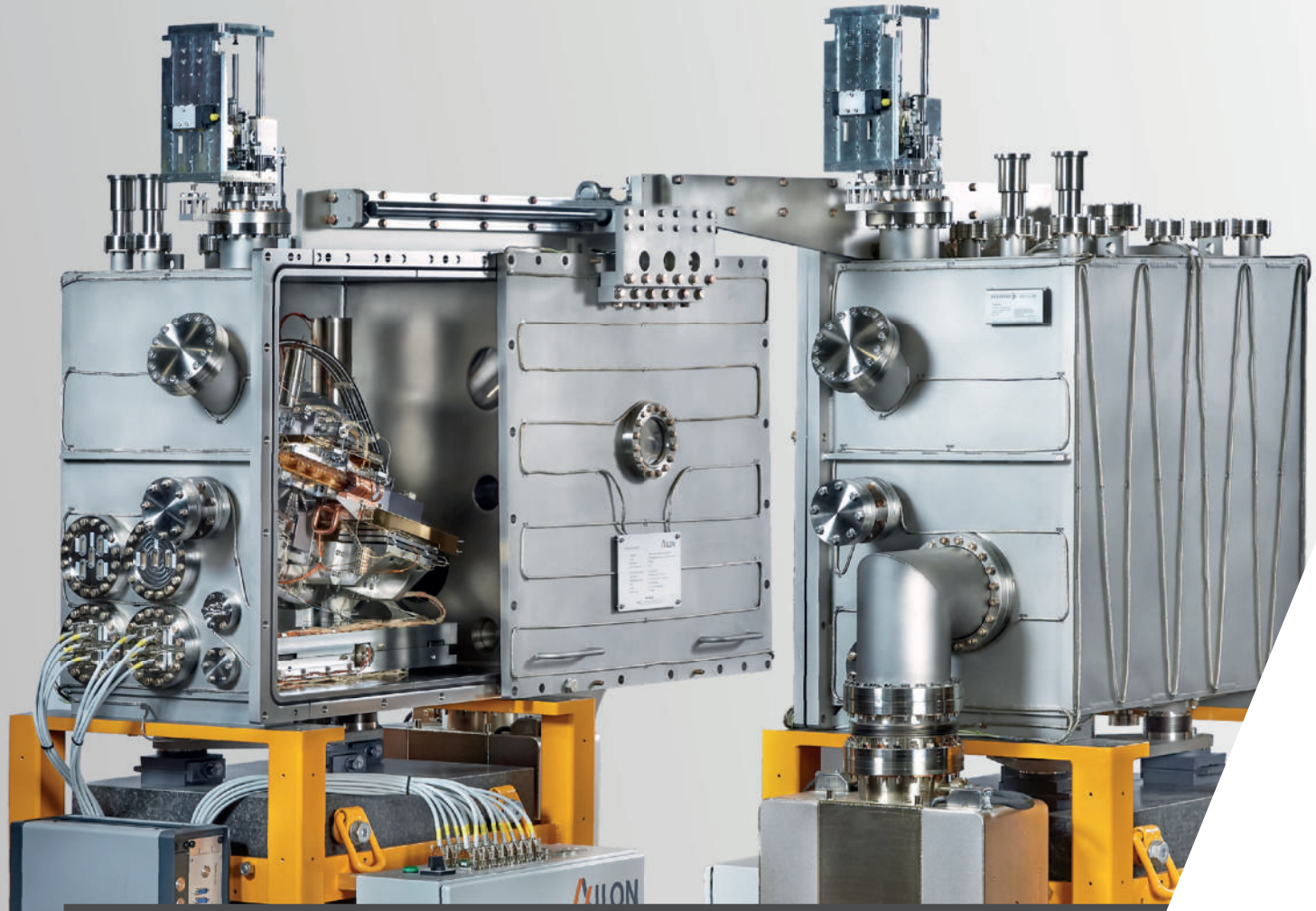


Data Sheet

Monochromators

Optics for ultimate performance
energy tunability

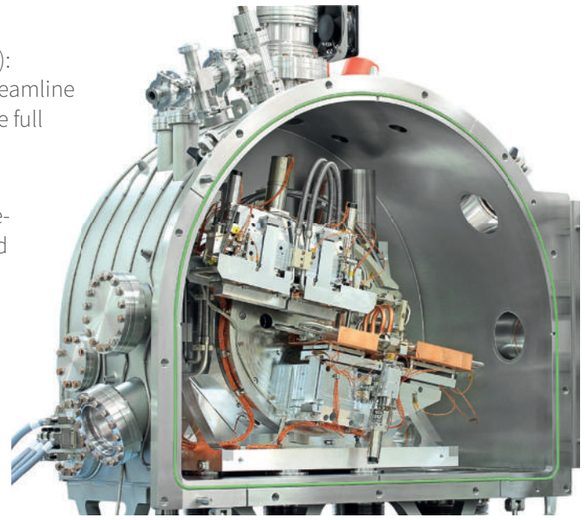
XILON

Introducing…

AXILON's state-of-the-art monochromators for Synchrotrons and Free Electron Laser facilities (FEL): With our long term experience in this core field of beamline instrumentation we are able to provide you with the full range of monochromators.

AXILON manufactures standard solutions with state-of-the-art performance as well as highly customized and groundbreaking monochromators designed and built to your particular needs.

Our monochromator designs have been optimised and tuned for rigidity and stiffness and provide ultimate angular stability, one of the key requirements for the new diffraction-limited Synchrotrons and FEL sources. AXILON is delivering monochromators with stability levels below <20nrad rms under operating conditions for both horizontal and vertical bounce geometries.

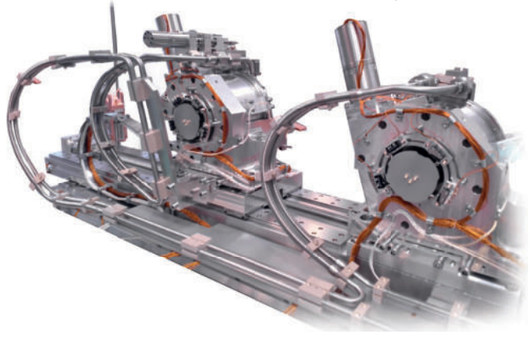


Vertical DCM/DMM for GEMINI, Advanced Light Source
(cover page: Vertical DCM/DMMs for the APS-U project)

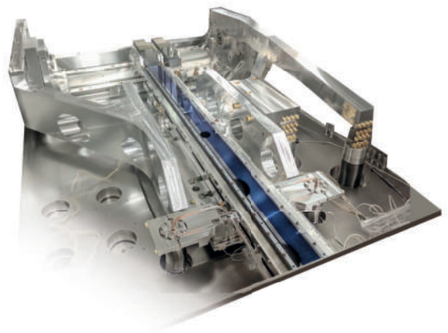
Product range

Our engineering expertise and scientific background covers the whole variety of monochromator types. If your specific application is not on the list, come and talk to us, we will find a solution.

Type	crystal, multilayer, crystal and multilayer combined, grating, Laue sagittal bent crystals, detuning of channel-cut crystals
