



# MICROMETER

Model 49-56

## INSTRUCTION MANUAL

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Version 1.0.12 0720



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## Warranty Statement

The model 49-56 Micro meter is sold and distributed by Industrial Physics. We warrant this instrument to be free of defects in performance, materials and workmanship. We will replace free of charge and correct any defect in workmanship or performance without charge for labor.

Our obligation under terms of this warranty is effective only if the defect develops in a normal installation and under normal use and service and if the Micrometer, is returned intact to our plant with prior authorization and with all transportation charges prepaid, within twelve (12) months from the date of purchase.

Our obligation to repair without charge is effective only, if the Micrometer has been properly installed and used in accordance with our written instructions.

The complete terms regarding instrument warranty can be requested at Industrial Physics.

## Shipping Instructions

To ensure freedom from damage in shipment, the Micrometer should always be repacked as it was when originally received including the transport protection collar.

Before shipping, an authorization to return should be secured from Industrial Physics, by telephone, FAX or written letter. The best way to ship will also be advised at that time.

In all correspondence concerning this instrument, please quote the type- and serial number as given on the identification plate or as given on the info screen of the instrument.





## The TMI Group of Companies

Messmer Büchel • Testing Machines Inc. • Adamel Lhomargy SARL  
FIBRO system ab • TMI Canada • TMI Trading (Shanghai) Co. Ltd

# CE DECLARATION OF CONFORMITY

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Declare under sole responsibility that the following product(s):

**Models 49-56-00-xxxx and 49-56-01-xxxx Micrometers** (xxxx = 0001 – 0099)

Comply to the following directives and harmonised standards:

**2004/108/EC**      **Electro magnetic Compatibility standards (EMC)**

EN 61326-1      : 2013  
EN 61000-3-2      : 2006 + A1: 2009 + A2: 2009  
EN 61000-3-3      : 2008

**2006/95**      **EC Low Voltage Directive (LVD)**

EN 61010-1      : 2010

**2011/65/EC**      **Restriction of hazardous substances (RoHS)**

EN 50581      : 2012

This certificate is based on an evaluation of a sample of the above mentioned product

Issued on behalf of the TMI GROUP

  
A. Jansen / Managing Director (Büchel B.V.)

Date of Issue: 20<sup>th</sup> June 2014



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## 1. OPERATOR SAFETY

Read this manual carefully before installation and use of this instrument.



### 1.1 GENERAL INFORMATION

The design of this instrument is subject to continuous development. Consequently, this instrument may incorporate minor changes in detail from the information contained in this manual.

The instrument described in this manual is designed to be used by trained personnel only. Adjustment, maintenance and repair of the equipment should only be carried out by qualified personnel, who are aware of the hazards involved.

### 1.2 SAFETY PRECAUTIONS

For the correct and safe use of this instrument it is essential that both operating and service personnel follow accepted safety procedures in addition to the safety precautions specified in this manual and statements and/or symbols on the instrument.

Whenever it is likely that safe operation is impaired or not possible, the instrument must be made inoperative and guarded against any unintended operation. Messmer Büchel or one of its representatives must then be informed for further instructions.

Always connect this instrument using the power cord supplied with it to a wall socket (or outlet) carrying the correct voltage and having a safety earth connection!



#### **Warning:**

*Electrical components inside the Micrometer may carry enough electrical current to cause injury or death. Maintenance or trouble shooting of any electrical component inside the Micrometer may only be performed by a Messmer Büchel approved Technician.*

*Never remove any cover from the instrument before the mains power cable is disconnected!*

#### Attention:

*The 49-56 Micrometer is designed to be used only indoor and in dry conditions.*

*The 49-56 Micrometer is intended to be used only in vertical, upright position.*

*In case the instrument is equipped with an internal strip feeder unit there is a possible hazard getting trapped in the area of its driving wheels!*

*Only clean the 49-56 Micrometer using a soft dry cloth.*



## 2. INTRODUCTION

The new Messmer Buchel model 49-56 Micrometer combines a modern contemporary look with a robust mechanical design and new improved electronics. The instrument uses a TFT color display that together with its touch screen is the base for a user friendly interface.

The 49-56 Micrometer is designed for thickness measurements on sheet materials. The 49-56 can be configured to meet a variety of international specifications and test standards for different types of materials including paper, corrugated, plastic film tissue paper, nonwovens, textiles and other sheet like substrates.

The international standards generally specify the measurement conditions for a given type of material. The essential requirements are the measurement pressure and the area of the feeler surface.

### 2.1 FEATURES

- Modern design
- Movable color TFT display with touch screen
- Measuring range 0.000 – 10.000 mm
- Adjustable gap (measuring height)
- Metric or imperial units
- On screen statistics
- Sample detect sensor
- Multilingual user interface
- Special anvil diameters and dead weight loads available
- Internal calibration routine (no optional PC needed)
- Serial port that can be used as RS232, Printer and GraphMaster output (GraphMaster is an optional analysis and data storage program)
- Optional internal strip feeder unit for strips up to 75mm wide.
- Optional Gauge blocks available (for verifying the instrument)
- Optional footswitch (to start test)

### 2.2 APPLICATIONS

Paper, Paperboard, Corrugated, Cloth, Plastic, Plastic film  
Textile Fabrics, Nonwovens, Felts, Floor Coverings,  
Leather and Wipes



### 3. UNPACKING

Remove the straps around the corrugated box. Open the top side of the box and take out the instruction manual, and parts that are packed in this section of the box.

Lift the 49-56 Micrometer gently from the corrugated box and place it on a sturdy laboratory bench. Remove the plastic film in which the instrument has been packed. Check the instrument for transport damage. If damaged, contact your insurance company and **DO NOT** throw away the packing as this is your evidence. The accessories are packed in separate boxes and / or envelopes.

