

Ultra-compact PEBBLE NIR spectrometer with high stability



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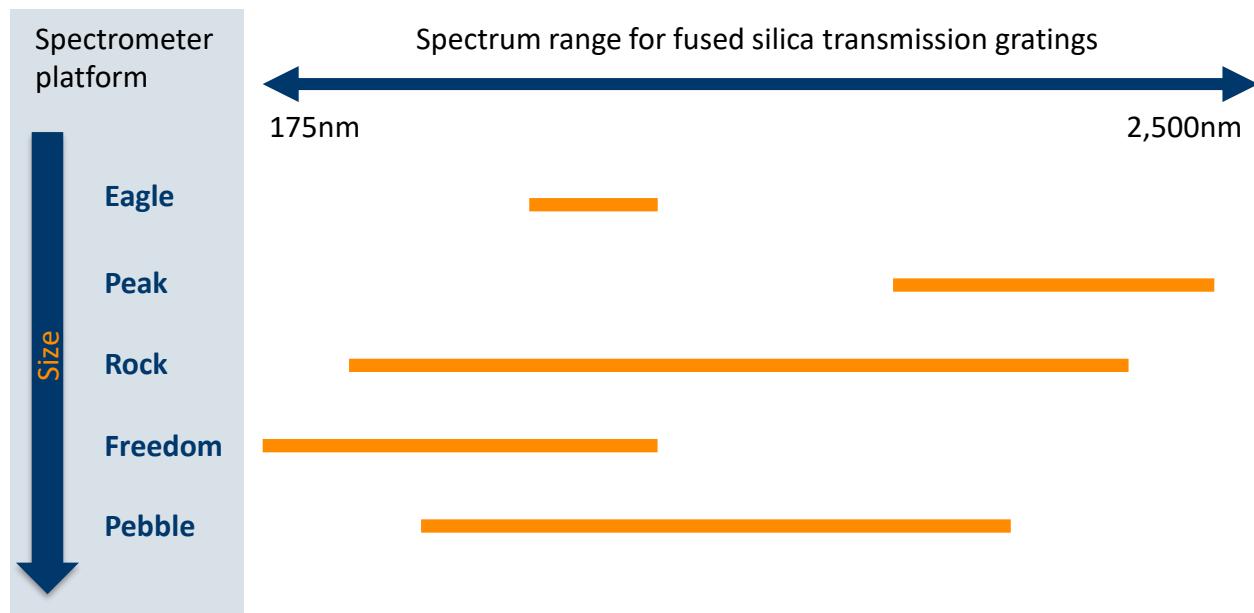
Ibsen is a manufacturer of OEM spectrometers for integration into spectroscopic instruments

3 main reasons to choose Ibsen	How it impact consistency	Annual output
 Transmission grating	High efficiency High stability Enable compact design	+40k a year
 Spectrometer design	+200 years combined tenure in design team Environmentally robust design Thermally stable optomechanics Designed for volume production	+6 designs annually
 Spectrometer production	Low unit-to-unit variation by design enables good transferability 100% inspection of all units	+8.5k a year

Our solutions lies within the spectrum from 175nm to 2.5um and brings value to a diverse set of final applications

We cover the entire spectrum supported by fused silica transmission gratings

Wavelength coverage from all platforms in declining size



Final applications*



* Some of the applications where our components and/or modules has delivered value

New product: PEBBLE NIR key features

- ▀ 950 – 1700 nm
- ▀ Numerical aperture 0.22
- ▀ 12 nm resolution
- ▀ Uncooled InGaAs detector array with 128 pixels
- ▀ Footprint of 23 x 21 x 8 mm
- ▀ 3 kHz frame rate



New product: PEBBLE NIR

▀ Benefits

- ▀ Compact size
- ▀ High sensitivity
- ▀ High frame rate
- ▀ Environmental stability
- ▀ Low unit-to-unit variation



The key challenges in process and handheld NIR are stability and transferability

- Stability:
 - Performance should be maintained when the unit is exposed to temperature changes, vibrations and shock
 - For the spectrometer environmental variation often lead to mechanical displacements of optical components
- Transferability
 - The instrument software (chemometrics) model should provide the same result for the same sample measured with different instruments
 - For the spectrometer this often translates to low unit-to-unit variation for resolution and peak shape

Why PEBBLE NIR is the best compact spectral sensor on the market

- Stability:
 - PEBBLE NIR uses no moving parts
 - PEBBLE NIR uses transmission optics which guarantees better stability than reflective optics
 - PEBBLE NIR is based on a proven, rugged opto-mechanical design
- Transferability
 - PEBBLE NIR provides low unit-to-unit variation by design
 - Low variation on resolution due to tolerance tolerant design
 - 100% inspection against PASS/FAIL criteria for key parameters
 - Symmetrical and consistent peak shapes due to lens-based design