MATRIX Spine System—MIS Instrumentation. A minimally invasive instrument system for use with the MATRIX Spine System.

Technique Guide

SYNTHES® Spine

Instruments and implants approved by the AO Foundation

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Image intensifier control

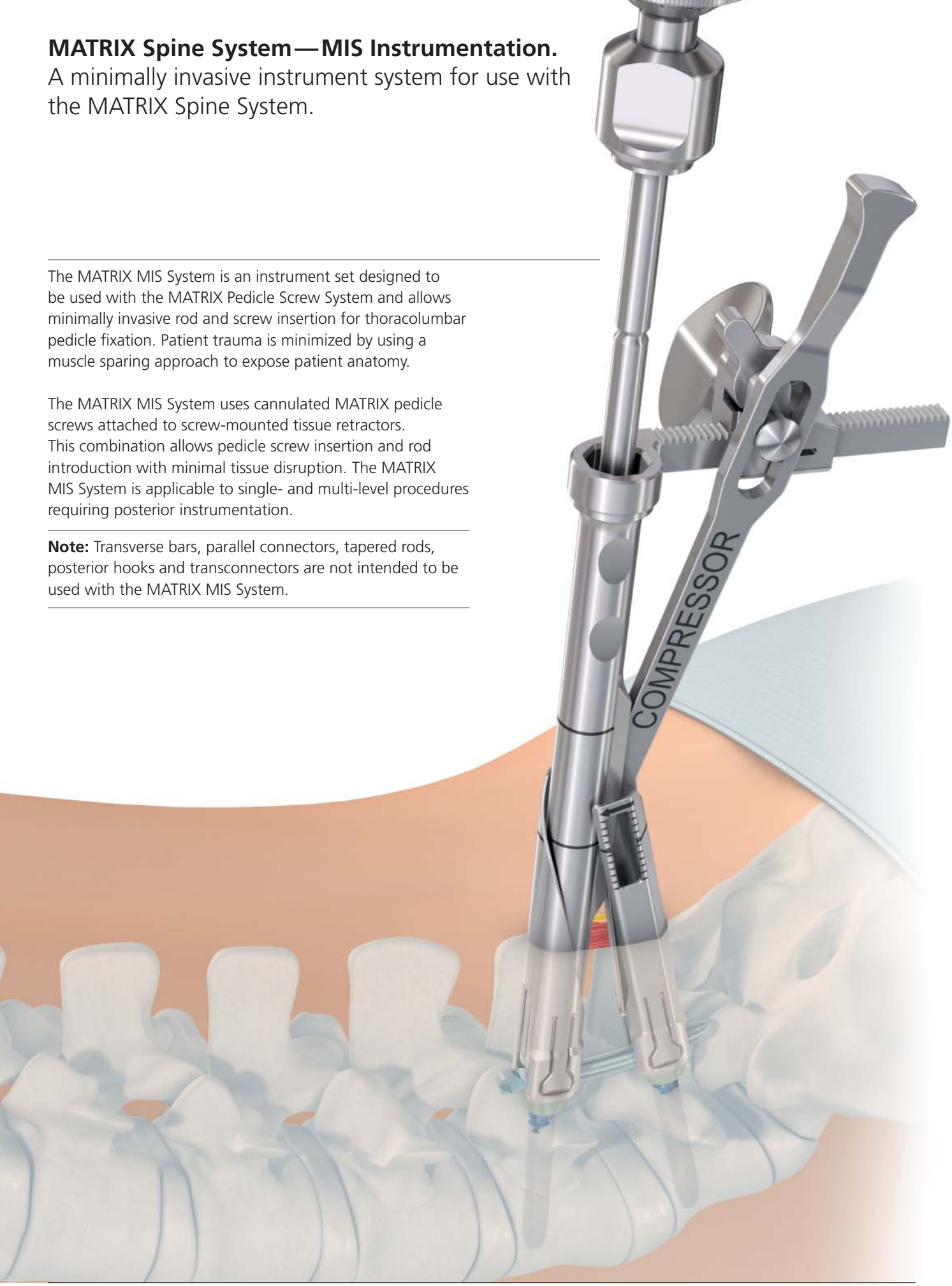
MATRIX Spine System—MIS Instrumentation.

