **GRAPH**, 300 seconds has been preset as the measuring time for one measuring period. If required, this can be adjusted.

In the group field **DEVICE SETTINGS**, activate the connected DG-700 by clicking the control box on the left of the column **DEVICE TYPE** so that a checkmark appears.

Fig. 4.7: Required Input
4.2.2 Display of the registered measuring devices

By clicking the *SCAN FOR PORTS/DEVICES* button, all computer ports can be scanned for connected measuring devices, and devices currently connected can be displayed with their serial number.

Click on the button *SCAN FOR PORTS/DEVICES*.

All computer ports are scanned for connected measuring devices.

*Fig. 4.8*

If the computer has an internal modem, this is displayed with the notification *SKIP THIS PORT?*. Confirm this notification by clicking *YES*. The modem will no longer be considered.

All correctly connected measuring devices are displayed after the measurement in the window *COMM PORT TEST*.

The COM port assigned is displayed with number, type of measuring device and the serial number.

Close the window by clicking *OK*.

*Fig. 4.9: Comm Port Test window*
Should your measuring device not appear in the list, check the following:

- Is your measuring device connected to the laptop?
- Is your measuring device switched on?
- Has the COM port been created in the Windows Device Manager? If not, have the drivers been installed correctly?
- If the Bluetooth function of your laptop is still active, turn it off, because it may disturb communication between the measuring device and TECLOG3.

Then repeat the port scan by clicking on the *SCAN FOR PORTS/DEVICES* button.

For further information on TECLOG3, please consult the BlowerDoor MultipleFan reference guide (see our website at [www.blowerdoor.com](http://www.blowerdoor.com) in the “Downloads & Information” section).

**Save as default configuration**

If you would like to always use TECLOG3 with the same configuration, save the latter as the default.

- To save a configuration as the default, check the option *SAVE AS DEFAULT CONFIGURATION*.
- Confirm by clicking *OK*.

*Fig. 4.10: Save as default configuration*
4.2.3 Overview of channel settings

Adjust the settings for the differential pressure channels of the DG-700 measuring device in the
CHANNEL SETTINGS window.

The CHANNEL SETTINGS window is opened by clicking on the button
VIEW AND EDIT CHANNEL SETTINGS in the CONFIGURATION SETTINGS window.

![Fig. 4.11: Opening the Channel Settings window](image)

In the configuration file „CONFIG_MLM_DUCT-TEST.TECLOGCONF“ , the settings for the two pressure
differential channels have already been adjusted for the measurement with the Micro Leakage Meter.
4.2.4 Setting up the pressure differential channels of the DG-700

For the DG-700, you must assign each differential pressure channel (channel pressure differential or MLM pressure differential).

Channel A records the pressure in the ventilation ductwork and should be set to **Envelope Pressure**.

Channel B records the pressure in the MLM and, for a correct analysis, should be set to **Micro-Leakage Meter Flow**.

In the configuration file „**CONFIG_MLM_DUCT-TEST.TECLOGCONFIG**“, the settings for the two pressure differential channels have already been adjusted for measurement with the Micro Leakage Meter.
4.3 Starting, saving, and ending measurements

Once the pressure differential channels have been adjusted, you can start the measurement.

Starting the measurement

Menu: → RECORDING → START RECORDING

TECLOG3 will first check the connection to all COM ports and the connected measuring device (DG-700).

Note:
If the DG-700 is not found, a notification window with the message *DID NOT FIND...* appears. The missing measuring device is indicated with its serial number. Confirm by clicking on *OK*. The window *CONFIGURATION SETTINGS* will open and you can check the adjustments made and the ports created.

Enter a file name in the *ENTER FILENAME FOR SAVING* window.

All measured values since starting the measurement are written into this file. The file will automatically be assigned the ending *TECLOGDATA*.

Ending the measurement

Menu: → RECORDING → STOP RECORDING

**Fig. 4.15: Starting the measurement**

**Fig. 4.16: Ending the measurement**
4.4 Data recording mode: Overview of the working window

Upon starting the measurement, TECLOG3 opens in the data recording mode. All incoming measurement values are displayed digitally in real time and graphically in the form of a measuring curve. The measurement is recorded and simultaneously saved in a file.

The TECLOG3 working window consists of three parts:

- **Control panel**
- **Live diagram**
- **Digital display of the measured value.**

The DuctBlaster B measuring fan is controlled via the **control panel**.