It is recommended to conserve the original box in case the instrument needs to be transported. If the apparatus has to be returned to the factory, it is strongly suggested to use the original packaging (see warranty statement).

The contents of the box is:

- Model 49-56 Micrometer                                  Model :.....
- Serial nr:.....
- Instruction manual
- Power cable

Options:

- Optional internal weight                                  weight:.....
- Optional external weight  
(Including adapter shaft)                                  weight:.....
- RS232 C cable
- Stand alone thermal mini printer unit + cable (serial connection).
- GraphMaster software
- Footswitch

Date: \_\_\_\_\_      Signature: \_\_\_\_\_

**Note:** 

*Carefully check all small wrappings, boxes and envelopes in the large corrugated box to be sure all parts and supplies, as listed on the packing list, are accounted for.*





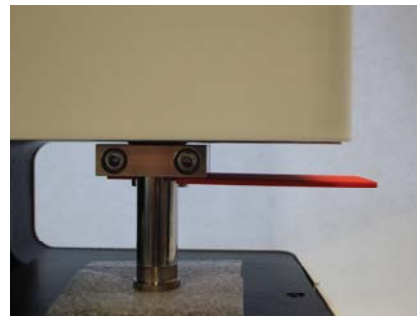
## 4. PREPARATION

The 49-56 Micrometer is a table top instrument which occupies a surface area of 11 x 26 cm. Its weight is approximately 13 kg.

Place the Micrometer on a very stable and perfectly flat table or support. To avoid incorrect results the instrument must be kept isolated from any source of vibrations and/or shocks.

### 4.1 TRANSPORT PROTECTION COLLAR

During transport a transport protection collar is installed to prevent the measuring shaft and the instrument's internal weight from damaging the sensitive internal measuring system.



The transport protection can be recognized by its orange strip as shown in the above pictures. Before the instrument can be connected to the main power supply or used, the transport protection collar must be completely removed! This can be done by the Allan key supplied with the instrument.

The orange strip is covering the instrument's sample detect sensor. In case the instrument is switched on while the transport protection is still in place the instrument will show the following error message during the initialization process.

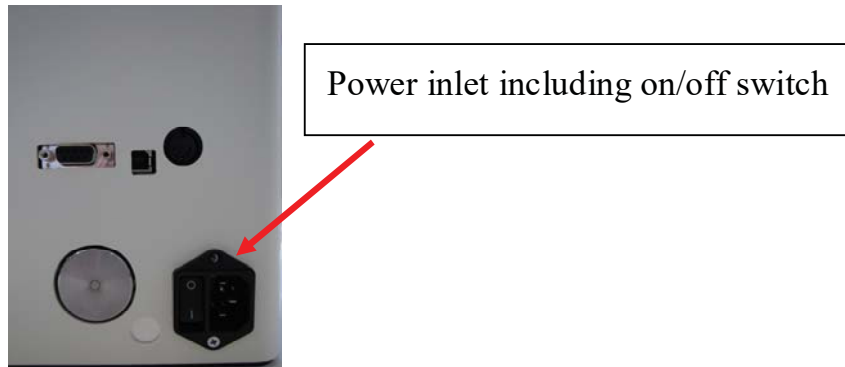


Also the error buzzer sounds and the instrument is now in an infinite loop. You must switch off the instrument and completely remove the transport protection collar. Before you can safely operate the instrument, this is to prevent damage to the system.



## 4.2 ELECTRICAL POWER

The 49-56 Micrometer has a single phase input voltage range of 100 - 230VAC 50/60 Hz. Before connecting the power cable to the power inlet located at the back side of the instrument check if the instrument is wired for your local supply voltage. Always connect to a wall socket or outlet equipped with a safety earth connection!



### **Warning:**



*If the supplied power plug needs to be adapted to the local situation this must be done by a qualified electrical engineer. Please also read chapter 1 OPERATOR SAFETY. The plug **must** have a capacity of 10-16 Amps and be equipped with a safety earth Terminal!*

### **Please note:**

Wire colours power cord:

Brown = Line  
Blue = Neutral  
Yel/Grn = Earth



### 4.3 FUSE

The instrument is equipped with a 5 x 20mm, 250V slow blow glass fuse with a capacity of 1 Amp.



FUSE HOLDER (250V / 1AT)



#### *Important notes:*



*In case of a blown fuse it needs to be replaced by one that has the identical shape and the same current rating. In this case always disconnect the power cord from the AC power inlet of the instrument before opening the fuse holder.*

*Do not use fuses with a higher current rating than the original as this can cause damage to the instrument!*

*The use of repaired fuses, and/or short circuiting the fuse holder is prohibited!*

*The fuse holder can be opened by using a small screwdriver. Turn inside part a quarter turn to the left and slide it out to get access to the fuse. Replace it, slide it back in and fix it by turning a quarter turn to the right.*



#### 4.4 INSTRUMENT POSITION

The 49-56 Micrometer can be used in different orientations. For this reason the instrument is equipped with a movable display unit. The display unit can rotate over an angle of 90 degrees.



You can open the display by entering your finger in the opening indicated in the above picture. Then gently pull the display and rotate until the desired angle.



Position the instrument for the most convenient operation and set the display module in such way that you can easily read- and operate it.



## 5. INSTRUMENT CONTROLS

Connect the instrument to electrical power as described in chapter 4.1 and switch the instrument on. The **ON/OFF** SWITCH is part of the power inlet located at the back side of the tester.

If the connections are OK the display will initially show the TMI group logo followed by a picture showing the instrument and a green progress bar.