A minimally invasive instrument system for use with the MATRIX Spine System.

The MATRIX MIS System is an instrument set designed to be used with the MATRIX Pedicle Screw System and allows minimally invasive rod and screw insertion for thoracolumbar pedicle fixation. Patient trauma is minimized by using a muscle sparing approach to expose patient anatomy.

The MATRIX MIS System uses cannulated MATRIX pedicle screws attached to screw-mounted tissue retractors. This combination allows pedicle screw insertion and rod introduction with minimal tissue disruption. The MATRIX MIS System is applicable to single- and multi-level procedures requiring posterior instrumentation.

Note: Transverse bars, parallel connectors, tapered rods, posterior hooks and transconnectors are not intended to be used with the MATRIX MIS System.



Locking Cap

- Square thread form designed to reduce cross threading.
- The saddle on the underside of the locking cap has a groove and ridge geometry to assist resistance to rod push-through. The concave shape saddles the rod, preventing it from skiving during rod reduction.
- The saddle's design also pilots the locking cap to the polyaxial head and rod.
- Self-retaining T25 StarDrive recess designed to resist damage to implant at high loads.*

Cannulated Polyaxial Pedicle Screw

- Dual-core, double-lead thread is designed to anchor the screw implants in both the cortical and cancellous bony anatomy.
- Threaded T25 StarDrive recess is designed to deliver torque efficiently and effectively, even under high load applications.* The inner thread provides a low-profile connection for instrumentation, delivering visibility and implant rigidity.
- Allows up to 50° of angulation to ease in situ connection to the longitudinal rod.
- The low-profile polyaxial head minimizes the implant height above the bony anatomy.
- The polyaxial head withstands reduction and free-hand tightening maneuvers.
- The rod reduction features are located at the top of the polyaxial head, allowing instruments to be easily attached and removed from the implant.
- 1.8 mm cannulation for use over 1.6 mm Kirschner wires
- Standard head incorporates features to easily mate with tissue retractors.
- Top loading for easy rod reduction.

* Data on file at Synthes.

MATRIX Spine System—MIS Instrumentation. A minimally invasive instrument system for use with the MATRIX Spine System.

5.5 mm Minimally Invasive Rods

Prelordosed Rods
- Prelordosed to minimize intraoperative rod bending
- Bullet-nosed to allow navigation through soft tissue
- Articulation interface for rod introduction

100 mm Bend Radius
- Same bend radius as standard Synthes prelordosed rods
- 35 mm to 85 mm lengths, in 5 mm increments

200 mm Bend Radius
- Larger bend radius provides a flatter curve for longer constructs
- 60 mm to 130 mm lengths, in 5 mm increments

Cannulated Pedicle Preparation Instruments

A comprehensive set of cannulated pedicle preparation instruments allows the surgeon to precisely prepare, size and implant the MATRIX MIS System.

Rod Introduction Instrument

- Allows rod to pivot with user-controlled braking
- Maintains rod position during cap insertion
- Rod detached in one-step process
- Ergonomic handle
- Controlled rod insertion

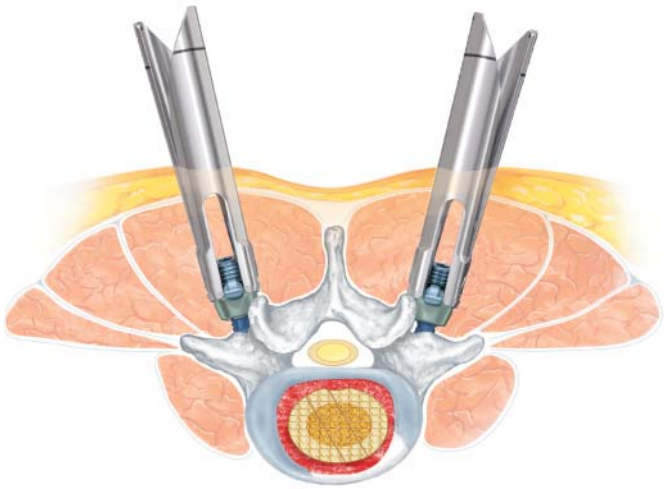
Screw-mounted Tissue Retractors

- Helical blades allow nesting to create an in situ portal
- Minimize tissue disruption
- Create an in situ portal for visualization of construct
- Efficient construct assembly with reduced tool exchanges