In the **live diagram**, the values measured are displayed as measuring curves. Each activated channel is represented by (at least) one measuring curve.
4.4.1 Overview: Controlling the measuring device (DG-700) via the control panel

The DG-700, connected to the speed controller of the DuctBlaster, is controlled from the control panel.

![Control panel of TECLOG3](image)

**Fig. 4.18: Control panel of TECLOG3**

**Showing and hiding the control panels for the DG-700**

By clicking the *Devices* button in the tool bar, the control unit for the DG-700 in the control panel is shown or hidden.

*Fig. 4.19*

**Showing and hiding the central controller**

By clicking the *MASTER* button in the tool bar, the control unit for the central controller in the control panel is shown or hidden.

*Fig. 4.20*

For the measurement of ventilation ductwork, we recommend only showing the *MASTER* and controlling the process from there.
Slider (manual control of the fans)

Move the slider on the bar with the LEFT MOUSE BUTTON. Moving it to the right will increase fan speed, moving it to the left will reduce it.

Safety note:
To stop the fan, click on FAN OFF or press the ESC KEY on your keyboard.

Cruise control for automated controlling

By clicking the CRUISE FAN button, TECLOG3 automatically controls the constant target pressure differential (in this example: -80 Pa).

Safety note:
To stop the fan, click on FAN OFF or press the ESC KEY on your keyboard.

Toggle between depressurization measurement (DEPRESS) and pressurization measurement (PRESS)

Exhaust air ducts are measured at negative pressure, supply air ducts at positive pressure.

Toggling from a series of depressurization measurements (DEPRESS) to a series of pressurization measurements (PRESS) or vice versa is done via the drop-down menu PRESS / DEPRESS. Make sure to select an option in order for the automated control to work without problems.

Cruise settings (CONFIG)

Clicking on CONFIG allows you to change the cruise settings.
Clicking the **Config** button opens the **Master Cruise Control** window. There, you can adjust the settings for automated control of the fan.

- Pressurization or depressurization method (**Mode**)
  - Negative pressure = depressurization
  - Positive pressure = pressurization
- Pressure limit for automated fan switch-off (**High Pressure Limit**)

> When measuring ventilation ductwork, the standard setting of 100 Pa is usually not enough and needs to be increased accordingly.

- Speed of the fan control is set (**Fan Adjust Rate**).
4.4.2 Overview: Live diagram with measuring curve

The measured values are shown in two ways: in the live diagram with a measuring curve (at least one) for each channel, and in the digital view of measurement values. All activated channels are displayed graphically. (Fig. 4.26).

![Live diagram in the TECLOG3 working window](image)

**Fig. 4.26:** Live diagram in the TECLOG3 working window
Presentation of the diagram

The buttons *Auto T* and *Auto Y* in the tool bar allow you to toggle the automatic adjustment of the axis distribution.

*Fig. 4.27*

By holding down the shift key while pulling out a rectangle with the left mouse button, you can show and magnify details of the diagram.

For further options for adjusting the graphic presentation, consult the BlowerDoor MultipleFan reference guide (also see our website at [www.blowerdoor.de](http://www.blowerdoor.de) under the “Downloads and Information” button.)

Measuring curves

Each channel of the DG-700 that has previously been set up in the *Channel Settings* (Section 4.2.3) is assigned at least one measuring curve in the live diagram. The measured values of Channel A, which is set to record the pressure differential of the ventilation duct (*Envelope Pressure*), are displayed in a measuring curve. Channel B, which is connected to the MLM (*Micro Leakage Meter*), can be displayed by up to three curves: MLM pressure differential, air flow, and the inserted disk.

Setting up a measuring period

In the live diagram, measuring ranges can be set up as measuring periods for a freely selected time frame. These marked measuring periods are used to determine the results when drawing up the report.

*Fig. 4.28*

In the configuration file, the measuring period has been preset to 300 seconds (5 minutes).
4.4.3 Overview: File View

To the right of the live diagram, you can display the current measured values, the measuring values of a selected point in time, or the average values of a measuring period.