### THE TMI GROUP OF COMPANIES

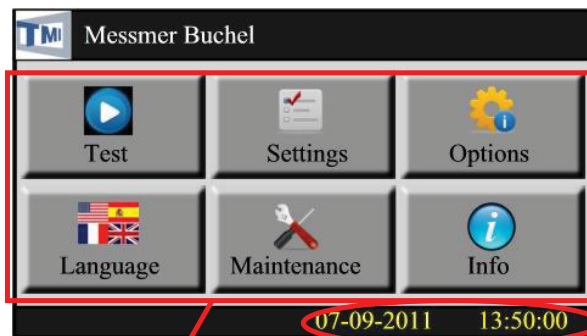


Loading.....



During the time that the progress bar is showed the instrument initialises itself and reads the last used test setup from the internal memory. It also checks important calibration information and the condition of the internal measuring sensor. In case any errors where detected an error message is displayed and the error buzzer is sound (3 beeps). If no errors are detected the measuring opening is automatically set to the correct value and the main menu screen is displayed.

### 5.1 MAIN MENU



Actual Date & Time

Touch Screen area (showing 6 keys)

The 49-56 Micrometer is equipped with a touch screen. Touching one of the keys will bring you to the next menu or perform the operation that was selected.



## Main menu keys:



Touching this key will bring you to the test screen where you can start and control thickness tests. A detailed explanation can be found in chapter 6 TESTING of this manual.



Touching this key will bring you to the settings menu, here you are able to change/set the following items:

*Measuring units*  
*Test mode*  
*Delay time*  
*Measuring gap (height)*  
*No of Plies*

Please read chapter 5.2 SETTINGS MENU for more details.

**Note:** The settings key can be pass-word protected to prevent unauthorized personnel to change any settings!




Touching this key will bring you to the options menu, here you are able to change/set the following items:

*Sample detect sensor (on/off)*  
*Sample ID*  
*Time & Date*  
*Serial port (function & baud rate & Statistics on/off)*  
*Paper feed option*

Please read chapter 5.3 OPTIONS MENU for more details.

**Note:** The options key can be pass-word protected to prevent unauthorized personnel to change any settings!



Here you can select one of 10 possible languages. If this key is touched the first of two selection screens opens. The languages are indicated by the different national flags if The language that you desire is not in the first screen press the green arrow to go to the next screen, then select the language of your choice or press  to return to the main menu again.



Go to next screen




Return to main menu





After touching this key the maintenance screen will be displayed. Here you can find status information of several sensors, switches and settings as well as some calibration data. Also you can enter the calibration routines from this screen. More detailed info can be found in chapter 7 TECHNICAL INFORMATION.



After touching this key the information screen will be displayed. In this screen you can find the Micrometers model- and serial number as well as the current software version that is used. Also you can find the address and phone number of the TMI group company that supplied this instrument. Touch this icon  in the upper right corner of the display to return to the main menu.

## 5.2 SETTINGS MENU



### Settings menu keys:



#### Active settings

You can toggle through the measuring unit's  $\mu\text{m}$ , **mm** and **mil** by repeatedly touching this key. The unit indicated in this key shows the unit that is currently set to be used.



Depending of the sample detect setting (*see options menu*) it is possible to set two different test modes:

If sample detect is **on** you can toggle between **OCO** and **CON**.  
If sample detect is **off** you can toggle between **OCO** and **COC**.

*OCO* = open – close - open

*COC* = close – open – close

*CON* = continues mode (always open – close – open)

See next page



In *OCO* and *CON* mode the upper anvil is lifted to the measuring height that was set in the gap option. If a test is performed the upper anvil is lowered to the sample, and after the thickness is measured the anvil is raised to the set measuring height again.

In *COC* mode the upper anvil is lowered to the lower anvil as being the start position before a thickness test. If a thickness test is performed in the *COC* mode the upper anvil will be raised to the measuring height that was set in the gap option and then lowered to the lower anvil (sample) again to make the measurement.

**Notes:**

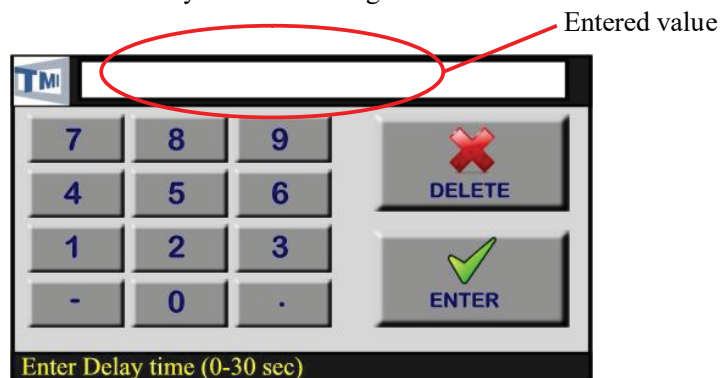


After the (mode) key is touched, the instrument will automatically adjust the upper anvil to the desired position. To be able to select the alternative option this process must be finished first.

In the **CON mode** new tests will be started automatically as long as the sample detect sensor is covered. A maximum of 200 tests can be done, then the statistics will be calculated and displayed or the test series will be terminated.



When touching this key, a key panel will be displayed where you can enter a delay time in the range of 0 – 30 seconds.



During thickness testing the upper anvil is lowered to the sample. In case a **delay time of 0 sec.** was entered a reading will be taken as soon as the electronics of the instrument indicate that the upper anvil is in lowest position. In case a delay time (**1-30 sec.**) was entered the upper anvil will be lowered to the sample and a reading will be taken after the delay time is elapsed.