Supplemental Posterior Fixation

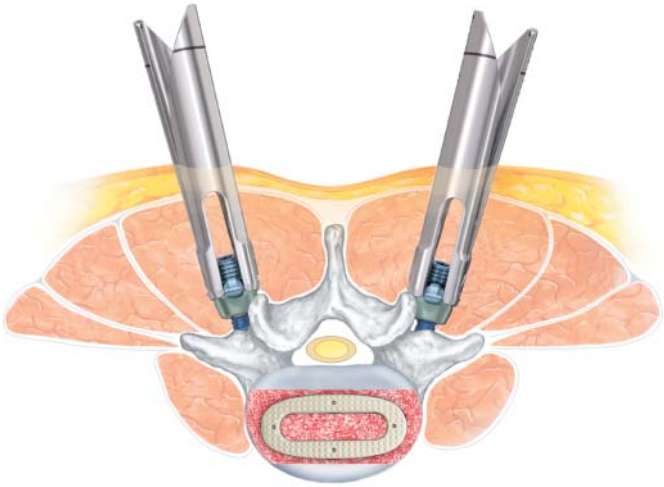
Anterior fusion procedures
MATRIX MIS provides posterior stabilization to augment an ALIF procedure where supplemental posterior instrumentation is desired. The comprehensive instrument set allows minimally invasive pedicle screw and rod placement with minimal posterior soft tissue disruption.

Note: Please refer to the *Anterior Lumbar Interbody Fusion (ALIF) Technique Guide* for complete instructions on the ALIF approach.



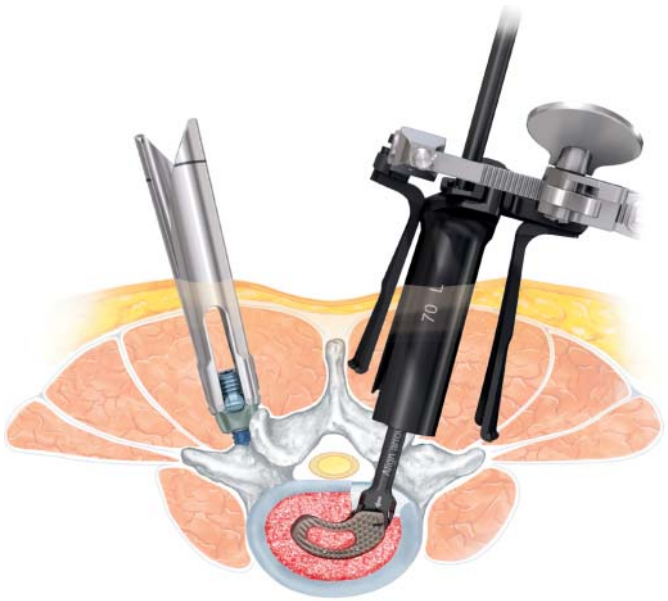
Lateral fusion procedures
MATRIX MIS can also be used to augment the transpsoas approach when supplemental posterior instrumentation is desired.

Note: Please refer to the *Oracle System Technique Guide* for complete instructions on the transpsoas approach.



Posterior fusion procedures

MATRIX MIS provides supplemental posterior fixation to support minimally invasive posterior spacer procedures. It also allows ipsilateral and contralateral atraumatic pedicle screw and rod placement after a minimally invasive oblique, T-PLIF or PLIF procedure is done through a Synthes minimally invasive retraction system. These retraction systems include MIRA (Minimally Invasive Retractor Access) Retractors, Insight Access Tubes, and the Insight Access Retractor Blades.



Notes:

Please refer to the *Insight Access Tube Set Technique Guide* for complete instructions on Insight Access Tube use.

Please refer to the *Insight Access Retractor System Technique Guide* for complete instructions on Insight Access Retractor Blade use.

Please refer to the *Minimally Invasive Retractor Access (MIRA) Technique Guide* for complete instructions on MIRA use.

