NIRQuest Spectrometers

Near-Infrared Measurements for Nearly Anything

NIRQuest

No matter what your work demands, NIRQuest® has you covered. The NIRQuest Series of Near-Infrared Spectrometers deliver excellent performance, accuracy and reliability.

These small-footprint spectrometers cover various ranges (depending on your configuration) from 900-2500 nm and are ideal for demanding applications ranging from moisture detection and chemical analysis to high-resolution laser and optical fiber characterization.

Features

- 512-element InGaAs array detector options covering 900-1700 nm, 900-2200 nm and 900-2100 nm
- 256-element options covering 900-2050 nm and 900-2500 nm
- Wide range of grating and optical bench options to optimize your setup
- External hardware triggering function for capturing data when an external event occurs or to trigger an event after data acquisition

Each NIRQuest spectrometer model is preset with optical bench and grating options appropriate for many NIR applications. However, we also offer a full range of slit, filter and grating options to optimize your setup for higher resolution needs or other similar performance requirements.

NIRQuest Options at a Glance

Model	Description	Best for These Application Needs
NIRQuest256-2.1	NIR Spectrometer, 900-2050 nm, 256-element InGaAs array; includes grating NIR2 (900-2050 nm), order-sorting filter and 25 µm slit	Good response at higher wavelengths (peak detector response ~1900 nm) and optical resolution <8.0 nm (FWHM)
NIRQuest256-2.5	NIR Spectrometer, 900-2500 nm, 256-element InGaAs array; includes grating NIR1 (900-2500 nm), order-sorting filter and 25 µm slit	Good response at higher wavelengths (peak detector response ~2200 nm) and optical resolution <10.0 nm (FWHM)
NIRQuest512	NIR Spectrometer, 900-1700 nm, 512-element InGaAs array; includes grating NIR3 (900-1700 nm) and 25 µm slit	Optimum response at ~1600 nm and good optical resolution (~3.0 nm FWHM)
NIRQuest512-2.2	NIR Spectrometer, 900-2200 nm, 512-element InGaAs array; includes grating NIR2 (900-2100 nm), order sorting filter and 25 µm slit	Good response across 900-2200 nm without sacrificing optical resolution performance (~4.6 nm FWHM)
NIRQuest512-2.5	NIR Spectrometer, 900-2500 nm, 512-element InGaAs array; includes grating NIR1 (900-2500 nm), order sorting filter and 25 µm slit	Good optical resolution (~6.3 nm FWHM) and low dark noise at long integration times

NIR Spectroscopy Applications

This list is by no means exhaustive, but it will give you an idea of the types of NIR spectroscopy applications that you can accomplish with NIRQuest:

Food & Beverage

- New observation of nondestructive evaluation for sweetness in apple fruit
- Water and fat determination in pork meat
- Qualification of quality parameters in selected vegetables and essential oil plants
- Analysis of barley and other grains
- Analysis of alcohol, real extract, original gravity, nitrogen and polyphenols in beers

Environmental

- Reflectance analysis for nitrogen of soils
- Pulpwood quality of standing trees
- Pigment analysis in various animal species
- Remote monitoring of dust particles from dry lake beds

Life Sciences and Biomedical

- Determination of cholinesterase in human blood using near infrared spectroscopy
- Characterization of NIR lasers
- Determination of NIR indicator dyes
- Analysis of constituents used in drug discovery

Industrial

- Near infrared spectroscopy for the monitoring of brewing processes
- Intrinsic near infrared sensor for the determination of the drainage behavior of aqueous detergent solutions
- Qualification of lubricants and other mineral oil products

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Specifications Comparison Table