Geometry	vertical and horizontal bounce, single bounce, large offset, fixed offset, channel cut
Cooling	cryogenic, water, thermally stabilized
Level of integration	turnkey, smaller and large scale upgrades
Services	design, FEA, testing under operating conditions, installation, commissioning, service agreements
Options/accessories	LN2 cooling system ChillAX, feedback system, interferometry, motion controls



Double-Crystal Laue Monochromator
for the Australian Synchrotron



High Stability Grating Monochromator
for the LCLS FEL (Stanford)

Double Crystal Monochromators (DCM)

DCMs provide a highly stable outgoing beam and deliver ultimate resolution and flux over a large X-ray energy range. Horizontal and vertical deflection geometries can be selected depending on your application.

parameter	value
Energy range	2.8 to 35 keV
# of crystal sets	up to 4, e.g. Si111, Si220, Si311
Bragg range	0 to 45° up to 85° for lower energies
Bragg resolution	≤ 0.2 µrad
Bragg speed	~ 0.5°/sec > 2°/sec for servo option
Offset range	4 to 30 mm
Motion axes	Bragg, gap, roll, pitch piezo roll and pitch for feedback common vertical and horizontal
Vacuum	< 10^{-8} mbar
Stability	< 20 nrad rms (0.1 – 2,000 Hz)

Two Horizontal-Bounce
Cryo-Cooled DCMs for Diamond
Light Source DLS

ChillAX

AXILON's liquid nitrogen chiller sets new standards for the performance of high heat load components providing superior stability (< 1 mbar rms), cooling capacity and automation.

