

TGM-Series

Toroidal Grating Monochromators

Coming from Synchrotron technologies

**Synchrotron
compatible**

Tunable light source

High throughput

**Aberration
corrected VLS
gratings**

High Resolution

EUV spectroscopy



Monochromators to explore the 8-400 nm spectral range

The TGM (Toroidal Grating Monochromator) series are grazing monochromators especially designed for analyzing the whole VUV wavelength range from 8 to 400 nm.



TGM1200 in HV configuration

Thanks to its original optical design based on toroidal VLS grating, the TGM series is a low aberration grazing monochromator with an unmatched throughput. Coupled with a single channel detector, this device analyzes VUV radiations, such as those emitted from UV plasma sources. It can also be used as a stand alone, tunable light source when equipped with dedicated UV light source. TGM are available in three configurations (TGM300, TGM1200 and TGM1900) depending on the spectral range and resolution you want to achieve.

Applications

- FUV/EUV Reflectometry
- VUV Tunable filter/Light source
- Transmission measurements
- Laser Harmonic Filter
- Plasma Physics Study

Features

- Single Toroidal Grating design
- Low astigmatism level
- Dual grating Slider option
- High Vacuum compatible
- Entrance and exit slits fixed in position
- Choice of master or replica gratings
- Fully automated wavelength drive
- RS232/USB2 controller
- HORIBA Scientific software

Benefits

- Optimized for throughput
- High S/N ratio measurement
- Versatility under vacuum
- 10^{-6} mbar – optional 10^{-9} mbar (UHV)
- Easy integration in any setup
- Synchrotron compatible with master gratings and UHV option
- Easy to operate
- Easy programmable with SDK
- Easy computer control

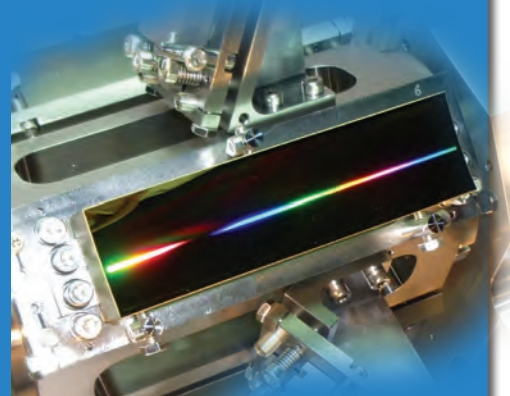
Variable Line spacing Gratings

TGM are using VLS toroidal gratings. They disperse and refocus the light from the entrance slit onto the exit slit of the monochromator.

The wavelength selection and the scanning are obtained through a simple rotation of the grating.

The groove spacing of these gratings is computer-optimized to produce high quality images with a minimum of astigmatism and coma over a large spectral range and even at high numerical aperture.

The VLS grating grooves are no longer straight and parallel, but instead correspond to confocal hyperboloids or ellipsoids. Optimizing the position, angles and arm lengths of the two recording beams provides the optical designer with the degrees of freedom necessary to minimize aberrations.

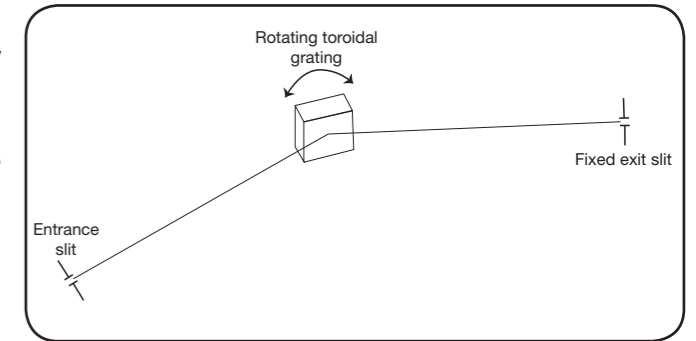


The new generation of toroidal monochromator

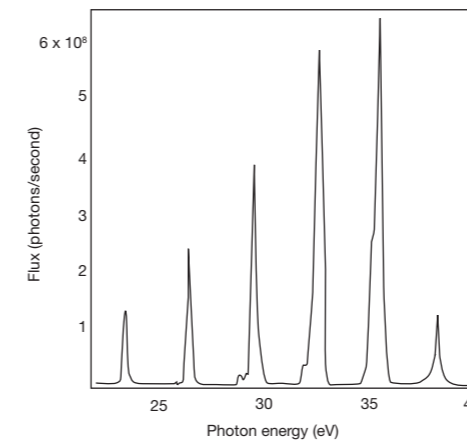
An original HORIBA Scientific Concept

The TGM series bring up to date the concept of the first VUV instrument in the world designed around a single toroidal aberration corrected grating (LHT30, HORIBA Scientific patent), while improving the resolution and reducing the stray light. Its optical design dramatically reduces astigmatism and results in excellent luminosity and spectral purity, even at low wavelength.

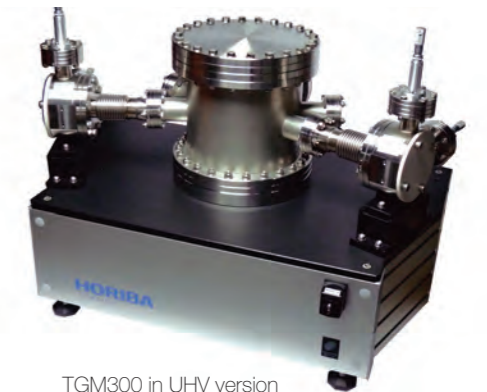
First dedicated to synchrotrons, TGM are now available in tabletop version for a wide range of applications.



The wavelength selection is done by grating rotation (computer-controlled), slits remaining fixed which is particularly useful when used as a tunable light source.



