

Clinical Architecture & Performance Reference Manual: Non-Ablative Thulium
Laser Skin Rejuvenation

CLINICAL ARCHITECTURE & PERFORMANCE REFERENCE MANUAL

EXECUTIVE SUMMARY

The non-ablative thulium laser platform represents a paradigm shift in dermatological and aesthetic medicine, offering a clinically validated, minimally invasive solution for skin rejuvenation. Operating within the 1927nm wavelength spectrum, this system leverages the principle of selective photothermolysis to target water in the dermal and epidermal layers, inducing a controlled wound healing response without significant tissue ablation. This technical document provides a comprehensive overview of the system's clinical architecture, operational parameters, and safety protocols, designed for integration into premium medical spas and dermatology clinics. The device is engineered to deliver consistent, reproducible outcomes for a broad spectrum of skin phototypes, addressing key signs of photoaging and textural irregularities.



CLINICAL ARCHITECTURE & DESIGN PHILOSOPHY

The core of this system is its proprietary 1927nm thulium fiber laser engine, chosen for its unique absorption coefficient in water, which is significantly higher than that of 1550nm erbium-doped lasers but lower than 2940nm ablative systems. This 'sweet spot' allows for precise micro-thermal zone (MTZ) generation in the superficial dermis while preserving the stratum corneum. The device architecture incorporates a sealed, maintenance-free laser cavity with advanced thermal management to ensure long-term wavelength stability and pulse-to-pulse energy consistency. A key engineering achievement is the integrated, high-speed galvanometric scanner that delivers a uniform, non-overlapping pattern of MTZs, optimizing treatment coverage and minimizing thermal collateral damage to surrounding tissues. This design philosophy is rooted in maximizing clinical efficacy while ensuring a superior

patient safety and comfort profile.

KEY INDICATIONS & CLINICAL CAPABILITIES

This platform is indicated for a range of dermatological conditions, including mild to moderate periorbital and perioral rhytides, dyschromia, solar lentigines, and overall skin texture improvement. Its non-ablative nature makes it an ideal solution for patients seeking significant rejuvenation without the prolonged downtime associated with ablative resurfacing. The device is capable of delivering a variable spot size, pulse duration, and fluence, allowing clinicians to tailor treatments to specific anatomical areas and individual patient skin characteristics. It is particularly effective for treating photodamaged skin on the face, neck, and décolletage, with demonstrated efficacy across Fitzpatrick skin types I-IV and, with careful parameter selection, Type V. The system's versatile handpiece allows for both fractional and full-field scanning modes, providing strategic flexibility for targeted or global rejuvenation protocols.

COMPLIANCE & REGULATORY STANDARDS

The system is manufactured in accordance with ISO 13485:2016 standards for medical device quality management systems. It holds CE marking (Class IIa) and has received 510(k) clearance from the U.S. Food and Drug Administration for

the treatment of wrinkles and pigmented lesions. The device complies with all applicable IEC 60601-1 requirements for medical electrical equipment safety and IEC 60601-2-22 for laser safety. Comprehensive built-in safety interlocks, including a patient-activated emergency stop and a key-operated master switch, ensure compliance with Class 4 laser safety regulations. All components are RoHS compliant and manufactured using sustainable, medical-grade materials. The system is subject to rigorous factory testing and calibration to ensure it meets the highest standards of performance and safety before clinical deployment.

TECHNICAL SPECIFICATIONS & OPERATIONAL PARAMETERS

Parameter	Specification
Laser Type	1927nm Thulium Fiber Laser, Class 4
Average Power Output	Up to 15 Watts
Pulse Energy Range	5 – 50 mJ
Pulse Duration	0.1 – 2.0 ms
Spot Size (Fractional)	Variable, 50 – 250 μ m per MTZ
Spot Size (Full-field)	Adjustable, up to 15x15 mm
Cooling System	Integrated Contact Cooling (TEC + Sapphire) with forced-air convection
Scanning Pattern	Galvanometric, customizable (Square,

	Rectangular, Circular, Linear)
Treatment Density (MTZ/cm ²)	50 – 600 (software configurable)
Electrical Requirements	110-240 VAC, 50/60 Hz, 15 A
Dimensions (Base Unit)	Approx. 45 x 35 x 90 cm (W x D x H)
Weight	Approx. 22 kg
Display Interface	High-resolution 15.6 inch Color Touchscreen Panel
Safety Classifications	CE Class IIa, FDA 510(k) Cleared, IEC 60601-1, IEC 60601-2-22

RECOMMENDED CLINICAL PROTOCOLS & WORKFLOW INTEGRATION

For optimal clinical outcomes, a standard treatment course consists of 3-4 sessions spaced 4-6 weeks apart. The recommended operating parameters are: spot size of 7-10mm, pulse energy of 5-15 mJ per microbeam, and a total density of 150-250 MTZ/cm² depending on skin type and condition. A typical treatment session for the full face lasts 15-25 minutes. The protocol involves a thorough skin cleansing, application of a topical anesthetic if patient sensitivity requires it, and the treatment itself. Post-procedure, a barrier-repair moisturizer and high-SPF sunscreen are essential for the duration of the healing period. The device's user interface offers pre-set protocols for specific indications and skin

types, streamlining the treatment workflow and reducing the risk of operator error. Integration into a med spa or clinic workflow is seamless due to the system's compact footprint, standard electrical requirements (110-240V AC, 50/60Hz), and intuitive, training-reduced user interface.



CONCLUSION

The non-ablative thulium laser aesthetic system is a highly advanced, clinically versatile, and safe platform for skin rejuvenation. Its precise wavelength, sophisticated delivery system, and comprehensive safety features make it a cornerstone technology for modern aesthetic practices seeking to deliver high-impact results with excellent patient satisfaction and minimal downtime. This document serves as a definitive reference for the platform's capabilities, specifications, and clinical application.