Physical	NIRQuest512	NIRQuest512-2.2	NIRQuest512-2.5	NIRQuest256-2.1	NIRQuest256-2.5
Dimensions (mm):	182 x 110 x 47	182 x 110 x 47	182 x 110 x 47	182 x 110 x 47	182 x 110 x 47
Weight:	1.18 kg (2.6 lb.)	1.18 kg (2.6 lb.)	1.18 kg (2.6 lb.)	1.18 kg (2.6 lb.)	1.18 kg (2.6 lb.)
Detector					
Useable range:	900-1700 nm	900-2200 nm	900-2550 nm	900-2050 nm	900-2500 nm
Pixels/Pixel size:	512/ 25 µm x 500 µm	512/ 25 µm x 250 µm	512/ 25 µm x 250 µm	256/ 50 µm x 500 µm	256/ 50 µm x 500 µm
Optical Bench					
Slit (standard):	25 µm	25 µm	25 µm	25 µm	25 µm
Entrance aperture (custom options):	10 µm, 50 µm, 100 µm and 200 µm (or no slit)	10 µm, 50 µm, 100 µm and 200 µm (or no slit)	10 µm, 50 µm, 100 µm and 200 µm (or no slit)	10 µm, 50 µm, 100 µm and 200 µm (or no slit)	10 µm, 50 µm, 100 µm and 200 µm (or no slit)
Grating options (standard):	Grating NIR3, 150 l/mm, 900-1700 nm	Grating NIR2, 100 l/mm, 900-2050 nm	Grating NIR1, 75 l/mm, 1075-2500 nm	Grating NIR2, 100 l/mm, 900-2050 nm	Grating NIR1, 75 l/mm, 1075-2500 nm
Grating options (custom):	NIR10, NIR11, NIR12, NIR13 and NIR14	NIR2, NIR3, NIR10, NIR11, NIR12 and NIR13	NIR2, NIR3, NIR10, NIR11, NIR12 and NIR13	NIR2, NIR3, NIR10, NIR11, NIR12 and NIR13	NIR2, NIR3, NIR10, NIR11, NIR12 and NIR13
Order-sorting (standard):	NA	Yes	Yes	Yes	Yes
Longpass filter:	OF1-RG830 longpass NIR filter (optional)	OF1-RG830 longpass NIR filter (optional)	OF1-RG830 longpass NIR filter (optional)	OF1-RG830 longpass NIR filter (optional)	OF1-RG830 longpass NIR filter (optional)
Fiber optic connector:	SMA 905 to 0.22 NA optical fiber	SMA 905 to 0.22 NA optical fiber	SMA 905 to 0.22 NA optical fiber	SMA 905 to 0.22 NA optical fiber	SMA 905 to 0.22 NA optical fiber
Spectroscopic					
Wavelength range:	900-1700 nm w/NIR3	900-2200 nm w/NIR2	900-2500 nm w/NIR1	900-2050 nm w/NIR2	900-2500 nm w/NIR1
Optical resolution (FWHM):	~3.1 nm w/25 µm slit	~5.0 nm w/25 µm slit	~6.3 nm w/25 µm slit	~7.6 nm w/25 µm slit	~ 9.5 nm w/25 µm slit
Signal-to-noise ratio at full signal:	>15000:1 @ 100 ms integration; >13000:1 @ 1000 ms integration	10000:1 @ 100 ms integration	10000:1 @ 100 ms integration	10000:1 @ 100 ms integration	7500:1 @ 10 ms integration
A/D resolution	16-bit	16-bit	16-bit	16-bit	16-bit
Dark noise:	6 RMS counts @ 100 ms	6 RMS counts @ 100 ms	4 RMS counts @ 10 ms	6 RMS counts @ 100 ms	8 RMS counts @ 10 ms
	12 RMS counts @ 1000 ms	12 RMS counts @ 250 ms	16 RMS counts @ 250 ms	12 RMS counts @ 250 ms	12 RMS counts @ 30 ms
Dynamic range:	15 x 10^6 (system); 15000:1 for a single acquisition	15 x 10^6 (system); 10000:1 for a single acquisition	15 x 10^6 (system); 10000:1 for a single acquisition	15 x 10^6 (system); 10000:1 for a single acquisition	15 x 10^6 (system); 7500:1 for a single acquisition
Integration time:	1 ms-120 seconds	1 ms-2000 ms	1 ms – 400 ms	1 ms-2000 ms	1 ms-60 ms
Electronics					
Data transfer speed:	Full scan to memory every 5 ms with USB	Full scan to memory every 5 ms with USB	Full scan to memory every 5 ms with USB	Full scan to memory every 5 ms with USB	Full scan to memory every 5 ms with USB
Trigger modes:	2 modes	2 modes	2 modes	2 modes	2 modes
Strobe functions:	Yes	Yes	Yes	Yes	Yes
Temperature & Thermoelectric Cooling					
Temperature limits (environmental):	10-35 ºC (0-90% non-condensing)	10-35 ºC (0-90% non-condensing)	10-35 ºC (0-90% non-condensing)	10-35 ºC (0-90% non-condensing)	10-35 ºC (0-90% non-condensing)
TEC setpoint (software controlled):	Control at -5 ºC (up to 30 ºC below ambient)	Control at -20 ºC (up to 45 ºC below ambient)	Control at -20 ºC (up to 45 ºC below ambient)	Control at -20 ºC (up to 45 ºC below ambient)	Control at -20 ºC (up to 45 ºC below ambient)
Computer					
Operating systems	Windows 2000/XP and Vista (32-bit only); Mac OS X and Linux w/USB port; any 32-bit Windows OS with serial port	Windows 2000/XP and Vista (32-bit only); Mac OS X and Linux w/USB port; any 32-bit Windows OS with serial port	Windows 2000/XP and Vista (32-bit only); Mac OS X and Linux w/USB port; any 32-bit Windows OS with serial port	Windows 2000/XP and Vista (32-bit only); Mac OS X and Linux w/USB port; any 32-bit Windows OS with serial port	Windows 2000/XP and Vista (32-bit only); Mac OS X and Linux w/USB port; any 32-bit Windows OS with serial port

