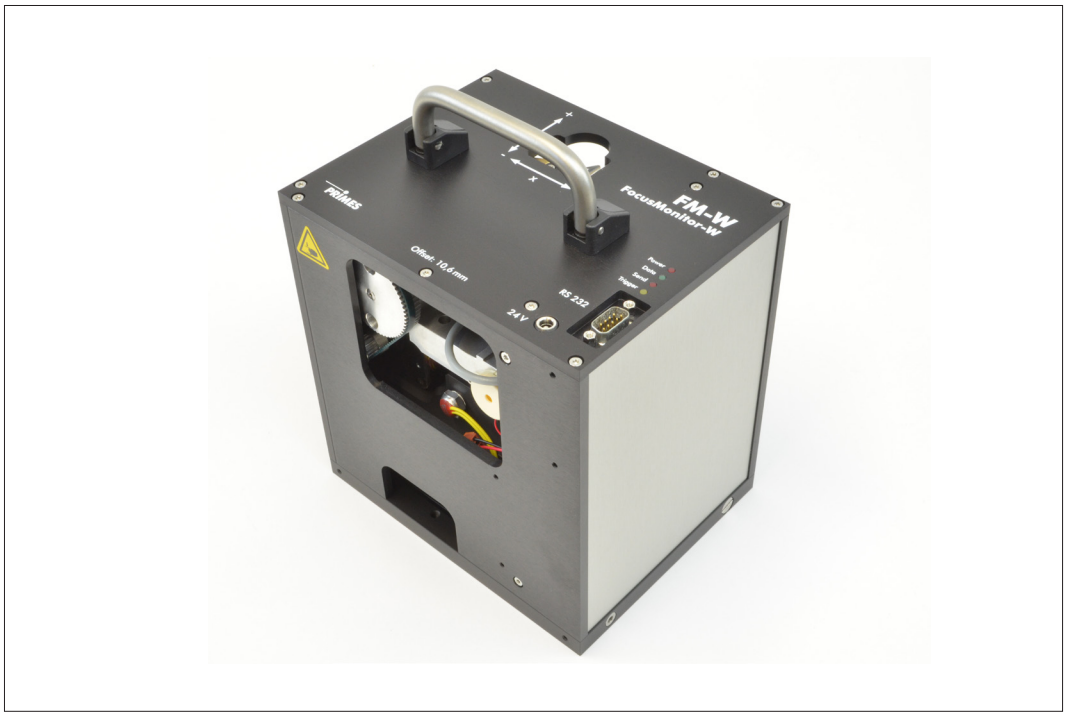
PRIMES

Short Start Guide

Translation of the Original Instructions



FocusMonitor-W

FM-W

Additional Documentation to the Operating Manual FocusMonitor/BeamMonitor

Revision 02/2016 EN

Contents

1 About this Documentation

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

IMPORTANT

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

2 Distinguishing Features in Comparison with the Standard Device

- The FocusMonitor-W 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 or loaded from a settings file.
- An absorber is integrated in the measuring device (power, max. 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 RS232 interface

