MONOCHROMATORS AND SPECTROGRAPHS

SINGLE CHANNEL DETECTION SYSTEMS

MINISPECTROMETERS

BENCHTOP SPECTROMETERS

FT-IR SPECTROMETERS

ACCESSORIES FOR SPECTROSCOPY INSTRUMENTS

Oriel Cornerstone™ 130 1/8 m Monochromator

Cornerstone 130 1/8 m Monochromator

- New, USB 2.0 models; RS-232 and IEEE-488 also available
- Excellent stray light control
- Motorized wavelength drive
- Operates two gratings simultaneously, individually replaceable
- Electronic shutter

The Cornerstone™ 130 family of Oriel Monochromators supports two gratings simultaneously, which can be easily interchanged, has an integrated shutter, and is available with RS 232 and IEEE-488 interfaces or with USB 2.0. Its simplicity, high performance, and economical price make it an ideal instrument for research or OEM applications.

Optical Configuration

The optical design of these instruments is based on an out of plane version of the Ebert-Fastie monochromator. This is a 180°, in-line configuration, which simplifies system alignment. Additionally, this compact design has a very small footprint so it requires little tabletop space. For the Cornerstone 130, we computer optimized this optical configuration to ensure the highest resolution, greatest throughput, and the lowest stray light. Although the system is a fast F/3.7, the optimized design provides excellent stray light rejection while minimizing aberrations.
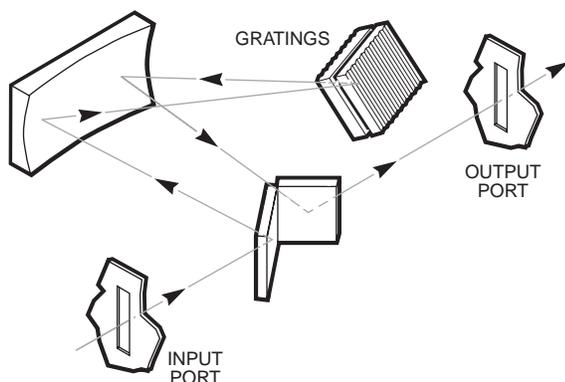

Fig. 1 Optical configuration of the Cornerstone^{TM} 130 Monochromators

Motorized Wavelength Drive

The Cornerstone™ 130 is our only automated 1/8 m monochromator. Your computer controls everything. The wavelength drive in this monochromator was designed to increase speed as much as possible without sacrificing accuracy or precision. This rapid direct drive mechanism slews at a maximum rate of 205 nm/s (with 1200 l/mm grating). Wavelength accuracy with a 1200 l/mm grating is 0.50 nm and precision is a tight 0.11 nm. Cornerstone 130 also uses the wavelength drive to change gratings; the rapid slew rate of the instrumentÕs drive allows grating changes in only ~10 seconds.

Stray Light

Stray light comes in a number of different forms and may be caused by a wide variety of design and manufacturing factors. The Cornerstoneª 130 incorporates a sophisticated design, proven materials, and a quality manufacturing system to ensure high stray light rejection. The amount of stray light measured on top of true signal will depend on many experimental factors as well as the performance of the instrument. When comparing stray light specifications it is important to compare values that were measured under identical circumstances. The spectral distribution of the source and the response of the detection system are often the dominant factors when determining a stray light value. Here we list two stray light tests to provide some meaningful points of comparison. Both measurements used a UV-VIS photomultiplier, Oriel model 77340. The first test also used an Oriel deuterium source.

Measurement 1*

Using a holographic grating, blazed at 250 nm, the signal at 210 nm with a glass plate in the beam path was 0.1% of the signal at 210 nm without the glass. At 250 nm, the stray light signal was only 0.025% of the unblocked signal.

Measurement 2**

Using a Helium Neon Laser at 632.8 nm focused on the slit in an F/4 cone, the average of the stray radiation readings at 612.8 and 652.8 nm was 0.008% of the signal at 632.8 nm. A 1200 l/mm, 500 nm blaze ruled grating was used. In this case, the response of the detector is irrelevant as the only light detected is at 632.8 nm.

* The comparison is based on a taxing, but real measurement scenario, measuring monochromatic UV in the presence of a source producing scattered UV-VIS and a detector sensing it. The test is similar in principle to the ASTM E387 Test used for spectrophotometers. The test first records the signal at 210 and 250 nm. Then, all the real signal is blocked by insertion of a glass plate; what remains is scattered radiation.
** This measurement is primarily an indicator of the grating quality.

Instrument Control

We have made it as easy as possible to harness all the power of the Cornerstone 130. We offer two models: one with RS232 and IEEE-488 interfaces, and the other with a USB 2.0 interface. The optional Oriel remote hand controller is usable with either model. You can communicate with either version of the Cornerstone 130, in one of 3 manners.

