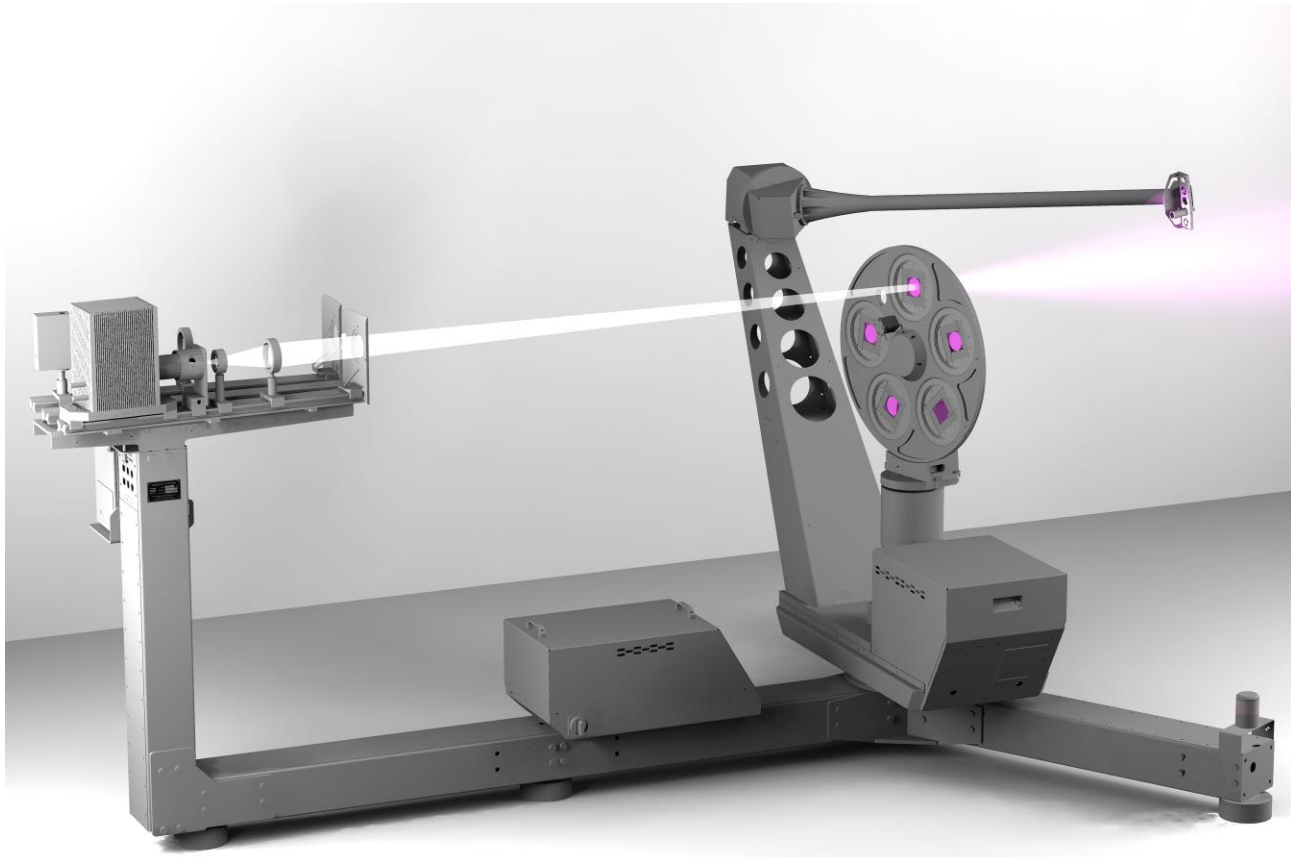


## Gonio-Photometer for BSDF reflection & transmission measurements



**pab gonio-photometer** PG2 is specifically designed for fast and precise measurements of reflective and transmissive samples in research and commercial applications. Outstanding performance in speed and angular resolution is achieved with high performance servo drives, a rigid mechanical frame, optimized axis controls and industry leading software. It summarizes 20 years of experience in BSDF and light scattering measurements.

