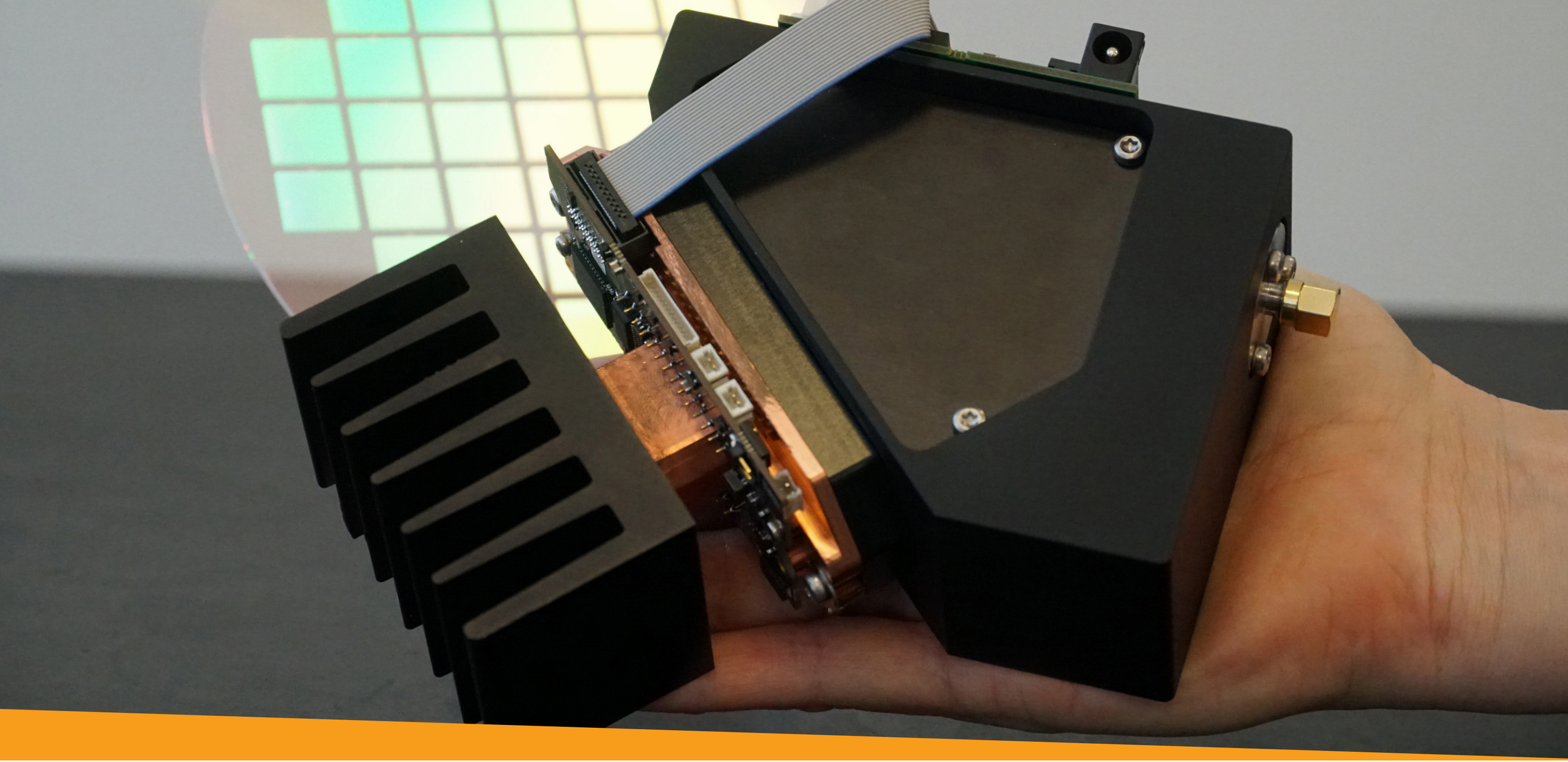


ROCK NIR and XNIR

High Throughput with 4 Times the Sensitivity of Comparable Spectrometers

Ibsen photonics

ROCK NIR and XNIR - Provides Faster and More Accurate Measurements

The ROCK NIR and XNIR spectrometers provide industry-leading optical throughput, with 4-8 times the sensitivity of comparable spectrometers. Due to this, the best possible SNR is achieved enabling the spectrometer to measure faster and more accurately compared to other spectrometer designs of similar form factor.

