For Stable Internal Fixation of the Sternum

Titanium Sternal Fixation System

Surgical Technique





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MR Information

The Titanium Sternal Fixation System has not been evaluated for safety and compatibility in the MR environment. It has not been tested for heating, migration or image artifact in the MR environment. The safety of the Titanium Sternal Fixation System in the MR environment is unknown. Scanning a patient who has this device may result in patient injury.

Image intensifier control

The DePuy Synthes Titanium Sternal Fixation System provides stable internal fixation of the sternum following a sternotomy or fracture of the sternum.

Broad variety of sternal plates

Different titanium plates according to the anatomical structures and patient's need are available:

- Straight locking plates for a stable sternal rib-to-rib fixation
- Sternal body plates for minimal dissection
- Star-shaped and H-shaped locking plates for fixation of the manubrium
- Titanium sternal locking straight plate without pin for transverse fractures⁺



+ Contraindicated for use in acute cardiac patients.



Self-tapping and self-drilling locking screws

Both self-tapping and self-drilling locking screws are available to accommodate surgeon preference.

Secure and stable locking

The plate functions like an external fixator, applied internally.

The screwhead of the sternal locking screws locks securely into the threaded plate hole to provide stable fixation (Figure 1).

Emergency release pin on all plates^{*}

All plates consist of two parts joined by a U-shaped release pin in the cross section. The release pin allows a quick and easy sternal reentry in cardiac emergency cases (Figure 2).





Figure 1



‡ Except the Titanium Sternal Locking Straight Plate, 13 holes, without pin (460.046), which is contraindicated for use in acute cardiac patients.

Figure 2

Construct strength comparison

Constructs loaded in tension in lateral direction. All tests were performed on 10 mm thick composite polyurethane foam test blocks composed of an inner (cancellous) core of 5 lb/ft³ polyurethane foam with a 1.25 mm thick (cortical) shell of 10 lb/ft³ polyurethane foam laminated to the exterior.*



Sample test construct (X-Plate setup shown)



*Mechanical test data on file at DePuy Synthes.

Mechanical test results may not necessarily be indicative of clinical performance.

In 1958, the AO formulated four basic principles, which have become the guidelines for internal fixation.^{1,2}

Anatomic reduction

Fracture reduction and fixation to restore anatomical relationships.

Early, active mobilization

Early and safe mobilization and rehabilitation of the injured part and the patient as a whole.



Stable fixation

Fracture fixation providing absolute or relative stability, as required by the patient, the injury, and the personality of the fracture.

Preservation of blood supply

Preservation of the blood supply to soft tissues and bone by gentle reduction techniques and careful handling.

1. Müller ME, Allgöwer M, Schneider R, Willenegger H. *Manual of Internal Fixation*. 3rd ed. Berlin, Heidelberg, New York: Springer-Verlag; 1991.

2. Rüedi TP, RE Buckley, CG Moran. AO Principles of Fracture Management. 2nd ed. Stuttgart New York: Thieme; 2007.

Indications

Primary or secondary closure/repair of the sternum following sternotomy or fracture of the sternum, to stabilize the sternum and promote fusion.

Warnings:

- These devices can break during use (when subjected to excessive forces or outside the recommended surgical technique). While the surgeon must make the final decision on removal of the broken part based on associated risk, in doing so, we recommend that whenever possible and practical for the individual patient, the broken part should be removed.
- Medical devices containing stainless steel which may elicit an allergic reaction in patients with hypersensitivity to nickel.
- Be aware that implants are not as strong as native bone. Implants subjected to substantial loads may fail.

Position patient

Position the patient with the arms tucked along the sides. Avoid placing arms at 90° on arm boards, as this makes chest closure more difficult.



2

Debride (for secondary closure of the sternum)

Remove existing wires. Debride the involved sternal edges until they are free of devitalized tissue and down to bleeding tissue. Hemostasis should be obtained.

A curette can be used to remove any nonviable cartilaginous rib.