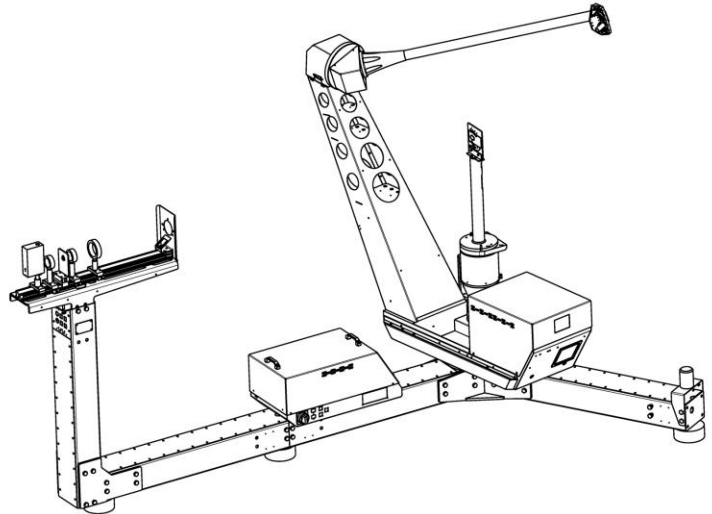
### Key features:

- full out-of-plane acquisition of BRDF,BSDF
- absolute BRDF,BSDF values
- adaptive angular resolution
- wide, adaptive dynamic range
- angular isotropic response of detector
- scanning covers 99% of the sphere
- measurements on-the-fly
- high sampling rate
- custom options available
- angular resolution better than 1mrad
- modular design
- stationary light sources
- flexible choice of light sources
- easy to operate, low maintenance
- built-in calibration procedure
- conforms to ASTM2387
- extensions to near-field photometry
- adapter for LED and lamp measurements

## field installable options

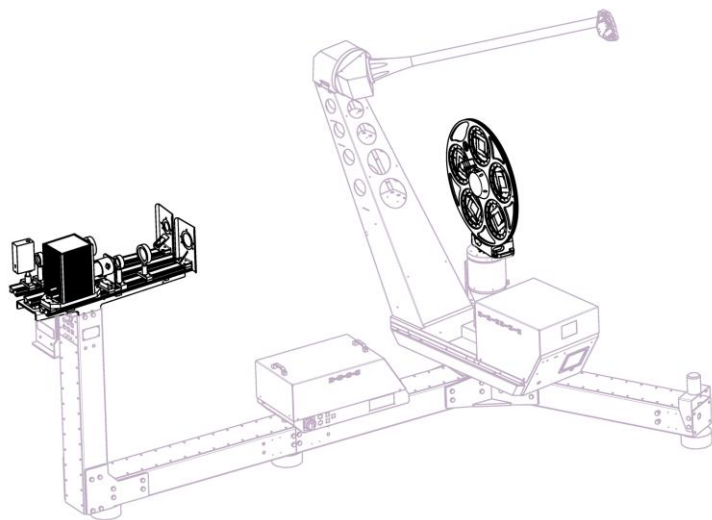
### base configuration

- modular system
- multi channel VIS, UV, IR detectors
- full control of detector angles  $\vartheta_{out}, \varphi_{out}$
- sample mount manual
- sample angle  $\vartheta_{in}$  controlled
- sample angle  $\varphi_{in}$  set manually
- sample size max 180 x 300mm
- near-grazing incident/outgoing directions
- stabilised Halogen source, beam optics
- opt measurement of LEDs and lamps
- custom sample mounts available



