

Internal sample holders

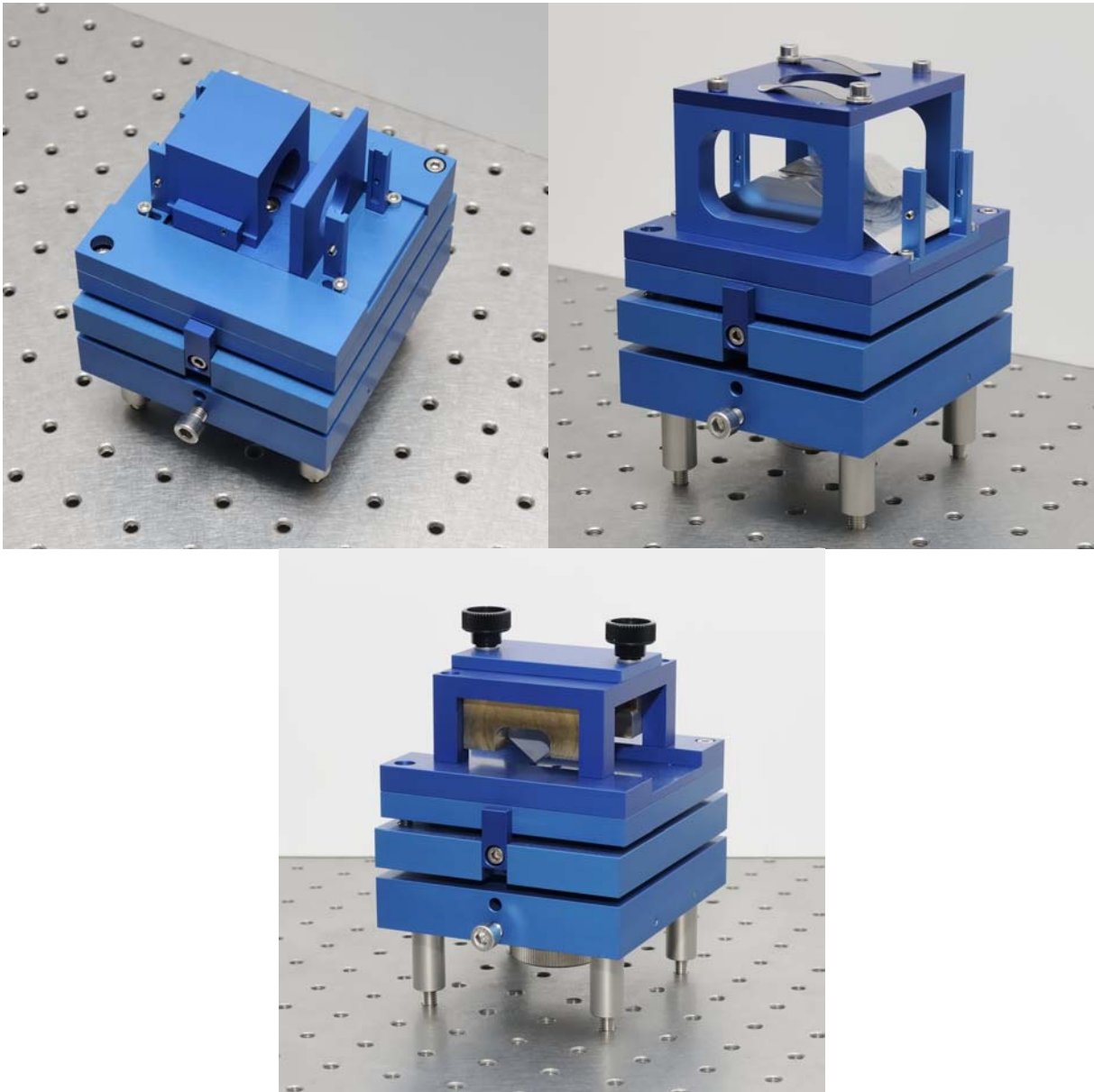


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0. Base structure

All sample holders for the internal sample compartment have the same base structure which is provided with the sample holder for transmission measurements / comes with every TDS system. This structure allows you to change the position of the sample holder in two axes, rotate it or change the slope in relation to the THz beam.

