

Section 2
The T-Scan 10 Digital Occlusal Analysis System

Chapter 4
T-Scan 10 Recording Dynamics,
Force and Timing Software
Tools, and the Chairside
Clinical Skills for Optimal
T-Scan Implementation

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ABSTRACT

The newly designed T-Scan 10 Computerized Occlusal Analysis system represents the State of the Art in occlusal diagnosis. The reliability of the system's High Definition (HD) recording sensors, the many occlusal analysis timing and force software features, and the modern-day computer hardware electronics that record occlusal function in 0.003 second real-time increments, affords a clinician unparalleled occlusal contact timing and force data, with which to predictably diagnose and treat many occlusal abnormalities. T-Scan 10 represents the culmination of 40 years of T-Scan technology innovation and development, with updated desktop graphics and additional toolbar icons that improve T-Scan diagnostic functionality, while enhancing the clinician's chairside T-Scan implementation. Important new tools include the Force Eraser that allows the clinician to remove any sensor surface recording artifact and repair corrupted force data from a sensor matrix crack. The Implant Warning that detects occlusal force overload specifically on dental implant crowns and implant-support restorations. And a unique new T-Scan 10 feature is the ability to export T-Scan data directly into the Digital Smile Design (DSD) esthetic planning software, which makes for seamless management of patient's occlusal status within an esthetic treatment plan. However, T-Scan 10's most important advancement has melded T-Scan digital occlusal force and timing data with digitally scanned virtual dental arches, by overlaying T-Scan data onto a patient's virtual cast. This Digital Impression Overlay (DIO) places T-Scan 10 directly into the Digital Workflow, that has rapidly become the Dental Medicine standard in modern-day prosthodontic and implant practice. Two examples of how to best align a scanned virtual cast using the DIO feature are

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included, as are three illustrations of where and how to employ the Force Eraser tool. Also included are detailed descriptions of five useful diagnostic occlusal recordings employed when treating commonly-observed occlusal problems. And notably, Chapter 4 outlines the 3 Learning Levels of T-Scan Clinical Competency, and the Kerstein Principles of Optimum T-Scan Clinical Implementation, which detail the best clinical practices when recording, analyzing, and making T-Scan-guided occlusal adjustments; each of which must be mastered for a clinician to become effective with the T-Scan 10 technology.

INTRODUCTION

Present day computerized occlusal analysis represents the State of the Art in occlusal diagnosis. T-Scan 10 Novus (Tekscan, Inc., Norwood, MA, USA) represents the culmination of 40 years of T-Scan technology innovation into the science of Dental Occlusion. T-Scan 10 has improved desktop graphics and icons for simpler display, to minimize clinician complexity, which had made previous T-Scan versions somewhat difficult to readily learn and effectively implement clinically. The combination of the reliability of the High Definition (HD) T-Scan recording sensors, the occlusal timing and relative force analysis software features, and the modern-day computer hardware electronics, affords the clinician unparalleled occlusal force and timing information with which to diagnose and treat a wide range of commonly-observed occlusal problems. The T-Scan technology's studied abilities to measure time durations (Kerstein & Wright 1991; Hirano, Okuma, & Hayakawa, 2002), illustrate ordered tooth contact time-sequences (Kerstein, Chapman, & Klein, 1997; Koos, Holler, Schille, & Godt, 2012), reproduce relative occlusal force (Harty, Lowe, Kerstein, & Radke, 2006; Koos, Godt, Schille, & Göz, 2010; da Silva Martins & Caramelo, et al., 2014; Qadeer, Ozcan, Edelhoff & van Pelt, 2020; Thumati, Thumati, Poovani, Sattur, Srinivas, Kerstein & Radke, 2021; Kerstein & Radke, 2022; Cabrita, Alves, Casado, Ascenso, Caramês, & Marques, 2023), and locate excessively forceful occlusal contacts (Maness, 1988; Maness, 1991), is a vastly superior diagnostic method compared to the commonly utilized, non-digital occlusal indicators which dentists routinely employ to determine occlusal contact force levels (articulating paper markings, wax imprints, silicone imprints, and articulated stone dental casts (Kerstein, 2010). None of these dental materials have demonstrated any scientifically proven capability to record tooth contact time-sequences, or describe relative differences in contact occlusal force levels. Moreover, all of these non-digital occlusal indicators require the clinician to "Subjectively Interpret" their meaning and their supposed occlusal function representations (Kerstein & Radke, 2013; Basson, Kerstein & Radke, 2020; Sutter 2017).

T-Scan 10 has been designed to shorten the learning curve for the clinician while standardizing the display and eliminating any significant clinician preferential software set up options present in prior T-Scan versions. Important desktop changes include the enlarged Force vs. Time Graph for easier visualization of all the color-coded force and timing lines, and a rotating 3-Dimensional ForceView window that improves the visualization of the moving individual force columns observed during movie playback. The rotating 3-D ForceView allows the clinician to orient the window in any view during playback, to best eliminate the overlap of the rising and falling force columns (Figure 1a). With T-Scan 10, the main desktop Toolbar displays additional icons that activate important new software features that were recently added into the newest version of the program. Doctors can import and export patient data, generate reports, attach notes and photos, and create mp4 video files of the scan (replacing the .avi video feature in T-Scan 8), while also being able to import intraoral digitally-impressed .STL files of a patient's arch, which can then be

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