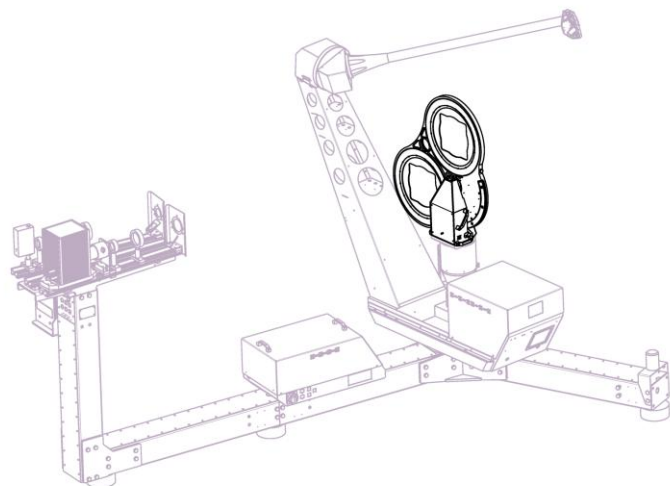
### sample auto changer *phiot5*

- 5 samples, plus reference beam position
- sample size max 110mm x 110mm
- adapters for smaller samples
- full control of incident angles  $\vartheta_{in}, \varphi_{in}$
- sample changes integrated into database and control program
- field interchangeable with manual sample mount
- supports bar-code label on samples
- (shown here with dual lamp setup)



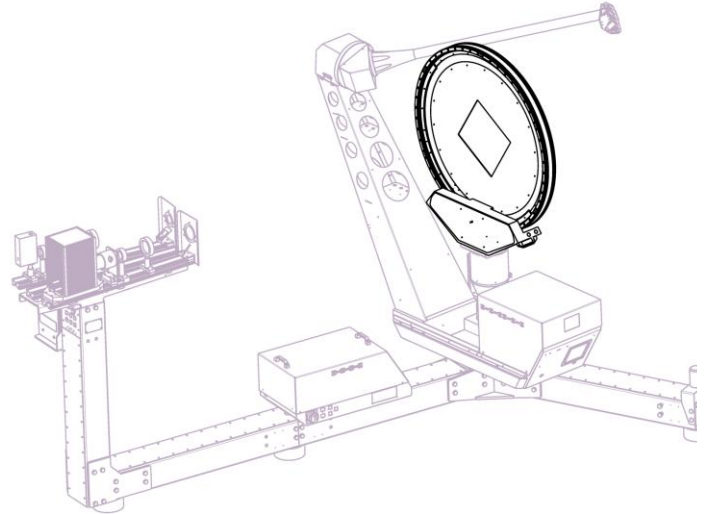
### sample auto changer *phiot2*

- 2 samples, plus reference beam position
- sample size ISO-A4, 210mm x 297mm
- adapters for smaller samples
- full control of incident angles  $\vartheta_{in}, \varphi_{in}$
- sample changes integrated into database and control program
- field interchangeable with manual sample mount
- supports bar-code label on samples



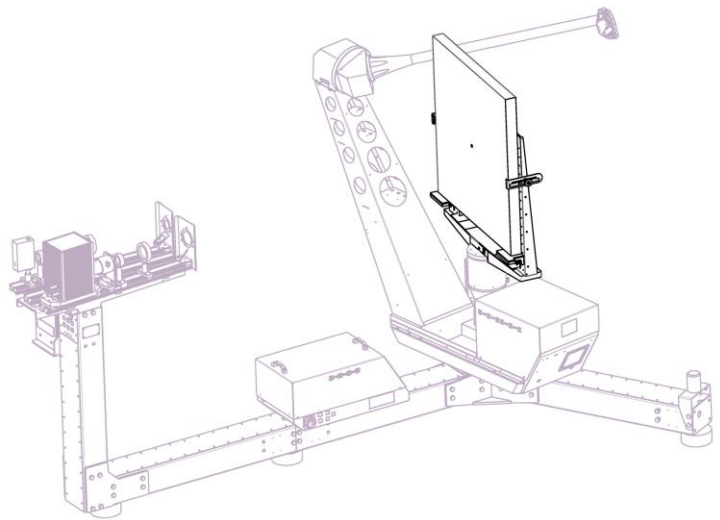
sample mount *phirot*

- 1 sample
- sample size max 700mm diagonal
- max weight 2kg
- full control of incident angles  $\vartheta_{in}$   $\phi_{in}$
- easy swappable inner sample mount
- mounts almost any sample type
- near-grazing incident/outgoing directions
- field interchangeable with other sample mounts



