PRIMES

Short Start Guide

Translation of the Original Instructions

FocusMonitor FMW+

Additional Documentation to the Operating Manual

FocusMonitor FM+

Revision 01/2018 EN

IMPORTANT!

READ CAREFULLY BEFORE USE.

KEEP FOR FUTURE USE.

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1 About this documentation

This documentation describes the special version „FocusMonitor FMW+“ of the PRIMES measuring device “FocusMonitor FM+” and presents the differences. It supplements the standard operating manual of the FocusMonitor FM+.

IMPORTANT!

Please pay special attention to the safety instructions given in the standard operating manual of the FocusMonitor FM+.

2 Distinguishing features in comparison with the standard device

- The FocusMonitor FMW+ does not have an integrated z-axis. For the measurement the focus is moved along the axis by the system. Information regarding the z-position can either be entered manually via the settings dialogue (measurement >> single measurement) in the LaserDiagnosticsSoftware.
- An absorber is integrated into the measuring device (maximum absorber power of 1000 watts).
- The maximum energy per measurement is 90 kJ (max. irradiation time=90 s at 1000 Watt).
- The measuring device does not have a protective gas connection
- Direct connection to the PC via Ethernet.

3 Connections

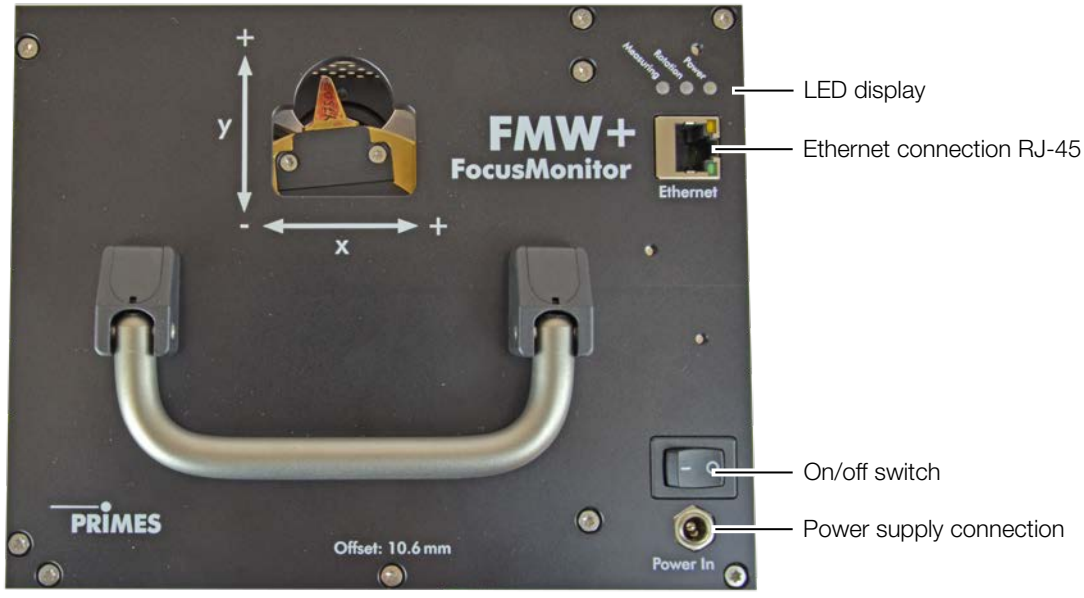


Fig. 3.1: Connections of the FMW+

4 Status display

The different operating modes are indicated by three LEDs.

Designation	Color	Meaning
Measuring	Red	Measurement is running
Rotation	Orange	Motor is running
Power	White	Voltage is applied (24 V)

5 Adapt device

Depending on the laser type the corresponding measuring tip and a suitable detector have to be used. The DFIG-PS+ detector is included ex works; the measuring tip has to be mounted by the customer.

Detector type	Laser	Type of Sensor	Amplification	Wavelength range in µm
DFC+	CO_2	Pyro-detector	1	9 – 12
DFY-PS+	NIR/VIS	Photodiode	Automatic adaptation of the sensitivity	0.4 – 1.1
DFIG-PS+	NIR	Photodiode	Automatic adaptation of the sensitivity	1 – 2.1

Tab. 5.1: Variety of detectors

Measuring tip	High Power CO_2	High Div YAG	Diode Tip
Typical pin hole diameter in µm	20-25	20	50
Beam divergence/acceptance angle in mrad	< 240	< 200	< 500
Typical wavelength in µm	9-12	0.4-1.1	0.4-1.0
CO_2 Laser			
Max. power density*) in MW/cm²	30	—	—
Max. power in kW	1	—	—
Nd:YAG Laser			
Max. power density*) in MW/cm²	—	10	1
Max. power in kW	—	1	1
Diode Laser			
Max. power density in MW/cm²	—	1	1
Suitable Detectors			
Detector type	DFC+	DFIG-PS+, DFY-PS+	DFIG-PS+, DFY-PS+

Tab. 5.2: Variety of measurement tips and detectors

*) Please note the damage threshold in the Operating Manual FocusMonitor FM+.

5.1 Inserting the measuring tip

To prevent transport damage, the measuring tip is disassembled when delivered. It is to be installed with the curved part facing towards the beam source.
There are different measurement tips available for different wavelengths (see Tab. 5.2 on page 6).

NOTICE

Danger of damaging the measuring tip

The small drill hole in the measuring tip can be blocked easily by dirt particles or by touching it with bare hands.

▶ **When mounting/dismounting the tip, please wear powder-free latex gloves and ensure a dirt- and dust-free environment.**

1. Turn off the supply voltage.
2. Turn the drive wheel (see Fig. 5.4) clockwise until the disc extends approx. 15 mm into the measuring window in a positive y-direction.

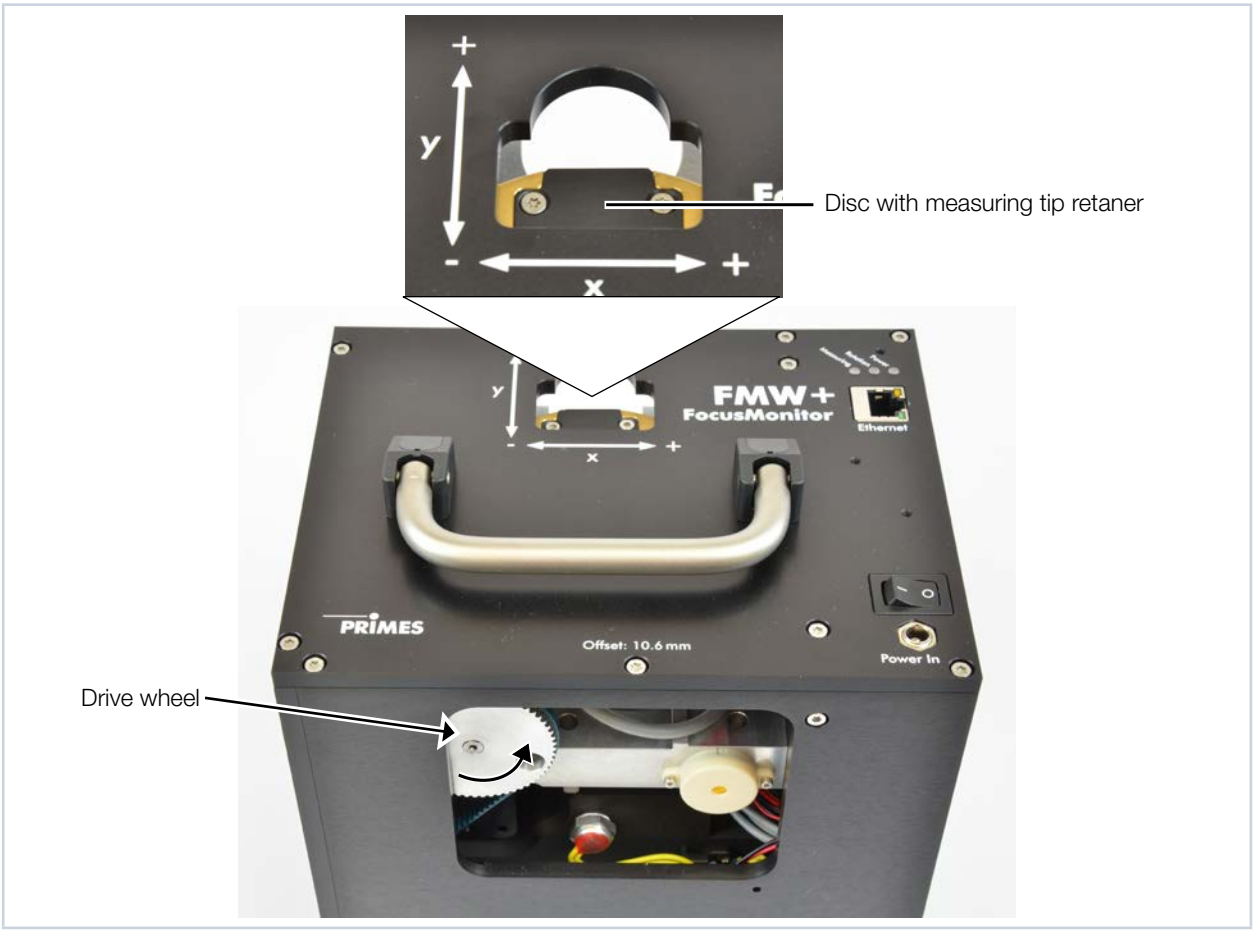


Fig. 5.1: Moving the disc into the measuring window

3. Turn the disc until the measuring tip retainer becomes visible in the opening of the housing.
4. Remove the fastening screws (Torx T8) as well as the retaining plate.
5. Carefully insert the new measuring tip in the disc (caution, the entrance aperture is located on the arched side of the tip, see Fig. 5.2).