Precautions: A sternal bone specimen should be sent to pathology to assess for osteomyelitis. Antibiotic treatment should be based on the identification of pathogens from bone cultures at the time of bone biopsy or debridement. Bone cultures are obtained first, then suspected pathogensare covered by initiation of a parenteral antimicrobial treatment.^{1,2}



- Concia E, Prandini N, Massari L, Ghisellini F, Consoli V, Menichetti F. Osteomyelitis: clinical update for practical guidelines. *Nucl Med Commun.* Aug 2006;27(8):645-60. [Medline].
- Calhoun JH, Manring MM. Adult osteomyelitis. Infect Dis Clin North Am. Dec 2005;19(4):765-86

Expose ribs laterally, if necessary

Beginning medially, elevate the pectoralis major muscles with overlying soft tissue attached to create flaps and permit later approximation in the midline.

It is usually not necessary to perform a second incision at the shoulder to release the pectoral muscle insertion.

Following debridement and muscle elevation, pulse lavage the entire surgical site with an adequate volume of saline with antibiotics.



4 Measure sternal edges Instrument 319.11 Depth Gauge

Using the depth gauge, measure the sternal edges adjacent to each rib where a plate may be placed.

Add 3 mm to the thickness of the sternal edge to account for the plate thickness and to determine the appropriate length drill bit with stop.

Alternative instrument

03.501.065 Caliper



Reduce sternum

Instruments398.903Sternal Reduction Forceps, angled,
with teeth398.985Bone Reduction Forceps, large

Reduce the sternum using reduction forceps on both the superior and inferior aspects of the sternum.

When placing the forceps, care should be taken to avoid the intercostal and mammary vessels and nerves.

Alternative instrument

398.902

Sternal Reduction Forceps

Note: Sternum can also be reduced with stainless steel surgical wire, if desired.

Precaution: Avoid direct contact of stainless steel wires with titanium implants to avoid galvanic corrosion.

6

Cut and contour template

Instruments	
329.40.98	Bending Template
391.990	Plate and Rod Cutter

Cut the bending template to a length that allows placement of a minimum of four screws on each side of the sternum.

Contour the template to the sternum and ribs.





Select plate

Instrument

319.990 Plate and Rod Cutter

Select the appropriate length titanium sternal locking plate. Center the release pin on the sternum with sufficient plate length on each side to allow a minimum of four locking screws on each side.

The plate can be cut to length, if necessary, using the plate and rod cutter.

Alternative instrument

391.967* Shortcut Plate Cutter (2 required)

As an alternative, shortcut plate cutters may be used.

Note: All steps of preparation and implantation of the Sternal Locking Plate have to be done, whenever possible, with the assembled plate. Do not disassemble the plate by pulling out the Emergency Release Pin.

Pre for a m

Precaution: Select a plate with sufficient length to allow				
a minimum of four screws on each side.				
8				
Contour plate				

Instrument	
329.142	Combination Bending Pliers

A	lter	nat	tive	instr	ume	ents

391.963.96	Universal Bending Pliers
497.689	Bending Insert

Orient the plate so that the titanium emergency release pin is parallel to the midline of the sternum. The closed end of the emergency release pin should be oriented cranially. Contour the plate to match the template. The top side of the plate is etched with the part number, and the holes are countersunk to allow the screws to seat fully.

* Also available.







Use the combination bending pliers to make in-plane bends first, followed by out-of-plane bends.

Note: Be aware that performing bends in reverse order might not result in optimal contouring.

Contour the plate with the emergency release pin inserted. If the emergency release pin interferes with the bending tool, it can be temporarily removed. (See page 20 "Insert emergency release pin" for correct reinsertion of the pin.)

Note: Be careful not to deform the pin section of the plate halves while contouring. If this portion of the plate is bent, the plate could break or the emergency release pin could become stuck in the plate.

Check the plate against the template to ensure it has the correct shape.

Note: The smaller sternal body plates can be bent with universal bending pliers.

Prior to contouring the plate to the patient's anatomy, bending inserts may be threaded into the plate holes in regions where more extensive contouring is desired. Use a MatrixMANDIBLETM/MaxtrixRIB® System screwdriver blade to thread these into the selected plate hole. Bend the plate to the desired geometry. Once the proper bend is achieved (and before affixing the plate to the bone), remove the bending inserts.