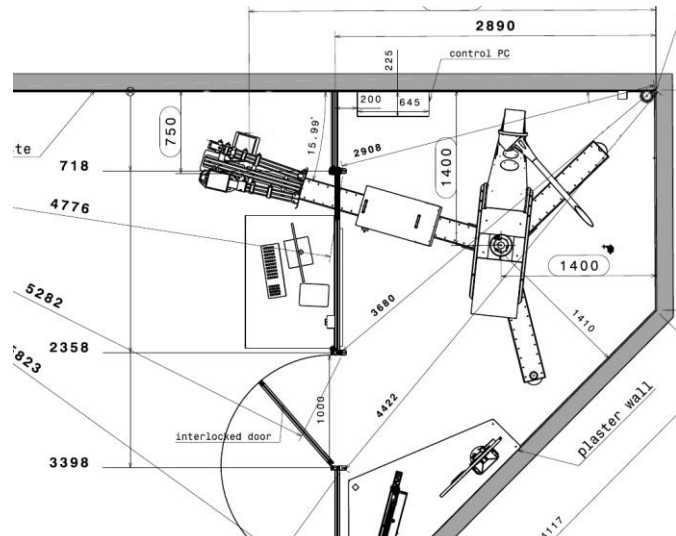
large sample mount *LSH*

- maximised sample size, 800mm x 1000mm
- sample weight max 50kg
- adaptable and robust mounting flanges for samples
- optional surface scan of smaller samples

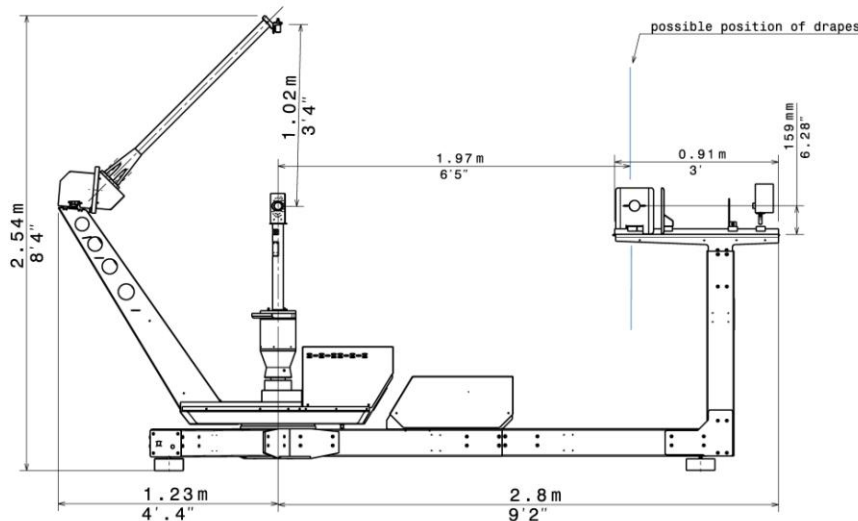


consulting on lab layout

- side specific compact installation, optimised use of floorspace
- design and installation of barrier in compliance with local lab safety rules
- interlocked door for access to machine
- lamps accessible outside enclosure
- view ports for visual control of PG2 during adjustments and demonstrations
- optional laser interlocks
- optional overhead crane and rail for heavy samples or *phirot* mount
- custom black drapes to limit stray-light. Material suitable for theatres, including flammability rating



