

Titan 3™ Low-Speed Handpiece (Project 07-28) (9/09)

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The StarDental® Titan 3™ is an autoclavable air driven stainless steel low-speed handpiece system. The Titan-T™ is an equivalent low-speed handpiece system manufactured with a titanium housing. The Titan3™ and previous stainless steel StarDental® low-speed handpieces have



been frequently used in federal dental clinics. The Titan 3™ and Titan-T™ are produced in two versions: a handpiece that requires lubrication of the transmission gear in the Ball Bearing Latch Angle and a LubeFree handpiece system which has a non-lubricated transmission gear. During this project, the push-button lubricated Ball Bearing Auto Latch Angle Titan 3™ stainless steel low-speed handpiece was evaluated and compared to the push-button LubeFree Ball Bearing Auto Latch Angle Titan-T™ titanium handpiece system. The Titan-T™ is the first non-lubricated low-speed evaluated by DECS. There are two motors (5,000 RPM and 20,000 RPM) and multiple attachments for these systems. All StarDental® Motors and the Motor-to-Angle adapters (stainless steel or titanium) are considered to be lube free by the manufacturer. Both motors can be run in a forward or reverse direction. For operative/restorative procedures, in addition to the push-button LubeFree Ball Bearing Auto Latch Angle, the other available options are a LubeFree Ball Bearing Manual Latch Angle, a LubeFree Ball Bearing Autochuck Friction Grip Angle and a LubeFree Ball Bearing Manual Chuck Friction Grip Angle. These are also available in versions requiring lubrication. The Five-Star® Prophy Angle attachment is available in either a lubricated or LubeFree option. There are other attachment alternatives including a Straight Nose Cone, a Torque Multiplier, a 10:1 Gear Reduction Latch Angle and Endodontic Auto or Manual Latch Angles. Titan Motor 2-Line® or 4-Line® 360 degree quick connect swivels are available to attach the handpiece to the unit hosing. The attachment between the Motor and the Motor-to-Angle adapter creates a secondary 360 degree swivel. The swivels are intended to reduce tubing drag, allow handpiece rotation to difficult areas of the mouth and increase operator comfort.

The LubeFree Motor, Motor-to-Angle adapters and Angles require minimum maintenance as outlined in the instructions included with the handpiece systems. The “cartridge” housing the ball bearings, gears and chuck mechanism within the Latch Angle for both the Titan 3™ and Titan-T™ is considered “lubricated for life and sealed to keep dirt out” by the manufacturer. Post treatment maintenance consists of cleaning all external surfaces with isopropyl alcohol wipes and/or cotton swabs and drying thoroughly before packaging for sterilization. All elements of the handpiece system (Angle, Motor-to-Angle adapter and Motor) must be separated from each other before sterilization. The transmission gear for the lubricated Angles must be lubricated with DentaLube® II Advanced Handpiece Lubricant before sterilization. The StarDental® Motors and the Ball Bearing Auto Latch Angles have a one-year warranty against defects in material and workmanship from the date of purchase. The Motor-to-Angle adaptor has a six-month warranty.

Manufacturer:

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Suggested Retail and Government Pricing:

Titan 3™ Stainless Steel Motors and Attachments

Description	Item Number	Retail Price	Govt Price
5,000 RPM Motor ***	262261	\$806.00	\$448.19
20,000 RPM Motor	262262	\$702.00	\$395.15
Motor-to-Angle Adaptor ***	264073	\$175.00	\$111.80
Straight Nose Cone Attachment	257506	\$350.00	\$244.40
Swivel, Titan Motor 2-Line® (Used with all Titan low-speeds) ***	260152	\$164.00	\$78.49
Swivel, Titan Motor 4-Line® (Used with all Titan low-speeds)	260144	\$164.00	\$78.49

Titan 3™ Stainless Steel LubeFree Angles

Description	Item Number	Retail Price	Govt Price
Five Star® Propphy Angle	263240	\$122.00	\$60.06
Ball Bearing Auto Latch Angle	264146	\$295.00	\$144.69
Ball Bearing Manual Latch Angle	262738	\$214.00	\$104.33
Ball Bearing Autochuck Friction Grip Angle	264151	\$292.00	\$144.69
Ball Bearing Manual Chuck Friction Grip Angle	262740	\$217.00	\$106.47

Titan 3™ Stainless Steel Lubricated Angles

Description	Item Number	Retail Price	Govt Price
Five Star® Propphy Angle	263176	\$109.00	\$53.51
Ball Bearing Auto Latch Angle ***	264182	\$273.00	\$133.77
Ball Bearing Manual Latch Angle	259005	\$200.00	\$98.25
Ball Bearing Autochuck Friction Grip Angle	264149	\$272.00	\$133.77
Ball Bearing Manual Chuck Friction Grip Angle	258965	\$205.00	\$101.01

*** Used During the DECS Evaluation

ADVANTAGES:

- + Excellent longevity of the Lube Free Titan 3™ Motor and Motor-to-Angle adapter
- + No degradation of power during course of evaluation for the Motor and Motor-to-Angle adapter
- + High torque over a broad low-speed range
- + Design should allow good intra-oral visibility
- + Good concentricity, low noise
- + Numerous attachments to perform a variety of procedures
- + 5,000 RPM and 20,000 RPM motors available

DISADVANTAGES:

- Complete failure of Titan 3™ latch angles heads in 12–18 months of simulated laboratory use
- Possible compromised infection control/sterilization due to corrosion inside latch angle heads
- LubeFree Titan-T™ push button latch angle performance comparable to Titan 3™ lubricated angle
- Must buy separate motors for low (5000 RPM) and higher (20,000 RPM) speed ranges

SUMMARY AND CONCLUSIONS:

