

The NIR Specialists

The spectrometers of the PGS family are designed for use in the NIR. InGaAs (indium-gallium-arsenide) is used as a detector material in this wavelength range. The special combination of aspheric collimator and focusing lens allows the use of plane gratings optimized for the NIR, while maintaining good flat field correction of the spectral imaging. Excellent long-term stability is ensured by the permanent connection of all optical components.

Optical components of the PGS family

- blazed plane gratings
- aspheric lenses
- mono-fiber with slit as optical input
- cooled InGaAs photodiode array as opto-electronic output

Central body

In the PGS family, a special aluminum alloy (coefficient of expansion $\alpha \sim 13 \times 10^{-6}$) is used for the central body. This housing is the carrier of the blazed grating and of the aspheric collimator and focusing lens. The input fiber and the detector are permanently connected to the central body, therefore providing excellent stability.

Gratings

The gratings for the PGS family are mechanically ruled or holographically recorded plane gratings. The maximum efficiency is adapted to the special wavelength range in the NIR. The grating surface with the clear diameter of the lenses is dimensioned so that the light of a fiber with NA of up to 0.37 can be hold.

Input fiber

The coupling of light is performed in the standard way via a glass monofiber. These fibers have a diameter of 600 μm and a NA = 0.22. The end of the fiber features a slit with a height of 500 μm (NIR 1.7) or 250 μm (NIR 2.2). The slit heights at the entrance are adapted to the pixel heights of the InGaAs arrays. A crosssectional conversion similar to the silicon detectors is not necessary.

Detector

For the PGS NIR 1.7 standard InGaAs is used for the wavelength range up to 1700 nm. Detectors with 256 or 512 elements are available. To go up to the wavelength range of 2.2 μm the use of Extended InGaAs is necessary. In the PGS NIR 2.0 and PGS NIR 2.2 detectors with 256 elements are used. For the Extended InGaAs arrays, blocking filter for suppressing the 2nd diffraction order is applied to the array.

Detector

	PGS NIR 1.7-512	PGS NIR 1.7-256	PGS NIR 2.0-256	PGS NIR 2.2-256
Producer	Sensor Unlimited Inc	Hamamatsu	Hamamatsu	Hamamatsu
Typ	Multiplexed InGaAs SU 512LD-1.7 T1	Multiplexed InGaAs G9203	Multiplexed InGaAs G9206*	Multiplexed InGaAs G9206*
Number of pixels	512	256	256	256
Dimensions of pixels	25 x 500 μm	50 x 500 μm	50 x 250 μm	50 x 250 μm

*According to manufacturer specification up to 5 defect pixels are allowed.

Preamplifier

	PGS NIR 1.7-512	PGS NIR 1.7 1.7-256	PGS NIR 2.0 2.0-256	PGS NIR 2.2 2.2-256
Output	differential output		differential output	
Output voltage range	ca. $\pm 4\text{ V}$		ca. $\pm 4\text{ V}$	
Rise time	40 V/ μs differential		40 V/ μs differential	
Clock-Rate	40 KHz up to 2 MHz		80 KHz up to 4 MHz	
Read out pixel rate	10 – 500 kPixel/s		10 – 500 kPixel/s	
Power consumption	650 mW incl. diode array (without cooling)		650 mW incl. diode array (without cooling)	

System data

Realised with	15-Bit-AD-conversion Clock-Rate 80 KHz
Noise	typ. < 4 count standard deviation of dark signal
Dynamic range	≥ 13 Bit



PGS Family
The NIR Specialists

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Plane Grating Spectrometer
from Carl Zeiss



We make it visible.

Plane Grating Spectrometer

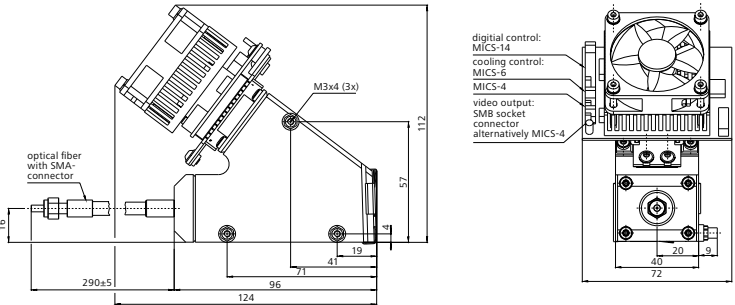
PGS NIR 1.7-256 (960 nm – 1690 nm)
PGS NIR 1.7-512 (960 nm – 1690 nm)
PGS NIR 2.0-256 (1340 nm – 2000 nm)
PGS NIR 2.2-256 (1000 nm – 2150 nm)



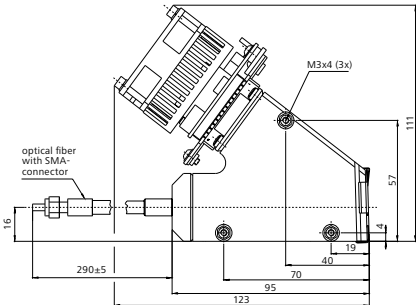
Technical Specifications

		PGS NIR 1.7-512	PGS NIR 1.7-256
Optical entrance	input round	Fiber consisting of Infrasil-quartz glass Diameter: 0.6 mm Length: 300 mm NA = 0.22 (has to be filled for full specification) mounted in SMA-coupling	Fiber consisting of Infrasil-quartz glass Diameter: 0.6 mm Length: 300 mm NA = 0.22 (has to be filled for full specification) mounted in SMA-coupling
	output linear	Slit width: 80 µm	Slit width: 80 µm
Filter		950 nm edge filter	950 nm edge filter
2nd order filter on detector		—	—
Grating		Plane grating, 484 l/mm, blazed for approx. 1.2 µm	Plane grating, 484 l/mm, blazed for approx. 1.2 µm
Diode array		Producer: Sensor Unlimited Inc Type: SU512LD-1.7 T1 Number pixels: 512	Producer: Hamamatsu Type: S9203-256 Number pixels: 256
Spectral range		960 – 1690 nm	960 – 1690 nm
Wavelength accuracy		± 1 nm	± 1 nm
Temperature – induced drift (10–40°C)		< 0.012 nm/K	< 0.012 nm/K
Mean spectral pixel pitch		$\Delta\lambda_{\text{Pixel}} \approx 1.5 \text{ nm}$	$\Delta\lambda_{\text{Pixel}} \approx 3 \text{ nm}$
Resolution		$\Delta\lambda_{\text{FWHM}} \approx 5 \text{ nm}$	$\Delta\lambda_{\text{FWHM}} \approx 8 \text{ nm}$
Straylight		≤ 0.1 % as transmission of 10 mm water at 1405 nm (exposure from halogen lamp)	≤ 0.1 % as transmission of 10 mm water at 1405 nm (exposure from halogen lamp)
Weight		approx. 590 g	approx. 590 g

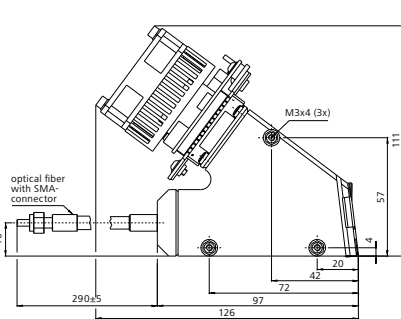
Dimensional drawing PGS NIR 1.7-512



Dimensional drawing PGS NIR 1.7-256



Dimensional drawing PGS NIR 2.0-256



Dimensional drawing PGS NIR 2.2-256