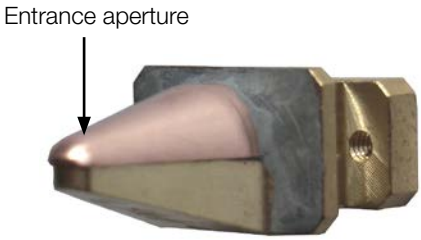


Fig. 5.2: Entrance aperture (pinhole) in the measuring tip

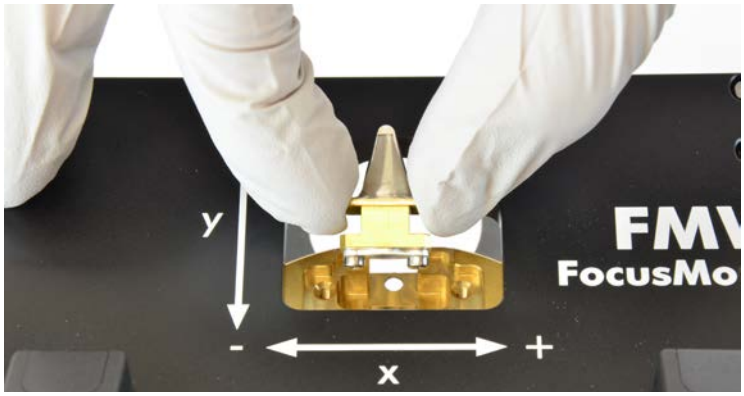


Fig. 5.3: Inserting the measuring tip

6. Insert the retaining plate in the disc with the guidance groove pointing upwards and an angle of 45 degrees and press it downwards into the opening (see Fig. 5.4).

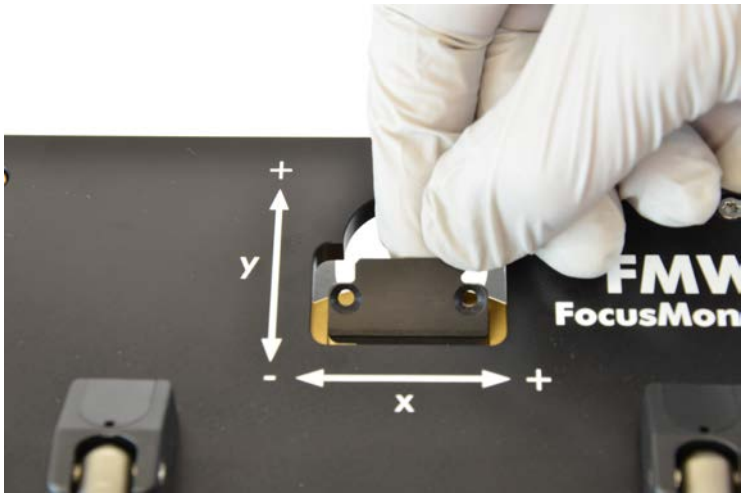


Fig. 5.4: Inserting the retaining plate

7. Insert the screws and fasten them hand-tight.
8. Move the measuring tip out of the measuring window to ensure it is protected.

When turning the supply voltage back on, the measuring head automatically moves back into its resting position.

6 Notes on the absorber

The high-power absorber can absorb an energy application of 90 kJ (1000 W · 90 s).

NOTICE

Risk of damage caused by overheating

The absorber is equipped with an alarm siren that warns of overheating. It activates when the absorber casing reaches a temperature of 60 °C.

- **In case of alarm, immediately turn off the laser and allow the absorber to cool!**

NOTICE

Risk of burns

The laser beam can make the surface of the absorber very hot.

- **Do not touch the absorber during or immediately after a measurement!**

7 Mounting/Dismounting

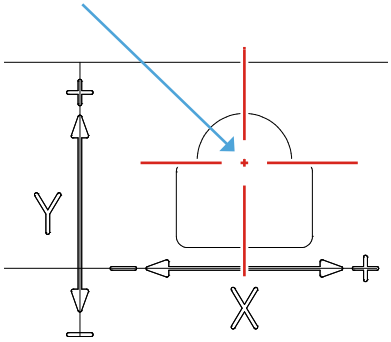
7.1 Installation position

The FMW+ was designed for a vertical beam incidence from above.

7.2 Alignment

1. When positioning the device in x- and y- direction, please make sure that the laser beam hits the center of the semi-circle in the inlet aperture.

Position of the laser beam



8 Electrical connection

The FMW+ requires a voltage supply of 24 V DC for the operation. A suitable power supply is included in the scope of delivery. Use only the included cable to connect the power supply with the local power supply.

Data is transmitted between the FocusMonitor FMW+ and PC/LAN via the Ethernet connection.

8.1 Connection to the PC/LAN and establishing the power supply

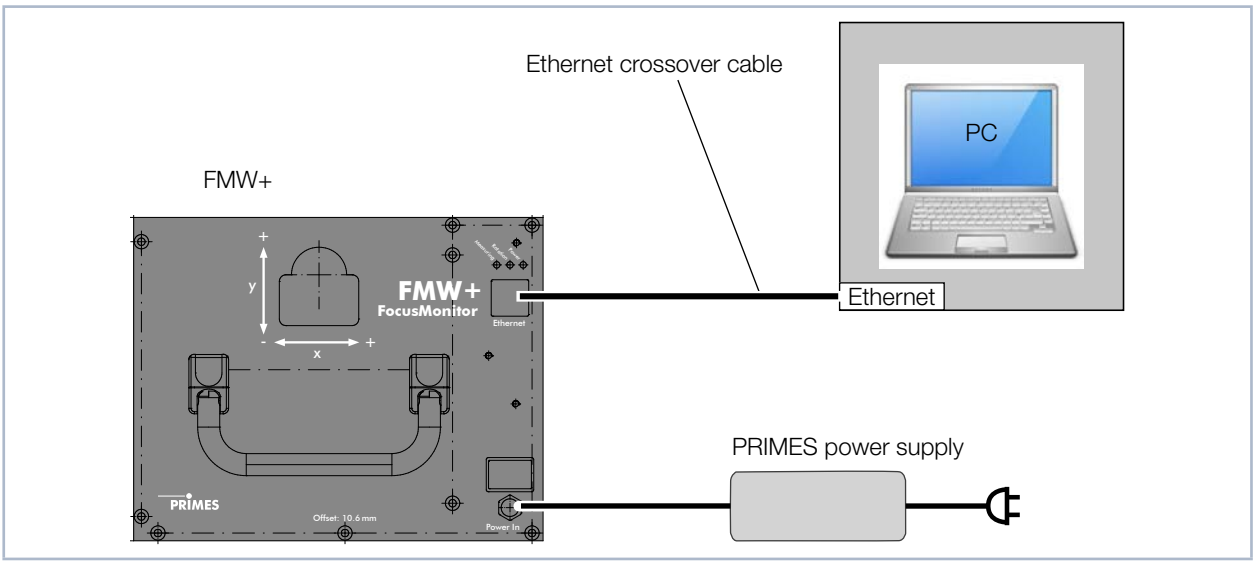


Fig. 8.1: Connection of FMW+

Connect the FMW+ to the PC via a crossover cable or to the network via a patch cable.

9 Measuring with the LaserDiagnosticsSoftware LDS

With the FocusMonitor FMW+, you can measure one or more planes. Since the FocusMonitor FMW+ does not have its own mobile z-axis, the system must move the focusing lens or the device in this direction when measuring multiple planes.
You will find detailed explanations concerning the settings and measuring mode in the operating manuals of the FM+ and LaserDiagnosticsSoftware LDS.

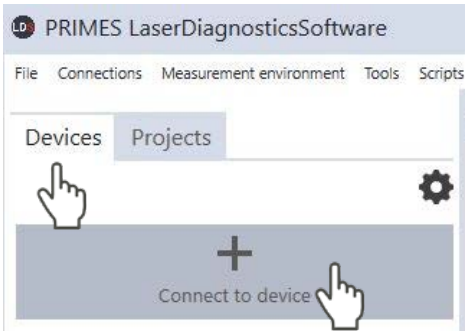
9.1 Single plane measurement

9.1.1 Connect the device with the LaserDiagnosticsSoftware LDS

1. Switch on the FocusMonitor FMW+.

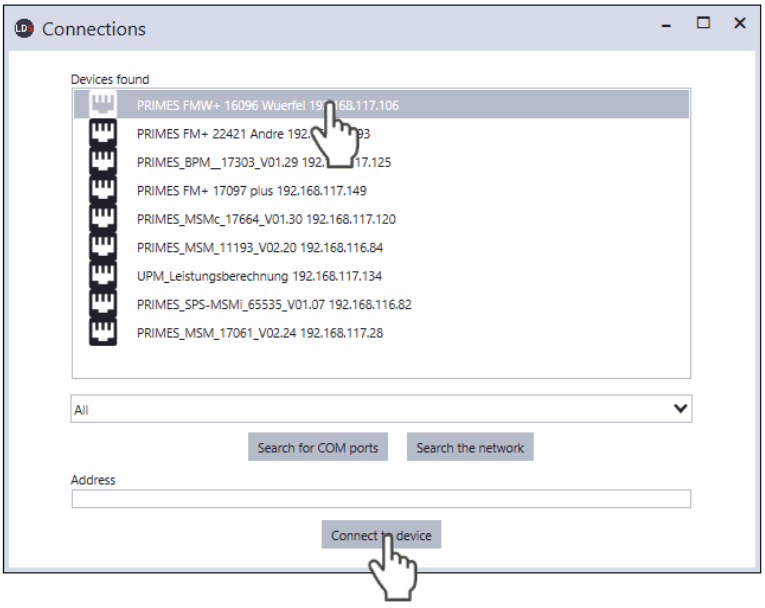
👁 The operating mode is shown in the status display (see chapter 4 on page 6).

2. Start the LaserDiagnosticsSoftware LDS.
3. Click on the ***Devices*** tab.
4. Click on the ***+ Connect to device*** button under the tab.



👁 The ***Connections*** window appears.