Precautions:

- Use bending screws for severe bends to prevent plate hole deformation while contouring the plate.
- Bending screws may be left in place if they cannot be removed.
- DePuy Synthes recommends the use of at least four screws per side/per plate for sternal osteotomies with this system.
- Avoid excessive and reverse bending as it may weaken the plate and lead to premature implant failure.

9

Position plate

Position the plate to allow placement of a minimum of four screws on each side of the fracture.

For sternal locking straight plates, position the plate on the superior portion of the rib to avoid the intercostal vessels and nerves during drilling.

Precautions:

- In order to determine the appropriate amount of fixation for stability, the surgeon should consider the size and shape of the fracture or osteotomy.
- Use a minimum of four screws per side/per plate for sternal osteotomies with this system.



Drill

Instruments

03.501.010– 03.501.024	1.5 mm Drill Bits with stop, Stryker J-latch, 10 mm–24 mm stop (2 mm increments)
03.501.200	1.5 mm/1.8 mm Threaded Drill Guide

Note: The alternative technique with self-drilling screws can be used (see page 17).

Alternative instrument

03.501.212 1.8 mm Drill Bit with 12 mm stop, Stryker J-latch

Insert the 1.5 mm/1.8 mm threaded drill guide into the plate to ensure the locking screw will be aligned with the plate hole.

For the sternum, use the drill bit with stop of the proper length as determined in Step 4. Recognize that the thickness of the adjacent ribs may be less than the sternal edge. Drill bits with stop are available in lengths ranging from 10 mm to 24 mm, in 2 mm increments, matching the locking screw lengths.

Note: If a screw is difficult to insert after using the 1.5 mm drill bit, the 1.8 mm drill bit with stop can be used to drill a larger hole.

Precautions:

- Do not drill any deeper than determined in step 4 to avoid the risk of pneumothorax.
- Do not drill in the region above the internal mammary arteries.
- Irrigate during drilling to avoid thermal damage to the bone.
- Drilling speed should never exceed 1800 rpm. Higher speeds can result in thermal necrosis of the bone and increased hole diameter and may lead to unstable fixation.
- Recognize that the thickness of the adjacent ribs may be less than the sternal edge.
- For medial screws, drill bicortically.
- For lateral screws, drill bicortically wherever possible.

Remove the 1.5 mm/1.8 mm threaded drill guide.





Select and insert screw

Instruments			
03.503.071	MatrixMANDIBLE/RIB Self-Retaining Screwdriver Blade, medium		
311.023	Ratcheting Screwdriver Handle		
319.11	Depth Gauge		

Measure the depth of the drilled hole using the depth gauge through the plate to confirm the appropriate screw length.

Be careful not to extend the tip of the depth gauge past the far cortex of the sternum/rib.

Select the proper length 3.0 mm titanium locking screw.

Precaution: The screw should be no longer than necessary to engage the posterior cortex, to avoid deeper injury. The tip of the screw should not extend more than 0.5 mm beyond the posterior cortex to avoid the risk of pneumothorax.

Note: Screws can be measured using the screw length indicator on the module.

Insert the locking screw through the plate and tighten manually until secure.







Drill and place remaining screws

Insert a second screw on the opposite side of the sternum following Steps 10 and 11. Insert all remaining screws in the same manner.

Check that the flat prong on the emergency release pin is bent at a slight angle $(20^\circ-25^\circ)$ to reduce the chance of pin migration.



Precaution: Avoid over-bending of the flat prong (>25°), as this can lead to breakage or inability to remove the pin for emergency reentry.



Insert remaining plates

Place remaining plates following Steps 6 through 12. A minimum of three plates is recommended.

DePuy Synthes recommends a minimum of three plates in the sternal body for optimal sternal closure following a full sternotomy.

Precautions:

- If one plate is used in combination with stainless steel surgical wires, DePuy Synthes recommends using at least four wires for closure of a full sternotomy. If two plates are used in combination with stainless steel wires, a minimum of two wires should be used.
- Avoid direct contact of stainless steel wires with titanium implants to prevent galvanic corrosion.
- After implant placement is complete, discard any fragments or modified parts in an approved sharps container.
- Irrigate and apply suction for removal of debris potentially generated during implantation.