## Dimensions and interfaces



### factory installable options

- multi channel detector head  
Si,InGAs, MCT sensors cover UV to mid-IR  
filters available per detector  
optional parallel acquisition of channels
- spectrometric detector head, standard 10nm resolution
- Xenon short-arc light source  
stabilised, filtered
- focused Laser sources: diode, plasma, discharge  
choice of laser type and optics
- mid IR ranges 5um,10um upon request
- additional angular resolver  
increases angular resolution of motor axes down to below 0.1mrad
- custom interfaces at sample holder and detector  
e.g. fluid connectors

### interfaces and site

- environmental & site requirements:  
flat stable floor, dust free air  
temp 20-25 deg C  
humidity max 70%, recommended <60%  
recommended space height: 3.2m, width 3.7m, length 5m  
machine weight 610kg  
mains: 3-phase (3xL+N, PE) 230/400V 16A
- full Linux control PC:  
USB keyboard/mouse  
flatscreen monitor 1960x1200 pixel  
TP100/TP1000 Ethernet  
hardware RAID-5/6 for system and database
- software: Linux operating system  
easy integration into existing networks
- standard network protocols:  
DHCP, SSH, HTTP, SQL
- turn-key safety features:  
industrial interlock system included  
temperature control  
motor monitoring
- complete sample bar-code handling:  
opt. bar-code label printer and scanner
- multiple fully controlled lamps  
available: 230V AC, 24V, 12V, 5V DC
- Internet connection:  
remote ssh access for warranty and maintenance  
TP100/1000, DHCP
- barrier+interlock required at site for safety  
alternatively select 'cage' option for compact enclosure
- all surfaces in low reflectance matte black finish
- complimentary free consulting on lab layout:  
dimensions, wall and floor materials, drapes (black molleton), access and interlock



## Technical data & parameters

- rotational limits  
none. all axes feature an unobstructed rotation
- angular coverage of detector  
99% of the sphere  
except cone around base  
of sample mounting
- self-shadowing of detector  
for reflection measurements  
approx.  $1.1^\circ$   
depending on detector type
- angular ranges for sample mount  
incident angle  $\vartheta$ :  
0-85° with manual sample mount  
0-84° with sample changer  
incident angle  $\varphi$   
0-360° for all mounts  
exit angle  $\vartheta$   
0-approx 88°,  
depends on sample attachment  
all values for beam diameter of laser diode
- maximum detector velocity 4 m/s  
rotational speed armA approx. 30 rev/min
- interlock type Schmersal AZM200 or Jokab-Safety, specifications upon request
- CE and EN conforming, North American UL components and wiring available
- angular resolution  
detector arm A <10"  
detector arm B <5"  
sample incident angle  $\vartheta$  < 5"  
sample incident angle  $\varphi$   
steps of 15° with manual mount  
approx. 5' with auto-changer
- angular repeat accuracy & hysteresis loss  
detector arm A  
 $\pm 5'$ , < 0.3° (motor encoder)  
 $\pm 5'$  (direct encoder) \*  
detector arm B:  $\pm 6'$  < 2' ‡  
sample  $\vartheta$ :  $\pm 6'$  , < 2' ‡  
sample  $\varphi$ :  
<0.2° with manual mount  
<0.2° with auto-changer  
‡ spec. by actuator manuf.  
\* spec. by angular encoder manufacturer
- detector dynamic range  
custom full digital sensor system  
standard  $1:10^7$  SNR, 1kHz sampling rate, higher range upon request
- light source stability  
halogen <0.3% short term (no ripple)  
laser diode 650nm < 0.2%  
other sources (e.g. HeNe) upon request
- angular opening angles:  
std detector cell VIS 10mmØ , 1m dist, 0.57°  
opt detector aperture 1mm, 1m dist, 3'  
std halogen lamp, f=200, 40mmØ, 2m dist, 1.1°  
laser-diode or HeNe laser filtering optional

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