A typical high-order harmonic spectrum from argon. Data courtesy of M. Wörner (MBI)



TGM300 in UHV version

Gratings available

| Model | Gratings | | Spectral range | | Exit Dispersion | Resolution** (FWHM in nm) |
|----------|-------------|-----------------|----------------|----------|---|---------------------------|
| | Part Number | Density (gr/mm) | nm | eV | | |
| TGM300 | 540 00 900* | 550 | 10 - 50 | 25 - 124 | 1.8 nm/mm at 10 nm, 1.6 nm/mm at 50 nm | 0.20 at 30 nm |
| | 540 00 910* | 550 | 15 - 150 | 10 - 83 | 1.8 nm/mm at 15 nm, 1.2 nm/mm at 150 nm | 0.25 at 50 nm |
| | 540 00 920* | 275 | 50 - 300 | 4 - 25 | 3.5 nm/mm at 50 nm, 2.3 nm/mm at 300 nm | 0.40 at 110 nm |
| TGM1200 | 540 00 800 | 950 | 12.5 - 52.5 | 24 - 100 | 0.3 nm/mm at 12.5 nm, 0.34 nm/mm at 52.5 nm | 0.02 at 22 nm |
| | 540 00 810 | 250 | 50 - 200 | 6 - 25 | 1.1 nm/mm at 50 nm, 1.3 nm/mm at 200 nm | 0.07 at 90 nm |
| | 540 00 820 | 125 | 85 - 400 | 3 - 15 | 2.1 nm/mm at 85 nm, 2.6 nm/mm at 400 nm | 0.16 at 165 nm |
| TGM 1900 | 540 00 600 | 1800 | 8 - 32 | 39 - 155 | 0.08 nm/mm at 8 nm, 0.11 nm/mm at 32 nm | 0.01 at 26 nm |
| | 540 00 610 | 450 | 32 - 128 | 10 - 39 | 0.3 nm/mm at 32 nm, 0.4 nm/mm at 128 nm | 0.04 at 100 nm |

* Gratings are available in master or replica version
** using 10 μ m x 2 mm slits

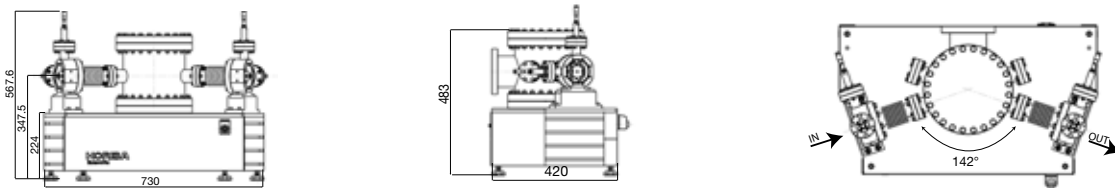
Options

- Ultra High Vacuum (UHV, 10^{-9} mbar) version
- Slider for grating change under vacuum
- Laser kit for easy alignment

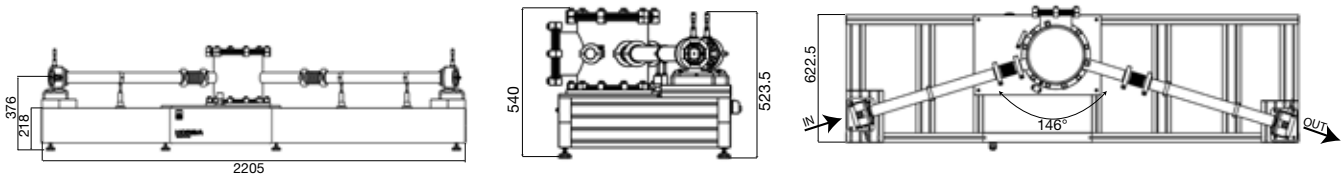
Accessories

- EUV/UV Light Sources
- Single channel detection
- Mirror chambers

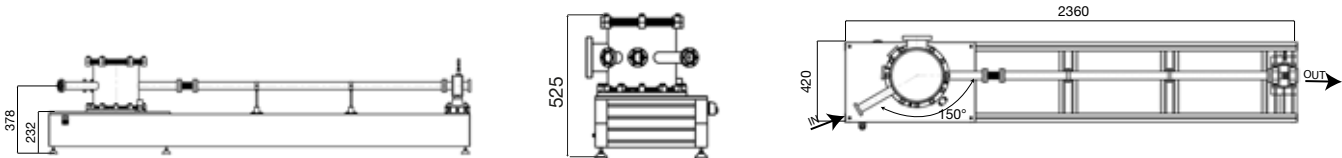
| | TGM300 | TGM1200 | TGM1900 |
|-----------------------------|---|----------|----------|
| Optical design | Toroidal VLS Grating (single optic) | | |
| Focal length | 320 mm | 1000 mm | 1146 mm |
| Aperture | f/16 | f/32 | f/34 |
| Optic coating | Pt or Au | | |
| Deviation angle | 142° | 146° | 150° |
| Drive | Sine arm | | |
| Vacuum | 10 ⁻⁶ mbar (HV version) or 10 ⁻⁹ mbar (UHV version) | | |
| Pumping flange | DN40 KF | DN100 LF | DN100 LF |
| Entrance/exit port | Micrometric slits (10 μm to 2 mm) | | |
| Entrance/exit flange | DN40 KF | | |
| Software | HORIBA Scientific software | | |
| PC Interface | RS232 - USB2 | | |



TGM300 in UHV version, single grating configuration



TGM1200 in HV version, with a two gratings in slider



TGM1900 in HV version, with two gratings in slider, custom version without entrance slit and arm

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