![Diagram of measured values in TECLOG3](image)

*Fig. 4.29: View of measured values in TECLOG3*

In the *Readouts* window, all data for monitoring the measurement is displayed:

- The current time
- Number of measuring points (*OBS #*)
- File name (*Recording File*)
- Total air flow (*Total Flow*)
- Testing pressure (*Env Pressure*)
- Settings and measured values for the activated pressure channel
Description of the File View

Colors in the File View

Depending on what has been marked, the color in the header of the file view will change.

Grey: Display of the currently measured values

Green: When a measuring period is marked or a new period is created, the display will be green.

Red: When a measuring time is marked in the live diagram, this display will be red.

Display of the MLM configuration *Disk*, the pressure differentials, and the air flow

When the control box before the channel name is activated (check mark), the measuring curve of this channel is displayed in the live diagram. When it is not activated, the curve is not displayed.

In the center column, you can view the names of the channels and the set-up options for the device/disk configuration of the MLM (*Disk*).

In the column to the right, the measurement values and the device configuration are displayed.
MLM View is blinking

Should the three-part display start blinking, this can be caused by one of the following:

- The MLM configuration *Disk* is *UNKNOWN*. To change the configuration with the left mouse button, click the button to the right of *Disk* and select the inserted disk.

- In spite of having selected the disk, there are no measuring values displayed under *Flow* (air flow): *Low*. Should the disk pressure differential be lower than the limit permitted, insert a smaller disk in the MLM. Select the respective disk in the *Disk* settings.

4.5 Conducting measurements according to German and European Industrial Standard DIN EN 12599

Starting TECLOG3 (see Section 4.3).

- Set the display to the optimum by only showing the Master.

- Select depressurization or pressurization measurement.
Computer-controlled measurements with TECLOG MLM

Fig. 4.38

4.5.1 Enter disk

Fig. 4.39

- Use the **CONFIG** button to set the pressure limit for automatic shut-down (**HIGH PRESSURE LIMIT**) to a level sufficiently above the testing pressure.

- In order for TECLOG3 to be able to calculate the air flow, the inserted disk must be indicated.

- Each disk has a defined measuring range with the highest possible accuracy for measuring the air flow (see Appendix B).

- Select the inserted disk in the drop-down menu.
4.5.2 Starting the target pressure adjustment

- The automatic control of the measuring device first requires entering the target pressure (here -80 Pa)
- Pressing the CRUISE FAN button starts the cruise function. TECLOG3 will now control the fan so that the pressure required in the ventilation ductwork (Channel A of the DG-700, defined as ENVELOPE PRESSURE) is achieved.
- If you are unable to reach the target pressure in spite of running the fan at full speed, insert a disk with a larger aperture into the MLM.

4.5.3 Starting a measuring period

Once you have created a stable pressure level in the ventilation duct (the duct pressure and air flow graphs in the live diagram run horizontally), the measuring period can be started.

To measure the airtightness of ventilation ducts according to German and European Industrial Standard DIN EN 12599, a measuring period of 5 minutes is required. The default setting of FAN-ON POR LENGTH (see Section 4.2.1) of 300 seconds sets the measuring period to 5 minutes.

- Start the measuring period by clicking the FAN-ON POR button.
- The EDIT PERIOD OF RECORD window will open.

You may enter a name (TEXT) for the measuring period. The other input options offered here are of no importance for airtightness tests of ventilation ductwork.
4.5.4 Ending measurements

If the selected pressure has been maintained until the end of the measuring period, the DuctBlaster can be turned off via the **FAN OFF** button or the **ESC** key.

You can then stop the recording of the measuring data.

Menu: → **RECORDING → STOP RECORDING**
4  Computer-controlled measurements with TECLOG MLM

In the **Stop Data Capture** window, you will see the notification “This will stop data capture. Continue?“

- In order to end the measurement, click on **Yes**.
- In order to continue the measurement, click on **No**.

**Fig. 4.45: Ending measurement?**

In the **Load File?** window you are asked if you would like to open the previously created file.

- In order to display the measurement, click on **Yes**.
- If you do not want to display the measurement, click on **No**.

**Fig. 4.46: Load file**

**Fig. 4.47**
4.5.5 Exporting measuring data in order to create the test report

The completed measurement can now be exported into the file

_TEST-REPORT_VENTILATION_DUCT_SYSTEMS_VERSION.XLTM_ in order to create the test report.

