

# Product Specification: SideWinder Series Spectrometer

## Description

The SideWinder (SW) Series spectrometers are designed for long-wavelength near-infrared applications, built with high-sensitivity InGaAs linear sensors and a 32-bit RISC processor for precision control. The compact, rugged optical engine is optimized for stability and performance, maintaining exceptional resistance to thermal, humidity, vibration, and shock variations to minimize wavelength shift and resolution drift. Covering wavelength ranges from 900 nm to 2500 nm, the SW Series offers both non-cooled and TEC-cooled models for enhanced noise reduction and extended integration times. Powered via USB with 6 programmable I/O lines, the SideWinder Series integrates easily into research, process-control, and OEM systems requiring reliable NIR performance.



## Models and Wavelength Ranges

- **Non-cooled Models (SW 5 Series)**
  - SW2520 – 900–1700 nm (128-pixel InGaAs sensor)
  - SW2560 – 900–1700 nm (256-pixel InGaAs sensor)
  - SW2570 – 900–1700 nm (512-pixel InGaAs sensor)
- **TEC-Cooled Models (SW 8 Series)**
  - SW2860 – 900–1700 nm (256-pixel InGaAs sensor, 1-stage TEC)
  - SW2870 – 900–1700 nm (512-pixel InGaAs sensor, 2-stage TEC)
- **Extended NIR Models (SW 9 Series)**
  - SW2930 – 910–2200 nm (256-pixel InGaAs sensor, 1-stage TEC)
  - SW2960 – 900–2500 nm (256-pixel InGaAs sensor, 1-stage TEC)
  - SW2970 – 900–2500 nm (512-pixel InGaAs sensor, 2-stage TEC)

## Main Features

- High-sensitivity InGaAs linear array sensors (128 / 256 / 512 pixels)
- Wide wavelength coverage — 900–1700 nm, 910–2200 nm, or 900–2500 nm

- Rugged Czerny–Turner optical design with f/# 5 and NA 0.1 for high stability against temperature, humidity, and vibration
- 32-bit RISC controller with USB 2.0 (480 Mbps) communication
- Integration time ranges: 100  $\mu$ s – 24 s (SW5/8 series); 100  $\mu$ s – 3000 ms (SW9 series)
- Configurable slits from 25 – 200  $\mu$ m (model dependent)
- High SNR (up to 6000) and dynamic range (up to 13 000) depending on model and gain mode
- 16-bit, 15 MHz A/D conversion
- Flash ROM storage for wavelength, linearity, and intensity calibration coefficients
- Up to 4,000 spectra buffering for continuous acquisition
- 6 programmable 3.3 V digital I/O pins for external control and trigger input
- TEC-cooled versions reduce dark noise for long integration times
- Plug-and-play SpectraSmart software support for spectral measurement and calibration

## Technical Details

- Optical System: Czerny–Turner design with 2nd & 3rd order rejection; f/# 5, NA 0.1 (focal length 60–60 mm)
- Sensors: InGaAs linear array (128 / 256 / 512 pixels)
- Resolution: 2 – 22 nm (depending on slit, sensor, and grating configuration)
- Wavelength Accuracy:  $\pm$  1 nm (typical); up to  $\pm$  1.5 nm in extreme conditions
- Repeatability:  $\pm$  0.2 nm (100 continuous measurements, Ar light source)
- Thermal Stability:  $<$  0.1 – 0.2 nm/ $^{\circ}$ C (model dependent)
- Stray Light:  $<$  0.1 – 0.45 % depending on model and wavelength
- Integration Time: 100  $\mu$ s – 24 s (SW5/8 series); 100  $\mu$ s – 2000 ms (SW9 series)
- A/D Conversion: 16-bit, 15 MHz
- Dynamic Range: up to 13 000 (typ., low gain)
- Baseline Signal Level:  $\approx$  1 000 counts (adjustable via software)
- Data Interface: USB 2.0 @ 480 Mbps (High-speed)
- Digital I/O: 6 programmable 3.3 V GPIO pins ( $V_{IL} \leq 0.8$  V,  $V_{IH} \geq 2.0$  V), UART TX/RX, external trigger, lamp control
- Fiber Interface: SMA905 ( $\varnothing$  3.18  $\pm$  0.005 mm ferrule, max length  $<$  9.812 mm)
- Power Requirements: +5 V DC, 300–480 mA via USB; TEC models require +5 V DC 1.3 A (1-stage) or 2.2 A (2-stage) via DC jack
- Environmental: Operating 0 – 50  $^{\circ}$ C; Storage  $-30$  – 70  $^{\circ}$ C; Humidity 0 – 90 % non-condensing

## Dimensions

- SW 5 Series (non-cooled): 110 (L) × 86 (W) × 32.4 (H) mm
- SW 8/9 Series (TEC-cooled): 130 (L) × 96 (W) × 58.3 (H) mm

## Power Requirements

- SW2520/2560/2570: +5 V DC, 300–350 mA (via USB)
- SW2860/2870: +5 V DC, 350 mA (USB), +5 V DC 1300 mA (TEC via DC Jack)
- SW2930/2960/2970: +5 V DC, 480 mA (USB), +5 V DC 2200 mA (TEC via DC Jack)

## Specifications

Model	Wavelength Range (nm)	Sensor Type	Pixels	SNR (High/Low Gain)	Dynamic Range (High/Low)	Cooling	Stray Light (%)	Thermal Stability (nm/°C)	Integration Time
<b>SW2520</b>	900–1700	InGaAs (non-cooled)	128	2000 / 4000	6500 / 8200	None	<0.2	<0.2	100 μs – 24 s
<b>SW2560</b>	900–1700	InGaAs (non-cooled)	256	2400 / 4500	6000 / 9300	None	<0.1	<0.1	100 μs – 24 s
<b>SW2570</b>	900–1700	InGaAs (non-cooled)	512	2500 / 4000	6000 / 9300	None	<0.2	<0.2	100 μs – 24 s
<b>SW2860</b>	900–1700	InGaAs TEC	256	3200 / 4500	8000 / 13000	1-stage	<0.1	<0.1	100 μs – 24 s
<b>SW2870</b>	900–1700	InGaAs TEC	512	3200 / 4500	7200 / 9300	2-stage	<0.1	<0.2	100 μs – 24 s
<b>SW2930</b>	910–2200	InGaAs TEC	256	2800 / 5300	6000 / 9300	1-stage	<0.2	<0.2	100 μs – 300 ms
<b>SW2960</b>	900–2500	InGaAs TEC	256	2500 / 4500	7000 / 12000	1-stage	<0.45	<0.1	100 μs – 200 ms
<b>SW2970</b>	900–2500	InGaAs TEC	512	3000 / 6000	6000 / 9300	2-stage	<0.1	<0.1	100 μs – 200 ms