3 Connections

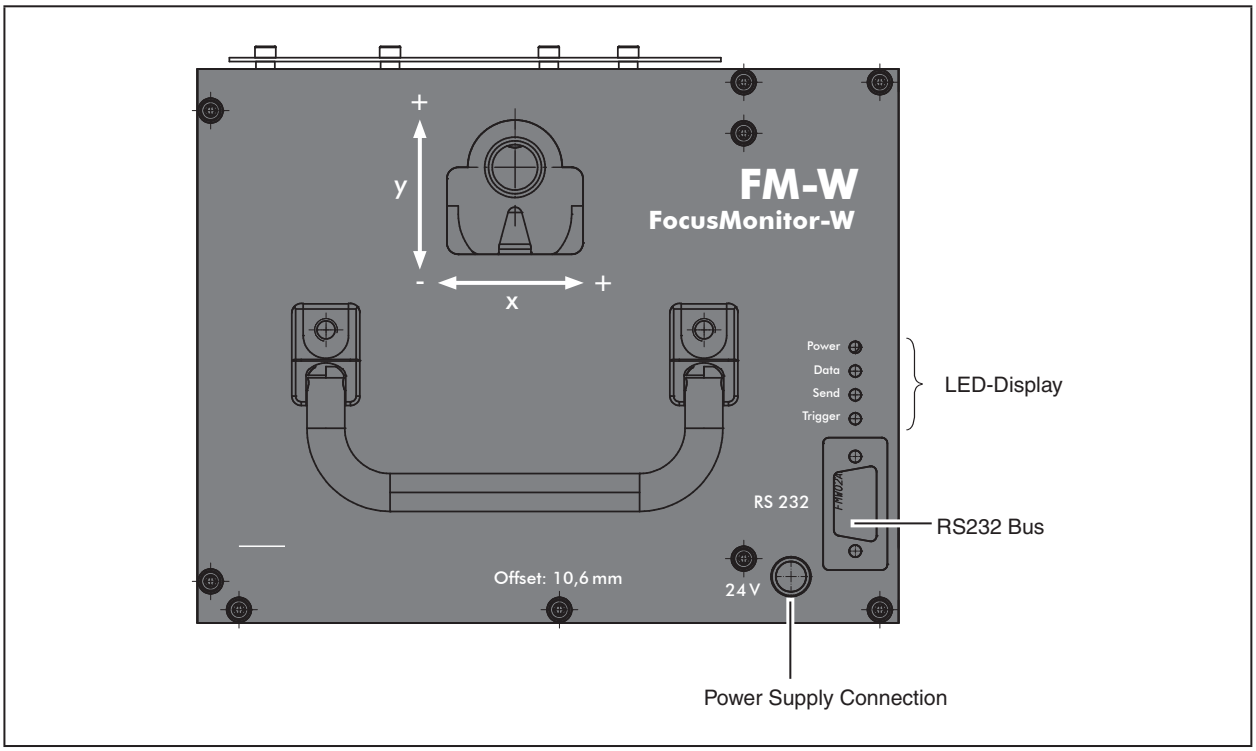


Fig. 3.1: Connections of the FMW

4 Displays

Designation	Color	Meaning
Power	Red	Voltage (24 V)
Data	Green	Devices send data on the bus
Send	Red	PC sends data on the bus
Trigger	Yellow	Trigger signal (only for maintenance purposes)

5 Adapt Device

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

	CO_2 Laser	YAG Laser
Detector	Pyro detector, 2 measurement ranges	NIR Detector, 2 Ranges
Measuring Tip	HP-CO_2	HighDivYAG

Tab. 5.1: Variety of measurement tips and detectors

For the CO_2 laser measuremen the current FMW works with both the DFCL- and the new DFCM detector (from November 2011). This requires a selection of the respective detector type in the sensor parameter window of the LaserDiagnosticsSoftware.

6 Information on the Operation of the Absorber

The high power absorber can absorb up to 90 kJ (1000 W · 90 s).

NOTICE

Danger of damage due to overheating

The absorber is equipped with an alarm which signals overheating. It goes off as soon as the housing of the absorber reaches a temperature of 60 °C.

- **In case of an alarm, the laser has to be turned off immediately to ensure the absorber can cool down!**

NOTICE

Danger of burning

Due to the laser beam the surface of the absorber can become very hot.

- **The absorber must not be touched during or directly after the measurement!**

7 Mounting/Dismounting

7.1 Inserting/Exchanging the Measuring Tip

There are different measurement tips available for different wavelengths (see „Tab. 5.1: Variety of measurement tips and detectors“ on page 5).

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. 7.1) clockwise until the disc extends approx. 15 mm into the measuring window in a positive y-direction.