Please refer to the following technique guides for complete instructions on the PLIF and T-PLIF approaches: *T-PAL, Posterior Lumbar Interbody Fusion (PLIF) Instruments* or *T-PLIF Spacer Instruments*.

AO Principles

In 1958, the AO formulated four basic principles, which have become the guidelines for internal fixation.[1] They are:
– Anatomic reduction
– Stable fixation
– Preservation of blood supply
– Early, active mobilization

The fundamental aims of fracture treatment in the limbs and fusion of the spine are the same. A specific goal in the spine is returning as much function as possible to the injured neural elements.[2, 3]

1. M.E. Müller, M. Allgöwer, R. Schneider, and H. Willenegger: *Manual of Internal Fixation*, 3rd Edition. Berlin; Springer-Verlag. 1991.
2. Ibid.
3. M. Aebi, J.S. Thalgott, and J.K. Webb. AO ASIF Principles in Spine Surgery. Berlin; Springer-Verlag. 1998.

Indications and Contraindications

Indications
The Synthes USS are noncervical spinal fixation devices intended for posterior pedicle screw fixation (T1–S2/ilium), posterior hook fixation (T1–L5), or anterolateral fixation (T8–L5). Pedicle screw fixation is limited to skeletally mature patients with the exception of the Small Stature USS, which includes small stature and pediatric patients. These devices are indicated as an adjunct to fusion for all of the following indications: degenerative disc disease (defined as discogenic back pain with degeneration of the disc confirmed by history and radiographic studies), spondylolisthesis, trauma (i.e., fracture or dislocation), deformities or curvatures (i.e., scoliosis, kyphosis, and/or lordosis, Scheuermann's Disease), tumor, stenosis, and failed previous fusion (pseudoarthrosis).

When treating patients with degenerative disc disease (DDD), transverse bars are not cleared for use as part of the posterior pedicle screw construct.

When used with the 3.5 mm/6.0 mm parallel connectors, the Synthes USS 6.0 mm rod systems can be linked to the CerviFix 3.5 mm Systems. In addition, when used with 3.5 mm/5.0 mm parallel connectors, the Synthes Small Stature USS can be linked to the CerviFix 3.5 mm Systems. When used with the 5.0 mm/6.0 mm parallel connectors, the Synthes Small Stature USS can be linked to the Synthes USS 6.0 mm rod systems.

When used with the 3.5 mm/6.0 mm and 4.0 mm/6.0 mm tapered rods, the Synthes USS 6.0 mm rod systems can be linked to the CerviFix 3.5 mm and 4.0 mm Systems, respectively. When used with the 3.5 mm/5.5 mm and 4.0 mm/5.5 mm tapered rods, MATRIX can be linked to the CerviFix 3.5 mm and 4.0 mm Systems, respectively. When used with the 5.5 mm/6.0 mm tapered rods, the Synthes USS 6.0 mm rod systems can be linked to the MATRIX System.

In addition, Synthes USS 6.0 mm rod systems can be interchanged with all USS 6.0 mm rods and transconnectors except Synthes 6.0 mm cobalt-chromium-molybdenum alloy and titanium grade 3 rods, which can only be used with Pangea.

Synthes USS
- 6.0 mm rod systems: USS Side-Opening, USS Dual-Opening, USS VAS variable axis components, USS Fracture, Click'X, Click'X Monoaxial, Pangea, Pangea Monoaxial, USS Polyaxial, USS Iliosacral, ClampFix
- 5.5 mm rod system: MATRIX
- 5.0 mm rod system: USS Small Stature

CerviFix
- 3.5 mm rod systems: CerviFix, Axon, Synapse
- 4.0 mm rod system: Synapse

Contraindications
- Use of these devices is contraindicated when there is active systemic infection, infection localized to the site of the proposed implantation, or when the patient has demonstrated allergy or foreign body sensitivity to any of the implant materials.
- Severe osteoporosis may prevent adequate fixation and thus preclude the use of this or any other orthopaedic implant.
- Conditions that may place excessive stresses on bone and implants, such as severe obesity or degenerative diseases, are relative contraindications. The decision whether to use these devices in patients with such conditions must be made by the physician taking into account the risks versus the benefits to the patients.
- Use of these implants is relatively contraindicated in patients whose activity, mental capacity, mental illness, alcoholism, drug abuse, occupation, or lifestyle may interfere with their ability to follow postoperative restrictions, thereby placing undue stresses on the implant during bony healing. This could result in a higher risk of implant failure.
- When treating patients with degenerative disc disease (DDD), transverse bars are not cleared for use as part of the posterior pedicle screw construct.