The spectrometers are designed with a numerical aperture of 0.22 NA to match the input fibers used in the industry. Hence, you can achieve optimal spectrometer performance using industry-standard optical components, to eliminate extra cost for specialized equipment.

Key Features

- Wavelength ranges: 900 to 1700 nm for NIR and 1100 to 2100 nm for XNIR
- Numerical aperture of 0.22
- Resolution from 3.3 nm to 10.0 nm for NIR and 5.6 nm to 12.8 nm for XNIR
- Footprint of 123 mm x 148 mm x 52 mm for NIR and 131 mm x 149 mm x 54 mm for XNIR
- Symmetrical peak shapes

Industries

Our spectrometers are well suited as the spectral engine in your analytical instrument for a wealth of applications in:

- Health care and life science
- Food and agriculture
- Light measurement
- Semiconductor manufacturing
- Security
- Biophotonics

High Throughput Design

The numerical aperture of the spectrometer is 0.22 (equivalent to a F-number of 2.2), which means that the spectrometer can accept a wide cone of light. For instance, the high NA of 0.22 matches the NA of typical multimode fibers thereby ensuring maximum coupling from a fiber to the spectrometer. This is in contrast to many other compact spectrometers that has lower NA and thereby does not couple nearly as much light into the spectrometer as the ROCK NIR and XNIR.

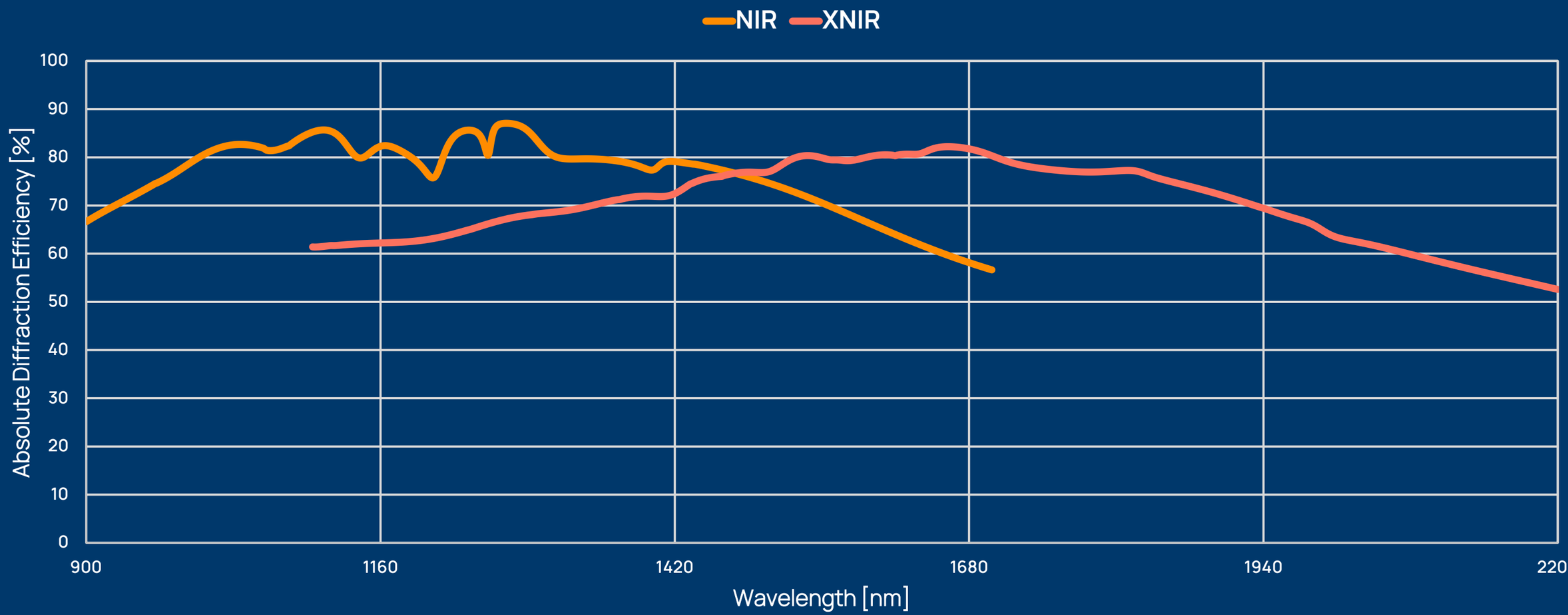
The ROCK NIR and XNIR spectrometers can be configured by Ibsen with a range of input slits providing the optical FWHM resolution that best suits your requirements. Since a slit will limit the amount of available light on the detector we always recommend that you work with the largest possible optical resolution that is acceptable in your application.