See next page.

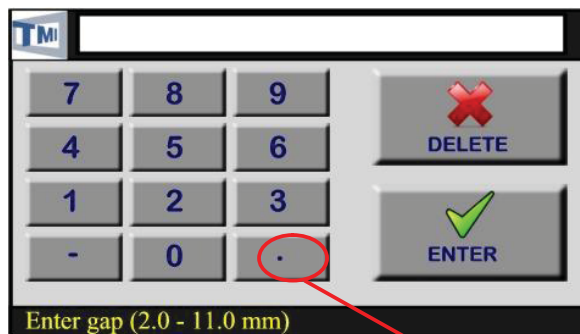




Enter the desired delay time by touching the number keys. The entered value will be displayed in the upper (white) window in this key panel. The value must be accepted by touching the *ENTER* key. If a wrong value is entered by mistake it can be deleted by touching the *DELETE* key. If the operator try's to accept a wrong value an *error message* is displayed and a buzzer is sound (3x). After entering a correct value the instrument returns to the settings menu.



When touching this key, a key panel will be displayed where you can enter a measuring gap in the range of 2.0 – 11.0 mm.



Decimal point

In OCO operation mode the measuring gap is the **opening** between the surface of the upper and lower anvil and can be considered as the “start position” for the thickness test. You can enter a gap that is most convenient for the material that you are testing. In OCO mode the upper anvil is returned to this position after a thickness measurement is done.

In COC operation mode the gap is the maximum **opening** that will be created between the upper and lower anvil during the thickness test.

Enter the desired measuring gap by touching the *number-* and *decimal point* keys. The entered value will be displayed in the upper (white) window in this key panel. The value must be accepted by touching the *ENTER* key. If a wrong value is entered by mistake it can be deleted by touching the *DELETE* key. If the operator try's to accept a wrong value an *error message* is displayed and a buzzer is sound (3x). After entering a correct value while the instrument is in OCO mode the upper anvil is adjusted to the gap that was entered then the instrument returns to the settings menu. In case of COC mode the instrument returns to the settings menu immediately.

**Note:** *The accuracy of the gap setting is – 0.0, + 0.5mm.*

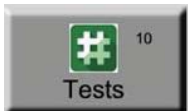




It is possible that the thickness of a stack of samples must be measured. When touching this key, a key panel will be displayed where you can enter the number of plies in that stack (1 – 50) (*see delay time for example*).

Enter the desired number of plies by touching the *number* keys. The entered value will be displayed in the upper (white) window in this key panel. The value must be accepted by touching the *ENTER* key. If a wrong value is entered by mistake it can be deleted by touching the *DELETE* key. If the operator try's to accept a wrong value an *error message* is displayed and a buzzer is sound (3x).

During testing the number of plies is displayed, and the result at the end of the tests is the *average thickness per ply*. This is also the value that is stored to be used in the statistical calculations.



When touching this key, a key panel will be displayed where you can enter the maximum number of tests in a test series. The entered number must be in the range of 1 – 200.

If the number of tests displayed in this touch key are completed the instrument will automatically end the tests series and calculate and display the statistics. In case the statistics option was switched off (in the serial menu, see page 20) the instrument will return to the main menu instead.

If the maximum number of tests is set to **1**, **single tests** will be performed. No test data will be stored for statistical calculations. In theory an endless test loop can be done this way. In this case no statistics are available at the end.

**Attention:** It is recommended to clean the anvil and zero the instrument from time to time to prevent measuring errors!

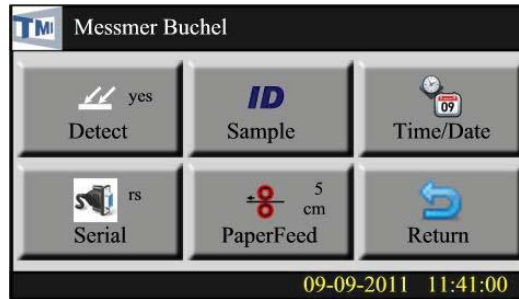


Touch this icon in the upper right corner of the display to return to the main menu.



### 5.3 OPTIONS MENU

Options menu keys:



By touching this key you can switch **on** or **off** the internal infra red sample detect sensor. If the sample detect sensor is on indicated by “**on**” in the detect key, you can start a thickness test by inserting the sample under the sample detect sensor. To be able to do so, the instruments display must show the Test Screen and the *OCO* or *CON* mode must be selected.

**Notes:**

*It is possible that when switching the sample sensor on or off The test mode is **automatically** changed. It is also possible that the upper measuring anvil **starts moving** in that process. See also test mode settings.*



*When the optional internal strip feeder must be used, please read section 6.3 Internal Strip feeder option at page 26.*

*In case of clear or very transparent samples it is most likely that the sample detect sensor is not able to detect these.*

*When using the sample detect sensor avoid direct sunlight onto the area where the sample detect sensor is located.*



When touching this key, the key panel will be displayed where you can enter a sample ID (number) of 30 maximum characters. The **decimal point** and **dash** key can also be used in this situation. The sample ID is used in the serial printer output report.



*dash*



*decimal point*

*Example:           12-09-2011.005*





Touching this key will open the Time and date menu.



← Date and time



By touching this key the date will be displayed in the US style: mm-dd-yyyy (month – day – year).



By touching this key the date will be displayed in the European style: dd-mm-yyyy (day – month – year).



Touching this key will open the keypad. You now can enter the accurate time. Take care that the new time is entered in the format as shown in the lower left corner of the display. Always enter 2 characters for hours, two characters for minutes, and two for seconds separated by a decimal point.

