

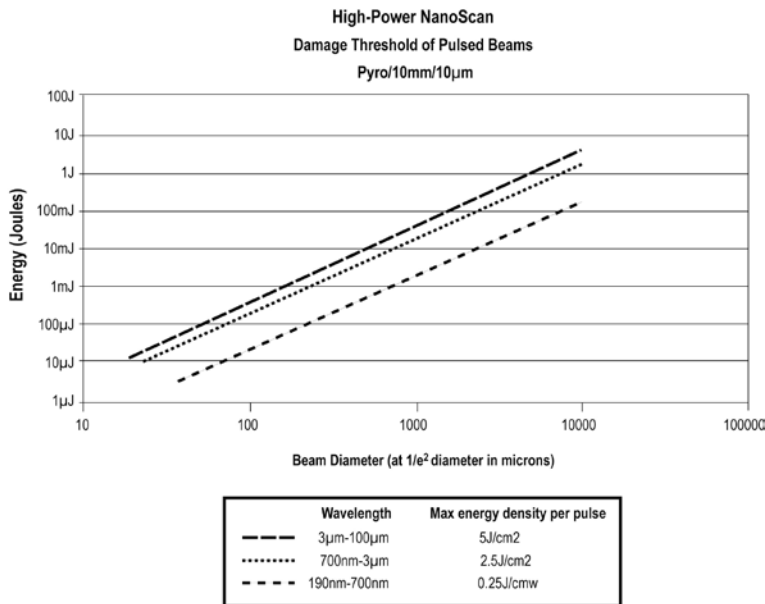
3.3.2 NanoScan for High-Power Beam Applications

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.

What Can be Measured?

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 scan head is designed to make short duration measurements to avoid excessive heating of components. The head should be only in the incident beam for 10 to 60 seconds depending on the power levels to prevent excessive heating of the components. The High-Power NanoScan scan head has been shown to be able to handle power densities of 3.2MW/cm² 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 a little less, due to the slightly lower reflectivity of the components at wavelengths around 1000nm. Visible and UV lasers can also be measured, but these will have lower limits yet.

The chart below shows the damage thresholds for pulsed beam energies for the three wavelength regimes. The lines represent the maximum energies per pulse for various spot sizes that correspond to 5J/cm² for the 3µm to 100µm wavelengths, 2.5J/cm² for the 700nm to 3µm range, and 250mJ/cm² for the UV-Visible range from 190nm to 700nm. When operating with pulsed lasers, calculate the energy per pulse to ensure that the values fall below these lines for the wavelength of the laser. Operation above these values will likely cause damage to the scan head apertures.



High-Power NanoScan with cooling fan

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



High-Power NanoScan

Ordering Information - High Power NanoScan

All High-Power NanoScan Systems Include: Fan cooled scanhead. For use at wavelengths from 200nm to greater than 20µms. 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.

NanoScan Integrated Software package. Software for use with NanoScan under Microsoft Windows 2000 Professional, XP Professional, Vista, and Windows 7 (32-and 64-bit) operating systems.

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 and ActiveX automation.

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

Certificate of Calibration traceable to National Institute of Standards and Testing (NIST) to better than ±3%.

Pyroelectric Detectors

Item	Description	P/N
USB NS-Pyro/9/5/Cu5	NanoScan Pyroelectric Detector 9mm aperture 5 µm copper slits. High-resolution head featuring pyroelectric detector, 63.5mm diameter head with rotation mount, 9mm entrance aperture, and matched pair of 5µm copper slits. Use for wavelengths from 190nm to >20µm. This model does not include a cooling fan.	PH00307
USB NS-PYRO/9/5	NanoScan Pyroelectric Detector 9mm aperture 5micron slits. High-resolution head featuring pyroelectric detector, 63.5mm diameter head with rotation mount, 9mm entrance aperture, and matched pair of 5µm wide slits. Use for wavelengths from 190nm to >20µm. This model does not include a cooling fan. USB	PH00025
USB NS-PYRO/9/25	NanoScan Pyroelectric Detector 9mm aperture 25micron slits. High-resolution head featuring pyroelectric detector, 63.5mm diameter head with rotation mount, 9mm entrance aperture, and matched pair of 25µm wide slits. Use for wavelengths from 190nm to >20µm. This model does not include a cooling fan.	PH00228
USB NS-PYRO/20/25	NanoScan Large Area Pyroelectric Detector 20mm aperture 25micron slits. High-resolution head featuring pyroelectric detector, 100mm diameter head with rotation mount, 20mm entrance aperture, and matched pair of 25micron wide slits. Use for wavelengths from 190nm to >20micron. This model does not include a cooling fan. USB	PH00026
USB NS-PYRO HP/20/10	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/e ² 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
USB NS-PYRO HP/9/5	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/e ² 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
NH-PYRO/9/5	Head only NanoScan-Pyro 9mm aperture 5µm slits	PH00041
NH-PYRO/9/25	Head only NanoScan-Pyro 9mm aperture 25µm slits	PH00243
NH-PYRO/20/25	Head only NanoScan-Pyro 20mm aperture 25µm slits	PH00042
NH-HP-NS/20/10	Head only High-Power NanoScan 20mm aperture 10µm slits	PH00043
NH-HP-NS/9/5	Head only High-Power NanoScan 9mm aperture 5µm slits	PH00044