# Q-switched Nd:YAG Laser - Official Clinical Overview & Datasheet

## EXECUTIVE SUMMARY

The Q-switched Nd:YAG laser represents the gold-standard platform for professional pigment clearance, tattoo removal, and multi-application cutaneous therapy. Designed for high-volume dermatology clinics and medical spas, this system delivers nanosecond-domain pulse energies that selectively photoacoustically disrupt dermal and epidermal chromophores with minimal thermal diffusion. Its dual-wavelength architecture (1064nm & 532nm) enables precise targeting of deep and superficial pigments, ranging from professional tattoos to melasma, nevus of Ota, and solar lentigines.

Clinically positioned as a high-ROI capital investment, the platform combines therapeutic versatility with low consumable costs and extended component lifespan. Primary value propositions include: pain-manageable treatments without general anesthesia, superior clearance rates over alternative modalities, and built-in epidermal protection via a high-speed cryogen or contact cooling interface. For practice owners, the device reduces per-procedure time, expands service menu offerings, and ensures regulatory compliance for medical reimbursable indications.

CLINICAL ARCHITECTURE & DESIGN

The system integrates a military-grade, air- and water-cooled solid-state Nd:YAG resonator with a premium Q-switch module (either Pockels cell or passive saturable absorber), delivering pulse durations in the 5–20 nanosecond range. The laser cavity incorporates imported optically pumped semiconductor or flashlamp excitation units, ensuring ±3% pulse-to-pulse energy stability over an eight-hour clinical shift. A dual-light guide articulated arm (or high-transmission fiber delivery) terminates in an ergonomic, autoclaveable handpiece with interchangeable spot sizes (1.5mm to 8mm round or square-top profiles).

Advanced epidermal cooling is achieved via a configurable closed-loop chiller with a sapphire contact window (0°C to +4°C surface temperature) synchronized

to the Q-switched emission. An optional R404a cryogen spray unit (40–80ms pulses, adjustable pre/post delay) provides second skin layer protection for high-fluence treatments. The power supply uses redundant insulated-gate bipolar transistors (IGBTs) and a self-diagnosing water pump with flow sensor and particulate filtration to prevent overheating and guarantee 24/7 operation under duty cycles up to 3 pulses per second.

KEY INDICATIONS & CAPABILITIES

- Dual-wavelength photoacoustic targeting: 1064nm (deep: black/dark blue/ green tattoos, dermal melanin, leg veins) and 532nm (superficial: red/orange/brown tattoos, epidermal pigmentation, freckles) with automatic wavelength switching in the handpiece.
- Adjustable pulse energy and spot geometry: energy density (fluence) from 0.5 to 12 J/cm² (532nm) and 1 to 16 J/cm² (1064nm); six round spot sizes plus a 2x8mm fractional-like rectangular mode for textural improvement.
- Smart clinical user interface: 10.4-inch capacitive touchscreen preloaded with over 80 preset protocols (Fitzpatrick I–VI, tattoo colors, lesion types) that dynamically set fluence, repetition rate (1–10 Hz), and cooling parameters; real-time skin impedance monitoring triggers automatic fluence reduction.
- Large-mode applicator for high-speed treatments: 6mm and 8mm handpiece tips enable removal of large benign pigmented lesions (e.g., nevus spilus, café-au-lait) at rates up to 2 cm² per second, reducing procedure time by up to 40%

versus traditional 2–3mm spots.

- Integrated laser safety and dosimetry: built-in energy meter with closed-loop feedback, audible countdown, and a dual-footswitch (standby/fire) preventing accidental emission; patient and operator ophthalmic shields included.

## COMPLIANCE & STANDARDS

The Q-switched Nd:YAG laser system carries Medical CE Mark (Class 4 active device) under Directive 2017/745/EU, FDA 510(k) clearance for soft tissue incision, tattoo removal, benign pigmented lesion ablation, and wrinkle treatment, ISO 13485:2016 (production quality system), and IEC 60825-1:2014 (laser product safety class 4). Each unit undergoes factory power output validation, MPE (maximum permissible exposure) testing, and includes a technical file for UKCA, NMPA (China), KFDA, and ANVISA registrations. A post-market surveillance plan and full risk management file (ISO 14971) are available to buyers.

## TECHNICAL SPECIFICATIONS

The following parameters represent nominal performance values measured at the handpiece tip under calibrated clinical conditions. All values are subject to standard manufacturing tolerance (±5%) and are certified at system delivery.

| Parameter | Specification |
|---|---|
| Laser Type / Wavelengths | Q-switched Nd:YAG / 1064 nm & 532 nm (frequency-doubled) |
| Pulse Duration (FWHM) | 5 – 10 ns (1064 nm) / ≤ 8 ns (532 nm) |
| Peak Power | > 20 MW (per pulse at 1064 nm, 1000 mJ) |
| Spot Sizes | 1.5, 2, 3, 4, 5, 6, 8 mm round; 2x8 mm fractional rectangular |
| Fluence Range (1064 nm) | 1 – 16 J/cm² (dependent on spot size) |
| Fluence Range (532 nm) | 0.5 – 12 J/cm² (dependent on spot size) |
| Repetition Rate | Single shot – 10 Hz (adjustable in 0.5 Hz steps) |
| Cooling System | Contact sapphire (0°C to +4°C) + optional R404a cryogen spray |
| Display & Interface | 10.4 inch capacitive touchscreen, preset protocols, energy feedback |
| Electrical / Dimensions | 110-240 VAC, 50/60 Hz, 1000W; 45 kg (99 lb); 450x500x950 mm (WxDxH) |