*Example:*      **05.23.00**      *or*    **18.35.00**



Touching this key will open the keypad. You now can enter the accurate date. Take care that the new date is entered in the format as shown in the lower left corner of the display. Depending of the selected style, US or European, always enter 2 characters for days, 2 characters for month and 4 characters for year separated by a dash.

*Example:*      **10<sup>th</sup> of January 2012**

**US style:**      **01-10-2012**

**Euro style:**    **10-01-2012**



By touching this key you can return to the main menu screen.

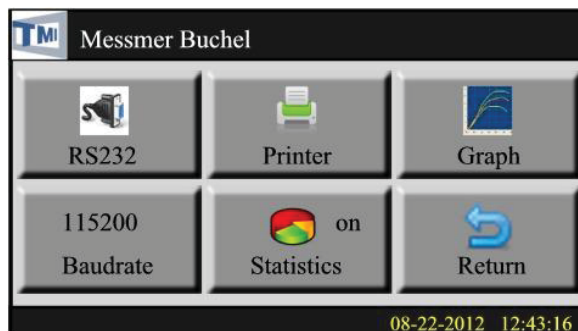




*Active function*

*rs* = RS232  
*pri* = Printer  
*gra* = Graphmaster

Touching this key in the options menu will open the serial port setup menu.



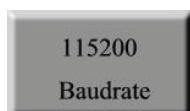
In this menu you can select the function of the serial port and set the desired baud rate.



By touching one of these keys the correspondent function can be selected for the serial port. The functions are respectively:

*RS232 port.*  
*Serial printer output port.*  
*Graphmaster data output port.*

The current active function is indicated in the serial key in the options menu.



Touching this key opens a window where you can select the baud rate used by the serial port. You can select the following baud rates:

9600  
 19200  
 38400  
 57600  
 115200 (default)

The current active baud rate is indicated in the baud rate key in the options menu more technical information regarding the serial port can be found in chapter SERIAL PORT.

See next page.





You can toggle between “Statistics on” and “Statistics off” by repeatedly touching this key. In case “statistics on” is selected, statistical data is calculated and displayed using the measured thickness values collected during the last test series. In case of “statistics off”, no statistical data is calculated. The actual status of this setting is indicated in the statistics key.



By touching this key you can return to the options menu screen.



This last key in the options menu can be used to set the step distance of the optional internal paper feed. In case the instrument is equipped with an internal strip feeder unit continues testing can be done on a strip of material (max. 70mm wide). The step distance is the distance between two consecutive measuring points on this strip. The current active step distance is indicated in the paper feed key in the options menu.

*If the distance is 0 cm, the strip feeder unit is switched off.*

A step distance value of 0 – 50 cm can be entered by means of the key pad that is displayed after the key was touched.

*If instead of the step distance in cm, the text **no** is displayed in The paper feed key then your instrument is not equipped with a paper feed unit or this function is not made active in the instruments software.*



By touching this key you can return from the options- to the main menu screen.



## 6. TESTING

Before testing is started make sure that no error messages are displayed during instrument setup and that calibration is valid. The instrument must be switched on for 30 minutes before making measurements to allow the temperature of the system to stabilise.

### SAMPLING

The number of specimens and method of sampling can be found in one of the applicable international standards for the type of material under test.

Prepare samples preferably with a minimum dimension of 60 x 60 mm.

Ensure that each test piece is not so large that the Micrometer reading is affected by the forces exerted when the sample bends under its own weight during measurement.

### CONDITIONING

Several materials that can be tested on the 49-56 Micrometer are very sensitive to changes in the moisture content of the specimen. The environmental conditions, and the conditioning of the test samples shall be done in accordance to one of the applicable international standards for the type of material under test.



#### Important note:

When measuring thin materials like films etc. dust and dirt can be of major influence on the test results. Sometimes dust and dirt can be attracted to the samples under test by means of antistatic influences. Also it is possible that the sample itself can pollute the measuring anvils of the 49-56 Micrometer. Therefore it is recommended to clean the measuring anvils on a regular basis using alcohol (or ethanol) and an antistatic cloth as well as compressed air.



## 6.1 THICKNESS TESTING

After touching the *test* key in the main menu



the test screen opens:



Before a new test series is started it is recommended to “zero” the instrument. Clean the measuring surfaces carefully and remove dust by blowing compressed air. Remove all samples from the measuring area.

Now touch the *zero* key:



The instrument will ask you to remove the sample “*Remove Sample Press Start*”.

If OK pres the *start* key:



If the instrument is in OCO mode the upper anvil will be lowered to the lower anvil. While the upper anvil is resting on the lower anvil the display reading is set to zero. If the start key is activated the green “ready” led will turn to red “busy”. If the operation is done the led will turn green again to indicate “ready” for next test.

In case of COC mode the upper anvil will first be raised, then the instrument will ask you to remove the sample and touch *start* to set the zero.

**Note:** *If no tests are done (no test result displayed) it is possible to return to the main menu screen by touching the display in the rolling average zone.*





After the instrument is zeroed, enter a sample and touch *start*.

The led indication in the *start* key will turn red (*busy*). The upper anvil is lowered onto the sample, a measurement is done and the result is displayed.

The result showed on the display after the test is the ***average thickness per ply!***

Then depending of the test mode the upper anvil will return to its starting position and the led in the *start* switch turn green again to indicate “*ready for next test*”. In case a delay time was entered in the settings menu the measurement will be taken after this time is elapsed.



In case the operator recognizes that the test result is not valid he can delete this immediately after the test by pressing the *delete* key.

This result will then not be used to calculate statistical data.

Also the number of tests will not be increased.



