

# Qred AFBR-S20R1XX

## Ultra-Compact NIR Spectrometer with Cooled High-Performance Image Sensor

### Overview

The Qred is the world's first truly portable near-infrared spectrometer. On a footprint smaller than a credit card, it includes high-throughput Czerny-Turner optics with a TEC-cooled InGaAs image sensor. The advanced thermal design provides high thermal stability and excellent heat transfer without a fan. The rugged design with no moving parts ensures reliable operation in rough environments. The Qred offers the following:

- Full processing of spectra in the device (offset, nonlinearity, dark spectrum, and spectral sensitivity)
- Stable measurement conditions due to active cooled sensor
- AUX connector for analog and digital I/O, communication interfaces and power supply



### Key Features

- Spectral resolution from 4 nm
- Cooled InGaAs detector
- Ultra-compact design
- Powerful onboard processing and evaluation

### Applications

- Food safety
- Chemical analysis
- Quality control
- System integration
- Counterfeit detection
- Environmental analysis
- Biomedical applications
- Pharmaceutical analysis
- Process control and monitoring

Part Number	Product Configuration	Wavelength Range	Spectral Resolution
AFBR-S20R12R	Qred 256C-1.7	900 nm to 1700 nm	8 nm
AFBR-S20R12E	Qred 256C-2.5	900 nm to 1700 nm	4 nm
AFBR-S20R15R	Qred 512C-1.7	900 nm to 2500 nm	16 nm
AFBR-S20R15E	Qred 512C-2.5	900 nm to 2500 nm	8 nm

Specifications	
Focal length	50 mm
Entrance slit	50 $\mu$ m: 256-pixel sensor version 30 $\mu$ m: 512-pixel sensor version
Dynamic range	15000:1
Numerical aperture	0.14
Stray light	<0.1 %
Detector	Cooled 256/512-pixel InGaAs sensor
A/D converter	16-bit
Calibration	Wavelength, sensitivity, nonlinearity, and multiple dark spectra stored in device
Internal memory	32 MB (>3000 spectra)
Transfer speed to PC	USB 2.0 high-speed
Optical Interface	SMA connector
Digital interfaces	USB 2.0 with Type-C connector, SPI, UART
Dimensions	67.0 mm $\times$ 58.0 mm $\times$ 22.5 mm
Weight	160g
Operating temperature	-15°C to 60°C (non-condensing)
Storage temperature	-25°C to 70°C
Power consumption	5V DC without cooling: 200 mA without cooling: up to 3A
PC operating system	Windows 10, 8, 7, Vista

## Application Software

Every Qred spectrometer includes Waves user software developed for general-purpose spectroscopy applications. Waves includes sophisticated algorithms for data acquisition and evaluation, which provides the following features through a clear and straightforward user interface.

- Take and display series of spectra
- Automatic exposure control with dark spectrum interpolation
- Import most ASCII-based file formats
- Export as ASCII table to almost any numerical analysis software
- Comprehensive tools for displaying and analyzing spectra
- Strip charts for comparing characteristic values between multiple spectra including peak follower in real time
- Graph printing and export to PDF
- Dynamic peak finder (no need to set a threshold level)
- Dark spectrum interpolation
- Transmission, absorption, and reflection measurements
- Colorimetry

Waves is very easy to use and very intuitive. Various spectrum evaluation options are available with minimal effort and only a few mouse clicks. For example, to zoom in, adjust the zoom slider. To move around, adjust the scrollbar. To change the x-axis unit, select the corresponding button. Values such as peaks or colorimetry are instantly calculated as soon as a spectrum is taken. Waves is available as a free download from our website.

## Software Library

A software development kit (SDK) is also included to control the spectrometer and take spectra from your own software. It consists of a Windows DLL library for the .NET framework, documentation, and sample code. The SDK can be used with any programming language that can use .NET DLLs, including C#, Visual Basic .NET, C++, Delphi, LabVIEW, Matlab, and Mathematica.

## Communication Protocol

The spectrometer can also be directly controlled from an embedded microcontroller or other operating systems using the device communication protocol. Just like our application software, the protocol is designed to be both powerful and easy to use for software developers.

## I/O Port

The Qred includes a new auxiliary connector for analog and digital I/O, communication interfaces and power supply (if USB is not used). The eight digital channels can be configured as trigger input, shutter or flash lamp control, process control, or general purpose I/O pins.

The Qred supports three trigger modes: software trigger, interval trigger, and external trigger. It can be set to trigger on the start or the end of the exposure period.

### Qred Schematic Drawing