Menu:

→ _FILE_ → _EXPORT_ → _DATA AS TEXT FILE_

The window that opens shows the settings for exporting the text file. To avoid any problems during the import into the test report, these settings must not be changed.

To export the data, click _EXPORT TO FILE_. The export file can now be saved in the desired folder.

Close the window by clicking the _DONE_ button.
5 Creating a test report according to German and European Industrial Standard DIN EN 12599

TECLOG MLM (Version TECLOG3) is a data logger. The program records all pressure curves for the duration of the airtightness measurement.

If you desire an analysis according to German and European Industrial Standard DIN EN 12599, the test report template for airtightness tests of ventilation ductwork on the software CD for TECLOG MLM (file name: Test-report_ventilation_duct_systems_version.xltm) is useful.

The test report template contains all necessary information for documenting airtightness tests of ventilation ductwork. Those knowledgeable in Excel can also adjust the template to their own needs.

Copy the test report template into a folder on your computer.

5.1 Opening the test report template

Open the MLM test report template Test-report_ventilation_duct_systems_version.xltem on your computer.

⚠️ The file contains Macros so that the TECLOG3 file can be loaded. In order for the read-in to work, the Macro security level in Excel must be set to low and Macros must be activated.

Save the file under a different name.
5.2 Loading the export file into the test report template

Use the Start window of the test report template for airtightness tests of ventilation ductwork (Fig. 5.1) to load the TECLOG3 export file (file extension .txt) into the test report.

To load the file, click on the button *IMPORT TECLOG3 DATA (.TXT)*. A window opens, where you can select the desired export file (.txt). Once the file has been selected, all measurement data is automatically loaded into the test report.

*Fig. 5.1: Test report for airtightness tests of ventilation duct systems for loading export files from TECLOG3*
5.3 Editing the test report

The test report for airtightness tests of ventilation ductwork contains several spreadsheets with the measuring data, the result, and its graphical display (see Fig. 5.2). Make sure that all measuring data is complete and correct. If necessary, enter the country-specific values.

Once the TECLOG3 export file has been loaded, the data in the individual spreadsheets can be completed and printed.

Fig. 5.2: Example
## Appendix A: Specifications of the Minneapolis MLM in combination with a DuctBlaster B fan as pressure generator

<table>
<thead>
<tr>
<th>Capacity</th>
<th>At a differential pressure of</th>
<th>Measuring accuracy:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,15 m³/h – 57,4 m³/h</td>
<td>250 Pa</td>
<td>± 5 % or ± 0.37 m³/h, whichever is greater (with disk 1 or 2)</td>
</tr>
<tr>
<td>2,15 m³/h – 69,7 m³/h</td>
<td>160 Pa</td>
<td>± 5 % or ± 0.37 m³/h, whichever is greater (with disk 1 or 2)</td>
</tr>
<tr>
<td>0,17 m³/h – 78,5 m³/h</td>
<td>80 Pa</td>
<td>from 2.15 m³/h to 78.5 m³/h : ± 5 % or ± 0.37 m³/h, whichever is greater (with disk 1 or 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>from 0.65 m³/h to 3.23 m³/h : ± 5 % or ± 0.09 m³/h, whichever is greater (with disk 3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≤ 0.83 m³/h : ± 0.04 m³/h (with disk 4)</td>
</tr>
</tbody>
</table>

**Dimensions:** L 300 mm, Ø 140 mm

**Weight:** approx. 800 g

For the specifications of the DG-700 pressure gauge, the DuctBlaster B and the corresponding speed controller, please consult the BlowerDoor MiniFan reference guide.
Appendix B: Calibration

All Micro Leakage Meters are shipped with a calibration certificate. Micro Leakage Meters basically always maintain their manufacturer’s calibration as long as they are free of mechanical damage. An airtightness test of the Micro Leakage Meter is recommended every two years.

Depending on the area of application, specific national regulations apply to the calibration of the DG-700 pressure gauges and the BlowerDoor measuring fan DuctBlaster B (as well as of the BlowerDoor measuring fans Model 3 and 4).

To maintain the high measuring accuracy of the gauges, we recommend ensuring regular calibration in accordance with manufacturer specifications. For the DG-700, an adjustment and manufacturer’s calibration is recommended every two years. The accuracy of BlowerDoor measuring fans should be checked by calibration every four years. National regulations still apply.