Please refer to package insert (GP2774) for the full list of warnings and precautions.

1

Patient positioning

Position the patient on a radiolucent OR table in the prone position. To obtain optimal visualization of the spine, the OR table should have enough clearance available for a fluoroscopic C-arm to rotate freely for AP, oblique and lateral views. Accurate visualization of the anatomic landmarks and fluoroscopic visualization of the pedicles are imperative for using the MATRIX MIS System. In the following sections, the use of AP and lateral fluoroscopy will be described.

2
Approach

Option A: Mini-open or Wiltse method

Instrument	
03.616.046	Blunt Dissector

The mini-open approach advocates atraumatic blunt dissection of the muscles so that all instruments and implants are introduced through a common incision. A Wiltse or modified Wiltse approach is suggested.[4]

Using fluoroscopy, locate and mark the lateral borders of the pedicles. This will indicate where the fascial incision should be made. As a general guide, the incision should be made 2 cm–4 cm lateral to the midline. This depends on patient anatomy and actual fluoroscopic location of the pedicles.

Lateral or bilateral skin and fascial incisions
After determining the surgical trajectory, make an incision in the skin and the fascia of the appropriate size (approximately 30 mm for single-level procedures). Following incision of the fascia, locate the cleavage plane between the multifidus and longissimus muscle groups. Using a Wiltse approach, bluntly dissect between the multifidus and longissimus muscle planes down to the bony anatomy. Careful separation of the muscle planes can yield an avascular dissection. Ensure that adequate dissection is performed to accommodate further instrument and implant placement. The blunt dissector can be used to facilitate dissection of the tissue planes.

Midline skin incision
Alternatively, a midline skin incision with lateral or bilateral fascial incisions can be used.

4. L.L. Wiltse, and C.W.Spencer. 1988. "New Uses and Refinements of the Paraspinal Approach to the Lumbar Spine". *Spine* 13(6): 696-706.

2. Approach continued

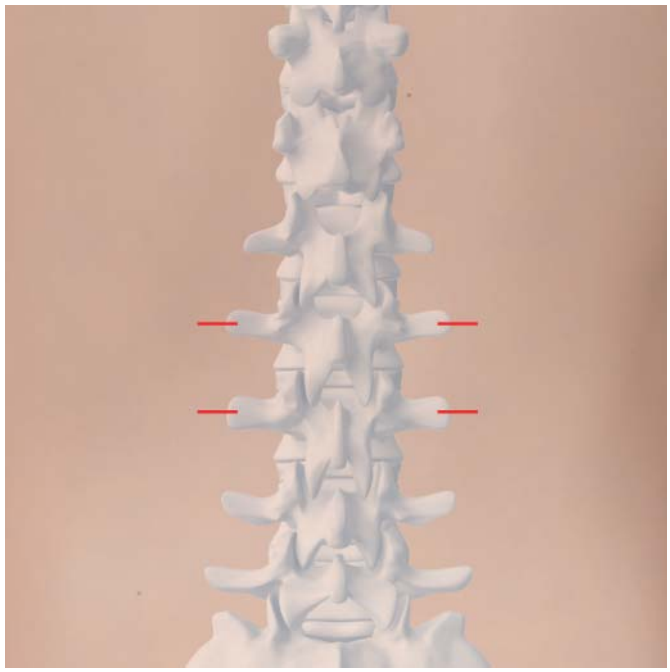
Option B: Percutaneous method

Instrument	
03.616.046	Blunt Dissector

The percutaneous approach facilitates atraumatic blunt dissection of the muscles through small individual incisions, through which single implants are placed.

Using fluoroscopy, locate and mark the lateral borders of each pedicle to receive a screw. These marks indicate where the individual incisions will be made. Each incision should have a transverse orientation and should be approximately 15 mm in length. This depends on patient anatomy and fluoroscopic location of the pedicles.

