



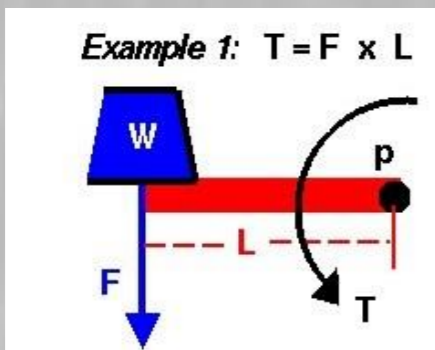
MECHATRONIC ORTHOPEDIC CANNULATED SCREWDRIVER AND DRILL WITH SMART AUTOMATIC TORQUE CONTROL SMART MECHATRONIC ORTHOPEDIC SCREWDRIVER / DRILL MSD 8620 - D



INTRODUCTION:

The MSD 8620 SMART MECHATRONIC ORTHOPEDIC SCREWDRIVER AND DRILL – D R&V Medical Equipments, is an innovative and revolutionary equipment which has been created to meet the demands posed by the high complexity of orthopedic surgery in the field of osteosynthesis today.

Before beginning with the equipment description, it is important to clarify the definition of "TORQUE" variable. In our particular case, TORQUE is defined as the angular tightening force of a screw.



Example 1: $T = F \times L$
If the screw is located at point P, and is adjusted correctly when a force W of 5 Kg is applied at a distance L of one centimeter, the Torque (angular tightening force) applied will be 5 Kg-cm.

As an osteosynthesis screw is inserted, its head compresses the plate against the bone with a force directly proportional to the Torque (angular tightening force) applied to it.

Osteosynthesis is a highly complex surgical procedure, which tests orthopedic surgeons skills, when carrying out the process of inserting, threading and securing with the correct level of torque (angular tightening force) the fixing screws, being this process carried out in a standard way manually. In some cases, with the purpose of relieving physical effort and reducing surgical time, electric screwdrivers are used, making necessary to stop their operation before the screw head reaches the fixation surface. This generates the risk of not being able to do it in time due to its high speed, which can damage the thread in the bone, or leave the screws with an over-adjustment, which can lead to the generation of post-surgical problems due to the presence of release signs.

The MSD 8620 – D SMART MECHATRONIC DRILL AND SCREWDRIVER, designed with state-of-the-art technology, provides orthopedic surgeons with great and innovative unique in the market advantages, such as an automatic maximum tightening torque detection control system (in "Mechatronic Screwdriver" mode), eliminating the risk of damage to the thread in the bone tissue, which can occur when manually positioning and fixing of the osteosynthesis material is performed, and a system for detecting the drill pass through the cortical wall ("Breakthrough"), which functions as an automatic drill depth control (in "Mechatronic Drill" Drill mode).

It is equipped with a last generation micro motor, with great power, efficiency and very high performance, which allows it to deliver an excellent torque of 36 Kg/cm (3,5 nW/m), in two speeds corresponding to 80 RPM in "Mechatronic Screwdriver mode", and 190 RPM in "Mechatronic Drill mode", in a smooth, silent and vibration-free form.

This micro motor is included in a very ergonomic and lightweight pistol-shaped handpiece, which has a three-position trigger to control the activation and direction of rotation of the micro motor, and an operating mode selection button: "Mechatronic Screwdriver / Drill". On the other hand, it has a 3/8" mandrel system, for the coupling of screwdriver and drill bits, easy, fast and safe to operate.

This handpiece is connected to a digital control unit with cutting edge technology, which is made up of a micro-controlled system, which incorporates a high-quality and excellent visibility 5" Display with a "Touch Screen" function, which provides information and control over the operating mode: "Mechatronic Screwdriver / Drill", the level of torque delivered by the micro-motor in Kg-cm, the selected type of screw, the micro-motor current status: Stop / Turning Right / Left, and the control buttons to select the mode of delivery of audio information: Voice / Tone, and to open a table for the selection of a complete range of osteosynthesis screws of different diameters, lengths and types, including cancellous, cortical and blocking, with information on the recommended drill bit diameters for them.

The control system permanently monitors the micro-motor's rotation speed, and by using a sophisticated PID (Proportional Integral Derivative) control algorithm, regulates it with great precision, keeping it constant, regardless the variations in the mechanical load, generated by the different bone tissue densities, according to the selected operation mode: "Mechatronic Screwdriver / Drill", being the speed in Screwdriver mode 80 RPM and 190 RPM in Drill mode. This constant speed of 190 RPM provides great drilling efficiency, reducing the risk of generating osteonecrosis due to friction, thereby improving the regeneration process, while simultaneously guaranteeing a high degree of precision and control.