14

Manubrium plate (optional)

Instrument

391.963.96 Universal Bending Pliers

A plate can be placed on the manubrium for extra support, if needed. Several star-shaped and H-shaped plates are available for placement on the manubrium. Follow guidelines in Steps 7 through 12 to place this plate.

A manubrium plate is considered optional when used in addition to the recommended construct in the previous step.

When a manubrium plate is optional, insert screws bicortically when possible. Monocortical placement of screws may be used according to surgeon preference.

The manubrium plates can be bent with universal bending pliers.

The H-shaped and star-shaped plates are intended only for use on the manubrium where fixation to the rib is impractical.







Closure and postoperative considerations

Irrigate the wound again with antibiotic-containing saline. Insert one #10 Jackson Pratt or Blake flat drain under each pectoral muscle flap and bring out through separate inferior incisions.

Approximate pectoral muscles with interrupted #1 Vicryl suture, and close skin and subcutaneous tissue in layers.

Drains are usually removed when output is consistently less than 20 cc per drain per day.

Note: Do not pull or lift the patient by the arms for 6 weeks. Do not raise arms higher than 90° at shoulder level.

Alternative Technique with Self-drilling Screws

Self-drilling locking screws are available as an alternative to the self-tapping locking screws.

1

Measure sternal edge and position plate

Measure the sternal edge and position the plate as described in Steps 1 to 9 of the surgical technique with self-tapping screws.



2

Select and insert screw

Instrument	
03.503.071	MatrixMANDIBLE/RIB Self-Retaining Screwdriver Blade, medium
311.023	Ratcheting Screwdriver Handle

Select the proper length 3.0 mm titanium sternal self-drilling locking screw based on sternal edge measurement as described in Step 4 of the self-tapping screws section (add 3 mm to the thickness of the sternal edge to account for the plate thickness).

Precautions:

- The self-drilling locking screw should be inserted perpendicular to the plate and the screw axis should be aligned with the thread axis of the plate hole.
- The self-drilling locking screw should be no longer than necessary to engage the posterior cortex, to avoid deeper injury. The tip of the screw should not extend more than 0.5 mm beyond the posterior cortex. In the area of the ribs, predrilling may facilitate the determination of the appropriate screw length.





2. Select and insert screw continued

Insert the sternal locking screw through the plate and tighten manually until secure.

Note: Screws can be measured using the screw length indicator on the module.

Precautions:

- Recognize that the thickness of the adjacent ribs may be less than the sternal edge.
- Screw lengths 14 mm and longer should not be used in the area of the ribs.²
- For medial screws, insert bicortically. For lateral screws, insert bicortically whenever possible.
- Do not insert screws any deeper than necessary, to avoid the risk of pneumothorax.
- Do not insert screws in the region above the internal mammary arteries.
- After surgery, routinely perform a chest x-ray to exclude the possibility of a pneumothorax.

3

Place remaining screws

Insert a second sternal self-drilling locking screw on the opposite side of the sternum following Steps 1 to 2 of the alternative technique with self-drilling screws. Insert all remaining sternal self-drilling locking screws in the same manner.

Complete the procedure following Steps 13 through 15 of the surgical technique with self-tapping screws.

 M. Mohr, E. Abrams, C. Engel, et al. "Geometry of human ribs pertinent to orthopedic chestwall reconstruction." J Biomech 2007; 40:1310-1317.

Emergency Reentry

Remove emergency release pin

Remove the emergency release pins from the plates.

Precaution: Discard the pins. Pins must not be reused.

Separate the two plate halves to open the sternum.

Note: Plate and screw removal is necessary for reentry with the Sternal Locking Plate 2.4, straight, without emergency release pin, or if sternal bony fusion has occurred. To facilitate plate and screw removal, the DePuy Synthes Universal Screw Removal Set 01.505.200 may be used.

Precaution: Irrigate and apply suction for removal of debris potentially generated during explantation.