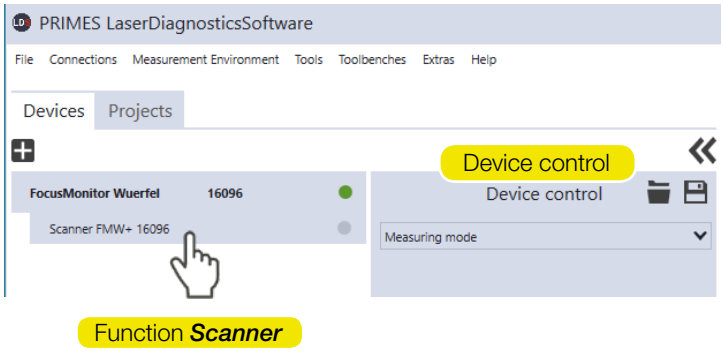
5. Click on the desired device.
6. Click on the ***Connect to device*** button.



👁 The FocusMonitor FMW+ is established as a connected device.

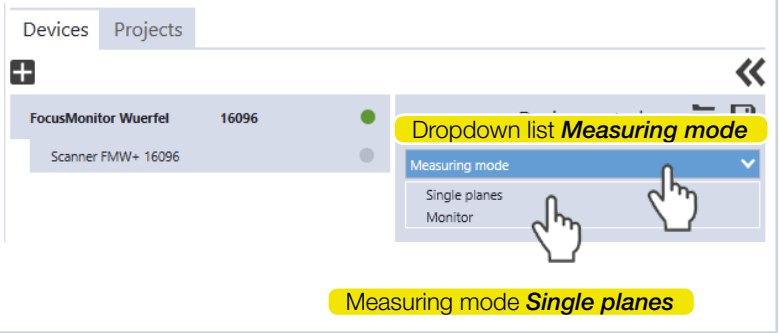
7. Click on the ***Scanner*** function.

👁 The ***Device control*** menu opens.



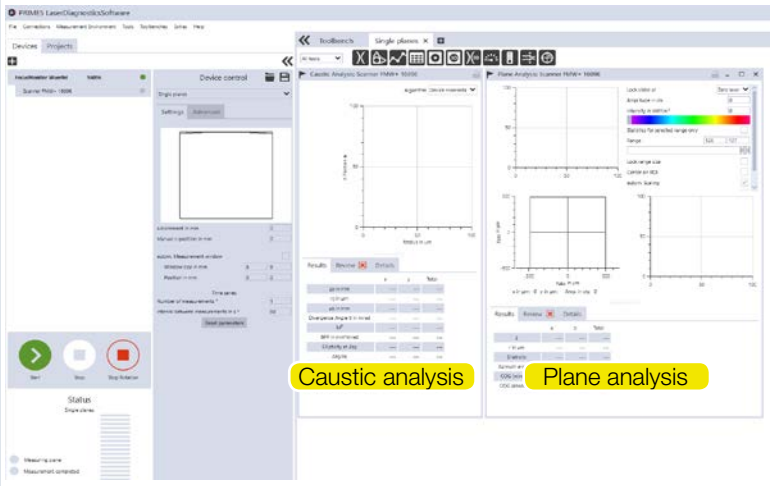
9.1.2 Selecting the measuring mode *Single planes*

1. In the ***Device control*** click on the ***Measuring mode*** drop-down list.
2. Click on the entry ***Single planes***.



The corresponding ***Device control*** opens.

The ***Single planes*** toolbench opens wit the tools ***Caustic analysis*** and ***Plane analysis***.



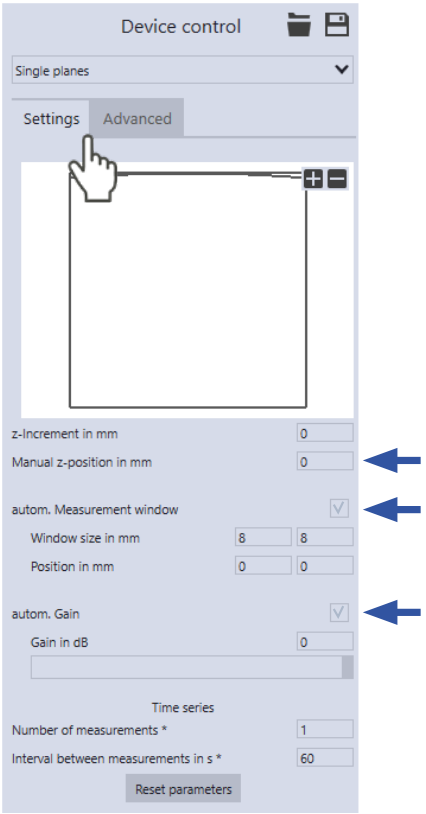
9.1.3 Configuring the settings (*Device control* > *Settings)*

1. Click on the ***Settings*** tab.
2. Enter the desired manual z-Position in mm.
3. Activate the check box ***autom. Measurement window.***
4. Activate the check box ***autom. Gain.***

- Please keep in mind that automatic amplification is not available with the CO_2 detector.

Only when measuring a time series

5. Enter the number of measurements.
6. Enter the measuring break between automatic caustic measurements in s.



9.1.4 Configuring advanced settings (*Device control > Advanced*)

1. Click on the ***Advanced*** tab.
2. Enter the number of pixels in the x/y-direction in order to configure the resolution.
3. Select the rotation speed of the measuring tip 1875, 3750 or 7500 rpm.
4. Enter the used wave length in nm.
5. Enter the laser power in Watt.
6. Enter the focal length of the focusing optic in mm.

Move axis

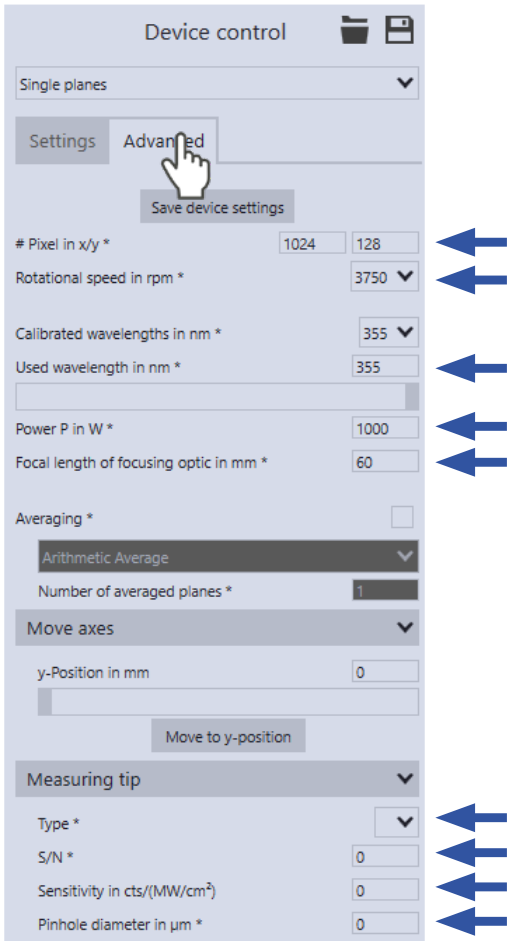
With FocusMonitor FMW+, it is only possible to move along the y-axis.

- More detailed information can be found in the manual „LaserDiagnosticsSoftware LDS“.

Measuring tip

You will find the entry values on the label attached to the packaging of the measuring tip used.

7. Select the type of measuring tip used.
8. Enter the serial number S/N of the measuring tip.
9. Enter the sensitivity of the measuring tip used in cts/(MW/cm²).
10. Enter the pinhole diameter of the measuring tip used.

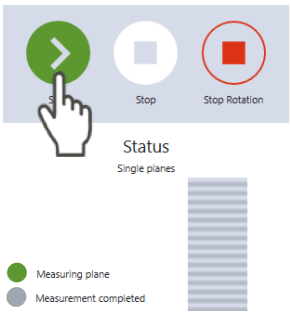


Label with measuring tip data

9.1.5 Starting measurement

1. Follow the safety instructions in the Operating Manual „FocusMonitor FM+“.
2. Turn on the laser.
3. Click on the ***Start*** button.

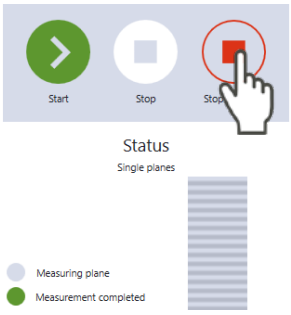
The progress of the measurement is indicated in the status window below the start/stop control panel.



9.1.6 Terminating measurement

In the status window below the Start/ Stop operating panel, ***Measuring completed*** is displayed.

1. Press the ***Stop Rotation*** button.
2. Turn off the laser.



9.1.7 Measuring results display

The measuring results are displayed in the opened tools once the measurement has been completed.