NIRQuest Spectrometers

Optical Bench Options for Your Custom NIRQuest Spectrometer

Each NIRQuest model is available as a standard configuration comprising some combination of InGaAs array detector, grating, order-sorting filter and 25 µm slit. In addition, you can customize your NIRQuest by mixing and matching optical bench accessories with the assistance of an Ocean Optics Applications Scientist. Here are your options:

Detectors

Each NIRQuest Spectrometer uses a different Hamamatsu InGaAs-array detector and comes with a preconfigured combination of that detector and optical bench components. If you wish to customize your setup – for example, change the slit size – you'll need to itemize the components, beginning with these detector options:

Item	Description
NQ256-2.1	NIR Spectrometer, 900-2100 nm, 256-element InGaAs array
NQ256-2.5	NIR Spectrometer, 900-2500 nm, 256-element InGaAs array
NQ512	NIR Spectrometer, 900-1700 nm, 512-element InGaAs array
NQ512-2.2	NIR Spectrometer, 900-2200 nm, 512-element InGaAs array
NQ512-2.5	NIR Spectrometer, 900-2500 nm, 512-element InGaAs array

Fixed Entrance Slits

Our entrance slits are rectangular apertures that are 1 mm tall and come in various widths. The standard NIRQuest configuration has a 25 µm slit. Here are your other options:

Slit	Description	Pixel Resolution (approximate), by Model				
		NIRQuest512	NIR-Quest512-2.2	NIR-Quest512-2.5	NIR-Quest256-2.1	NIR-Quest256-2.5
SLIT-10	10 µm width x 1 mm height	2.0 pixels	2.0 pixels	2.0 pixels	6.7 pixels	8.3 pixels
SLIT-25	25 µm width x 1 mm height	3.1 pixels	3.1 pixels	3.1 pixels	7.6 pixels	9.5 pixels
SLIT-50	50 µm width x 1 mm height	3.6 pixels	3.6 pixels	3.6 pixels	8.9 pixels	11.1 pixels
SLIT-100	100 µm width x 1 mm height	6.6 pixels	6.6 pixels	6.6 pixels	11.2 pixels	13.9 pixels
SLIT-200	200 µm width x 1 mm height	12.3 pixels	12.3 pixels	12.3 pixels	17.9 pixels	22.2 pixels

Order-sorting and Longpass Filters

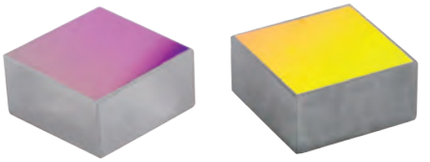
Order-sorting filters and longpass filters are installed in the optical bench. Order-sorting filters are standard with all NIRQuest models except the NIRQuest512. For custom NIRQuest orders, you'll need to call out the appropriate OSF filter (see table). The OF1-RG830 is a longpass filter recommended for custom configurations with Grating NIR1 or Grating NIR2.