Insert emergency release pin

To reclose the sternum, a forceps or reduction instrument may be used to return the plate halves to their original positions. Remove any soft tissue that could prevent them from interdigitating properly.

Once the plate halves are coupled, insert a new titanium emergency release pin. The closed end of the emergency release pin should be oriented cranially with the sloped bend oriented anteriorly.

Precautions:

- Bend the flat prong on the pin medially 20°–25°, to reduce the chance of pin migration.
- Avoid over-bending of the flat prong (>25°), as this can lead to breakage or inability to remove the pin for emergency reentry.









Available non sterile or sterile packed. Add S to product number for sterile product.

Titanium Sterna	l Locking Straight Plates	Π	
460.019	12 holes	$\mathbf{OOOO} \subset \mathbf{OOOO}$	5
460.023	20 holes	460.0)45
460.024S*	30 holes		
460.045	8 holes	0	
460.046+	13 holes, without pin	000000000000000000000000000000000000000	0
		460.0	J19
		000000000000000000000000000000000000	\mathbf{O}
		460.0)23
	000000000	000000000000000000000000000000000000000	\mathbf{O}
		460.024	↓S*

460.046+

Titanium Sternal Locking Screws

04.501.110.05- 04.501.120.05	3.0 mm Titanium Sternal Locking Screws, self-drilling, 10 mm–20 mm (2 mm increments, 5/pkg.)	
413.580-	3.0 mm Titanium Locking Screws, for	

Sternal Locking Plates, 10 mm-24 mm 413.594 (2 mm increments, self-tapping, 5/pkg.)

* Also available.

† Contraindicated for use in acute cardiac patients.

Instruments

03.501.010– 03.501.024*	1.5 mm Drill Bits with stop, Stryker J-latch, 10 mm–24 mm* (2 mm increments)	contraction (Linning) yill
03.501.065	Caliper	
03.501.200	1.5 mm/1.8 mm Threaded Drill Guide	
03.501.212	1.8 mm Drill Bit with 12 mm stop, Stryker J-latch, 82 mm	
03.503.071	MatrixMANDIBLE/RIB Self-Retaining Screwdriver Blade Medium	
305.695	Plate Bending Insert Block for Titanium Sternal Modules	
311.023	Ratcheting Screwdriver Handle	

* 24 mm length not included in set.

319.11	Depth Gauge, for 1.5 mm and 2.0 mm cortex screws	
329.142	Combination Bending Pliers, for 2.0 mm–2.4 mm plates	Leves Denor
329.40.98	Bending Template, 37 holes, 295 mm length	Decessood//peccessood
391.963.96	Universal Bending Pliers	
391.990	Plate and Rod Cutter	



Graphic Case, Trays and Modules 305.694 Module for Longer Titanium Sternal Locking Screw with Plate/Drill Bit 305.695 Plate Bending Insert Block for Titanium Sternal Modules 305.699 Label Sheet for Titanium Sternal Module (305.694) 690.691 Graphic Case, for Titanium Sternal Fixation System Set 690.692 Sternal Fixation Instrument Tray, for Screwdrivers, Forceps 690.693 Sternal Fixation Instrument Tray, for Plate Cutter, Bending Pliers Screw Length Markers (10/pkg.) 10 mm 304.110 304.112 12 mm 304.114 14 mm 304.116 16 mm 304.118 18 mm 304.120 20 mm 304.122 22 mm Instruments 1.5 mm Drill Bits, Stryker J-latch, 2 ea.

03.501.010	10 mm stop, 82 mm length
03.501.012	12 mm stop, 82 mm length
03.501.014	14 mm stop, 82 mm length
03.501.016	16 mm stop, 82 mm length
03.501.018	18 mm stop, 82 mm length
03.501.020	20 mm stop, 88 mm length
03.501.022	22 mm stop, 88 mm length
03.501.200	1.5 mm/1.8 mm Threaded Drill Guide, for Titanium Sternal Locking Plates, 2 ea.
03.501.212	1.8 mm Drill Bit with 12 mm stop, Stryker J-latch, 82 mm, 2 ea.
03.503.071	MatrixMANDIBLE/RIB Self-Retaining Screwdriver Blade, medium, 2 ea.