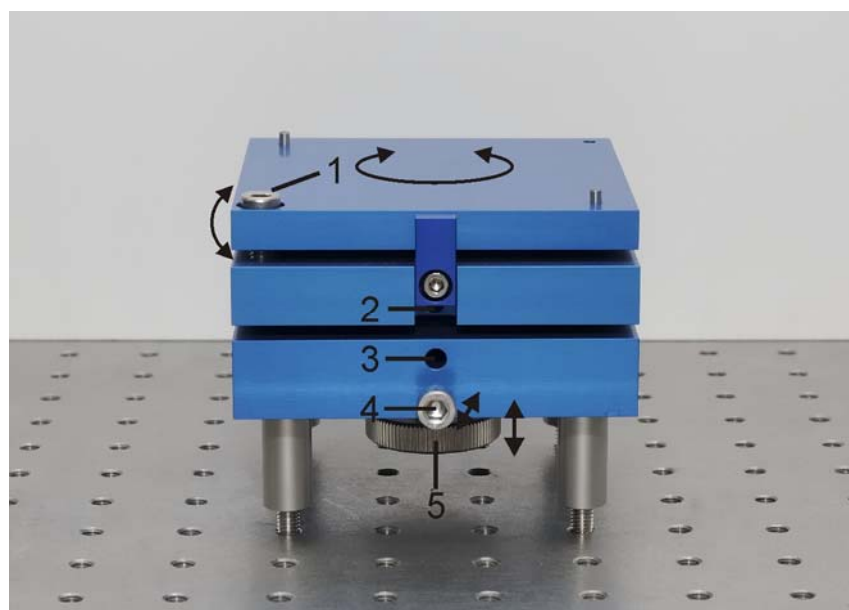


Figure 1: Base structure for internal sample holder.

In order to adjust the position and orientation you have four options:

- Use screw #1 to change the slope of the stage
- Loosen set screw #2 in order to rotate the stage horizontally
- Loosen set screw #3 and use knurled screw #5 to move the stage vertically
- Use screw #4 in order to move the stage horizontally

Please remember to fasten screws #2 and #3 in case you loosened them to adjust the stage.

The base structure is designed for the internal sample compartment of the TDS systems but it may be mounted to any other optical table / breadboard with a 25 mm grid of M6 mounting holes. The center height of the THz beam should be about 100 mm in order for the sample holders to work. However, the base structure rests on four 40 mm 1/2" posts from Thorlabs which may be replaced by longer versions in case your THz beam runs on a higher level.

If you purchased the sample holder for transmission with the base structure for a self built THz setup you need to detach the upper half by loosening the set screw #3 (enables the vertical displacement). Then you can detach the posts from the base structure, mount them to the bread board and put the base structure back together.