In case the test result is valid and the *start* key is touched to do the next tests, the test-result is stored and the number of tests increased. During the test series the actual rolling average of the test results measured so far is displayed. When all the samples are measured the operator can end the test series by touching the *statistics* key.

Now the statistical data will be calculated and displayed.

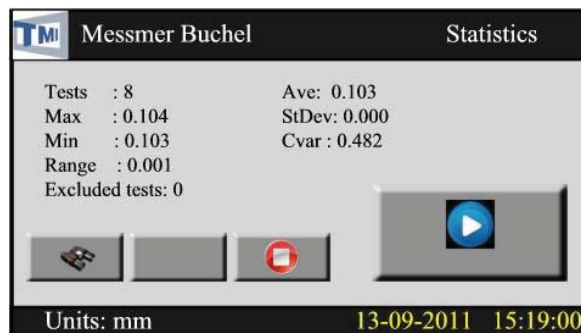


*The statistical data will automatically be displayed if the number of tests equals 200.*

**Note:** *In case the sample detect option was switched on in the options menu, a test can be started by entering a sample into the measuring area. An alternative way of starting the test is to use the optional footswitch..*

## 6.2 STATISTICS

When during testing the *statistics* key is touched to calculate and display the statistical data the following screen is showed:



In this screen you can find the maximum and minimum value that were measured during the test series as well as the calculated range, average, standard deviation and coefficient of variation. The units of measure are displayed in the lower left corner of the display.

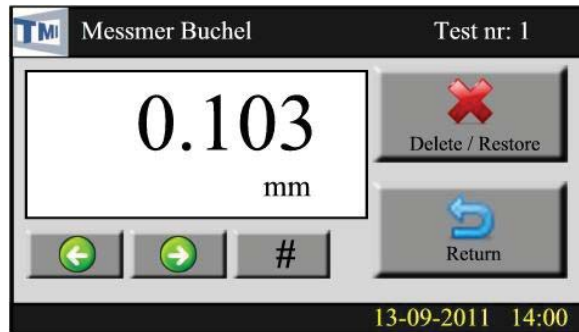
*See next page.*



It is possible to inspect the individual stored measuring results of the test series in progress. To do so touch the *memory* key:



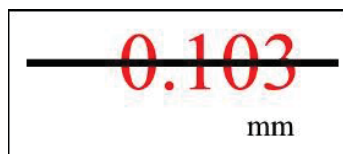
When this key is touched the following screen opens:



Initially the test result of test number *one* is showed. By touching the *arrows* key the next, or previous test result that was stored in the memory can be showed. The test Number that corresponds to the showed result is displayed in the upper right corner of the display. In case you know the number of the test result that you like to inspect, it is also possible to enter this number directly. Touch #, and then enter the number by means of the displayed keypad, accept by touching the *enter* key and the desired test result will be displayed.



It is possible to exclude or restore test results from or to the statistics calculations. If a test result is showed you can touch the *delete* key to exclude the test result from the calculations, or touch the *restore* key to include it again into the calculations. You can recognize an excluded result because it is crossed and displayed in red figures.

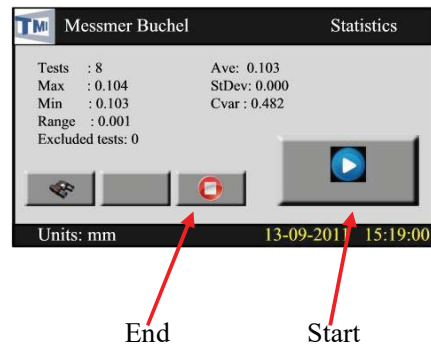


If you have edited the test results, touch the *return* key to recalculate the statistical data again. The statistics display will indicate the number of tests results used for the calculations and the number of test results that where excluded.

*See next page.*



While the statistical data is displayed it is possible to continue the current test series. If you touch the *start* key the instrument will return to the test screen. If the test series must be ended completely touch the *end* key, this will return the instrument to the main-menu screen.



### 6.3 INTERNAL STRIP FEEDER UNIT (option)

If the 49-56 Micrometer is equipped with an internal strip feeder unit, it is possible to automatically measure the thickness at regular intervals over the total length of a strip of material. The width of the strip preferably must be within a measure of 60 – 70 mm.

If the strip feeder unit is used with paper or similar materials, the sample detect sensor must be switched *on* to be able to detect the end of the strip. This can be done in the *options* menu. Also the strip feeders step distance of 1 – 50 cm must be set in the options menu. If a step distance of *0 cm* is set the paper feed unit is switched *off*.

If the strip feeder must be used with *clear film* or very *transparent materials* the sample detect sensor must be set to *off*, this can be done in the options menu. If the strip feeders step distance is set to any value other than *0 cm* the end of the strip will be detected as soon as the sample is no longer under the upper anvil and when the reading is lower than 0.005mm! This last reading will not be entered in the statistics of the test series.

If a step distance of *0 cm* is set the paper feed unit is switched *off*.

It is recommended to zero the instrument before a test series is started measuring clear film in combination with the strip feeder.

**Note:** *The strip feeder unit can not be used when the instrument is set to COC mode (close-open-close). When this mode is selected the sample detect sensor, and strip feeder unit are switched off automatically.*

**Attention:** *Please be aware of possible entrapment hazard in strip feeder area!*



Start tests using the strip feeder unit:

From the *main menu* touch *test* to open the test screen.

Before starting a test series on a strip of material, take care that the instrument is *zeroed* as explained in chapter 6.1 Thickness Testing. Then lead the beginning of the strip over the lower anvil, to the pressure- and drive wheel.