After determining the appropriate locations, make each incision in the skin and the fascia where appropriate. The blunt dissector can be used to facilitate dissection of the tissue prior to subsequent insertion of pedicle preparation instruments.



Pedicle Preparation

1
Perforate cortex of pedicle with Jamshidi needle

Instrument	
710.150.99S*	Bone Marrow Aspiration System, with 11 gauge, 15 cm needle with distal hole, sterile (Jamshidi Needle)

Working through the mini-open incision, locate the pedicles as described in *AO ASIF Principles in Spine Surgery*.[5] Place the tip of the Jamshidi needle at the entry point of the pedicle and align the Jamshidi needle with the pedicle trajectory. If necessary, reinsert and realign the needle. Advance the Jamshidi needle into the pedicle by tapping lightly with a mallet. Twist the handle one-quarter turn to detach the trocar from the Jamshidi needle while ensuring the Jamshidi needle remains in place.

Note: Use fluoroscopy to monitor position of the Jamshidi needle during insertion.

5. M. Aebi, J.S. Thalgott, and J.K. Webb. AO ASIF Principles in Spine Surgery. Berlin; Springer-Verlag. 1998. 102.

* Also available

Alternative technique:
Perforate cortex of pedicle with cannulated awl

Instruments	
03.600.030	Cannulated Awl, with 1.8 mm cannula, for 8.0 mm and 9.0 mm screws
or	
03.600.032	Cannulated Awl with 1.8 mm cannula, for 5.0 mm, 6.0 mm and 7.0 mm screws
03.606.021	Trocar Holding Sleeve, for Cannulated Awls
03.616.062	Trocar, for Cannulated Awls/Probes

Assemble cannulated awl
Unscrew the knob from the trocar sleeve and place it on a flat surface. Insert the large end of the trocar and seat it in the knob recess (Figure 1).

Slide the holding sleeve over the trocar and tighten (Figure 2).

When the trocar and trocar holding sleeve are assembled, the end of the trocar should be seated in the knob, making it flush with the knob (Figure 3).

Select the cannulated awl that corresponds to the appropriate screw diameter.

Insert the assembled trocar with holding sleeve into the palm handle of the cannulated awl and tighten (Figure 4).


Figure 1


Figure 2


Figure 3


Figure 4

Perforate cortex

Working through the mini-open incision, locate the pedicles as described in *AO ASIF Principles in Spine Surgery*.[6] Use a cannulated awl with the trocar and trocar holding sleeve to perforate the cortex of the pedicle. While maintaining the awl's position within the pedicle, rotate the trocar counterclockwise to remove it from the end of the awl.

Note: Use fluoroscopy to monitor position of the awl during insertion.

6. M. Aebi, J.S. Thalgott, and J.K. Webb. *AO ASIF Principles in Spine Surgery*. Berlin; Springer-Verlag. 1998. 102.

2
Insert Kirschner wire

Instrument	
02.606.003	1.6 mm Kirschner Wire, with blunt tip, 480 mm

Warning: Ensure the Kirschner wires remain securely in position throughout the entire duration of the procedure.

- Monitor the tip of the Kirschner wire under fluoroscopy to ensure it does not penetrate the anterior wall of the vertebral body. Ensure the Kirschner wires do not slip out before the screws are inserted.

The Kirschner wires are long enough to be held in place by hand during pedicle preparation and soft tissue dilation.

Insert the Kirschner wire into the end of the cannulated awl or Jamshidi needle.

- Advance the Kirschner wire, guided by fluoroscopy, to the appropriate depth. Kirschner wire etch lines can be used as a depth reference.

The Kirschner wire can be advanced manually or with the K-wire tool (see alternative technique using K-wire tool).

Insert all Kirschner wires as required.

Alternative technique:
Using the K-wire tool

Instrument	
03.616.070	K-Wire Tool
PDL102*	Slotted Mallet

The K-wire tool is used to either advance or remove Kirschner wires during the procedure. The arrow on the tool indicates direction of Kirschner wire advancement or removal.