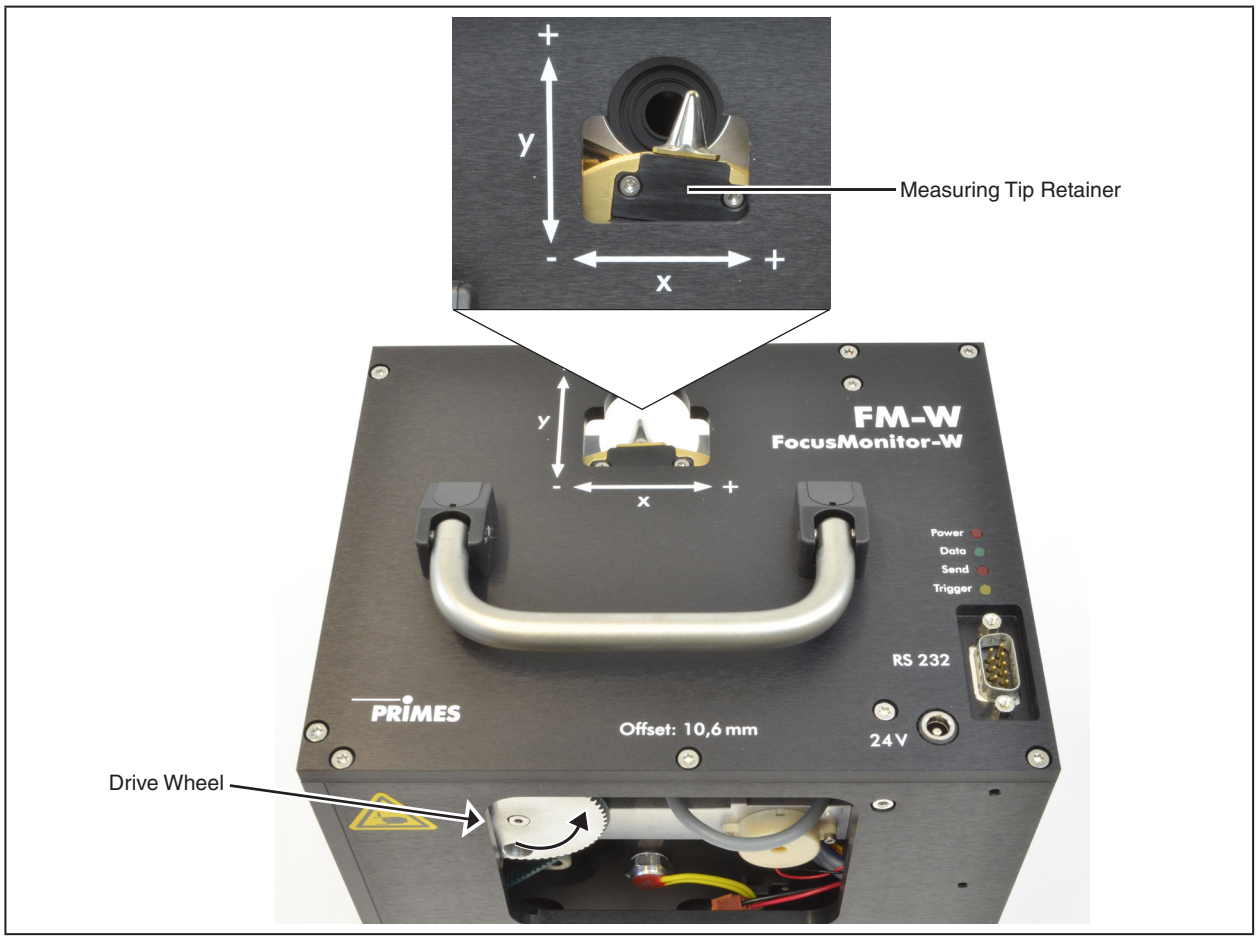


Fig. 7.1: Moving the disc into the measuring window

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. 7.2).

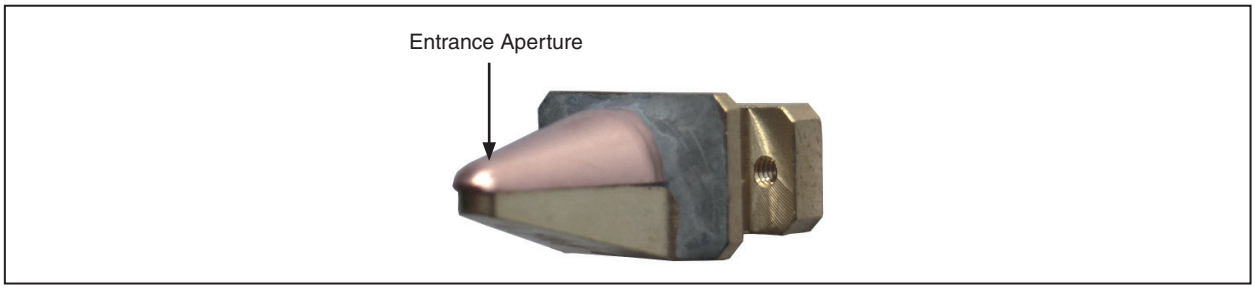


Fig. 7.2: Entrance aperture (pinhole) in the measuring tip.

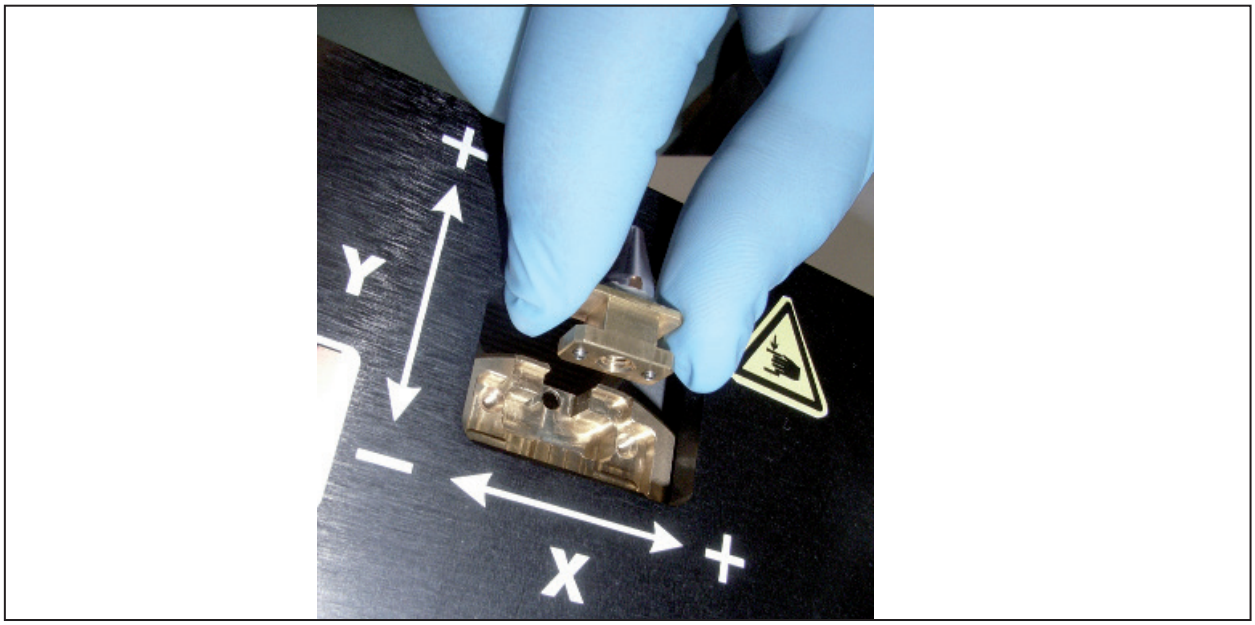


Fig. 7.3: Inserting the measuring tip

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. 7.4).