*See next page.*



These two wheels are located in the slot in the area under the display. To be able to clamp the strip between the pressure- and the drive wheel, *lift* the lever connected to the pressure wheel in upwards direction. Then slide the strip into the opening that is now created and *align* the strip with the internal *straight* body of the Micrometer.



Now touch the *start* key to begin the tests.

The instrument will take a measurement and then move the strip over the step distance that was set in the options menu to the next measuring position. The instrument will take measurements until the end of the strip is detected by the sample detect sensor. If the end of the strip is detected the instrument will automatically stop the measurements and a buzzer is sound (3x).

You can now touch the statistics key to calculate the statistical data or enter a new strip to continue the current test session. Take care that if the number of tests equal 200 the statistical data is calculated automatically.

**Note:** *It is possible to interrupt the strip feeder test session by touching the delete key. The instrument will finish the test that was already started on then sound the buzzer(3x) to indicate the test series is interrupted.*



## 6.4 SERIAL PORT

The serial port connector is located at the back side of the instrument.  
It is a 9 way female D-Sub connector.

The pin lay-out of the connector is:

Pin 2	=	RxD	(receive data)
Pin 3	=	TxD	(transmit data)
Pin 5	=	GND	(system ground)



The baud rate can be set in the *options* menu when the *serial* key is touched.  
You can select 5 possible baud rates:

*9600*  
*19200*  
*38400*  
*57600*  
*115200*

Data bits:	8
Stop bits:	1
Parity:	None

The function of the serial port can be set in the *options* menu, 3 possible functions can be Selected:

*RS232C output*  
*Serial printer output*  
*Graph master data output*



#### 6.4.1 RS232C output

After each single test an ASCII character string is send containing the following data:

2 characters, instrument identifier	BM	Büchel Micrometer
1 character, measuring units	1	1 = $\mu\text{m}$ , 2 = mm, 3 = mil
3 characters, test number	6	1 – 200
2 characters no. of plies	5	1 - 50
10 characters, test result	0.1049	(example)
1 character CR		Carriage return
1 character LF		Line feed

Total number of characters: 20

Example: **BM2 6 0.1049** <CR><LF>



**Warning:** Only connect this serial port to a device with the appropriate voltage levels. Connecting extend voltages to this serial port can damage the internal circuitry of the instrument.

#### 6.4.2 SERIAL PRINTER output

If this option is selected a serial printer can be connected to the serial port. If a serial printer is connected to his port, the current setup of the instrument, the individual test results and the statistics will be printed during and after the test series.

As an option Büchel BV can supply a thermal mini printer with the instrument. The optional thermal mini printer has the following specifications:

- Columns : 40
- Printer buffer 7400 characters (approx. 7.2 kB)
- Rechargeable Battery
- AC adapter

For full operating instructions, features and settings of the printer, read operation manual that is supplied with the mini printer very carefully.

If the printer is *connected*, switched *on* and *online* the current settings of the instrument will be printed immediately *after* the first test of a test series is completed. Also the test result of the first test is printed in the same operation. From now on after each next test the test result is printed until the operator touches the *statistics* key. The statistical data will only be printed if the test series is ended completely by touching the *end* key in the statistics screen.

See next page for printout example.



Example:

Industrial Physics

Micrometer V1.0.1  
Model: 49-56-00-0001  
SN: 9999-01

Sample ID: 05-09-2011.001

Plies: 5

16-09-2011  
11:16:46

mm

-----

Test nr:	Result:
1	0.104
2	0.104
3	0.103
4	0.103
5	0.103
6	0.103
7	0.103
8	0.103
9	0.103
10	0.103

-----

Tests : 10  
Excluded tests: 0

Max : 0.104  
Min : 0.103  
Range : 0.000

Ave : 0.103  
Stdev : 0.000  
Cvar : 0.101



**Warning:** *Only connect this serial port to a device with the appropriate voltage levels. Connecting extend voltages to this serial port can damage the internal circuitry of the instrument.*



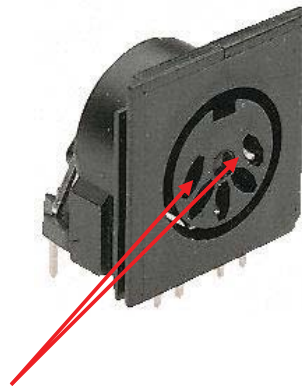
### 6.4.3 GRAPH MASTER *output*

If this option is selected the instrument can be connected to one of the *serial ports* on a *PC* on which the Graph Master software is installed. Graph Master is data management software that is capable of acquiring, displaying, analyzing, storing and publishing test results. Graphmaster compares data to user defined limits and prior measurements. Graphmaster eliminates data transcription errors and automates data collection, comparison and document publication. For more detailed information we refer to the graph Master software instruction manual.

### 6.5 FOOTSWITCH *input*

A test can be started with an external foot switch when the test screen is displayed on the instrument. The foot switch can be used instead of the touch key *start* or the *sample detect* sensor. The foot switch must be connected to the 5 way DIN socket at the back of the instrument.

The footswitch must have a normally open contact. Closing this contact will start the test.



Connect wires of foot switch to these two terminals (pin 1 & 3).