For detailed cleaning and sterilization instructions, please refer to www.synthes.com/cleaning-sterilization or sterilization instructions, if provided.

311.023	Ratcheting Screwdriver Handle, 2 ea.
319.11	Depth Gauge
329.142	Combination Bending Pliers,
	for 2.0 mm–2.4 mm plates
329.40.98	Bending Template, 37 holes, 2 ea.
391.963.96	Universal Bending Pliers, 2 ea.
391.990	Plate and Rod Cutter
398.903	Sternal Reduction Forceps, angled, with teeth, 2 ea.
398.985	Bone Reduction Forceps, large, 2 ea.
497.689	Bending Insert Screw, for Locking
	Reconstruction Plate, 2 ea.
Implants	
	3.0 mm Titanium Locking Screws, for
442 500	Sternal Locking Plates (self-tapping, 5/pkg.)
413.580	10 mm, 5 pkgs.
413.582	12 mm, 6 pkgs.
413.304	14 mm, 6 pkgs.
413.588	18 mm 6 pkgs.
413.590	20 mm, 6 pkgs.
413.592	22 mm, 6 pkgs.
460.019	Titanium Sternal Locking Straight Plate, 12 holes, 4 ea.
460.022*	Titanium Emergency Release Pin, 6 ea.
460.023	Titanium Sternal Locking Straight Plate, 20 holes, 4 ea.
460.027◊	Small Titanium Sternal Locking H-Plate, 8 holes, 2 ea.
460.0280	Large Titanium Sternal Locking H-Plate, 8 holes, 2 ea.
460.0350	Titanium Sternal Locking Star Plate, 6 holes, 2 ea.
460.0360	Titanium Sternal Locking Star Plate, 12 holes, 2 ea.

* Available sterile in 5-pack. Add .05S to product number.

 \Diamond Available non-sterile or sterile-packed. Add S to product number for sterile product.

Graphic Case, Trays and Modules			
305.690	Self-Drilling Screw Module, for the		
	Titanium Sternal Fixation System		
305.695	Plate Bending Insert Block for Titanium		
	Sternal Modules		
690.691	Graphic Case, for Titanium Sternal		
	Fixation System Set		
690.693	Sternal Fixation Instrument Tray,		
	for Plate Cutter, Bending Pliers		
690.694	Sternal Fixation Instrument Tray,		
	for Ratcheting Screwdriver, Forceps		
60.501.607	Label Sheet for Self-Drilling Screw Module		
	Screw Length Markers, for self-drilling screws		
304.110W	10 mm, 2 ea.		
304.112W	12 mm, 3 ea.		
304.114W	14 mm, 3 ea.		
304.116W	16 mm, 3 ea.		
304.118W	18 mm, 2 ea.		
Instruments			



03.501.065	Caliper
03.503.071	MatrixMANDIBLE/RIB Self-Retaining
	Screwdriver Blade, medium, 2 ea.
311.023	Ratcheting Screwdriver Handle, 2 ea.
329.142	Combination Bending Pliers,
	for 2.0 mm-2.4 mm plates
329.40.98	Bending Template, 37 holes, 2 ea.
391.963.96	Universal Bending Pliers, 2 ea.
391.990	Plate and Rod Cutter
398.903	Sternal Reduction Forceps, angled,
	with teeth, 2 ea.
398.985	Bone Reduction Forceps, large, 2 ea.
497.689	Bending Insert Screw, for Locking
	Reconstruction Plate, 2 ea.