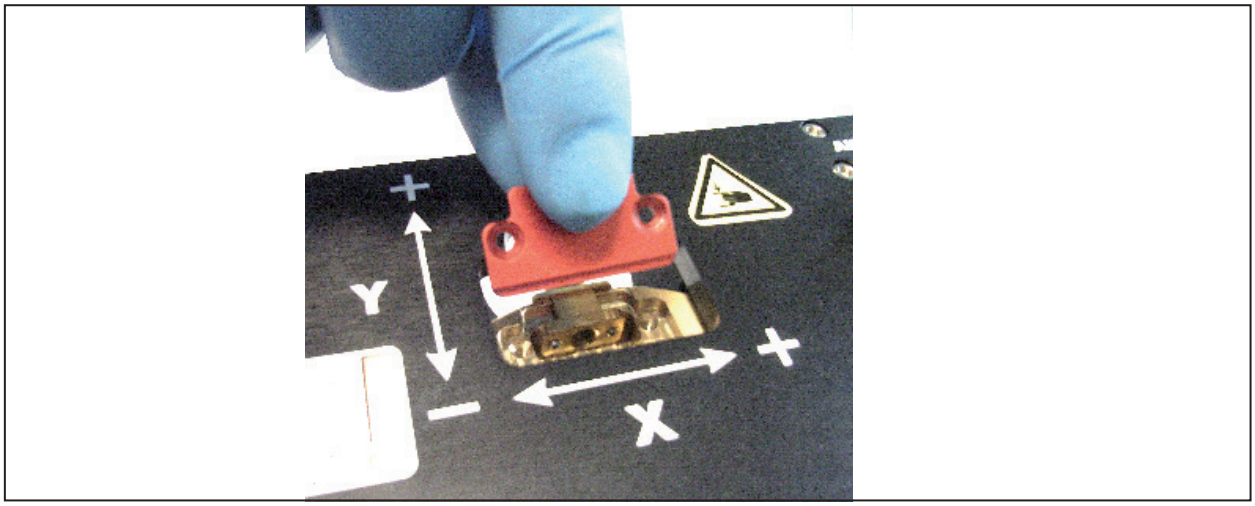


Fig. 7.4: Inserting the retaining plate

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.

7.1 Exchanging the Detector

The NIR detector is the standard detector of the FocusMonitor-W. 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.

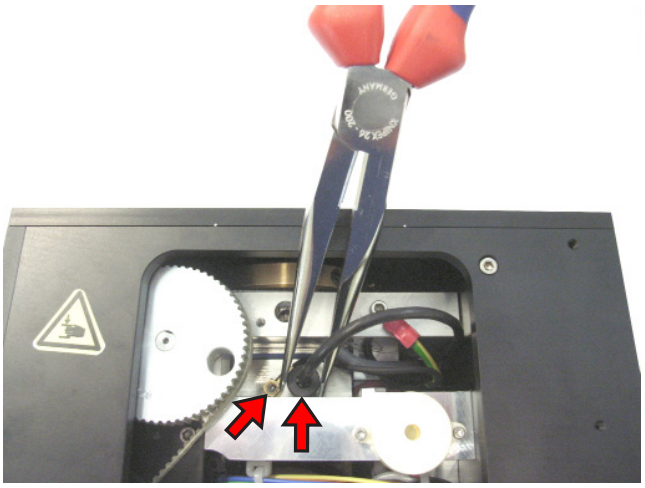
- **Do not touch the detector sensor with your fingers and do not put it down on the sensor surface.**

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:

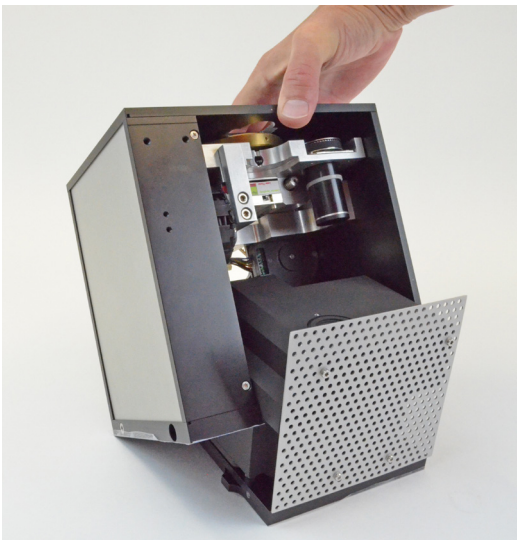
1. Turn off the supply voltage	
2. Turn the drive wheel anti-clockwise as long as possible. Now the detector is in its dismounting position.	