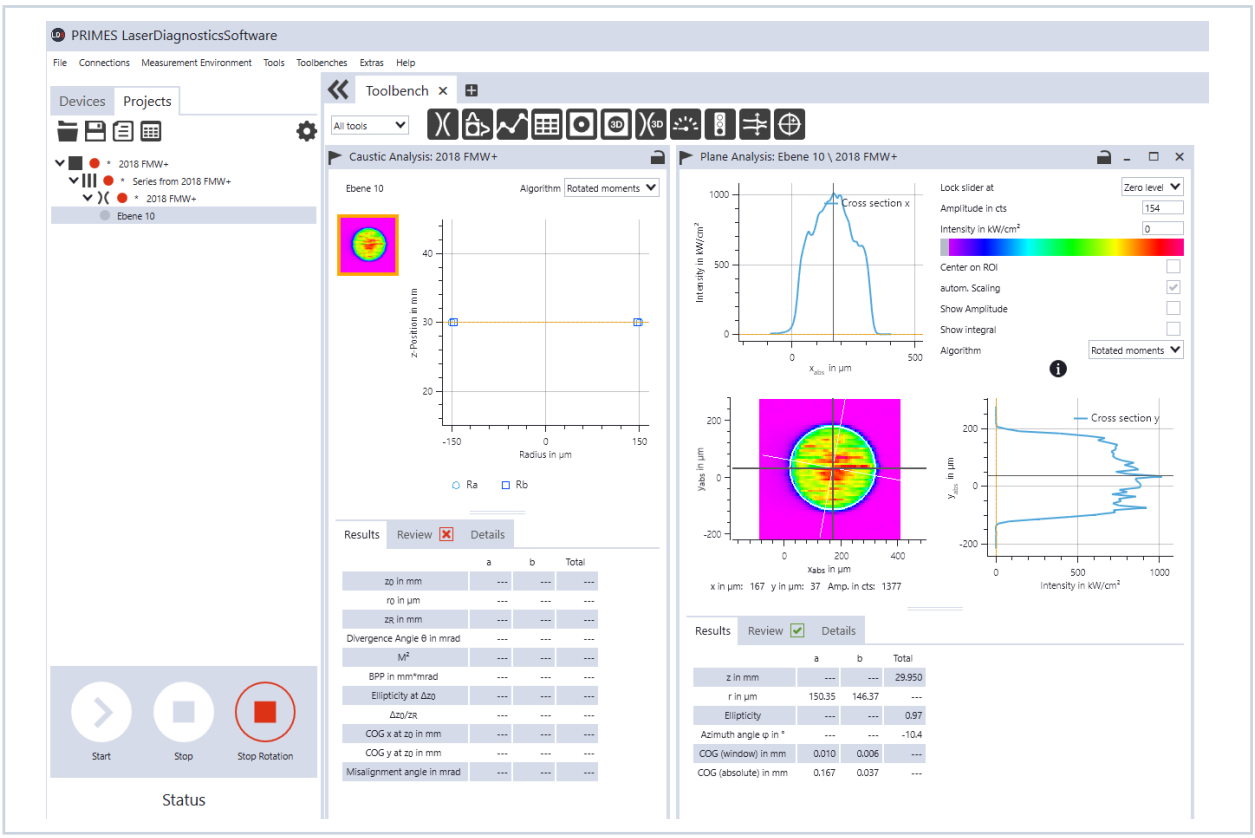


Fig. 9.1: Measuring results in the opened tools

9.2 Caustic measurement

Since the FocusMonitor FMW+ does not have its own z-axis to move along, the system must move either the device or focusing lens in this direction in order to measure the caustic.
You can enter each new z-position manually and start it manually or specify a z-increment with equidistant offsets.

9.2.1 Checking the Alignment with the LaserDiagnosticsSoftware LDS

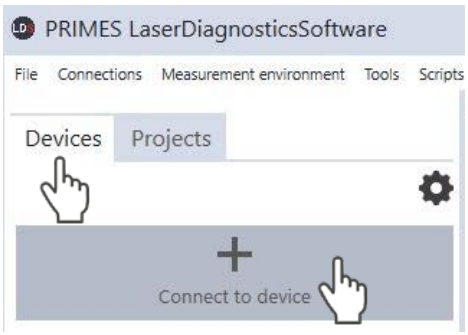
1. Switch on the FocusMonitor FMW+.

👁 The operating mode is shown in the status display (see chapter on page 4).

2. Start the LaserDiagnosticsSoftware LDS.

3. Click on the ***Devices*** tab.

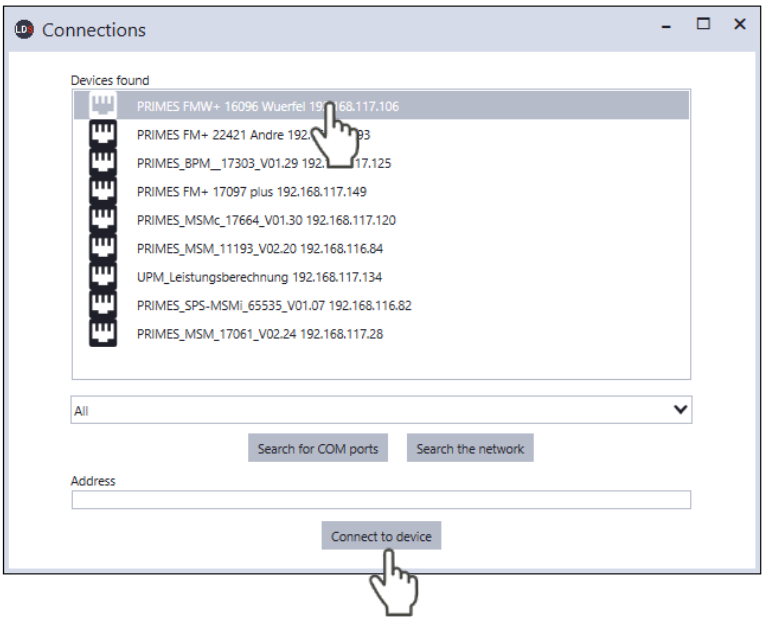
4. Click on the ***+ Connect to device*** button under the tab.



👁 The ***Connections*** window appears.

5. Click on the desired device.

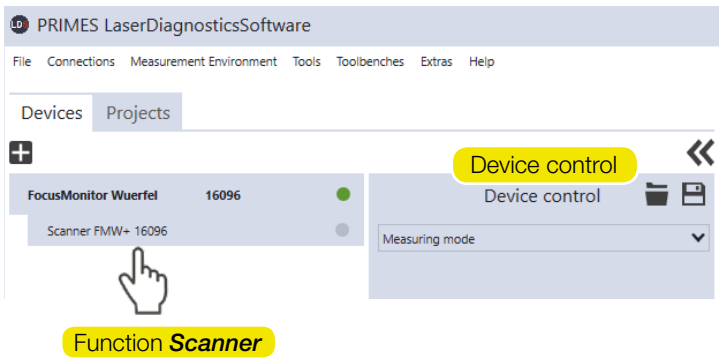
6. Click on the ***Connect to device*** button.



👁 The FocusMonitor FMW+ is established as a connected device.

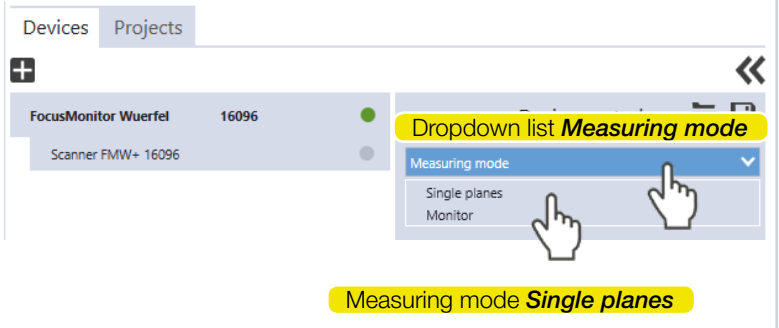
7. Click on the ***Scanner*** function.

👁 The ***Device control*** menu opens.



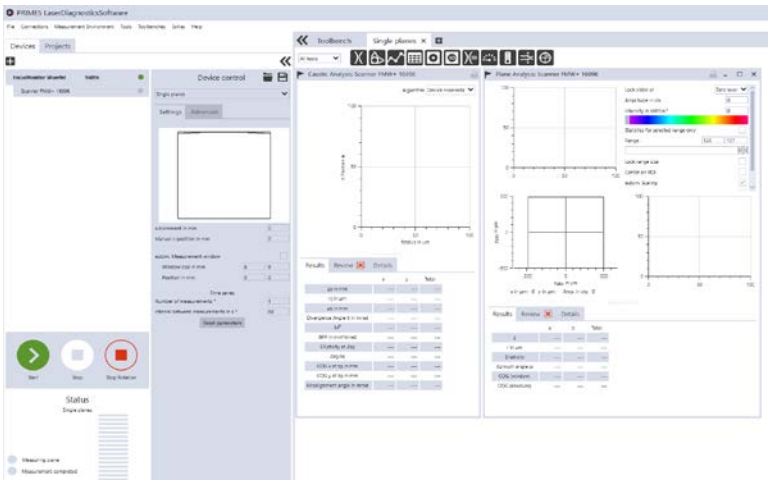
9.2.2 Selecting the measuring mode *Single planes*

1. In the ***Device control*** click on the ***Measuring mode*** drop-down list.
2. Click on the entry ***Single planes***.



The corresponding ***Device control*** opens.

The ***Single planes*** toolbench opens wit the tools ***Caustic analysis*** and ***Plane analysis***.



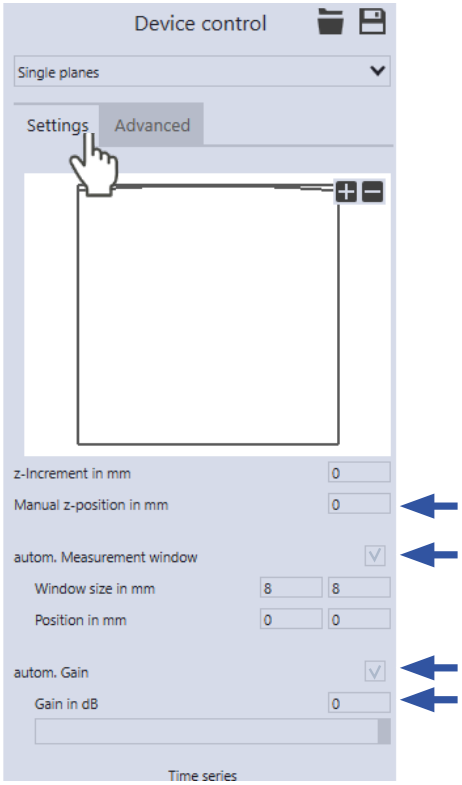
9.2.3 Configuring the settings (*Device control > Settings)*

1. Click on the ***Settings*** tab.
2. Enter the desired z-increment in mm.
3. Enter the desired manual z-Position in mm.
4. Activate the check box ***autom. Measurement window.***
5. Activate the check box ***autom. Gain.***

- Please keep in mind that automatic amplification is not available with the CO_2 detector.