Implants

	3.0 mm Titanium Sternal Locking Screws, self-drilling (5/pkg.)
04.501.110.05	10 mm, 4 pkgs.
04.501.112.05	12 mm, 6 pkgs.
04.501.114.05	14 mm, 6 pkgs.
04.501.116.05	16 mm, 6 pkgs.
04.501.118.05	18 mm, 4 pkgs.
460.022*	Titanium Emergency Release Pin,
	for use with Sternal Fixation System, 6 ea.
460.0360	Titanium Sternal Locking Star Plate,
	12 holes, 2 ea.
460.037◊	Titanium Sternal Locking X-Plate,
	10 holes, 2 ea.
460.038◊	Titanium Sternal Locking Double-T Plate,
	14 holes, 2 ea.
460.039◊	Titanium Sternal Locking Angled Plate,
	12 holes, 2 ea.
460.0400	Titanium Sternal Locking X-Plate, Wide
	10 holes, 2 ea.
460.0450	Titanium Sternal Locking Straight Plate,
	8 holes, 4 ea.
460.046†◊	Titanium Sternal Locking Straight Plate,
	13 holes, without pin, 2 ea.

* Available sterile in 5-pack. Add .05S to product number.

◊ Available nonsterile or sterile-packed. Add S to product number for sterile product.

+ Contraindicated for use in acute cardiac patients.

Titanium Sternal Fixation System Combination Set (01.501.627)

Graphic Case,	, Trays and Modules	
305.690	Self-Drilling Screw Module, for the Titanium Sternal Fixation System	
305.694	Module for Longer Titanium Sternal Locking Screw, with Plate/Drill Bit	
305.699	Label Sheet for Titanium Sternal Module 305.694	
60.501.601	Graphic Case, for Titanium Sternal Fixation System Combination Set	
60.501.607	Label sheet for Self-Drilling Screw Module	and the second s
304.110 304.112 304.114 304.116 304.118 304.120 304.122	Screw Length Markers (10/pkg.) 10mm 12mm 14mm 16mm 18mm 20mm 22mm	
304.110W 304.112W 304.114W 304.116W 304.118W	Screw Length Markers, for self-drilling screws 10 mm, 2 ea. 12 mm, 3 ea. 14 mm, 3 ea. 16 mm, 3 ea. 18 mm, 2 ea.	
Instruments	Coliner	
03.501.065	Caliper 1.5 mm/1.8 mm Threaded Drill Guide, for Titanium Sternal Locking Plates, 2 ea.	
03.501.212	1.8 mm Drill Bit Stryker J-Latch, 12 mm stop, 82 mm, 2 ea.	
03.503.071	MatrixMANDIBLE/RIB Self-Retaining Screwdriver Blade, medium, 2 ea.	
311.023	Ratcheting Screwdriver Handle, 2 ea.	
319.11	Depth Gauge, for 1.5 mm and 2.0 mm	