Item	Description
OSF-NIRQUEST256-2.1	Order-sorting filter, installed, for custom NIRQUEST256-2.1 configurations
OSF-NIRQUEST256-2.5	Order-sorting filter, installed, for custom NIRQUEST256-2.5 configurations
OSF-NIRQUEST512-xx	Order-sorting filter, installed, for custom NIRQUEST512 configurations; contact an Applications Scientist for details
OF1-RG830	Longpass filter, installed, transmits >830 nm; recommended for custom NIR-Quest configurations with Grating NIR1 or Grating NIR2

NIRQuest Spectrometers
Choosing the Right Grating

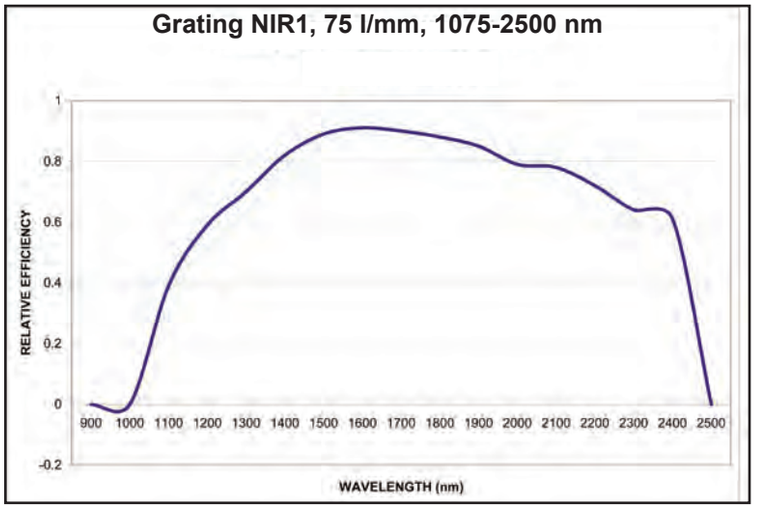
Grating Options

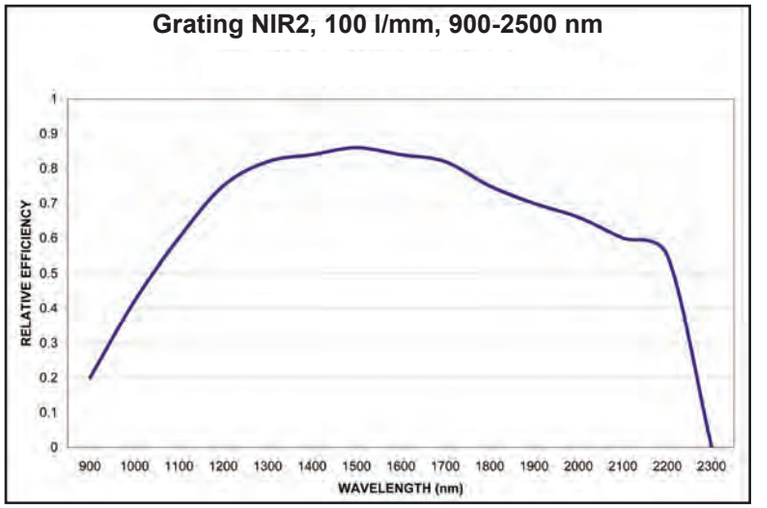
Customized NIRQuest Spectrometers are available with a choice of up to eight gratings. With each grating, you consider its groove density (which helps determine the resolution), its spectral range (which helps determine the wavelength range) and its blaze wavelength (which helps determine the most efficient range).