**Warning:** *Do not connect any external voltage to the foot switch connector! This input is intended for a normally open contact only. Anything else that is connected to this input can damage the internal circuitry.*



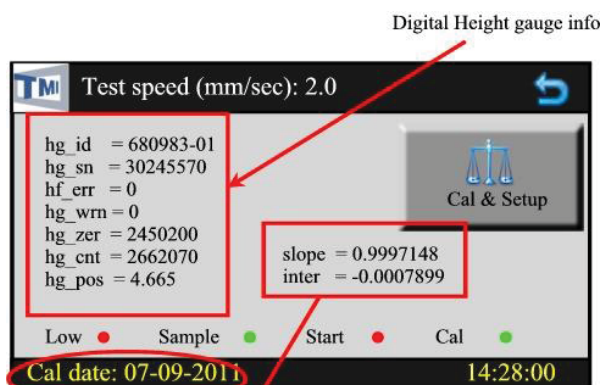


## 7. TECHNICAL INFORMATION

### 7.1 MAINTENANCE SCREEN

The maintenance screen is intended to be used by the service engineers of Industrial Physics. It shows the following data:

- ID, status and outputs of the internal digital position sensor (height gauge).
- Test (lowering) speed
- Date of last calibration
- Slope and intercept that were calculated during last calibration
- Status of lower position sensor (low)
- Status of Sample detect sensor (sample)
- Status of start switch input (start)
- Status of calibration (cal)
- Actual time



Calibration information



### 7.2 SETUP & CALIBRATION

By touching the Cal & Setup key in the maintenance screen it is possible to enter the following routines:

- Height gauge calibration routine

To be able to perform this calibration routine one of the following sets of certified gauge blocks are needed:

Item nr: **49-56-03**: mm gauge block set (8 gauge blocks)

0.100 – 0.200 – 0.500 – 1.000 – 3.000 – 5.000 – 7.500 and 10.000 mm

Item nr: **35-12-03**: inch gauge block set (6 gauge blocks)

0.01 – 0.100 – 0.200 – 0.300 – 0.400 – 0.500 inch (of which 0.5 cannot be used!)



Or **at least 4** calibrated and certified alternative gauges more or less covering the whole measuring range of the 49-56 Micro meter (0 – 10 mm, 0 – 0.4 inch).

- Test speed set up (lowering speed).
- Brightness adjustment of the display
- Company settings



**Note:** *All these routines are password protected and may only be entered by a qualified service engineer.*

### 7.3 TROUBLE SHOOTING

#### Electrical supply:

If the LCD display does not illuminate after you have switched the on/off switch to the on position please check:

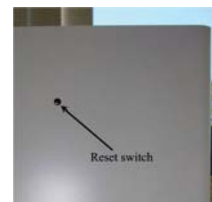
- **Is the power cable properly connected?** Switch off the instrument, ensure the power cable is securely connected to your electrical outlet and to the power inlet connector of the instrument. Switch instrument back on.
- **Is power supplied to your electrical outlet?** Switch off instrument, unplug it, and try with another appliance to determine if electricity is being supplied to that outlet.
- **Is supply voltage of the instrument correct?** Check if the supply voltage to the instrument is in the range of 100 - 230VAC 50/60 Hz? If not, **DO NOT** try to operate it. Please contact your local agent or Büchel BV for technical backup.
- **Fuse blown?** Read chapter 4.2 for instructions how to check and replace the fuse.

#### Programme locks itself during operation:

If for any reason the programme locks itself you can reset the instrument by pressing the reset button! After activating the reset button the tester will restart as if it has been switched on. It is preferred to use the reset button over an off / on cycle as fast power alterations may damage the internal circuitry. The reset push button is located at the back of the tester and can be operated by entering a special *plastic stylus* into the hole in the back panel of the instrument.

**Warning:** *Do not use any metal objects (i.e. screw drivers etc.) to operate the reset switch!*

In case no plastic stylus is available switch off the instrument, wait for 60 seconds and then switch on again.



#### 7.4 SPECIFICATIONS

Measuring range	:	0.000 - 10.000 mm 0 - 10000 $\mu\text{m}$ 0 - 394 mil
Measuring units	:	$\mu\text{m}$ , mm and mil
Accuracy	:	$\pm 1 \mu\text{m}$ or 0,1% of the reading whichever is greater.
Gap	:	Adjustable 1.0 – 11.0 mm
Delay time	:	Adjustable 0 – 30 seconds
Test mode	:	OCO open – close – open COC close – open – close CON continues mode (oco)
Statistics display	:	Nr of tests Nr of tests excluded from statistics Max Min Range Average Standard deviation Coefficient of variation
Lowering speed	:	1 – 5.9 mm/sec (factory setting)
Lower anvil dimension	:	58 mm diameter
Upper anvil dimension	:	On request
Test pressure	:	On request
Max. number of tests	:	200 (in one test series).
Internal languages	:	English - Dutch - German – French Spanish - Finnish – Italian – Polish – Turkish - Russian
Serial output	:	9 way female D-Sub connector RS232C – Printer – Graphmaster
Footswitch input	:	5 way DIN socket (pin 1 and 3)
Electrical supply	:	100-230VAC 50/60 Hz
Electrical power	:	50 Watt
Fuse	:	250V / 1A(T) glass tube 5 x 20mm
Environmental Operation conditions	:	Temperature 10 - 40 °C, Humidity 20 - 70%
Dimensions	:	265 x 110 x 335 mm (l x b x h)
Weight	:	$\pm 13$ kg



## 7.5 ADDRESSES Industrial Physics

### Industrial Physics Inks & Coatings

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2908LL Capelle ad IJssel  
The Netherlands

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Fax: +31 (0) 10-7900129

E-mail: [info-ic@IndustrialPhysics.com](mailto:info-ic@IndustrialPhysics.com)  
Website: <https://www.industrialphysics.com/en-us/ic>

### Testing Machines Inc.

40 McCullough Drive,  
New Castle  
DE 19720 USA

Phone: +1 302-613-5600

E-mail: [info@testingmachines.com](mailto:info@testingmachines.com)  
Website: [www.testingmachines.com](http://www.testingmachines.com)



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