Hand Controller

The 74009 Hand Controller is a dedicated interface just for the Cornerstone Monochromator Family. There is no need to memorize commands or key sequences; the 24 keys are clearly labeled with functions like "Step Up," "Go Wave," and "Shutter". The backlit LCD display provides constant information on grating lines/mm, filter wheel position, current wavelength, and shutter status. The 74009 provides intuitive access to nearly all the functionality of the Cornerstone 130.

Computer Control

The computer interface was also designed for simplicity and ease of use. The Cornerstone ASCII command set is simple to use via RS 232 or GPIB. For example, close the shutter is "SHUTTER C" and change to the second grating is "GRAT 2". The USB version utilizes an ActiveX control for ease of programming via VB, LabView, Excel, MatLab or any application supporting ActiveX controls.

Complete Software Packages

We offer various software applications for Cornerstone:

• A simple utility program to get up and running right away (included with all Cornerstone 130 instruments)

• For LabView programming we offer VIs (included with all Cornerstone 130 instruments)

• TRACQ^{TM} Basic; this is an optional instrument control and data acquisition software package. It controls the Cornerstone 130, its accessories, the Oriel Merlin™ Digital Lock-in, and new Optical Power Meter. TRACQ Basic^{TM} lets you set the monochromator parameters, i.e. grating changeover point, data collection points, etc., and walk away while Cornerstone does the work .

• TRACQ Pro^{TM} ; this program is our advanced Radiometry Software Application; it allows control of all Oriel spectroscopic instruments; it is primarily used to complement our InstaSpec^{TM} Benchtop Spectrometers, although it will control all Oriel Spectroscopic instruments (including the Cornerstone family of Monochromators)

Interchangeable Gratings

Each Cornerstone 130 grating comes mounted in its own pre-adjusted holder. Thus, the gratings are individually replaceable in the field. If, or when, your experiment changes, if you move to a new wavelength range, or if you require greater resolution - just order the single grating you need. There is no reason to send your entire system back, or to purchase multiple gratings all at once. Changing a grating takes only a few minutes and you will get repeatable results every time. The Cornerstone 130 holds two gratings simultaneously; if you wish to only use one grating, you will need to order the 74005 Grating Place Holder.

We offer a complete range of holographic and ruled gratings. Our standard Cornerstone gratings are listed in Table 1. Special gratings can be provided as well; contact a Sales Engineer with your requirements.

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Table 1 Grating Specifications for Cornerstone 130 1/8 m Monochromator

These gratings are mounted in pre-adjusted holders which can be inserted and removed, at any time, from the Cornerstone 130.

Line Density (l/mm)	Blaze Wavelength	Type	Reciprocal Dispersion (nm/mm)*	Peak Efficiency (%)	Primary Wavelength Region **	Instrument's Upper Wavelength Mechanical Limit (for specificed grating)	Model
3600	405 nm	Holographic	1.7	60	180 - 405 nm	530 nm	74020
2400	250 nm	Holographic	3.3	65	180 - 750 nm	800 nm	74021
1800	500 nm	Holographic	4.1	80	300 - 1070 nm	1070 nm	74022
1200	250 nm	Holographic	6.7	65	180 - 650 nm	1600 nm	74023
1200	350 nm	Ruled	6.6	80	200 - 1600 nm	1600 nm	74024
1200	750 nm	Ruled	6.2	85	450 - 1600 nm	1600 nm	74025
600	200 nm	Ruled	13.3	70	180 - 500 nm	3200 nm	74026
600	750 nm	Ruled	13.2	75	450 - 2000 nm	3200 nm	74027
600	1 µm	Ruled	13	80	600 - 2500 nm	3200 nm	74028
600	1.6 µm	Ruled	12.2	90	900 - 3000 nm	3200 nm	74035
300	2 µm	Ruled	26	90	1100 - 5000 nm	6400 nm	74029
200	1 µm	Ruled	40	85	600 - 2200 nm	9600 nm	74030
150	800 nm	Ruled	53	80	425 - 1600 nm	12.8 µm	74034
150	6 µm	Ruled	52	75	4.5 - 12 µm	12.8 µm	74031
75	7 µm	Ruled	105	80	4.5 - 20 µm	25.6 µm	74032
50	12 µm	Ruled	157	80	7 - 23 µm	38.4 µm	74033

* At blaze wavelength
** The primary wavelength region is where the grating efficiency is ≥20%. System efficiency will also be affected by the reflectivity of the mirrors and the grating angle, at any wavelength.

Three Types of Slits

We offer three types of slit assemblies for the Cornerstone™ 130. Choose the same size and type of slit for the input and output of your monochromator. All our slit assemblies have a 1.5 Inch Series male flange.