Grating	Intended Use	Groove Density (lines/mm)	Spectral Range	Blaze Wavelength	Best Efficiency (>30%)
NIR1	NIRQuest256-2.5, NIRQuest512-2.5	75	1600 nm	1700 nm	1075-2500 nm
NIR2	NIRQuest256-2.1, NIRQuest256-2.5, NIRQuest512-2.2, NIRQuest512-2.5	100	1200 nm	1600 nm	900-2050 nm
NIR3	NIRQuest256-2.1, NIRQuest256-2.5, NIRQuest512, NIRQuest512-2.2, NIRQuest512-2.5	150	~800 nm	1100 nm	900-1700 nm
NIR10	NIRQuest256-2.1, NIRQuest256-2.5, NIRQuest512, NIRQuest512-2.2, NIRQuest512-2.5	300	350-380 nm	1200 nm	750-2200 nm
NIR11	NIRQuest256-2.1, NIRQuest256-2.5, NIRQuest512, NIRQuest512-2.2, NIRQuest512-2.5	400	240-290 nm	1600 nm	980-2500 nm
NIR12	NIRQuest256-2.1, NIRQuest256-2.5, NIRQuest512, NIRQuest512-2.2, NIRQuest512-2.5	500	160-220 nm	1370 nm	900-2500 nm
NIR13	NIRQuest256-2.1, NIRQuest256-2.5, NIRQuest512, NIRQuest512-2.2, NIRQuest512-2.5	600	100-180 nm	1200 nm	800-2500 nm
NIR14	NIRQuest512	1000	50-90 nm	1310 nm	900-1700 nm

Additional grating options, adjustments to starting and ending wavelengths and similar customization may be available. Also, spectral range can vary by starting wavelength. For optimum performance, starting wavelengths should be set at >/= 900 nm. Please contact an Applications Scientist for details.





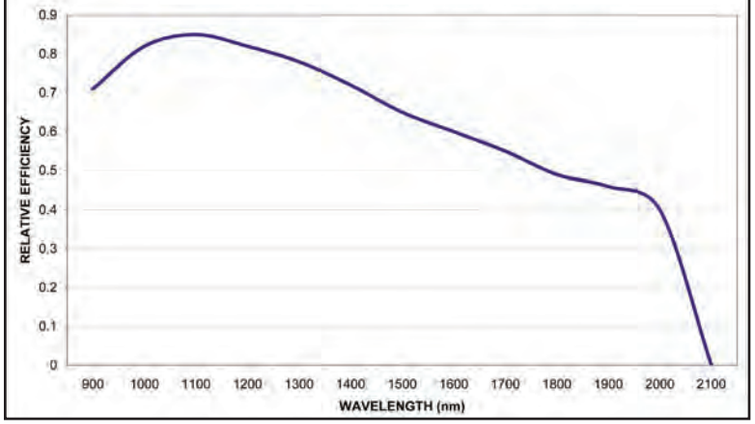
Technical Tip

Gratings and slits are fixed in place and can only be replaced at our manufacturing facility. That's why it's important to consider all the variables involved in system performance, including detector and grating response, slit size and other bench accessories. Our Application Scientists have configured thousands of spectrometers for all sorts of applications and can offer invaluable consultation as you consider your application.