Only when measuring a time series

6. Enter the number of measurements.
7. Enter the measuring break between automatic caustic measurements in s.



9.2.4 Configuring advanced settings (*Device control > Advanced*)

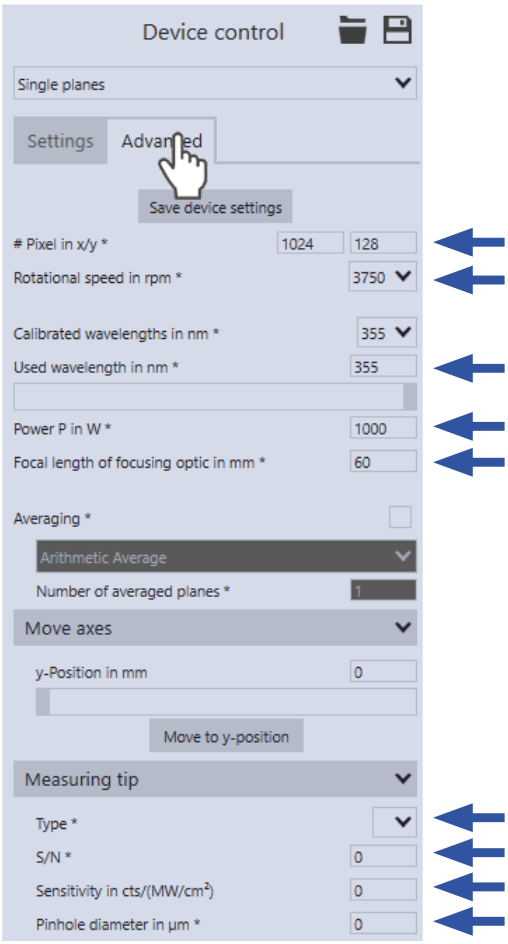
1. Click on the ***Advanced*** tab.
2. Enter the number of pixels in the x/y-direction in order to configure the resolution.
3. Select the rotation speed of the measuring tip 1875, 3750 or 7500 rpm.
4. Enter the used wave length in nm.
5. Enter the laser power in Watt.
6. Enter the focal length of the focusing optic in mm.

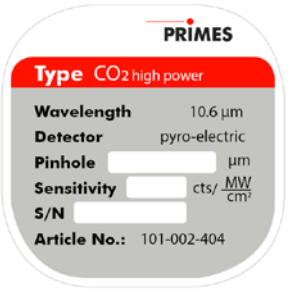
Move axis
With FocusMonitor FMW+, it is only possible to move along the y-axis.

- More detailed information can be found in the manual „LaserDiagnosticsSoftware LDS“.

Measuring tip
You will find the entry values on the label attached to the packaging of the measuring tip used.

7. Select the type of measuring tip used.
8. Enter the serial number S/N of the measuring tip.
9. Enter the sensitivity of the measuring tip used in cts/(MW/cm²).
10. Enter the pinhole diameter of the measuring tip used.



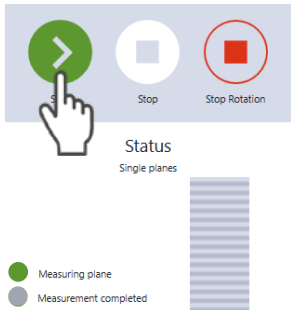


Label with measuring tip data

9.2.5 Starting caustic measurement

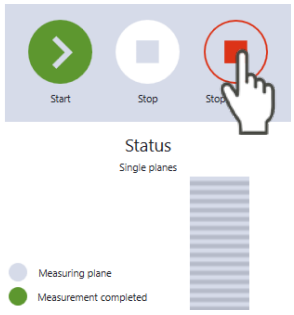
1. Follow the safety instructions in the Operating Manual „FocusMonitor FM+“.
2. Turn on the laser.
3. Click on the ***Start*** button.

The progress of the measurement is indicated in the status window below the start/stop control panel.

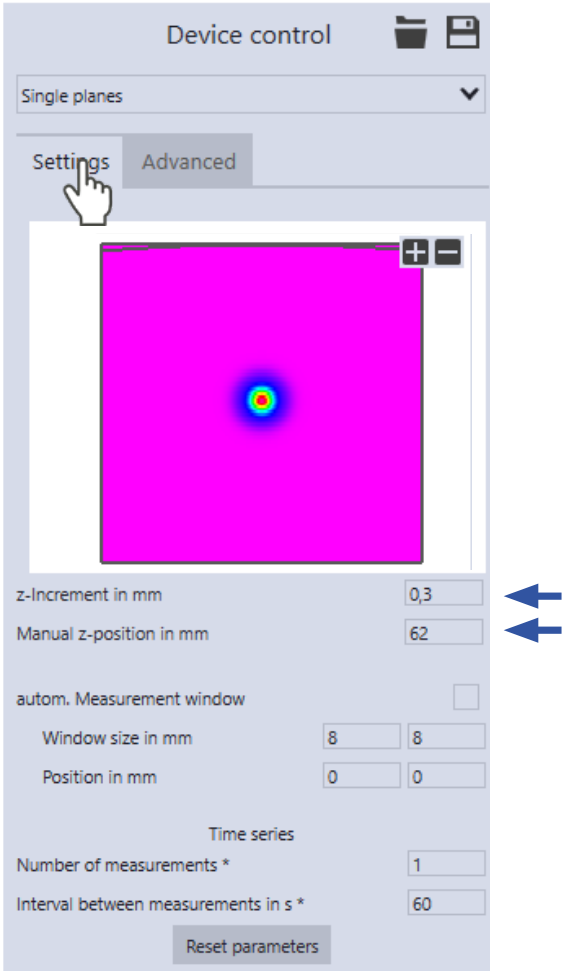


9.2.6 Measuring next plane

1. As soon as the ***Measurement completed*** status notification appears, you can measure the next plane.



1. Click on the ***Settings*** tab.
2. Enter the desired offset in mm in the ***z-Increment*** field.
3. Enter the desired start position in mm in the ***z-position*** field.
4. As soon as the ***Measurement completed*** status notification appears, click on ***Start*** again.
5. Repeat this process until the desired number of planes has been achieved.

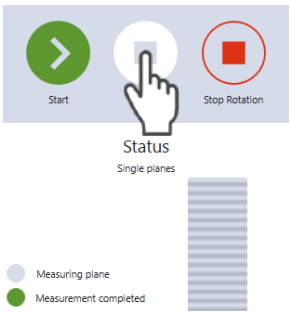


9.2.7 Terminating caustic measurement

▶ Click on the ***Stop*** button.

▶ Turn off the laser.

👁 In the status window below the Start/ Stop operating panel, ***Measuring completed*** is displayed.



9.2.8 Measuring results display

The measuring results are displayed in the opened tools once the measurement has been completed.

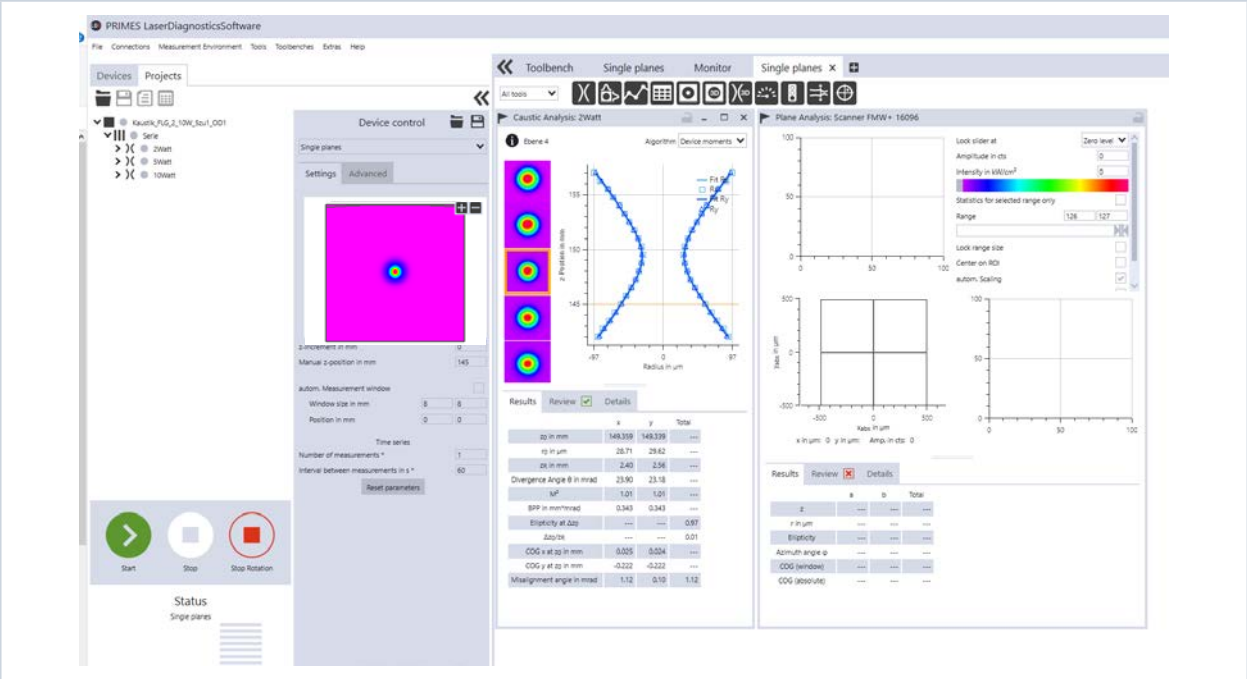


Fig. 9.2: Measuring results in the tools

9.3 Measuring mode *Monitor*

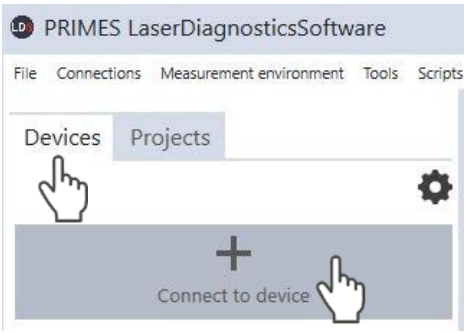
Monitor measuring mode was meant to be used to make adjustments. Data is not determined in this measuring mode, but rather only the desired plane is shown in false-colors.