Cortex Screws, measures up to 24 mm

329.142	Combination Bending Pliers,	In 305.694 Module	
	for 2.0 mm-2.4 mm plates	305.695	Plate Bending Insert Block for Titanium
329.40.98	Bending Template, 37 holes, 2 ea.		Sternal Modules
391.963.96	Universal Bending Pliers, 2 ea.		1.5 mm Drill Bits, Stryker J-latch, 2 ea.
391.990	Plate and Rod Cutter	03.501.010	10 mm stop, 82 mm length
398.903	Sternal Reduction Forceps, angled, with teeth, 2 ea.	03.501.012 03.501.014	12 mm stop, 82 mm length 14 mm stop, 82 mm length
398.985	Bone Reduction Forceps, large, 2 ea.	03.501.016	16 mm stop, 82 mm length
497.689	Bending Insert Screw, for Locking Reconstruction Plate, 2 ea.	03.501.018 03.501.020 03.501.022	18 mm stop, 82 mm length 20 mm stop, 88 mm length 22 mm stop, 88 mm length
In 305.690 Mod	dule		3.0 mm Titanium Locking Screws, for
305.695	Plate Bending Insert Block for Titanium		Sternal Locking Plates, (self-tapping, 5 pkg.)
	Sternal Modules	413.580	10 mm, 5 pkgs.
04.501.110.05	3.0 mm Titanium Sternal Locking Screws, self-drilling (5/pkg.) 10 mm, 4 pkg.	413.582 413.584 413.586	12 mm, 6 pkgs. 14 mm, 6 pkgs. 16 mm, 6 pkgs.
04.501.112.05	12 mm, 6 pkg.	413.588	18 mm, 6 pkgs.
04.501.114.05	14 mm, 6 pkg.	413.590	20 mm, 6 pkgs 22 mm, 6 pkgs
04.501.116.05	16 mm, 6 pkg.	415.552	
460.022*	18 mm, 4 pkg. Titanium Emorganov Palaaca Pin, for usa	460.019	Titanium Sternal Locking Straight Plate, 12 holes, 4 ea.
400.022	with Sternal Fixation System, 6 ea.	460.022*	Titanium Emergency Release Pin, 6 ea.
460.0360	Titanium Sternal Locking Star Plate, 12 holes, 2 ea.	460.023	Titanium Sternal Locking Straight Plate, 20 holes, 4 ea.
460.0370	Titanium Sternal Locking X-Plate, 10 holes, 2 ea.	460.0270	Small Titanium Sternal Locking H-Plate, 8 holes, 2 ea.
460.0380	Titanium Sternal Locking Double-T Plate, 14 holes, 2 ea.	460.0280	Large Titanium Sternal Locking H-Plate, 8 holes, 2 ea.
460.0390	Titanium Sternal Locking Angled Plate, 12 holes, 2 ea.	460.0350	Titanium Sternal Locking Star Plate, 6 holes, 2 ea.
460.040	Titanium Sternal Locking X-Plate, wide, 10 holes, 2 ea.	460.0360	Titanium Sternal Locking Star Plate, 12 holes, 2 ea.
460.0450	Titanium Sternal Locking Straight Plate, 8 holes, 4 ea.	497.689	Bending Insert Screw, for Locking Reconstruction Plate, 2 ea.
460.0460†	Titanium Sternal Locking Straight Plate, 13 holes, without pin, 2 ea.		
497.689	Bending Insert Screw, for Locking Reconstruction Plate, 2 ea.		

* Available sterile in 5-pack. Add .05S to product number.

◊ Available nonsterile or sterile-packed. Add S to product number for sterile product.

+ Contraindicated for use in acute cardiac patients.

Also Available

690.699	Sternal Fixation Instrument Tray, for Shortcuts, Bending Pliers		3.0 mm Titanium Sternal Locking Screws, self-drilling, single pack
		04.501.110.01	10 mm
	Universal Caliper	04.501.112.01	12 mm
03.501.210-	1.8 mm Drill Bits, Stryker J-latch,	04.501.114.01	14 mm
03.501.224	10 mm – 18 mm stops, 82 mm 20 mm – 24 mm stops, 88 mm	04.501.116.01	16 mm
03.501.410-	1.5 mm Drill Bits, hex coupling.	04.501.118.01	18 mm
03.501.424	10 mm–18 mm stops, 82 mm 20 mm–24 mm stops, 88 mm	04.501.120.01	20 mm
03.501.510-	1.8 mm Drill Bits, hex coupling,		3.0 mm Titanium Sternal Locking Screws,
03.501.524	10 mm – 18 mm stops, 82 mm		
	20 IIIII-24 IIIII Stops, 88 IIIII	04.501.1105	10 mm
05.505.072	Screwdriver Blade long	04.501.1125	12 mm
313 94	2.4 mm Screwdriver with Holding Sleeve	04.501.1145	14 mm
313.96	Cruciform Screwdriver	04.501.1165	16 mm
391 967	Shortcut Plate Cutter (2 required)	04.501.1185	18 mm
460.022.055	Titanium Emergency Release Pin, sterile,	04.501.1205	20 mm
	(5/pkg.)		
460.0245	Titanium Sternal Locking Straight Plate, 30 holes, sterile		
460.0485	Titanium Sternal Locking Double T-Plate, Tall, 18 holes, sterile		
03.501.056	Lag Tool, For Titanium Sternal Fixation System		
03.501.076	MatrixRIB/Thorax Self-retaining Screwdriver blade with AO Quick Coupling		
460.1715	Titanium Sternal Fixation Kit, Large H plate with 12 mm self-drilling screws, sterile		
460.1725	Titanium Sternal Fixation Kit, Large H plate with 14 mm self-drilling screws, sterile		

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