

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

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 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

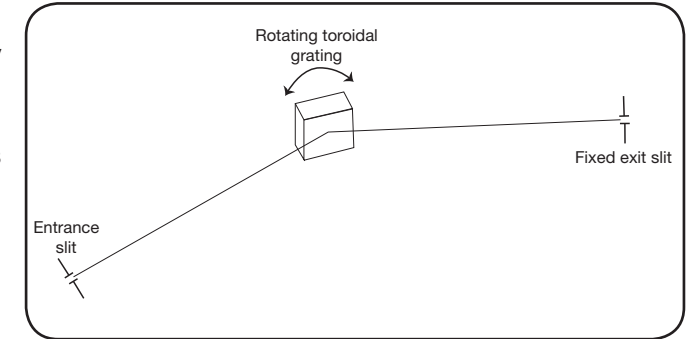
- Optimized for throughput
- High S/N ratio measurement
- Versatility under vacuum
- 10^{-6} mbar – optional 10^{-9} mbar (UHV)
- Easy integration in any setup
- Synchrotron compatible with master gratings and UHV option
- Easy to operate
- Easy programmable with SDK
- Easy computer control

The new generation of toroidal monochromator

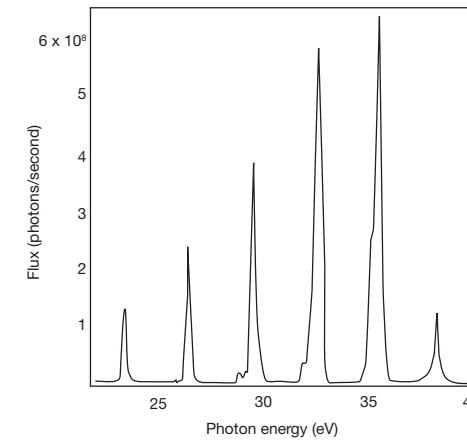
An original HORIBA Scientific Concept

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

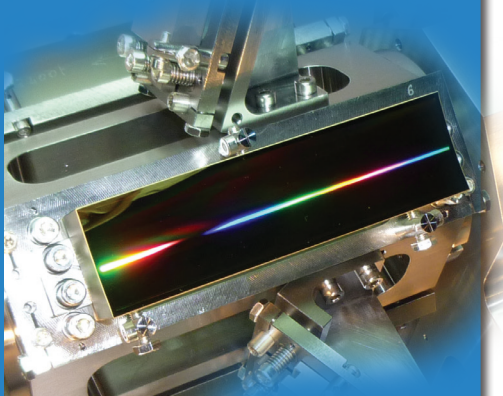
* Gratings are available in master or replica version
** using $10 \mu\text{m} \times 2 \text{mm}$ slits

Options

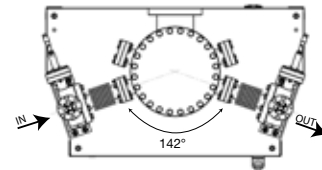
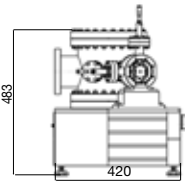
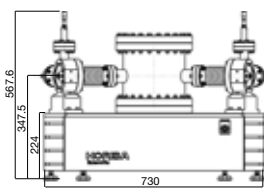
- Ultra High Vacuum (UHV, 10^{-9} mbar) version
- Slider for grating change under vacuum
- Laser kit for easy alignment

Accessories

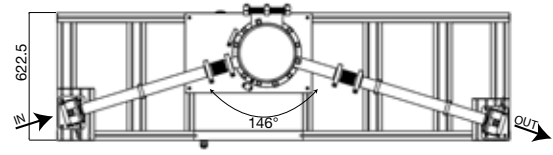
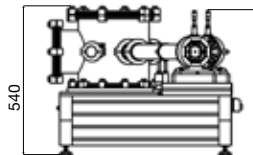
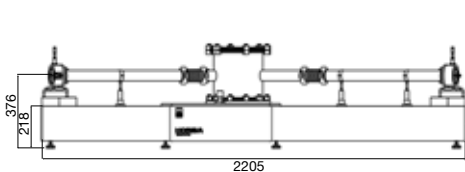
- EUV/UV Light Sources
- Single channel detection
- Mirror chambers



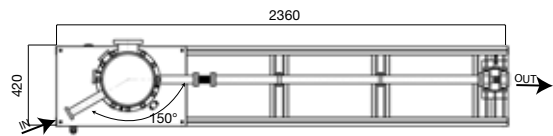
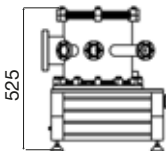
	TGM300	TGM1200	TGM1900
Optical design	Toroidal VLS Grating (single optic)		
Focal length	320 mm	1000 mm	1146 mm
Aperture	f/16	f/32	f/34
Optic coating	Pt or Au		
Deviation angle	142°	146°	150°
Drive	Sine arm		
Vacuum	10 ⁻⁶ mbar (HV version) or 10 ⁻⁹ mbar (UHV version)		
Pumping flange	DN40 KF	DN100 LF	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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