Ibsen Photonics can in most cases customize a ROCK spectrometer to accept almost any other line array detector. Please, contact Ibsen Photonics directly to discuss adaptation to a non-standard detector array.

Technical Specifications

		ROCK NIR	ROCK XNIR
Spectral range		900 – 1700 nm	1100 – 2100 nm
Wavelength accuracy		< 0.5 nm	< 0.5 nm
Resolution*	Slit width 25 µm (0.11 NA) 70 µm 150 µm	3.3 nm (512 pixel detector) 7.0 nm (256 pixel detector) 10.0 nm (256 pixel detector)	5.6 nm (256 pixel detector) 8.7 nm (256 pixel dectector) 12.8 nm (256 pixel detector)
Slit height		500 µm	500 µm
Numerical aperture		0.22 (0.11 NA if 25 µm slit width)	0.22 (0.11 NA if 25 µm slit width)
Stray light	Monochromatic input	< 0.03 % (at ± 10 x FWHM from peak)	< 0.03 % (at ± 10 x FWHM from peak)
Detector	G11477 can have up to 5% defective pixels	Hamamatsu G11508-256 / G11508-512 256 x 1 pixels / 512 x 1 pixels 50 x 500 µm pixel / 25 x 500 µm pixel size SNR 5000:1** Dynamic range 9500:1** One-stage TE-cooled InGaAs	Hamamatsu G11477-256 / G11477-512 256 x 1 pixels / 512 x 1 pixels 50 x 250 µm pixel / 25 x 250 µm pixel size SNR 3000:1*** Dynamic range 3500:1*** Two-stage TE-cooled InGaAs
Interface		DISB with SPI, DISB with USB 2.0	DISB with SPI, DISB with USB 2.0
Temperature induced drift		< 0.02 nm /°C	< 0.02 nm /°C
Operating temperature range	Non-condensing	0 to +50 °C	0 to +50 °C
Storage temperature range	Non-condensing	-40 to +85 °C	-40 to +85 °C
Dimensions	Excluding electronics	123 mm x 148 mm x 52 mm	131 mm x 149 mm x 54 mm

*Typical values
** Typical value when using the DISB-466 electronics at 1 second exposure time and a detector temperature of 0 °C
*** Estimated typical value at 0.5 seconds exposure time and a detector temperature of -20 °C



Transmission Gratings

The ROCK NIR and XNIR spectrometers utilizes Ibsen Photonics NIR and XNIR transmission gratings. The grating provides a high even diffraction efficiency, as evident by the absolute diffraction efficiency graph displayed above.

The design also provides very low polarization dependence as an added benefit.

Every grating used in the ROCK NIR and XNIR spectrometer is a master grating fabricated at Ibsen Photonics' clean-room facility in Denmark.

Detectors

The ROCK NIR and ROCK XNIR platform utilizes four different detectors as standard, specifically selected to cover the wavelength range of the different spectrometers with an efficient and low noise TE cooled InGaAs-based detector. The possibility of using either a 256 or 512 pixel detector further enables the spectrometer to be configured for high spectral resolution or high throughput.

470 / 471 – Hamamatsu G11508-256 / G11508-512

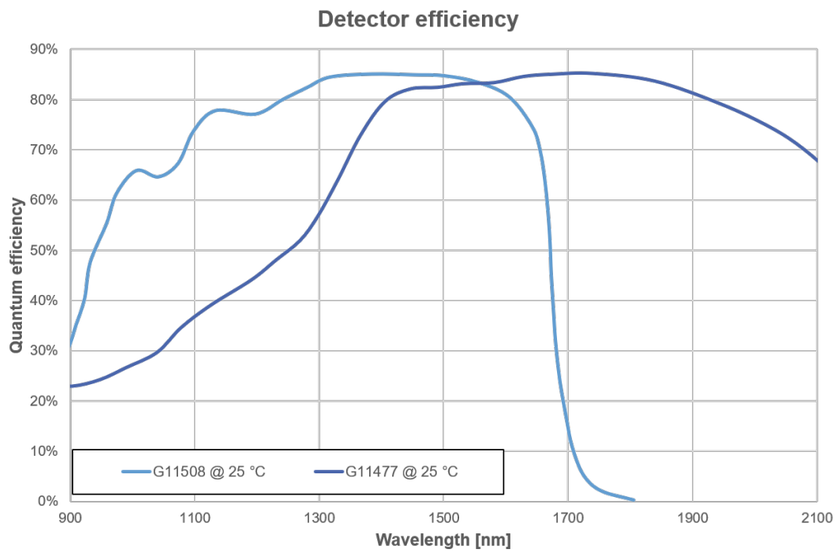
The Hamamatsu G11508 series of detectors offer great sensitivity in the 900 nm to 1700 nm spectral region while having low readout and dark noise, utilizing the built-in one stage TE cooling. The large electron well of the detector enables impressive signal-to-noise ratios while also achieving a high dynamic range, which can be changed dynamically to fit your use case. Each detector also has the added benefit of having no defective pixels in the pixel array.