BlowerDoor GmbH offers fan calibration as well as adjustment and factory calibration, or DAkkS calibration, of its pressure gauges (see the appendix describing our service offer).

Calibration parameters for the disks of the Minneapolis Micro Leakage Meter

<table>
<thead>
<tr>
<th>MLM configuration</th>
<th>Air-flow read</th>
<th>Calibration parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disk 1</td>
<td>Flow (m³/h) = 5.669 · (MLM pressure differential in Pa) 0.4880</td>
<td></td>
</tr>
<tr>
<td>Disk 2</td>
<td>Flow (m³/h) = 0.9769 · (MLM pressure differential in Pa) 0.4913</td>
<td></td>
</tr>
<tr>
<td>Disk 3</td>
<td>Flow (m³/h) = 0.1832 · (MLM pressure differential in Pa) 0.4811</td>
<td></td>
</tr>
<tr>
<td>Disk 4</td>
<td>Flow (m³/h) = 0.04732 · (MLM pressure differential in Pa) 0.4759</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**

All air flows established with the above calibration parameters are calculated under the assumption that the air flowing through the disk has a density of 1.204 kg/m³. This corresponds to an air density at the ambient conditions of 20 °C and 101325 Pa. If the density of the air flowing through the disk deviates from this air density, the air flow shown (read) on the measuring device does not correspond to the actual (measured) air flow.
To calculate the actual air flow with the actual air density (depending on the temperature and barometric pressure during the measurement) the manufacturer provides the following formula:

\[
\text{Air flow}_{\text{measured}} (\text{m}^3/\text{h}) = \frac{\text{Air flow}_{\text{read}} (\text{m}^3/\text{h}) \times \sqrt{\frac{1.204 \text{ kg/m}^3}{\text{air density (kg/m}^3)}}}{1.204 \text{ kg/m}^3}
\]

*) Use the density of air flowing through the disk of the MLM.

**Note:**
The test report template for airtightness tests of ventilation ductwork included in your shipment performs these calculations automatically. The air flow measured is the air flow at ambient conditions (temperature and pressure) during the measurement. Air flow \( \text{measured} \) corresponds to \( q_{vl \text{ measured}} \) in the test report template.

**Minimum MLM pressure differential (Pa) for the disks**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Disk 1</td>
<td>5 Pa</td>
<td>12.4</td>
<td>78.5</td>
<td>69.7</td>
<td>57.4</td>
</tr>
<tr>
<td>Disk 2</td>
<td>5 Pa</td>
<td>2.15</td>
<td>18.18</td>
<td>16.14</td>
<td>13.59</td>
</tr>
<tr>
<td>Disk 3</td>
<td>14 Pa</td>
<td>0.652</td>
<td>3.228</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td>Disk 4</td>
<td>14 Pa</td>
<td>0.166</td>
<td>0.833</td>
<td>−</td>
<td>−</td>
</tr>
</tbody>
</table>

**Cleaning the Minneapolis Micro Leakage Meter**
The Minneapolis Micro Leakage Meter can be cleaned with a damp cloth.
Fig. 6.1: Set-up for testing of the air permeability through already mounted windows and doors with Minneapolis Micro Leakage Meter (here: pressurization)
Fig. 6.2: Set-up for measurement of building components with assistance of a test case and with Minneapolis Micro Leakage Meter (here: depressurization)
Fig. 6.3: Set-up of Minneapolis Micro Leakage Meter for measurements of very small and very tight single rooms (e.g. clean rooms, laboratories) with small airflows (here: depressurization measurement); the MLM is fitted to an on-site existing test aperture (Ø ca. 20 cm).

Fig. 6.4: Set-up of Minneapolis Micro Leakage Meter for measurements of very small and very tight single rooms (e.g. clean rooms, laboratories) with small airflows (here: pressurization measurement); the MLM is fitted to an on-site existing test aperture (Ø ca. 20 cm).
Our Service offer

**Calibration of your BlowerDoor Measurement Systems**

At ± 4 % (flow rings A – C) and ± 5 % (flow rings D + E), both the accuracy of the BlowerDoor testing flow rings as well as that of the pressure gauge DG-700 at ± 1 % clearly exceed the legal minimum requirements.

To maintain the high measuring accuracy of the BlowerDoor Measurement System, we recommend ensuring regular calibration according to the manufacturer’s specifications: The accuracy of the BlowerDoor testing fan should be checked by calibration every four years. A previous fan check forms part of each fan calibration.