9.3.1 Checking the Alignment with the LaserDiagnosticsSoftware LDS

1. Switch on the FocusMonitor FMW+.

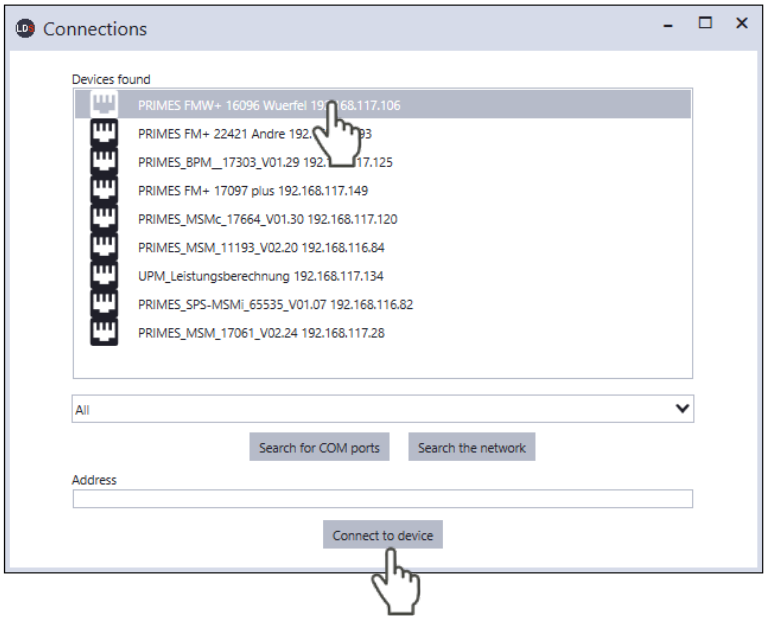
👁 The operating mode is shown in the status display (see chapter 4 on page 6).

2. Start the LaserDiagnosticsSoftware LDS.
3. Click on the ***Devices*** tab.
4. Click on the ***+ Connect to device*** button under the tab.



👁 The ***Connections*** window appears.

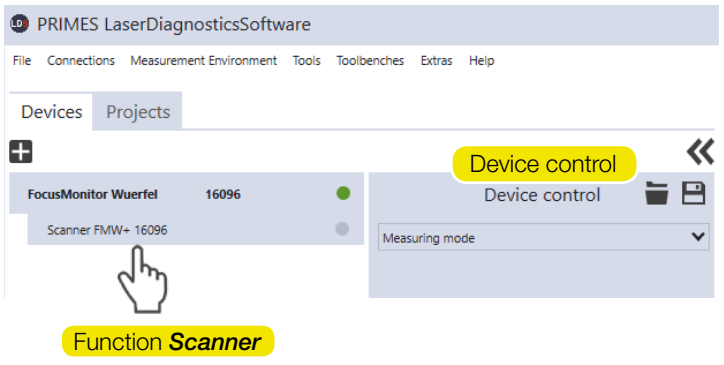
5. Click on the desired device.
6. Click on the ***Connect to device*** button.



👁 The FocusMonitor FMW+ is established as a connected device.

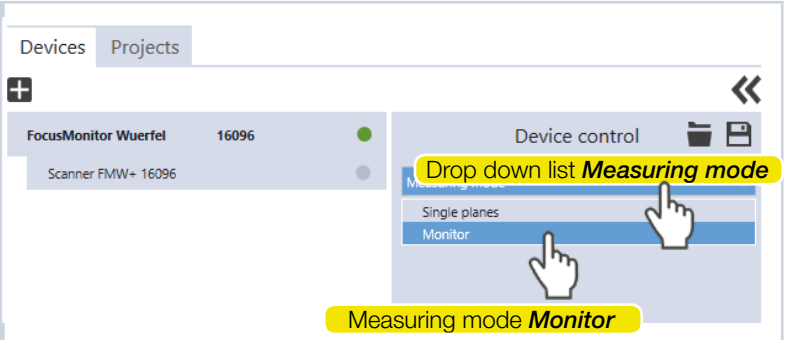
7. Click on the ***Scanner*** function.

👁 The ***Device control*** menu opens.



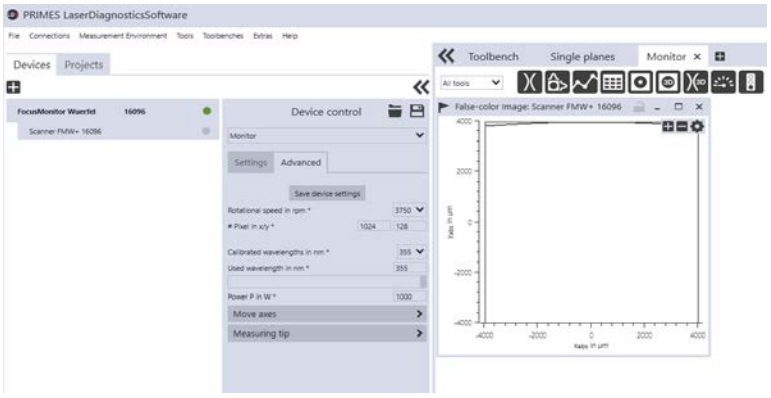
9.3.2 Selecting the measuring mode *Monitor*

1. In the ***Device control*** click on the ***Measuring mode*** drop-down list.
2. Click on the entry ***Monitor***.



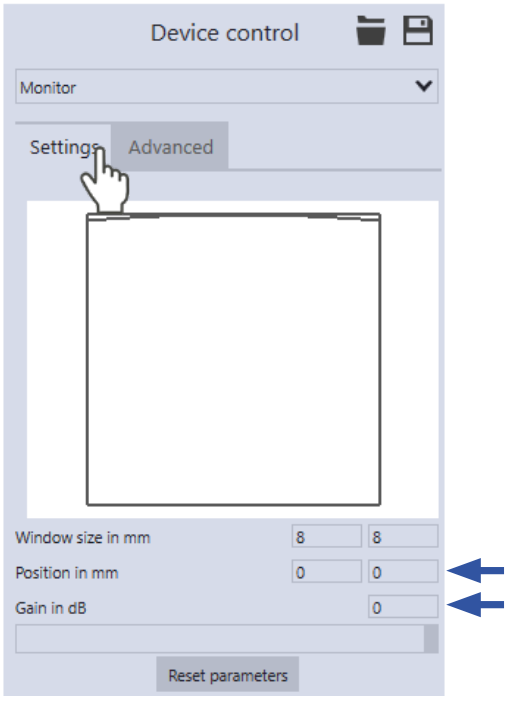
The corresponding ***Device control*** opens.

The ***Monitor*** toolbench opens wit the tool ***False color image***.



9.3.3 Configuring the settings (*Device control* > *Settings*)

1. Click on the ***Settings*** tab.
2. Enter the desired z-Position in mm.
3. Enter the desired gain in dB.



9.3.4 Configuring advanced settings (*Device control > Advanced*)

1. Click on the ***Advanced*** tab.
2. Select the rotation speed of the measuring tip 1875, 3750 or 7500 rpm.
3. Enter the number of pixels in the x/y-direction in order to configure the resolution.
4. Enter the used wave length in nm.
5. Enter the laser power in Watt.
6. Enter the focal length of the focusing optic in mm.

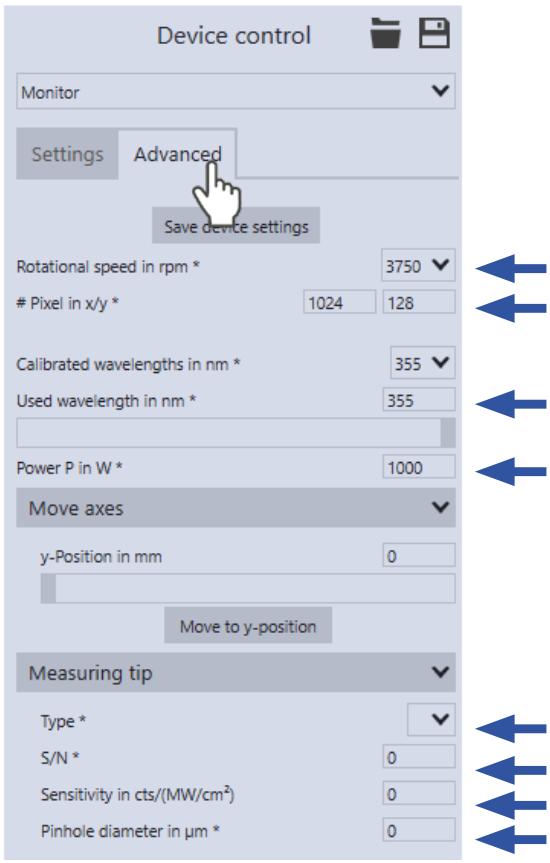
Move axis

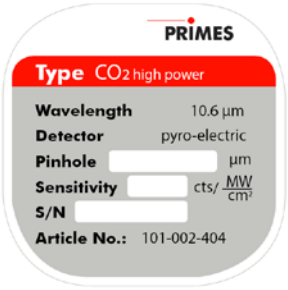
These settings are not relevant to the Monitor measuring mode.

Measuring tip

You will find the entry values on the label attached to the packaging of the measuring tip used.

7. Select the type of measuring tip used.
8. Enter the serial number S/N of the measuring tip.
9. Enter the sensitivity of the measuring tip used in cts/(MW/cm²).
10. Enter the pinhole diameter of the measuring tip used.