3. Carefully remove the two plugs from the detector, for example by means of long nose pliers.

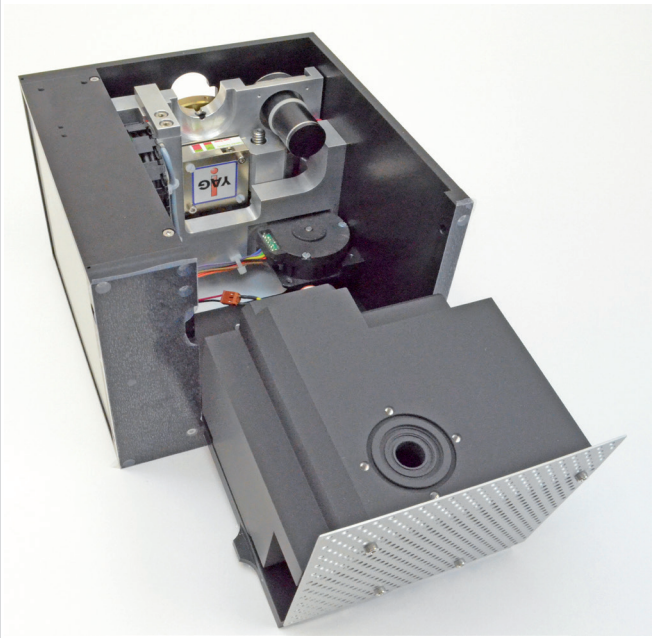


4. Remove the fastening screws on both sides of the bottom plate (please mind that the screws have different lengths).

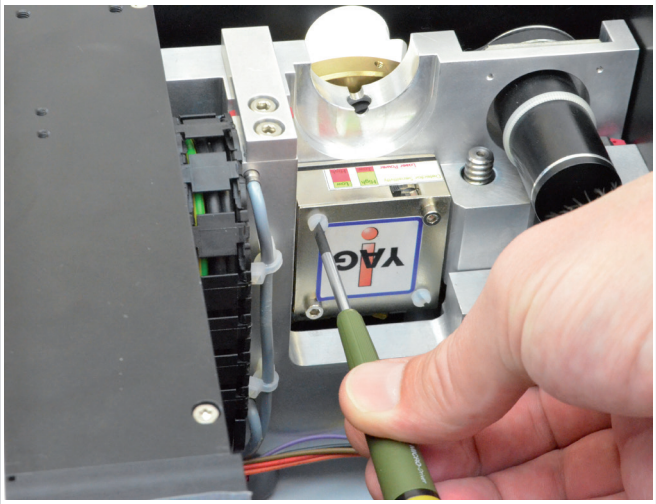
5. Tilt the housing backwards.



6. Opened FMW



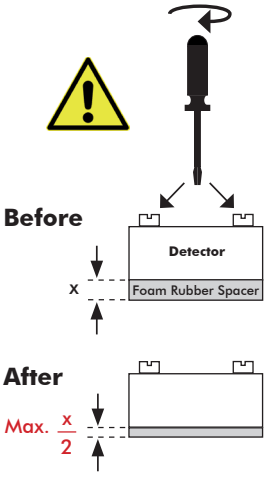
7. Remove the plastic retaining screws of the detector with the short screw driver (included in the scope of delivery) and carefully take the detector out of the housing.



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!



7.2 Setting the Measurement Sensitivity of the Detect

Depending on the laser power, the sensitivity of the detector has to be set.

	Detector	Switch position	Max. Laser Power with Focused Beam in Watt
CO_2-Laser	DFWCM-2	High	5 ... 50
		Low	50 ... 500
YAG-Laser	DFWY-2	High	< 40
		Low	40 ... 500

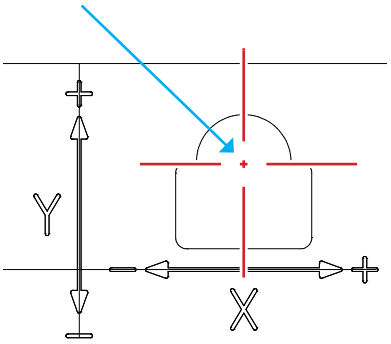
7.3 Installation Position

The FM-W was designed for a vertical beam incidence from above.

7.4 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



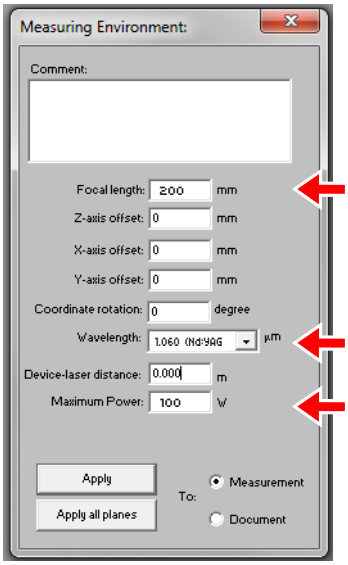
2. Move the system to the lower measurement position of the z-axis.

8 Basic Settings of the LaserDiagnosticsSoftware (LDS)

In the following, basic LDS settings are described which are required for a successful measurement. Saved settings can be reloaded via the menu ***File>>Load measurement preferences***. The standard extension for such a setting file of the FocusMonitor is ".ptx".

