Scientific diffraction gratings / Custom gratings

Gratings for astronomy & space experiments
Commitment to quality

HORIBA Jobin Yvon offers complete customer service, including expert technical advice for optimizing system configurations to meet customers’ needs.

HORIBA Jobin Yvon is ISO 9001:2000 certified, and our well-staffed departments are committed to customer satisfaction and product quality.
Holographic master and replica gratings

HJY expertise in gratings for space experiments

HJY has been producing gratings for space experiments since 1968. The first ruled gratings were produced for the French space experiment D2A in 1970.

HJY has produced some of the most technically-challenging space-flight gratings ever designed, applications ranging from off-plane X-ray gratings to toroidal VLS gratings for the VUV and transmission deep groove gratings for the IR range.

For example, HJY produced the four gratings for NASA/JHU FUSE spectrograph. The gratings are 5800 gr/mm, aberration corrected, holographically ruled on 300x300 mm, aspherical light weight ceramic.

A prototype FUSE spectrograph grating being removed from a vacuum tank in a clean room at HORIBA Jobin Yvon. The FUSE gratings are approximately a foot square with 5300-5800 lines per millimeter etched onto the surface (the exact number changes as a function of position across each grating, and they are slightly curved). These etchings are what disperse far-UV light into a spectrum for analysis, and provide the high spectral resolution of the spectrograph.

HJY has also often been selected by NASA and ESA for their most demanding missions. A very reduced list includes:

- SOHO SUMER France + Germany
- SOHO UVCS USA
- STIS (Hubble telescope) USA
- GALEX USA + France
- ROSETTA Alice USA + France
- COS (Hubble telescope) USA
- SOFIS Japan
- SPICAM/ MARS Express France
- OMI - EOS Netherlands
- LYMANN FUSE USA + France
- ROALEX USA
- GOMOS (Hubble telescope) France + Belgium
- MERIS/ENVISAT France
- UV S MARS Japan
- GOME Italy
- WEASAT China

Recently we produced gratings for missions such as EVE (NASA/LASP) and SSULI (NRL).

HJY receives NASA award

HJY received the NASA award “Commitment to Excellence in Technology Achievement” for its grating technology contribution for its specific support on the COS project.
“In recognition of your holographic gratings for the COS instrument that will enable a new generation of scientific exploration for the Hubble Space Telescope [...] and every person who looks to the sky in wonder [...] the gratings were delivered above the specification, on time and within cost,” said Prof. Jim Green.

Production and test facilities

HORIBA Jobin Yvon’s underground grating labs provide the necessary environmental stability required to mechanically rule and holographically record the highest-specification diffraction gratings.

Our ruling engines, lasers, collimators, optical components, and chemical processing equipment are housed in clean rooms throughout the facility.

Coating and chemical operations are performed in our own processing laboratory. The lab is geared to accommodate all the company’s replication and deposition requirements with equipment including fully-automatic high-vacuum evaporation systems.

All equipment involved in handling and processing of master gratings are operated in different cleanrooms down to class 100.

Space qualification

Space qualification was achieved for HJY’s ruled and holographic gratings (masters and replicas) by the French CNES as early as 1971 and 1972, when we produced gratings for the D2B satellite.

HORIBA Jobin Yvon ruled and holographic gratings were aboard the LDEF satellite, which stayed in space for 69 months before retrieval by the Space Shuttle. Extended space vacuum experiments (34000 orbits, with thermal cycling each orbit) demonstrated that HJY’s ruled and holographic gratings (masters and replicas) maintained wavefront quality, stray light levels, and absolute efficiency under harsh space conditions.
Bulk transmission gratings for astronomy

Holographic ion-etched ruled transmission gratings

High-efficiency IR transmission gratings (grisms) engraved into fused silica substrates

In many astronomy applications, grisms (transmission gratings patterned on a prism) are widely used for in-line dispersion of an infrared spectrum. In the infrared, classical replicated grisms present many limitations. The epoxy layer, necessary for replication, absorbs infrared light. In addition, this epoxy layer compromises the integrity of the grism when used at low temperatures.

To address these issues, HJY has designed and manufactured transmission gratings which are holographically patterned and etched directly into IR fused silica substrates.

Three grating types were developed, for wavelengths ranging from 1 micron to 2.4 microns. The diffraction efficiency reaches 60% to 70% in natural light.

Engraved directly into fused silica, these gratings can survive very low temperature conditions and vacuum environments.

High-efficiency UV transmission gratings (grisms) engraved into CaF₂ substrates

Through our expertise in ion etching, HJY has developed a process which allows us to produce optimized groove patterns in CaF₂. A master grating is ruled in a gold layer deposited on top of the grating substrate, and then the groove profile is transferred by ion etching directly into the substrate itself. The result is a monolithic sawtooth-profile grating which can withstand extreme temperatures and environmental conditions.

A saw-tooth profile transmission grating, ion-etched directly into a CaF₂ substrate for use at 140 nm in second order, has been successfully produced for the GALEX experiments.
FAX FORM

For more information or custom grating / mirror quotations, please complete the corresponding request info on our web site: www.jobinyvon.com or send this completed form by fax.

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My interest is:
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I intend to purchase
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☐ Diffraction Gratings
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Comments
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HORIBA Jobin Yvon is one of the world’s largest manufacturers of analytical and spectroscopic systems and components and we are committed to serving our customers with superior products and technical support.

Established in 1819, Jobin Yvon is part of the HORIBA Group which employs more than 4,500 people worldwide, with annual sales in excess of $900,000,000.

HORIBA Jobin Yvon, Sofie, Dilor, Spex and IBH are some of our well known and respected brand names.