The detector has a 256 x 1 or 512 x 1 pixel array, depending on the model, where each pixels has the dimension of either 50 µm x 500 µm (256 pixel array) or 25 µm x 500 µm (512 pixel array).

466 / 467 – Hamamatsu G11477-256 / G11477-512

The Hamamatsu G11477 series opens up NIR spectroscopy in an even higher wavelength range of 900 nm to 2150 nm, while still maintaining excellent dark noise performance, due to the integrated two-stage TE cooling. The extended NIR range of the detector is enabled by using a complex semiconductor matrix and up to 5% of pixels in the pixels array are therefore allowed to perform outside the specifications of Hamamatsu.

The detector has a 256 x 1 or 512 x 1 pixel array, depending on the model, where each pixels has the dimension of either 50 µm x 250 µm (256 pixel array) or 25 µm x 250 µm (512 pixel array).

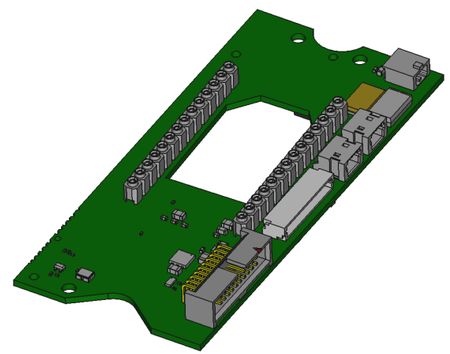


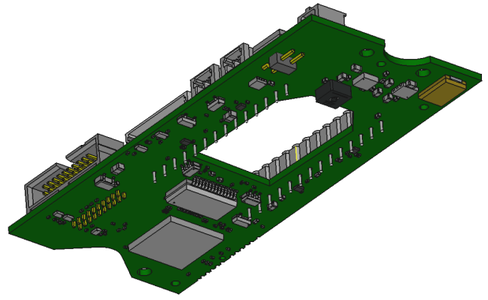
Electronics

For easy integration of the spectrometer into your application, Ibsen Photonics supplies its Digital Image Sensor Boards (DISB). The DISB is designed to effortlessly convert the analogue signal of the detector into a digital one and facilitate temperature control of the TE cooled detector, while operating via hardware commands over a Serial Peripheral Interface (SPI). The DISB electronics can also be supplied with a DISB-to-USB Bridge board, which converts the SPI connection to a standard USB 2.0 for convenient connection to a PC.

Alternatively, the spectrometer can be purchased without any accompanying electronics, giving direct access to the pins on the chosen detector

	DISB-466
	G11508 or G11477
Read-out speed	3 kHz (1 kHz via USB)
A/D bit depth	16-bit
Communication interface	SPI
Software trigger	Yes
Ext. hardware trigger	Yes
Min. trigger delay	1. 52 µs
Trigger jitter	20 ns
Time increments	200 ns
Exposure time	1.2 µs - 859 s
On-board calibration data	Yes
On-board averaging	Yes
GPIO pinout	Yes
Programmable lamp control	Yes
Region of interest	Yes
Temperature sensor	Yes
TEC control	Yes





Software interfacing

The **DISB-to-USB bridge** board developed by Ibsen Photonics is an additional board that can be added to any spectrometer equipped with DISB electronics, to convert the DISB's SPI connection to a standard USB 2.0 connector, for convenient use via a standard PC.

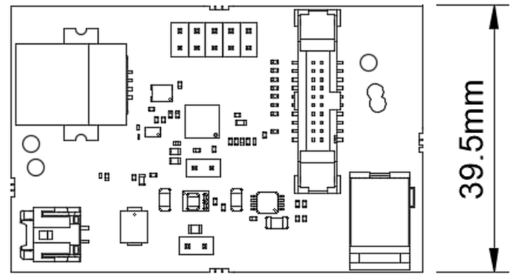
The DISB-to-USB board is based around the **FTDI FT4222H** chipset, with drivers available for Windows, Linux, or Mac. The entire USB protocol is handled in the chip with no requirement for specific complicated USB firmware programming.