On the other hand, the control system is equipped with a state-of-the-art sensor that permanently monitors the torque level of the micro-motor, delivering the information to a complex mathematical algorithm, which (in Screwdriver mode) generates by the first order derivative, two curves corresponding to the insertion and tightening phases of the screw, using this information to compare them on each sample, thus finding the maximum tightening torque, regardless of the patient's bone density, stopping the operation of the micro-motor, and generating the corresponding visual and audible alarm ("Maximum Torque Reached"). This provides surgeon with an extraordinary tool, unique in the market, for the reliable and safe insertion of the screws, reducing surgical time and making it independent of variables that can cause errors, such as bone density, or his level of sensitivity at the time of performing manually the adjustment process, based on his experience, among others. Likewise, in the Drill mode, the control system uses a similar sophisticated algorithm to generate the curves corresponding to the phase of drill entry into the bone's cortical wall, and to the phase of passing through the same to detect its exit, stopping the micro motor operation, generating the corresponding visual and audible alarm ("Breakthrough"). This feature works like an automatic drill depth control, providing protection to the adjacent soft tissues.

These extraordinary characteristics, added to a sophisticated design in ergonomics and operability, make the MSD 8620 SMART MECHATRONIC ORTHOPEDIC SCREWDRIVER / DRILL an excellent option, unique in the market, for the performance and development of highly complex and demanding orthopedic surgery procedures such as osteosynthesis, posed on current days.



**MECHATRONIC ORTHOPEDIC CANNULATED SCREWDRIVER AND DRILL
WITH SMART AUTOMATIC TORQUE CONTROL
SMART MECHATRONIC ORTHOPEDIC SCREWDRIVER / DRILL
MSD 8620 - D**

- * **NEWEST ORTHOPEDIC SCREWDRIVER AND DRILL WITH DIGITAL TORQUE AND SPEED CONTROL**
- * **CUTTING EDGE TECHNOLOGY SYSTEM FOR OSTEOSYNTHESIS**
- * **REDUCES THE RISK OF OVER-TIGHTENING AND/OR DAMAGE TO THE BONE THREAD WITH ITS SMART AUTOMATIC TORQUE CONTROL SYSTEM PATIENT'S BONE DENSITY INDEPENDENT**
- * **ALL SCREWS ON A PLATE ARE TIGHTENED WITH THE SAME TORQUE WHICH IMPROVES STABILITY AND LOOSENING RESISTANCE**
- * **CONSTANT SPEED DIGITAL CONTROL SYSTEM, WHICH REDUCES THE DUE TO FRICTION NECROSIS FORMATION RISK, IMPROVING THE REGENERATION PROCESS**



TECHNICAL FEATURES:

- ✓ High visibility and quality 5" display with "Touch Screen" function which indicates:
 - * Micro-motor delivered torque level in Kg-cm.
 - * Operation mode control: "Mechatronic Screwdriver / Drill".
 - * Selected screw type.
 - * Actual micro-motor state: Stop / Turning Right / Left according to hand piece trigger position.
 - * Alarm audio system actual mode: (VOICE / TONE).
 - * Aperture control button of a complete osteosynthesis screw selection table with different diameters lengths and types: Cancellous, Cortical, and Blocking, with information about the for each one recommended drill bit diameter.
- ✓ PID (Proportional Integral Derivative) micro-motor speed control in two speeds and directions: 80 y 190 RPM, right, left.
- ✓ Micro-motor torque level monitoring sensor, with a sequential sampling system and mathematical algorithm to obtain the maximum adjustment torque independent of bone density in "Screwdriver" mode, overload and pass through the cortical wall detection in "Drill" mode.
- ✓ Ergonomic and lightweight pistol shape handpiece, with three-position trigger to activate the micromotor: "Right / Stop / Left", and operation mode control button in two modes: "Mechatronic Screwdriver / Drill".
- ✓ Electronic micro-motor with planetary speed reduction gear system, and quadrature encoder.
- ✓ Easy fast and secure 3/8" mandrel system for screwdriver and drill bits mounting.
- ✓ Alarms system with selectable VOICE / TONE function through the respective touch screen display button:
 - Maximum Torque Reached alarm in Mechatronic Screwdriver mode.
 - Adjusting Torque alarm in Mechatronic Screwdriver mode.
 - Overload alarm in Mechatronic Drill mode.
 - Passing through the cortical wall detection alarm (Breakthrough) in Mechatronic Drill mode.
- ✓ Maximum delivered torque: 36 Kg/cm (3,5 nW/m).
- ✓ Operating voltage: 110 - 220 Volts. A.C. 50 / 60 Hz.