Double Multilayer Monochromators (DMM)

For applications demanding increased flux and energy bandwidth multilayer optics for monochromatizing can be the ideal choice. AXILON can customize the energy tuning optics and provide the flexibility you need for your beamline.

parameter	value
Energy range	4 to 40 keV
ML coatings	1 to 4, e.g. W/B4C, Mo/B4C, Ru/C
d-spacings	1.8 to 5.0 nm
Bragg range	0.5 to 2.5°
Bragg resolution	≤ 0.2 µrad
Offset range	4 to 25 mm
2nd ML longitudinal	50 to 3,000 mm
Motion axes	1st ML pitch, 2nd ML pitch, roll, longitudinal, vertical, horizontal
Vacuum	< 10^{-8} mbar

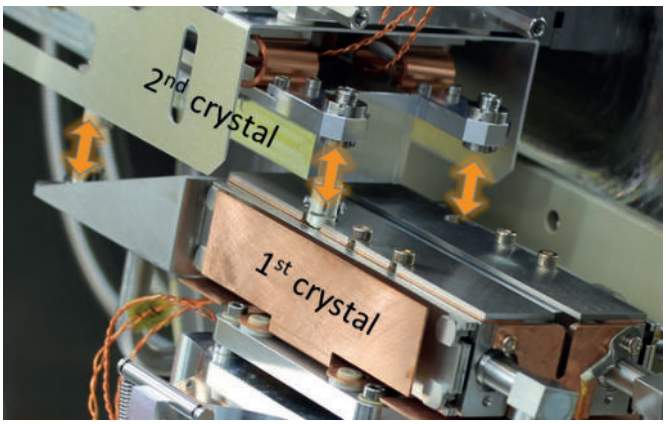
Two Horizontal-Bounce Cryo-Cooled DCMs
for Diamond Light Source DLS

Sub 20-nrad stability results

AXILON's in-house testing capabilities enables the verification of mechanical specifications of each component in the factory, prior to shipment.

- 3d measuring & laser tracker
- vacuum and pressure tests
- in-house motion controls
- stability characterization
- axes performance incl parasitic motions

Our metrology equipment includes an interferometer system enabling ultimate performance characterization down to the nm & nrad regime under vacuum and even under cryogenic conditions using our closed loop LN2 ChillAX.

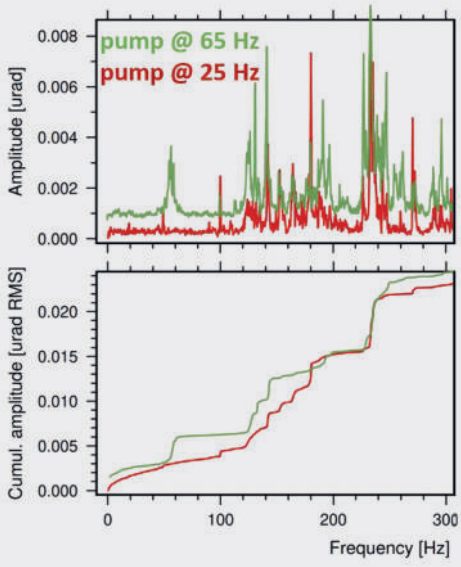


Differential interferometry setup between 1st and 2nd crystal

Factory test results for AXILON vertical and horizontal offset monochromators show pitch stability below 20nrad. The stability performance of crystal pitch and roll parallelism is measured with an in-situ differential interferometer setup. The graphs on the right show the pitch response while sweeping the flwo rate of the cryo cooler unit. At typical Nitrogen flow rates (pump frequency below 40 Hz) no eigenmodes below 120Hz can be observed.

For further tests and measurements discuss with us your ideas and needs for factory metrology!

DCM stability results



Results of a pitch angular response running a cryo pump sweep (15 to 70 Hz), top: frequency spectrum, bottom: cumulative frequency spectrum

Axilon AG
Robert-Bosch-Str. 1b
50354 Hürth • Germany

T +49 (221) 165 324 00
F +49 (221) 165 324 99

beamlines@axilon.de
www.axilon.de