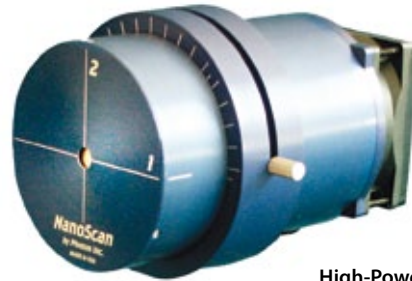


3.3.2 NanoScan for High-Power Beam Applications

Photon's High-Power NanoScan can measure focused CO₂ laser beams up to 5 kilowatts. The High-Power NanoScan is equipped with a pyroelectric detector with copper slits and drum. A cooling fan mounted on the scan head body provides additional heat management. With the new "peak connect" algorithm and the software controlled variable scan speed, the High-Power NanoScan is ideal for measuring lasers operating with pulse width modulation (PWM) power control. Measurement of Q-switched lasers and other higher frequency pulsed lasers is also possible using this feature.



High-Power NanoScan with cooling fan

What Can be Measured?

Photon's High-Power NanoScan is designed to measure "high-power" laser beams that were previously impossible to measure with standard NanoScan products. High-Power is a fairly indistinct term that means different things in different contexts. For our purposes, "high-power" is defined as between 100W and 5000W, however the High-Power NanoScan will not be able to measure this power range for all wavelengths. High-Power laser beams are handled by using reflective materials, and the level of reflectivity, and thus its inverse, absorption, are dependent on the wavelength of the laser light.

In general the long infrared wavelengths, such as that of the carbon dioxide laser at 10.6microns, are highly reflective. These allow for the highest power measurements up to the maximum levels of several kilowatts. When measuring these lasers and power levels the principle concern is the heat buildup in the scan head. The surfaces of the measurement drum and slits are better than 98% reflective to this wavelength, and thus only 2% of the incident power will be absorbed by the scanhead and heat it up. Nonetheless, at 5000W this represents a heat load of 100W that will raise the temperature of the internal components, which may cause damage to the detector and encoder electronics. The High-Power NanoScan is designed to be used for short-term measurements at these power levels. The beam should only be incident on the scan head for a few seconds. The software is equipped with a record mode that makes it easy to make a short measurement and then review the data while the scanhead is allowed to cool down.

Measuring high-power beams can be tricky. The lasers have the potential to damage the scan head, and any reflected light can be dangerous to both the operator and the surroundings. The High-Power NanoScan can measure these beams because it uses a combination of highly reflective components with high thermal dissipation capability. It is important to manage the reflected beam so that it neither reenters the laser cavity nor sends stray beams into the surrounding area.

The High-Power NanoScan scan head has been shown to be able to handle power densities of 3.2MWcm⁻² at 10.6µm, the power density of a 200µm beam at 1kW. At the shorter wavelengths of the other common industrial lasers, Nd:YAG and DPSS, the upper limits are little less, due to the slightly lower reflection of the components at wavelengths around 1000nm. Visible and UV lasers can also be measured, but these will have lower limits yet.

Consult the damage thresholds charts found in the manual before placing an order or exposing any NanoScan slit profiler to a laser beam.

High-Power NanoScan Configurations

Detector Type	Power Range	Wavelength	Aperture	Slits	Scan Head Size
Pyroelectric	~1W - ~5W upper limit dependent on wavelength	190nm - > 100µm	9mm	5µm	100mm
Pyroelectric Large Aperture	~1W - ~5W upper limit dependent on wavelength	190nm - > 100µm	20mm	10µm	100mm

Ordering Information - High-Power NanoScan

All High-Power NanoScan Systems Include: Fan cooled scanhead. For use at wavelengths from 200nm to greater than 20µm. Maximum power capacity is dependent on wavelength and spot size. Refer to operating space charts for more information.

Slits and scan drum are highly reflective and user must send reflected energy into appropriate dump. A direct back reflection may cause laser cavity to oscillate or if not properly directed may cause damage. User must handle all back-reflected energy from laser.

Measurements include: spot size, position and position difference information and laser profiles. Includes "peak connect" and software control of scan speed for measurement of pulsed and pulse width modulated (PWM). Software includes ability to capture and record bursts of data (Active X is optional with Pro Version).

USB 2.0 Controller allows NanoScan to interface to USB 2.0 port of laptop or desktop PC.

Item	Description	P/N
USB HP-NS-PYRO/9/5-STD	High-Power NanoScan scanhead with 9mm Pyroelectric Detector 5µm slits for use with higher power beams. High-resolution profiler featuring pyroelectric detector, 100mm diameter scanhead with rotation mount and matched pair of 5-µm wide slits. Use to measure spots 20µm and larger (1/e2 diameter) directly. Works with CW and pulsed beams with rates greater than 2kHz. Actual minimum pulse rate is dependent on beam size and scan rate. USB	PH00399
USB HP-NS-PYRO/9/5-PRO	Software includes automation feature. High-Power NanoScan scanhead with 9mm Pyroelectric Detector 5µm slits for use with higher power beams. High-resolution profiler featuring pyroelectric detector, 100mm diameter scanhead with rotation mount and matched pair of 5-µm wide slits. Use to measure spots 20µm and larger (1/e2 diameter) directly. Works with CW and pulsed beams with rates greater than 2kHz. Actual minimum pulse rate is dependent on beam size and scan rate. USB	PH00028
USB HP-NS-PYRO/20/10-STD	High-Power NanoScan scanhead with 20mm Pyroelectric Detector 10µm slits for use with higher power beams. High-resolution profiler featuring pyroelectric detector, 100mm diameter scanhead with rotation mount, 20 mm entrance aperture, and matched pair of 10-µm wide slits. Can measure spots 50 µm and larger (1/e2 diameter) directly. Works with CW and pulsed beams with rates greater than 2kHz. Actual minimum pulse rate is dependent on beam size and scan rate. USB	PH00398
USB HP-NS-PYRO/20/10-PRO	Software includes automation feature. High-Power NanoScan scanhead with 20mm Pyroelectric Detector 10µm slits for use with higher power beams. High-resolution profiler featuring pyroelectric detector, 100mm diameter scanhead with rotation mount, 20 mm entrance aperture, and matched pair of 10-µm wide slits. Can measure spots 50 µm and larger (1/e2 diameter) directly. Works with CW and pulsed beams with rates greater than 2kHz. Actual minimum pulse rate is dependent on beam size and scan rate. USB	PH00027
NH-HP-NS/9/5-STD	Head only High-Power NanoScan 9mm aperture 5µm slits	PH00415
NH-HP-NS/9/5-PRO	Head only High-Power NanoScan 9mm aperture 5µm slits	PH00044
NH-HP-NS/20/10-STD	Head only High-Power NanoScan 20mm aperture 10µm slits	PH00414
NH-HP-NS/20/10-PRO	Head only High-Power NanoScan 20mm aperture 10µm slits	PH00043