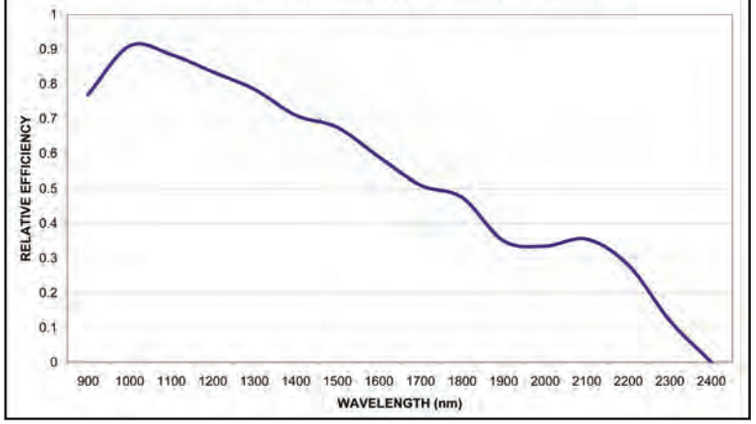
NIRQuest Spectrometers

NIRQuest Grating Efficiency Curves

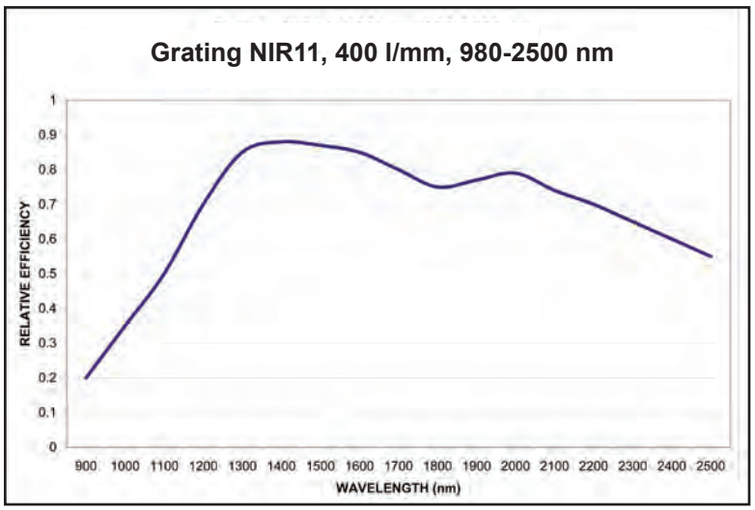
Grating NIR3, 150 l/mm, 900-1700 nm



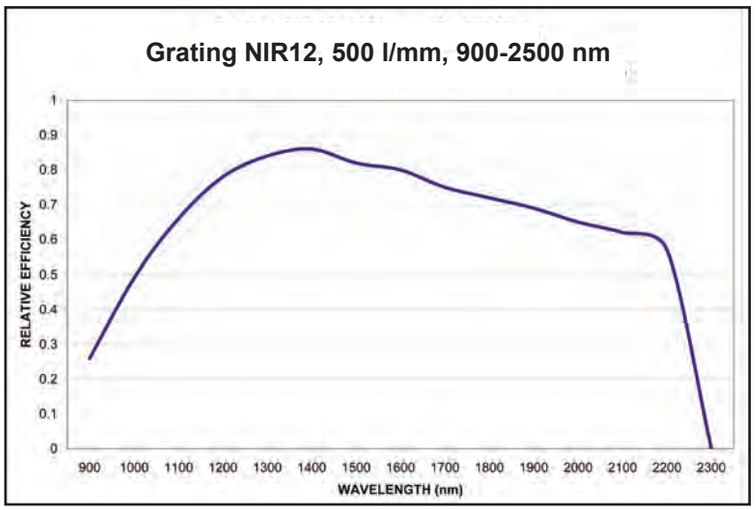
Grating NIR10, 300 l/mm, 750-2200 nm



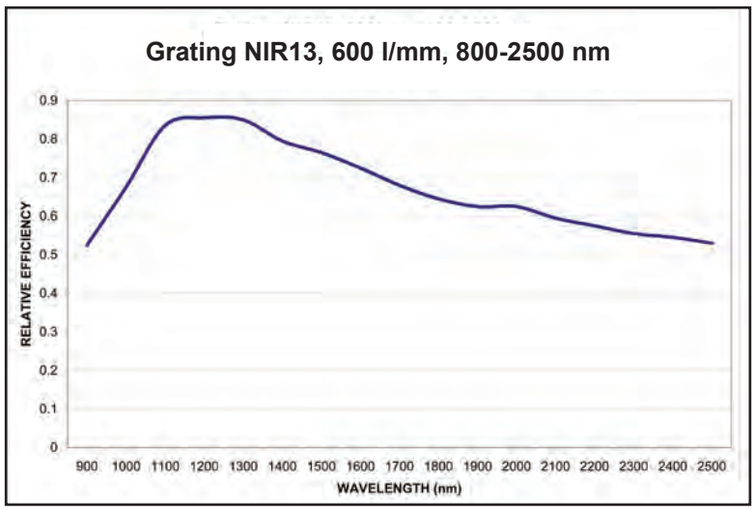
Grating NIR11, 400 l/mm, 980-2500 nm



Grating NIR12, 500 l/mm, 900-2500 nm



Grating NIR13, 600 l/mm, 800-2500 nm



Grating NIR14, 1000 l/mm, 900-1700 nm