Micrometer Driven Slit Assembly

- Continuously variable width from 4 µm to 3 mm
- Continuously variable height from 1 to 15 mm
- ±10 µm repeatability
- ±10 µm accuracy from 4 to 250 µm, ±5% from 250 µm to 3 mm

This slit assembly uses a precision micrometer drive to adjust the width.

Multiple Fixed Slit Assembly

- 8 fixed slit positions from 50 µm to 3.16 mm
- Slit height is adjustable from 1 to 12 mm

This assembly consists of a rotating disc with 8 fixed slits. A manual wheel rotates the disc, which has a positive detent for exact repeatability of slit position.

Fixed Slit Assembly

- Most economical for single slit size
- Fixed width and height

If you only need a few slit sizes, this is the most economical choice. These are precision slits fixed on a machined slide. You need the 77294 Fixed Slit Holder to hold the slit and mate it to the monochromator.

Optional Motorized Filter Wheel

Choose the 74010 Motorized Filter Wheel to hold order sorting or neutral density filters. The 74010 holds six 1 inch (25.4 mm) diameter filters with no reduction in F/# (clear aperture, 0.87 inch (22 mm). Cornerstone[a] 130 controls the 74010. Filter changeover is only 1.5 seconds for adjacent filters.

Simple Filter Interchange

With most filter wheels, you have to break down the setup to change filters, but with the 74010, the filters are held in individual mounts that snap into place from the top of the wheel. Six individual filter holders are included with each 74010 Filter Wheel. We also offer these separately under model 74011. Mount all your filters in 74011 Holders to protect them and have them ready for insertion into the filter wheel. The 74012 Rod Mount holds a 74011 Filter Holder atop an optical rod.

Mounting

Cornerstone™ 130 has 1/4-20 tapped holes in the bottom for rod mounting. See Fig. 2 for hole locations. To hard mount the instrument to an inch or metric optical table or to a rail carrier, order the 74006 Mounting Plate. The plate adds 0.25 inch (6.35 mm) to the 1.4 inch (35.6 mm) optical height. To simplify alignment of an Oriel Light Source to Cornerstone, we offer mounting kits.
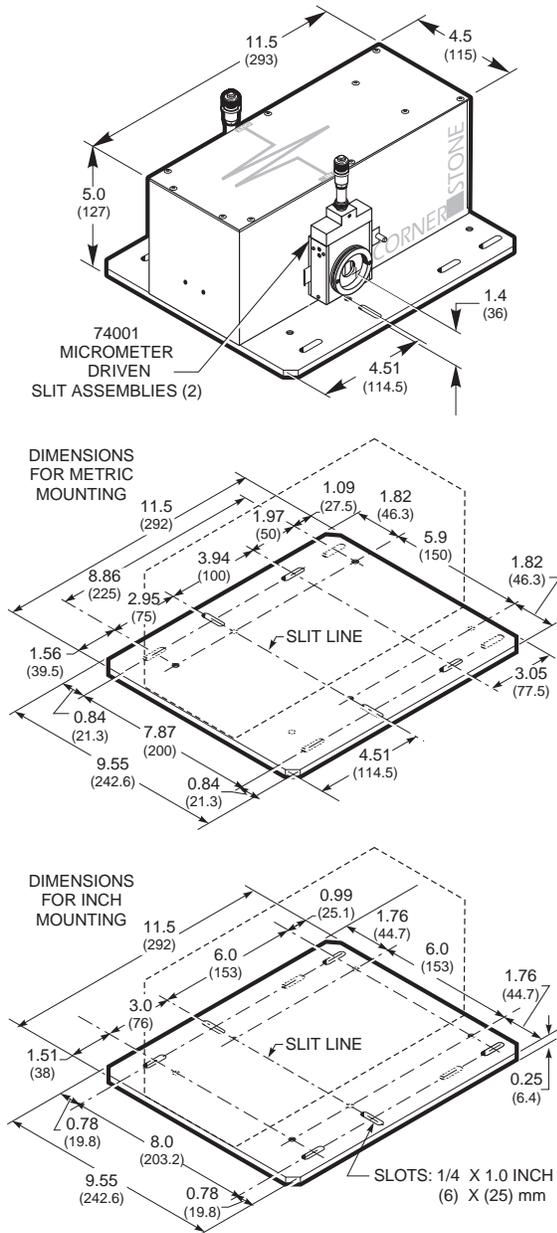
Specifications

Focal Length	130 mm
F/number	F/3.7
Usable Wavelength Range	180 nm to 24 µm with interchangeable gratings
Spectral Resolution *	
Wavelength Accuracy	0.50 nm
Wavelength Precision	0.08 nm
Maximum Slew Rate	350 nm/s
Weight	(3 kg)