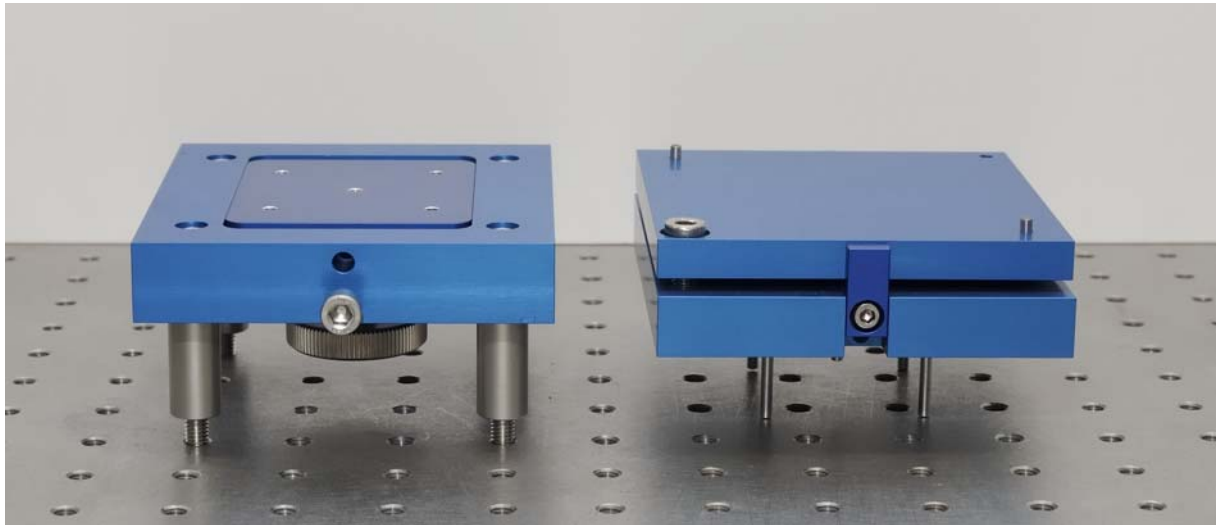


Figure 2: Disassembled base structure for mounting the posts to the breadboard.



Attention:

If you built the THz spectrometer yourself please make sure to align the THz beam at the correct height, parallel to the grid and in the middle between to lines of mounting. Otherwise the sample holders will not line up with the THz beam because the horizontal displacement cannot be compensated. Remember that the base structure and sample holder are designed for a beam height of 100 mm.

When changing the configuration from transmission to reflection or adding / removing the THz lenses you will always need to optimize the THz beam path by adjusting the orientation and position of the sample holders using the base structure.

1. SHT - sample holder transmission

The sample holder for transmission measurements comes with the base structure and every TDS system. It is designed for a collimated THz beam at a height of about 100 mm above the optical table (for other heights see the previous section). The sample holder consists of a plate, two sleds with focusing THz lenses, one adapter for large samples (at least 25 x 25 mm) and one adapter for small samples (at least 10 x 10 mm).

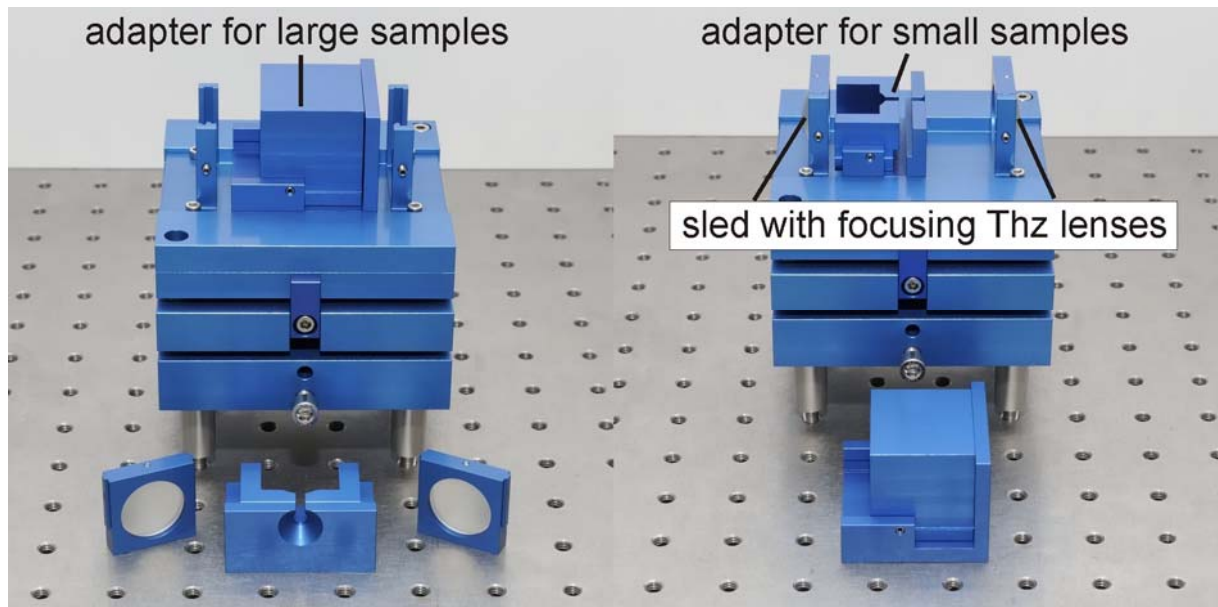


Figure 3: Sample holder transmission, mounted to base structure.