The CDC Guidelines for Infection Control in Dental Health-Care Settings – 2003 and Air Force dental infection control policy require heat sterilization of all handpieces, including the low-speed motor, between each patient.^{1,2} In 2005, the DECS Equipment Survey revealed that the StarDental® Titan low-speed handpiece had 20% of the market share within Air Force dental clinics and had the second highest customer satisfaction rating.³ Current versions of StarDental® low-speed handpieces are the stainless steel Titan 3™ and the titanium Titan-T™. Both are available as LubeFree systems or in the more traditional lubricated configuration. Although lube free high-speed handpieces have been available for over 20 years, the introduction of low-speed handpieces that do not require lubrication is more recent. Previous DECS evaluations of two lube-free high-speed handpieces revealed excellent longevity and performance parameters.^{4,5} The design and function of air driven high- and low-speed handpieces are

different. High-speeds have an air turbine designed to generate the high speed and power to cut enamel. Low-speeds have air driven motors which provide power through numerous meshing rotational gears to an array of attachments used for different purposes ranging from caries removal and dental prophylaxis to prosthodontic polishing procedures. There are more “working parts” to a low-speed system increasing the chances for system failure after repeated use and sterilization. A handpiece that does not require lubrication has several possible advantages. Valuable time spent maintaining and lubricating handpieces in between operative procedures is saved as is the cost of the required lubrication products. Possible human error in completing required maintenance procedures incorrectly with resultant handpiece deterioration is also diminished. Using a lube-free handpiece eliminates residual lubrication product. Without this elimination the handpiece lubricant: (1) might be inadvertently expelled into the restorative field, interfering with bonding agents; or (2) may create a residual build-up within the handpiece over repeated sterilizations causing handpiece malfunction.

The Titan 3™ and Titan-T™ 5,000 RPM lube-free Motors and lube-free Motor-to-Angle adapters performed extremely well with no failures during 1,000 clinical user simulations. Three of the initially tested Titan-T™ push-button LubeFree Ball Bearing Auto Latch Angle attachments failed and required replacement during the evaluation. The other three Titan-T™ latch angle heads survived 1,000 cycles of testing but caused significant losses in handpiece power after 500 cycles (12 months of simulated use). All of the lubricated Titan 3 Ball Bearing Auto Latch Angle attachments failed prior to testing at 750 cycles. The Auto Latch Angle attachments in both systems have a one-year warranty. The earliest failures of these attachments in either system occurred at one year of simulated use indicating survival of the warranty period in our test laboratory environment. Corrosion was observed in both systems on the transmission gear as early as 100 cycles. This had visually increased significantly at 250 cycles and continued to worsen until ultimate failure. Internal corrosion to this extent creates surfaces more likely to collect and harbor bioburden potentially compromising sterilization of the handpiece and infection control. Difficulty with inserting or removing burs from the handpiece heads was an indication of this internal corrosion and can be used clinically as an indication for possible replacement. Testing clearly demonstrated that the diminished handpiece performance was due to the deterioration of the lubricated Titan 3™ Ball Bearing Auto Latch Angles and the LubeFree Titan-T™ Ball Bearing Auto Latch Angles. Lubrication of the Titan 3™ heads appeared to be of no significant advantage as no increased longevity was observed and when examined microscopically, the corrosion and debris within the failed heads appeared no better and in some cases worse than the Titan-T™ heads. Noise levels for both handpiece systems were well below the ISO standard of 80 decibels. The concentricity of both handpiece systems remained well within ISO standards. However, increases in eccentricity occurred in both handpiece systems and was a predictable sign of impending failure of the latch angles.

The mean weight of the tested titanium Titan-T™ handpieces was 20.1% less than the stainless steel Titan 3™ handpieces. Although lighter handpieces are usually desirable, in a previous DECS handpiece evaluation, clinical evaluators stated that the weight of the attached hose minimized the ability to detect this weight reduction in a clinical setting.⁶ The two swivels, at the coupler and at the attachment between the Motor and the Motor-to-Angle adapter may reduce tubing drag and be as important as reduction in handpiece weight for ergonomic handpiece use.

Although the sterilization regimen used in the laboratory simulation may be more severe than in an actual clinical setting, DECS testing clearly revealed that Titan 3™ and Titan-T™ Motors and Motor-to-Angle attachments will last longer than the latch angle heads. Due to probable corrosion and performance deterioration, the auto latch angles as tested in this project should be considered for replacement after one year of use. Difficulty with inserting or removing burs may be a sign for replacement at earlier intervals. Since non-lubricated Motors and Motor-to-Angle adapters are used for all StarDental® low-speed handpieces, the differences in cost of a lubricated compared to a non-lubricated system is dictated by the handpiece angle head alternatives and whether the system is made of stainless steel or titanium. The LubeFree angle alternatives are slightly more expensive (\$5.00 to \$11.00 more) than their lubricated counterparts. The government cost of the lubricated Titan 3™ motor and attachments as tested is about \$40.00 less (government pricing) than the tested lube free titanium Titan-T™ system. An equivalent lube free stainless steel Titan 3™ system would be about \$30.00 less than the alternative titanium system.

The lighter, titanium non-lubricated Titan-T™ system performed in an equivalent manner to the lubricated Titan 3™ system. Lubrication of the Titan 3™ handpiece system did not increase longevity. The extra expense of a lube free Titan-T™ or lube free Titan 3™ system may be worth the price to eliminate required lubrication protocols. The stainless steel **Titan 3™ 5,000 RPM Motor and Motor-to-Angle adapter** are rated **Excellent**, while the stainless steel **lubricated Titan 3™ Ball Bearing Auto Latch Angle** is rated as **Acceptable** for use in U.S. Air Force dental facilities.

References

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