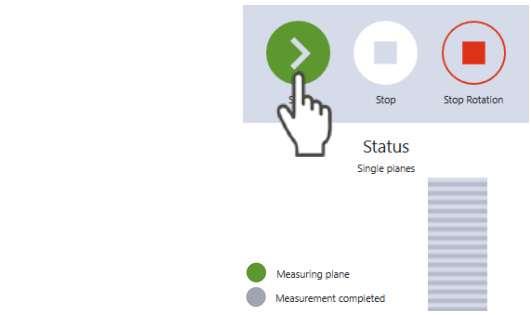




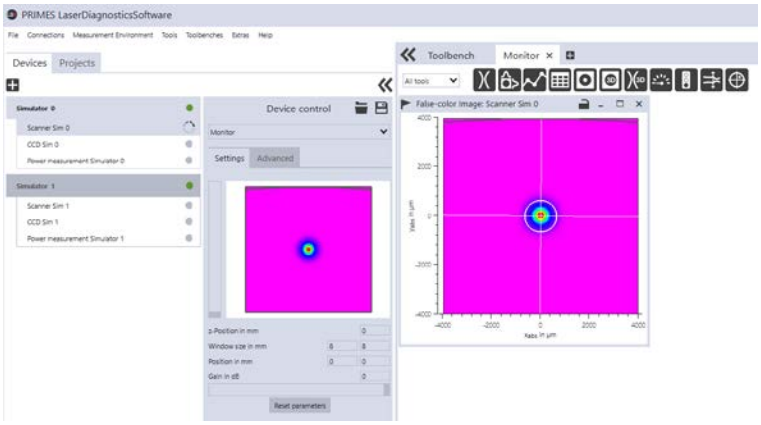
Label with measuring tip data

9.3.5 Starting measuring mode *Monitor*

1. Follow the safety instructions in the Operating Manual „FocusMonitor FM+“.
2. Turn on the laser.
3. Click on the ***Start*** button.



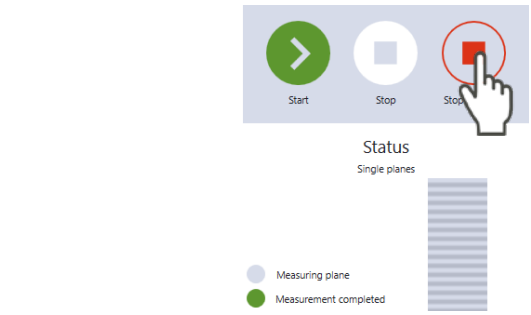
The selected planes are continually scanned in the x-y direction and shown in the ***False color view*** tool.



9.3.6 Terminating measuring mode *Monitor*

1. Click on the ***Stop*** button.
2. Turn off the laser.

In the status window below the Start/ Stop operating panel, ***Measurement completed*** is displayed.



10 Declaration of conformity

Original EG Declaration of Conformity

The manufacturer: PRIMES GmbH, Max-Planck-Straße 2, 64319 Pfungstadt, Germany,

hereby declares that the device with the designation:

FocusMonitor (FM)

Types: FM35; FM120; FM+ 120; FMW; FMW+

is in conformity with the following relevant EC Directives:

- Machinery Directive 2006/42/EC
- EMC Directive EMC 2014/30/EU
- Low voltage Directive 2014/35/EU
- Directive 2011/65/EC on the restriction of the use of certain hazardous substances (RoHS) in electrical and electronic equipment
- Directive 2004/22/EC on measuring instruments

Authorized for the documentation:
PRIMES GmbH, Max-Planck-Straße 2, 64319 Pfungstadt, Germany

The manufacturer obligates himself to provide the national authority in charge with technical documents in response to a duly substantiated request within an adequate period of time.

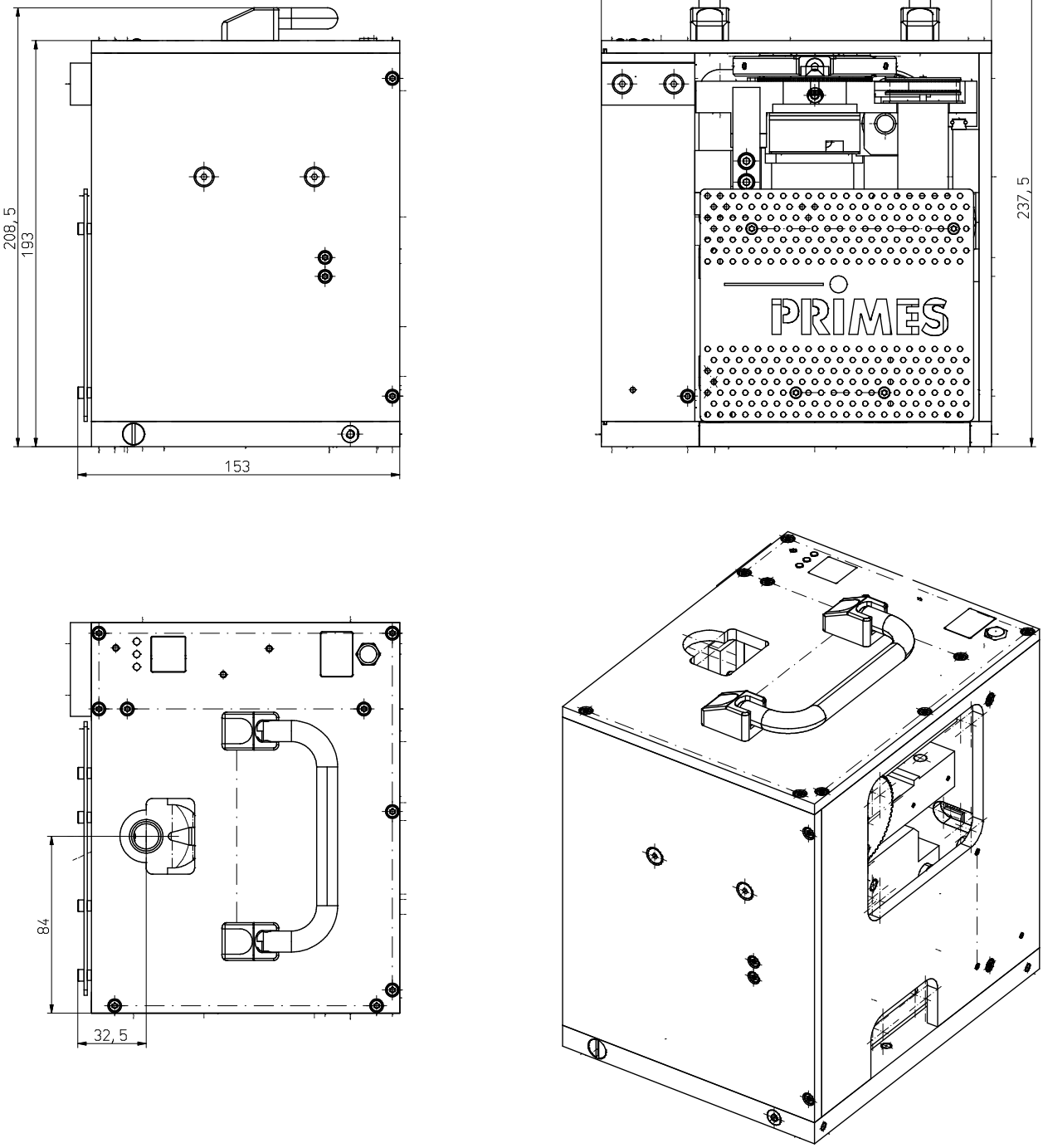
Pfungstadt, April 26, 2017

Dr. Reinhard Kramer, CEO

11 Technical data

Measurement parameters	
Power range	up to 1000 W
Max. energy per measurement	90 kJ
Wavelength range	0.4–12 µm
Beam dimensions, typ.	150–3000 µm (optionally up to 5000 µm)
Function of the measuring system	
Measurement window sizes	0.08 x 0.08 up to 8 x 8 mm
Optionally	0.08 x 0.08 up to 12 x 24 mm (at 64 pixel resolution)
Resolution	32 x 32–256 x 256 pixel
Rotation speed	1875, 3750 rpm
Supply data	
Power supply	24 V DC ± 5 %, max. 1.8 A
Communication	
Interfaces	Ethernet
Dimensions and weight	
Dimensions (L x W x H) Height with the carrying handle folded down	185.5 x 153 x 237.5 mm 208.5 mm
Weight, approx.	8 kg
Environmental conditions	
Operating temperature range	+10 °C up to +40 °C
Permissible relative humidity (non-condensing)	10–80 %

12 Dimensions



All dimensions in mm (general tolerance ISO 2768-v)

13 Appendix

13.1 Exchanging the measuring tip

There are different measurement tips available for different wavelengths (see „Tab. 5.2: Variety of measurement tips and detectors“ on page 6).

NOTICE

Danger of damaging the measuring tip

The small drill hole in the measuring tip can be blocked easily by dirt particles or by touching it with bare hands.

▶ **When mounting/dismounting the tip, please wear powder-free latex gloves and ensure a dirt- and dust-free environment.**

1. Turn off the supply voltage.
2. Turn the drive wheel (see Fig. 13.1) clockwise until the disc extends approx. 15 mm into the measuring window in a positive y-direction.