Attention:

The adapter for small samples requires using the focusing THz lenses in order for the THz beam not being cut off by the aperture of the adapter. When using the focusing lenses make sure that the flat side faces the sample and that you use the correct set of lenses (designated for the transmission setup). Please note that inserting the focusing THz lenses leads to a shift of the THz signal by about 25 ps.

The sample holder for reflection measurements comes with another set of THz lenses that have a significantly longer focal length which will result in a very poor THz signal. Additionally, the object plane needs to be in the center of the sample holder. Hence, the adapter for small samples is mounted to a different hole than the adapter for large samples.

2. SHR - sample holder reflection

The sample holder for reflection measurements requires the base structure that comes with the transmission setup and every TDS system. It is meant as an extension of the measurement capabilities of your THz spectrometer, enabling measurements on highly reflecting / absorbing samples. The sample holder consists of a plate, two sleds with focusing THz lenses, one adapter for large samples (at least 30 x 30 mm) and one adapter for small samples (at least 15 x 15 mm).

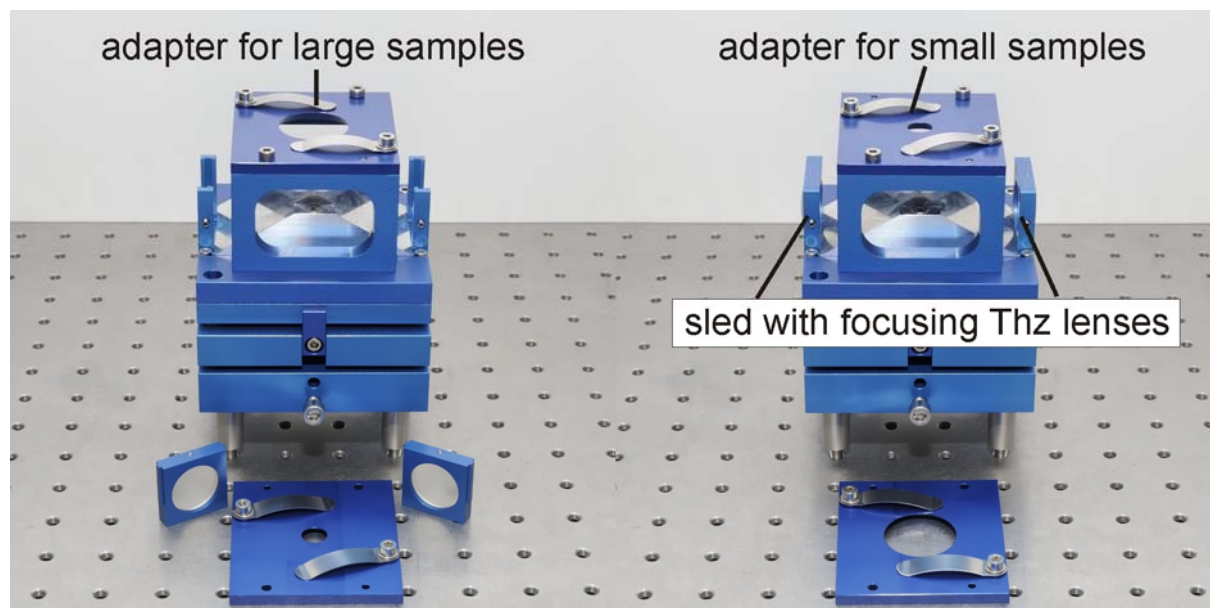


Figure 4: Sample holder reflection, mounted to base structure (not included).