BlowerDoor GmbH not only offers regular fan calibration, but also manufacturer’s calibration of pressure gauges at favorable prices. Details are available on [www.blowerdoor.com](http://www.blowerdoor.com).

**Seminars and in-house training**

In addition to the extensive seminar program covering aspects of an airtight building envelope offered by the Energie- und Umweltzentrum am Deister, BlowerDoor GmbH and its contract partners also provide individual training on site or on-demand webinars. Contact us for more information!

**Service at your construction site**

If required, we will lend our competence to support you in conducting a BlowerDoor measurement at your construction site. Contact us for an offer tailored to your needs!

**Listing in the directory of providers of BlowerDoor measurements**

As a BlowerDoor testing team, your listing in our online database is free of charge. Contact us at [info@blowerdoor.com](mailto:info@blowerdoor.com) if you would like an address entry, including a link to your email address and website in our directory of BlowerDoor test providers.
Our service offer

**CompetenceCenter**

All BlowerDoor testing teams receive access to our virtual Center of Competence at [www.blowerdoor.com](http://www.blowerdoor.com) free of charge, where we regularly provide you with news and offer interesting information for download. Contact us if you have not yet received your client number and access data from BlowerDoor GmbH.

**Advertising material for BlowerDoor testing teams**

Upon request, we support BlowerDoor testing teams with professional printable files on BlowerDoor measurements free of charge. The material will feature your own contact data and company logo. (View a sample at [www.blowerdoor.com](http://www.blowerdoor.com).) If interested, send us an e-mail with your complete address and your company logo as a jpg file in printable resolution to info@blowerdoor.com.

**Technical Support**

Should you have unexpected technical problems while conducting BlowerDoor measurements, our tech support team is available free of charge during our office hours at the following number: +49(0)5044/975-57 (chargeable call to German landline).
Guarantee

Object of the guarantee:
BlowerDoor standard, BlowerDoor MiniFan and BlowerDoor MultipleFan system

Besides the guarantee set forth in the law, BlowerDoor GmbH offers you a total of four years of guarantee for the complete BlowerDoor Measurement System (BlowerDoor fan including low flow rings and fan cover, DG-700, mounting frame and nylon panel, speed controller, tube set, and accessory bag). The guarantee starts with date of purchase. It takes into account all claims under guarantee submitted to BlowerDoor GmbH in writing during the period of guarantee.

Should a claim under guarantee require the measuring equipment to remain at the premises of BlowerDoor GmbH for more than 7 days, customers upon request will be loaned a corresponding replacement for the duration of the repairs. BlowerDoor GmbH will bear the cost of shipping to the client’s premises on the basis of standard cost of freight. Upon repair and on receipt of the repaired measuring device, customers shall send the measuring device loaned to them back to BlowerDoor GmbH at their own expense immediately. The costs as well as the risk of loss or damage on the way to or from the point where the claims under guarantee are accepted are borne by the respective shipping party.

Claims under guarantee cannot be considered

- when the measuring device or the object under guarantee has not been operated according to specifications, e.g. has not been properly handled or stored, in particular also when the operating instructions have not been observed or maintenance has been neglected,
- when the measuring device or the object under guarantee has been opened or repaired by non-authorized workshops or other people,
- when the measuring device or the object under guarantee shows damages that can be traced to wear or tear.

In accordance with this guarantee, BlowerDoor GmbH shall only provide guarantee services if the guarantee case is immediately and without any delay communicated to BlowerDoor GmbH in writing.

This guarantee shall not cover consequential damages, in particular financial losses for the customer caused by failure of the equipment.
Guarantee

Upon completion of the guarantee service, ownership of the parts replaced shall fall to BlowerDoor GmbH.

Process/Delivery

Only BlowerDoor GmbH, Zum Energie- und Umweltzentrum 1 in 31832 Springe-Eldagsen/Germany (Tel.: +49(0)5044/975-40) shall be entitled to accept claims under guarantee. Customers shall send the faulty measuring device or component to BlowerDoor GmbH. BlowerDoor GmbH shall bear the cost of return shipping on the basis of standard cost of freight.

The costs and risk of loss or damage on the way to or from the point where the claims under guarantee are received are borne by the respective shipping party.