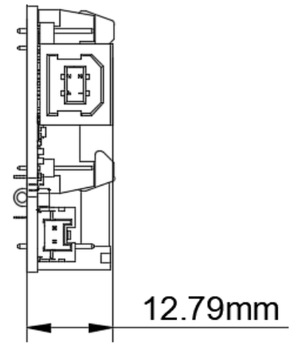
Ibsen Photonics supplies its LabVIEW-developed **Ibsen DISB-USB Evaluation software** as standard with the bridge board. This allows for the operation of the spectrometer and its features in a straightforward fashion using the Windows operating system.

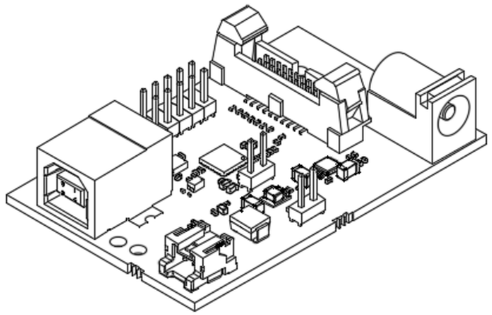
Additionally, an **SDK** is available for the bridge board, allowing for simple, intuitive, and fast deployment of instruction sets and code via C/C++, C#, LabVIEW, Python, or MATLAB, via DLL and accompanying header files. The proprietary Ibsen command set allows for initialization, spectrum capturing, and closing of the spectrometer connection, with as little as three commands, as shown below.

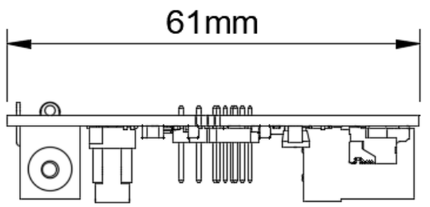
IBSEN_InitSpectrometer → **IBSEN_produceSpectra** → **IBSEN_closeDevice**

It is also possible to interface with FT4222H library files directly. Code samples using C/C++, C#, LabVIEW, and Python are available, if you need to develop your own implementation from the ground up.