*With 1200 l/mm grating, 10 µm x 2 mm slit

Fig. 2 Dimensional diagram of Cornerstone™ 130 1/8 m Monochromator
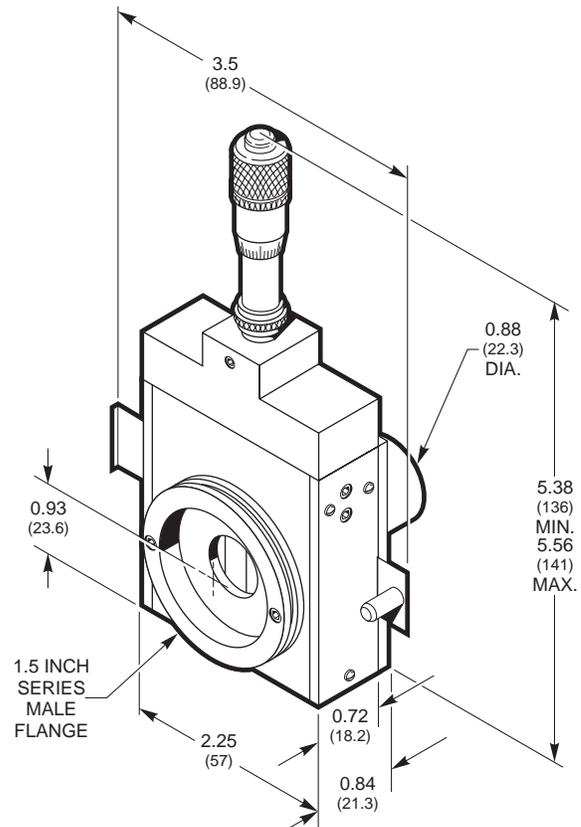
Fig. 3 Dimensional diagram of 74001 Micrometer Driven Slit Assembly

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Ordering Information

Cornerstone 130 Monochromators and Monochromator Systems

Model	Description	Interface(s)	Gratings Included	Slits Included	Price
74004	Cornerstone™ 130 1/8 m Motorized Monochromator	USB 2.0	None; Order separately	None; Order separately	
74037	UV-VIS Cornerstone™ 130 1/8 m Monochromator System	USB 2.0	(1) 74023 (1) 74024	(2) 74001 Micrometer Driven Slit Assemblies	
74038	High Resolution Cornerstone™ 130 1/8 m Monochromator System	USB 2.0	(1) 74021 (1) 74022	(2) 77294 Fixed Slit Holders (2) 77222 Fixed Slits	
74039	VIS-NIR Cornerstone™ 130 1/8 m Monochromator System	USB 2.0	(1) 74027 (1) 74035	(2) 74001 Micrometer Driven Slit Assemblies	
74000	Cornerstone™ 130 1/8 m Motorized Monochromator	RS-232 and IEEE-488	None; Order separately	None; Order separately	
74045	UV-VIS Cornerstone™ 130 1/3 m Monochromator System	RS-232 and IEEE-488	(1) 74023 (1) 74024	(2) 74001 Micrometer Driven Slit Assemblies	
74046	High Resolution Cornerstone™ 130 1/8 m Monochromator System	RS-232 and IEEE-488	(1) 74021 (1) 74022	(2)77294 Fixed Slit Holders (2) 77222 Fixed Slits	
74047	VIS-NIR Cornerstone™ 130 1/8 m Monochromator System	RS-232 and IEEE-488	(1) 74027 (1) 74035	(2) 74001 Micrometer Driven Slit Assemblies	

Gratings

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50	12 µm	Ruled	7 - 23 µm	38.4 µm	74033	
Grating Place Holder - Required when ordering a Cornerstone™ 130 with only (1) grating					74005	

Slit Assemblies

Description	Model	Price
Micrometer Driven Slit Assembly	74001	
Multiple Fixed Slit Assembly	77269	
Fixed Slit Holder Order at least one fixed slit for each holder	77294	

Accessories

Description	Model	Price
TRACQ Basic™	77890	
TRACQ Pro™	77891	
Hand Controller	74009	
Mounting Plate	74006	
7340 Dual Light Source and Cornerstone™ 130 Mounting Kit	74015	
250 W Research Source and Cornerstone™ 130 Mounting Kit	74017	
Motorized Filter Wheel	74010	
Filter Holder (6 included with 74010)	74011	
Rod Mount for 74011 Filter Holder	74012	

Fixed Slits

Slit Width (µm)	Slit Height (mm)	Resolution at 500 nm **	Model	Price
10	2	0,50	77222	
25	3	0,25	77220	
50	6	0,5	77219	
120	12*	1	77218	
280	12*	2	77217	
600	12*	4	77216	
760	12*	5	77215	
1240	12*	8	77214	
1560	12*	10	77213	
3160	12*	20	77212	
6320	12*	40	77211	

*Actual slit height is 18 mm, usable height is 12 mm
**For 1200 l/mm gratings