Attention:

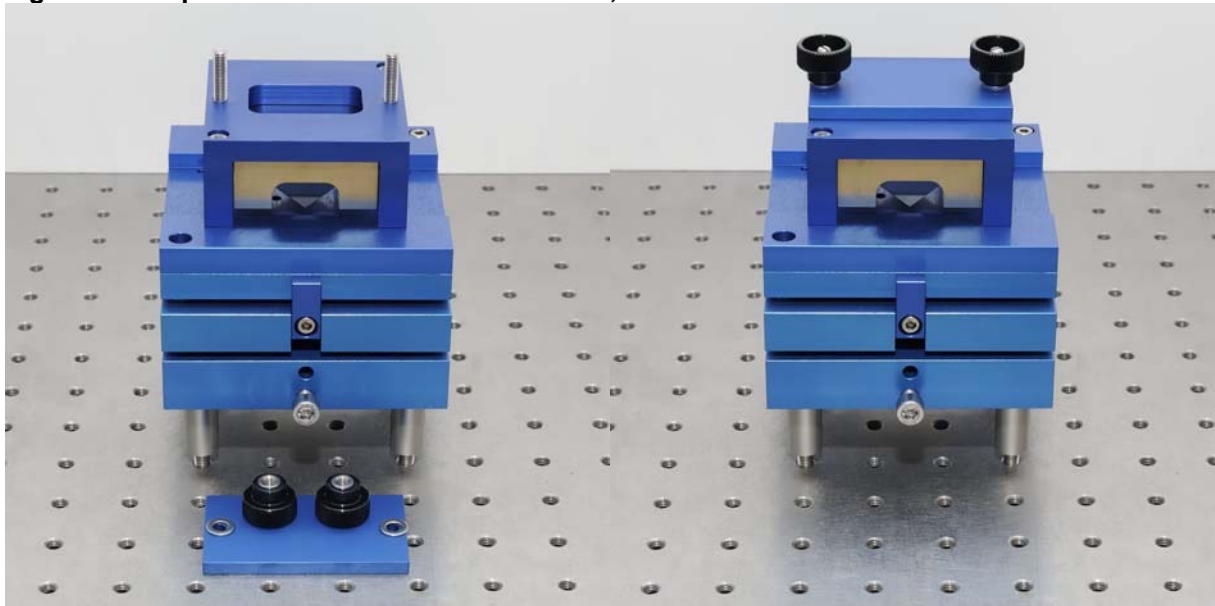
The adapter for small samples requires using the focusing THz lenses in order for the THz beam not being reflected by the adapter rather than the sample. When using the focusing lenses make sure that the flat side faces the sample and that you use the correct set of lenses (designated for the reflection setup). The sample holder for transmission measurements comes with another set of THz lenses that have a significantly shorter focal length which will result in a very poor THz signal.

When changing from transmission to reflection measurements the THz signal is shift by about 150 ps because of the longer THz beam path. Please note that adding the focusing THz lenses will result in another shift of about 25 ps. Hence, when you design your THz system please bear in mind that the pulse position may change with the measurement setup.

3. SHA - sample holder ATR

The sample holder for attenuated total reflection (ATR) measurements requires the base structure that comes with the transmission setup and every TDS system. It is meant for fluids or solids with a high absorption coefficient and a refractive index lower than 2.5. The THz beam is directed by the silicon ATR prism towards its top surface where attenuated total reflection occurs. The THz signal will be altered by the properties of the fluid. However, the penetration depth of the evanescent wave strongly depends on the wavelength. Hence, a quantitative analysis is much more complicated than for standard transmission or reflection measurements.

Figure 5: Sample holder for ATR measurements, with and without lid.



Warning:

When working with volatile fluids it is required to close the ATR sample holder using the lid provided in order to reduce fumes to a minimum. It has to be noted that these fumes could be ignited by the short pulse laser used to drive the THz antennas, especially for systems without an enclosure of the laser beam path. Therefore, the customer is required to handle the fluid according to its safety data sheet.

Because of the high refractive index of the silicon there is a significant time shift of the THz pulse compared to the transmission setup. The THz peak is found about 350 ps later. In case you build your own THz spectrometer we recommend setting the THz pulse for transmission at a time delay of about 150 ps. When using a 100 mm delay line you'll have enough room to work with the SHA.

4. Contact details

If you have any further questions or remarks, please do not hesitate to contact us.

BATOP GmbH
Wildenbruchstr. 15
D-07745 Jena
Germany

e-mail: info@batop.de

Tel.: +49 3641 634009 0
Fax.: +49 3641 634009 20