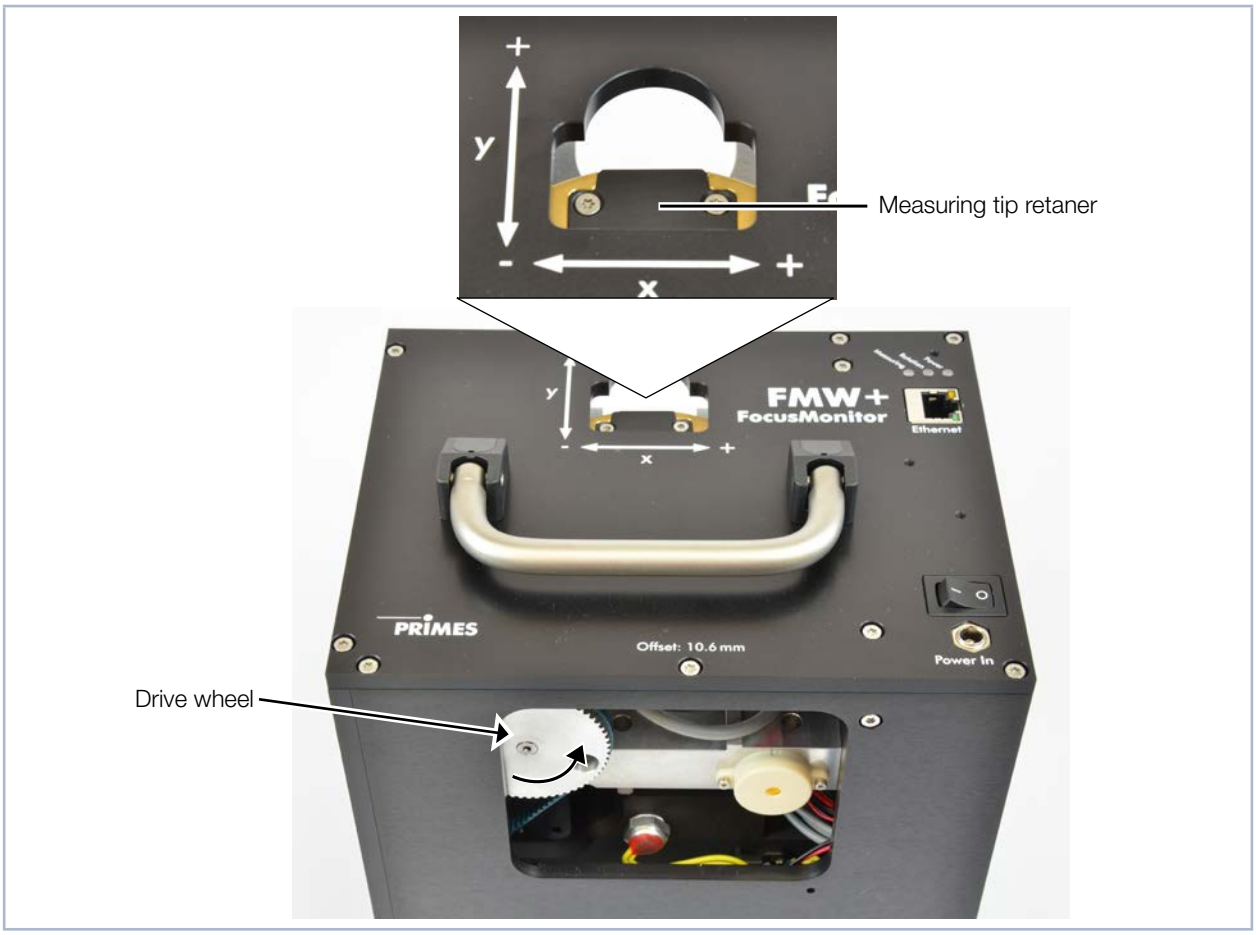


Fig. 13.1: Moving the disc into the measuring window

3. Turn the disc until the measuring tip retainer becomes visible in the opening of the housing.
4. Remove the fastening screws (Torx T8) as well as the retaining plate.
5. Carefully insert the new measuring tip in the disc (caution, the entrance aperture is located on the arched side of the tip, see Fig. 13.2).

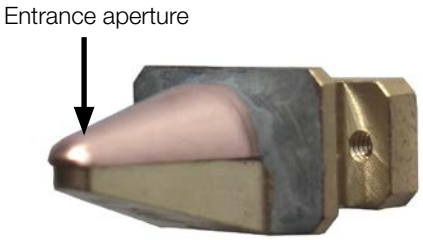


Fig. 13.2: Entrance aperture (pinhole) in the measuring tip.

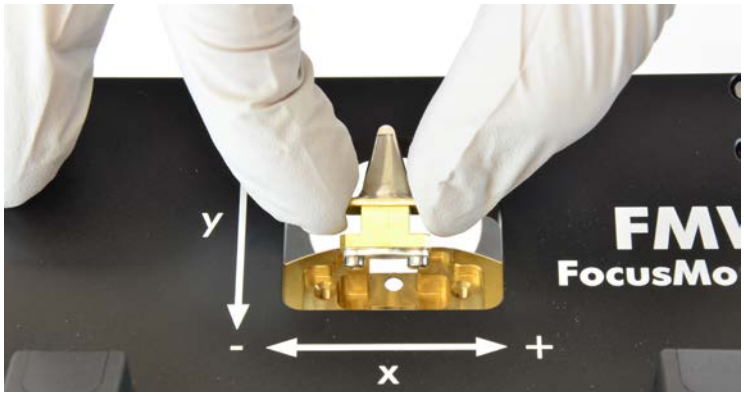


Fig. 13.3: Inserting the measuring tip

6. Insert the retaining plate in the disc with the guidance groove pointing upwards and an angle of 45 degrees and press it downwards into the opening (see Fig. 13.4).

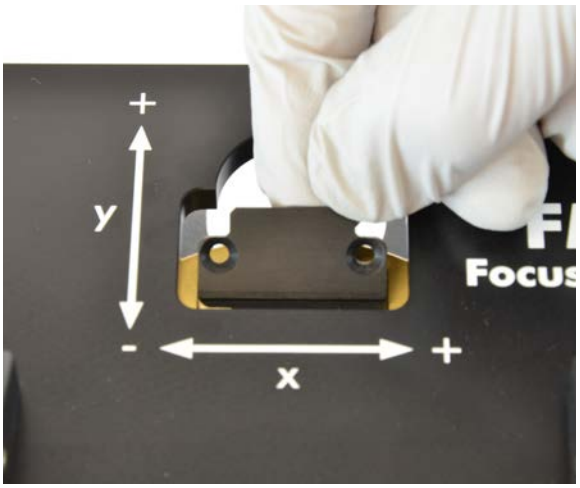


Fig. 13.4: Inserting the retaining plate

7. Insert the screws and fasten them hand-tight.
8. Move the measuring tip out of the measuring window to ensure it is protected.

When turning the supply voltage back on, the measuring head automatically moves back into its standby position.

13.2 Exchanging the detector

The NIR detector is the standard detector of the FMW+. For measurements with a CO_2 laser the detector has to be replaced by a CO_2 detector.

NOTICE

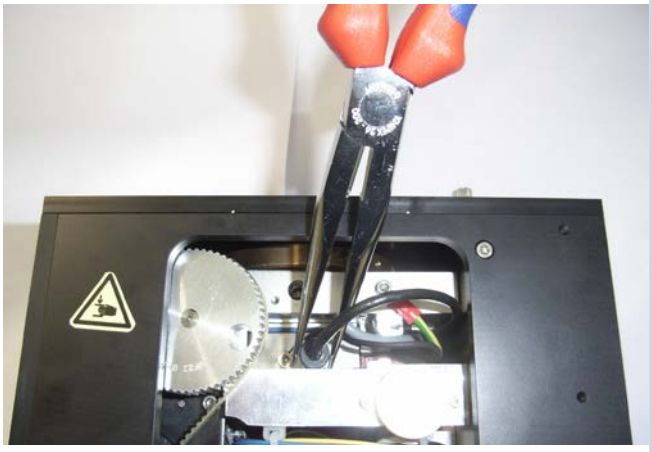
Danger of damage for the detector sensor

The detector sensor must not be damaged and has to be protected from pollution.

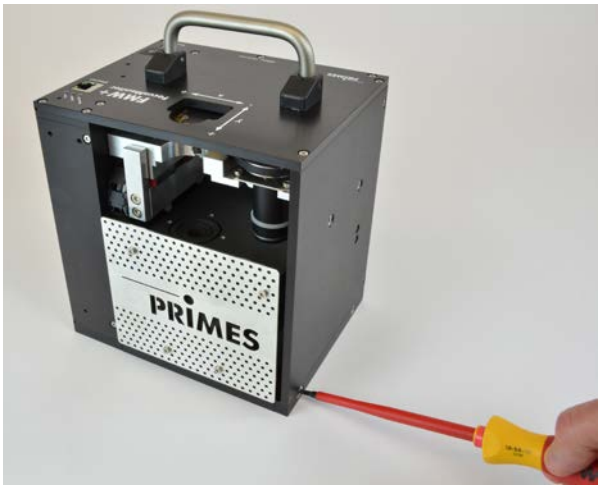
- **Do not touch the detector sensor with your fingers and do not put it down on the sensor surface.**

Only use insulating plastic screws to fasten the detector to prevent noise signals. Do not forget the foam rubber plate, otherwise the disc may be mechanically blocked by the screws.

Mounting sequence:

1. Turn off the supply voltage	
2. Turn the drive wheel anti-clockwise as long as possible. Now the detector is in its dismounting position.	
3. Carefully remove the two plugs from the detector, for example by means of long nose pliers.	

4. Remove the fastening screws on both sides of the bottom plate (please mind that the screws have different lengths).

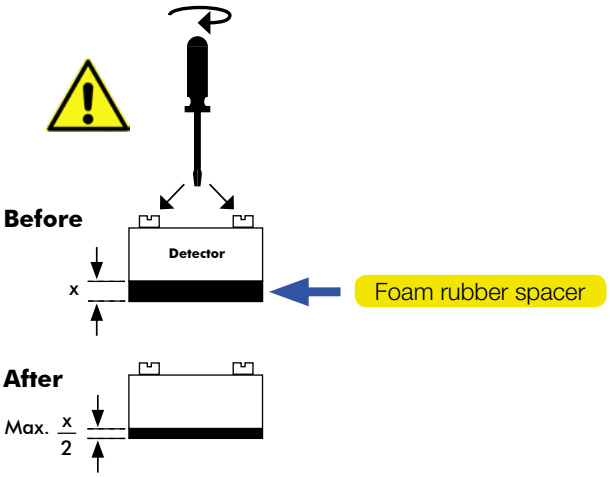


5. Tilt the housing backwards.

6. Opened FMW+.

7. Remove the plastic retaining screws of the detector with the short screw driver (included in the scope of delivery) and carefully take the detector out of the housing.

8. Build in the new detector in reversed order. Make sure you do not forget the foam rubber spacer!

Attention!

If the screws are tightened too firmly, they might block the rotary disc! Only tighten the screws hand-tight. The foam rubber spacer may not be compressed by more than 50 % of its original thickness!