8.1 Measuring Environment

1. Select the menu ***Measurement >> Environment.***
2. Enter/select the following:
   - the focal length
   - the wave length
   - Maximum power

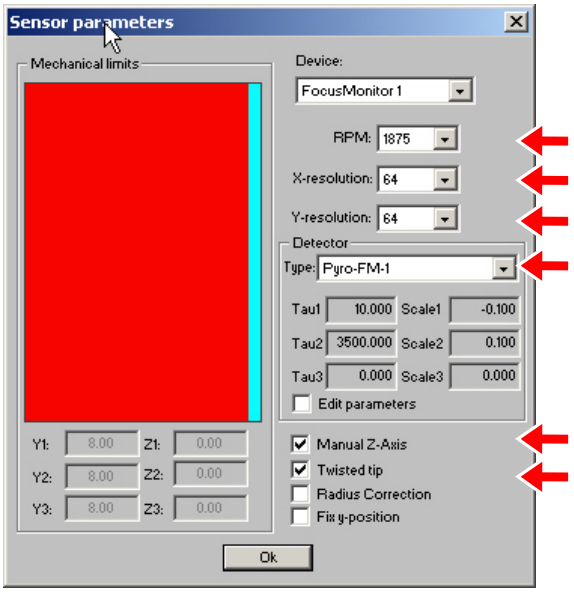


8.2 Sensor parameters

1. Select the menu ***Measurement >> Sensor parameters.***

2. Select:
   - The revolutions per minute
   - The resolution x=64, resolution y=64
   - The used detector type

3. Activate
   - The check box ☑ ***Manual z-axis***
   - The check box ☑ ***Twisted tip***



8.3 Beamfind Settings

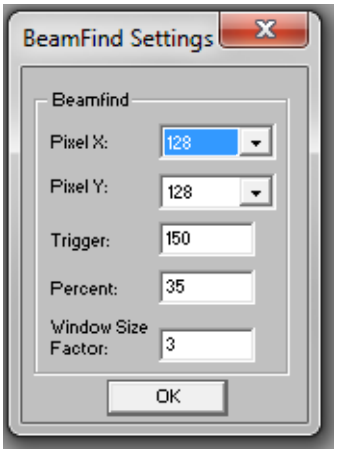
1. Select the menu ***Measurement >> Beamfind Settings...***

Pixel X/Y
(factory setting=64) In order to find the laser beam more easily, higher resolutions have to be set for lower powers.

Trigger
Set lower values for smaller beam diameters.

Percent
Set higher values for a higher sensitivity

Window Size Factor
The factor indicates the relation between the size of the measurement window and the beam diameter.



9 Measuring

WARNING

Danger of injuries due to laser radiation

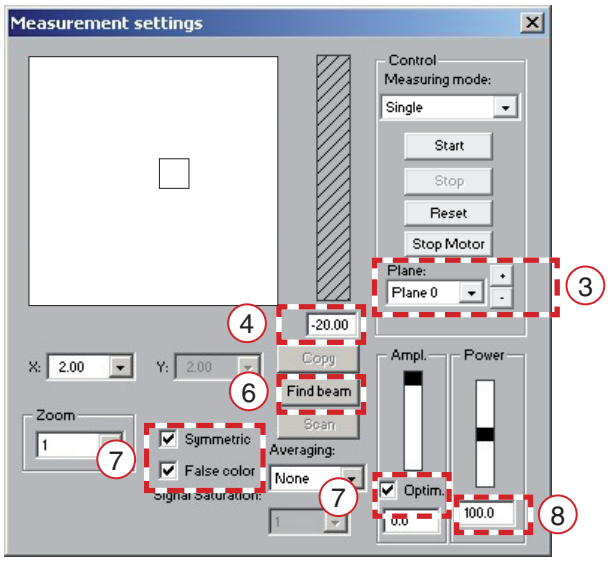
Scattered radiation may develop during the measurement (laser class 4).

- **Please always wear laser safety goggles which are adapted to the laser wavelength used.**
- **Please ensure an adequate shielding of the scattered radiation and the complete absorption of the radiation passing the device.**
- **Please ensure a vertical beam incidence into the measuring device.**

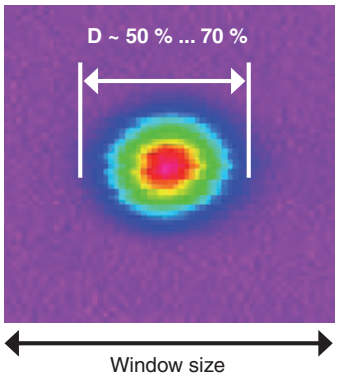
9.1 Manual Caustic Measurement

The caustic measurement is a serial measurement in case of which the z-position is varied. Every z-position is assigned an individual measurement plane with the respective measurement results.

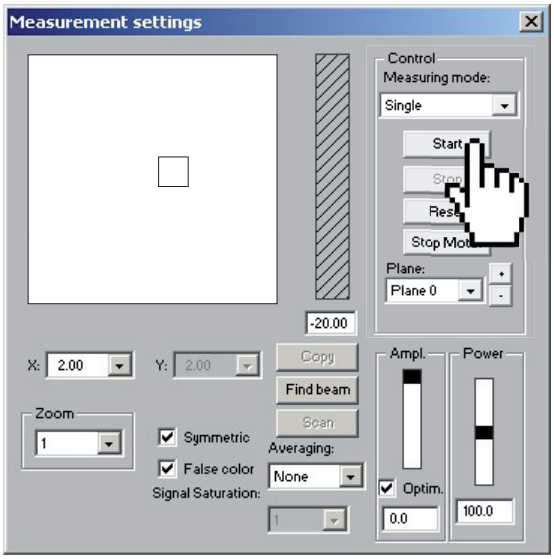
1. Draw up a new file (***File>>New***) or open an existing file (***File>>Open...***)
2. Select the menu ***Measurement >> Single..***
3. Select Plane 0.
4. Enter the desired z-position (e.g. -20).
5. Turn on the laser.
6. Click the ***Find beam*** button.
   (The Find beam button automatically positions and selects the measuring window. The z-position, however, remains unchanged and the search is limited to the set window area).
7. Activate the check boxes ☑***Symmetric***, ☑***False color*** and ☑***Optim...*** after the beam search.
8. Enter the laser power.