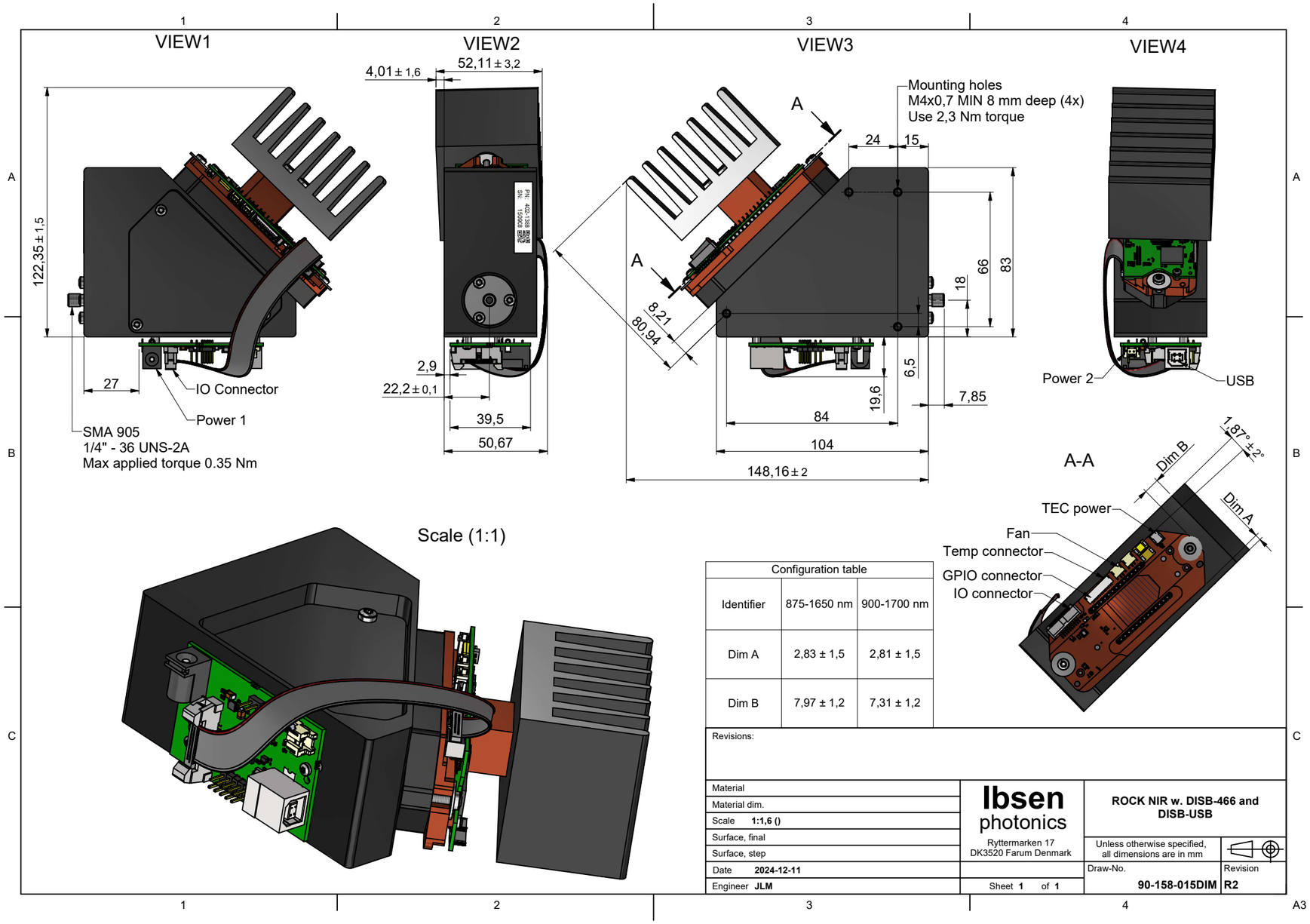






Mechanical Drawings

ROCK NIR including electronics



Scale (1:1)

Configuration table		
Identifier	875-1650 nm	900-1700 nm
Dim A	2,83 ± 1,5	2,81 ± 1,5
Dim B	7,97 ± 1,2	7,31 ± 1,2

Revisions:

Material		**Ibsen** photonics	**ROCK NIR w. DISB-466 and DISB-USB**
Material dim.			
Scale **1:1,6 ()**		Ryttermarken 17 DK3520 Farum Denmark	Unless otherwise specified, all dimensions are in mm
Surface, final			
Surface, step			Draw-No. **90-158-015DIM** / Revision **R2**
Date **2024-12-11**			
Engineer **JLM**		Sheet **1** of **1**	

About Ibsen Photonics

Ibsen was founded in 1991 by Per Ibsen under the name of Ibsen Micro Structures A/S. Today, 88% of Ibsen Photonics is majority owned by Foss A/S, a world leader in analytical solutions for the Food and Agricultural industries. Ibsen management and employees own 12 % of the shares in the company.

The Ibsen spirit combines the dynamic, entrepreneurial culture of a medium size company with a disciplined, operational mentality of a large corporation. With an average employee tenure of more than 10 years, Ibsen makes for a very effective organization that builds on more than 30 years of experience as a company.

Ibsen employs more than 75 people at our R&D and manufacturing facility in Denmark and achieved a turnover of more than 150 MDKK in 2023.

Working with Ibsen Photonics

The core expertise of Ibsen Photonics lies in opto-mechanical design, grating technology and metrology. We master the cycle from optics, grating simulation and design, through optical and semiconductor production technologies, to high volume assembly, packaging and testing. Over the years, we have developed many new designs, technologies and processes - many patented.

Our customers are large to medium-sized manufacturers of advanced optical devices and instruments, into which our products are integrated. With a highly organized production process, we are able to help customers obtain smooth instrument production, low unit-to-unit variation, high level of right first time, no field returns, and a low level of rework.

Our grating production facilities are world-class, including class 10 cleanroom facilities that we designed and built in 2000/2001, in which all environmental parameters are under continuous surveillance.

Our spectrometers are produced under strict quality control in our assembly facility in Denmark, certified to ISO 9001, ISO 13485, ISO 14001 and ISO 45001. This confirms Ibsen's capability to consistently produce high quality products that meet market standards and all regulatory requirements.

Contact us

Ibsen Photonics A/S
Ryttermarken 17
DK-3520 Farum
Denmark

Telephone:
+45 4434 7000

Email:
sales@ibsen.com

Ibsen photonics