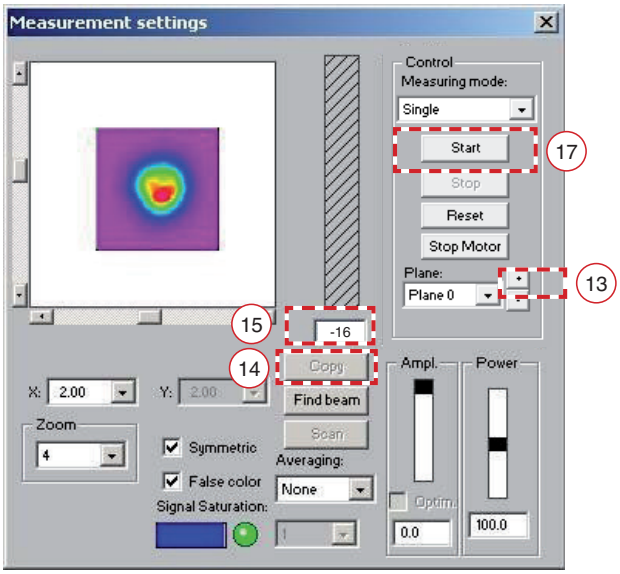
9. When adapting the found beam with ***x/y***, please make sure that it covers 50 to 70 percent of the window size and that it is positioned centrally.



10. Click the ***Start*** button.
11. Turn off the laser after a successful measurement. In case the measurement was not successful, go back to step 8 and correct the window adaption.
12. Move the system to the next measuring position.



13. Click the + button (plane 1).
14. Click the ***Copy*** button to copy all settings (window size and –position;x, y, z; etc.) from the previous plane to the present one.
15. Enter the new z-height (e.g. -16).
16. Turn on the laser and wait until it is stable.
17. Click the ***Start*** button.
18. When adapting the found beam with ***x/y***, please make sure that it covers 50 to 70 percent of the window size (see step 9).



19. Turn off the laser.
20. Move the system to the next measuring position.
21. Repeat steps 13 to 19 until all planes have been measured.
22. Click the ***Stop Motor*** button.

Attention!

The measuring tip still rotates after the measurement.

23. Save the data via ***File>>Save as...***

In order to make sure that the adapted values have a high significance, the measurement is to be carried out in a z-range of at least two Rayleigh-lengths. A range of four Rayleigh-lengths – as demanded in the ISO 11146 would be even better. 5 to 6 Rayleigh-lengths would be ideal.

9.2 Caustic Display

The results of the caustic measurement can be displayed by means of the menu item **`Presentation>>Caustic`**. On the left Fig. 9.1 shows the measured beam parameter either on the basis of the 86%-radii or the moment evaluation according to ISO 11146. In the middle of the picture the graphic shows the caustic profile. The beam radii are depicted on the beam spread direction. On the right the false color presentation of one measurement plane each – among other things selectable with the mouse - is shown together with numerical results of this single plane.

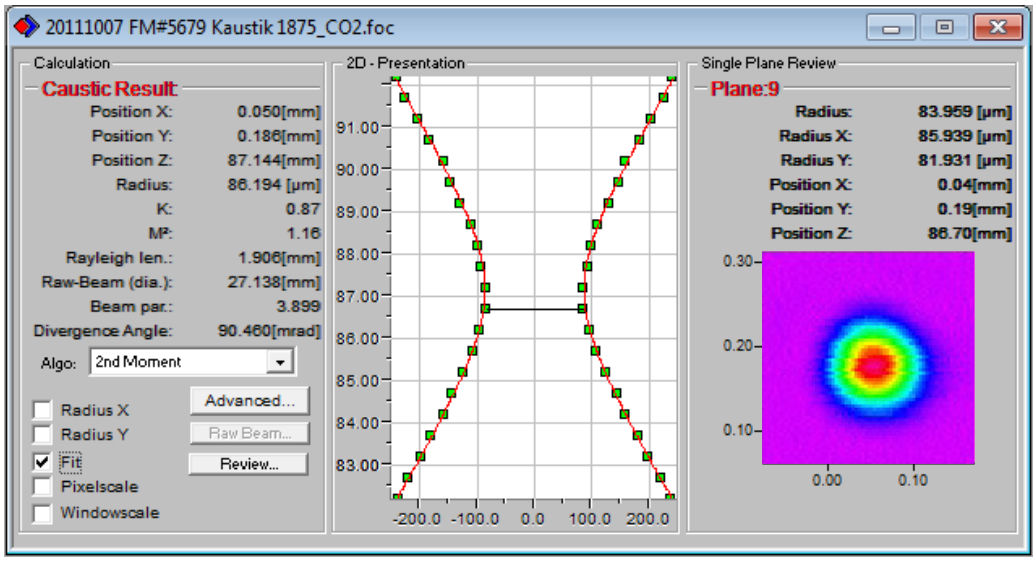


Fig. 9.1: Dialogue window ***Presentation>>Caustic***

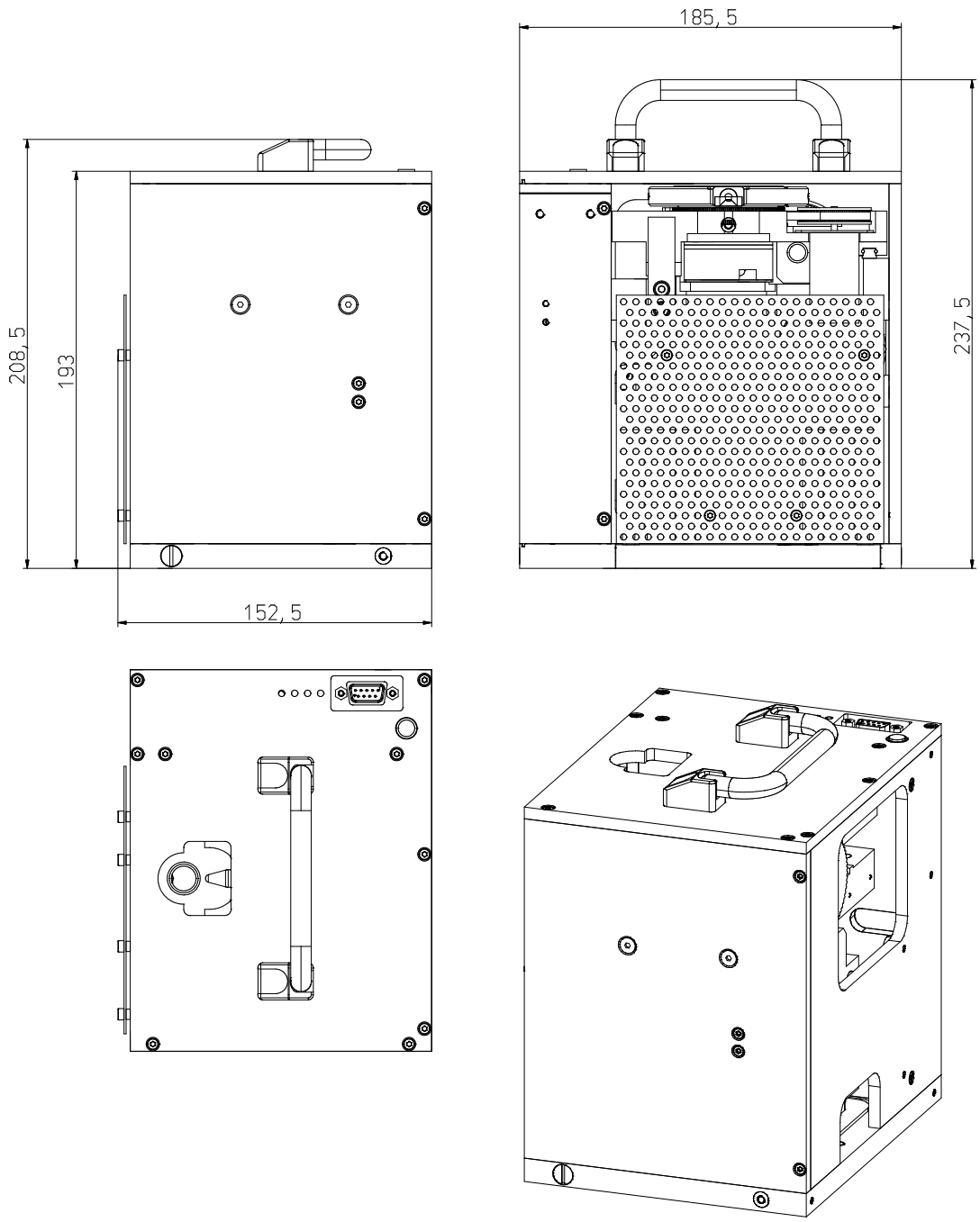
In order to evaluate the caustic, a hyperbolic compensating curve (ISO 11146) is adapted to the measuring values. This compensating curve describes the propagation of an ideal laser beam mathematically.
The red line depicts a compensating curve according to the calculated fits which can be displayed via the check box ***Fit*** in the 2D presentation

Further infor mation regarding further display- and evaluation possibilities can be found in the Operating Manual “FocusMonitor/BeamMonitor“.

10 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 (optionaly 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	RS 232
Dimensions and Weight	
Dimensions (L x W x H)	185.5 x 156.5 x 193 mm
Weight, approx.	8 kg
Environmental Conditions	
Operating temperature range	+10 °C up to +40 °C
Permissible relative humidity (non-condensing)	10 – 80 %

11 Dimensions



All measures are given in mm