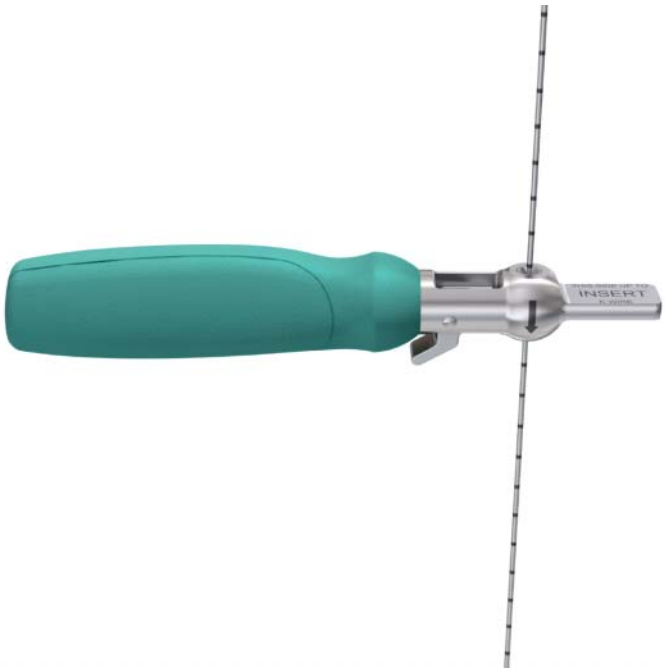
* Also available

To use the K-wire tool, depress the locking trigger and slip the tool over the Kirschner wire. Release the trigger to locate the tool at a position above the end of the cannulated awl or Jamshidi needle. The distance between the tool and the cannulated awl or Jamshidi needle should be equal to the insertion depth of the Kirschner wire.

Lightly mallet the impaction surface to advance the Kirschner wire.

Stop impacting when the tool reaches the top of the cannulated awl or Jamshidi needle.

Insert all Kirschner wires as required.



3
Probe pedicle (optional)

Instruments	
03.600.031	Probe, with 1.8 mm cannula, for 8.0 mm and 9.0 mm screws
or	
03.600.033	Probe, with 1.8 mm cannula, for 5.0 mm, 6.0 mm, and 7.0 mm screws

While maintaining the position of the K-wire within the pedicle, remove the cannulated awl or Jamshidi needle. Place the tip of the cannulated probe over the end of the K-wire. Probe pedicles as described in *AO ASIF Principles in Spine Surgery*.[7]

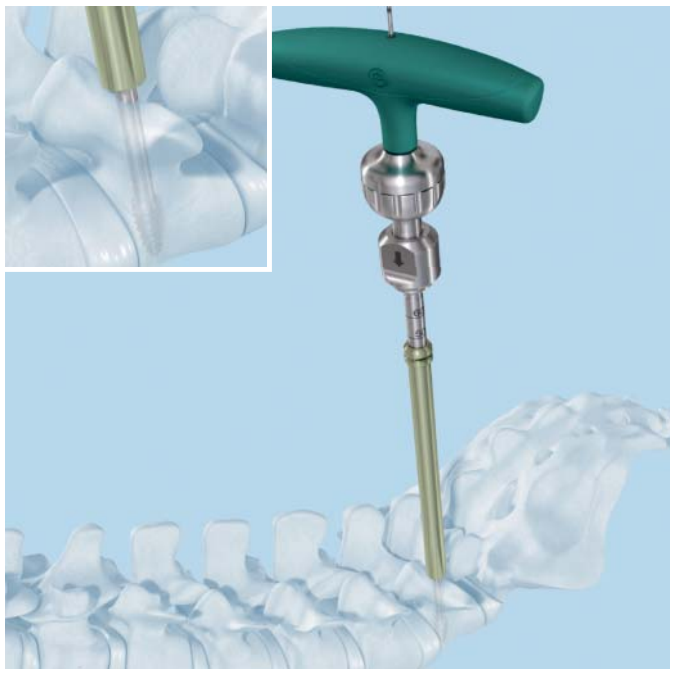
Note: To prevent inadvertent advancement of the K-wire, align the trajectory of the probe with the K-wire and monitor the K-wire position using fluoroscopy.

7. M. Aebi, J.S. Thalgott, and J.K. Webb. *AO ASIF Principles in Spine Surgery*. Berlin; Springer-Verlag. 1998. 102.

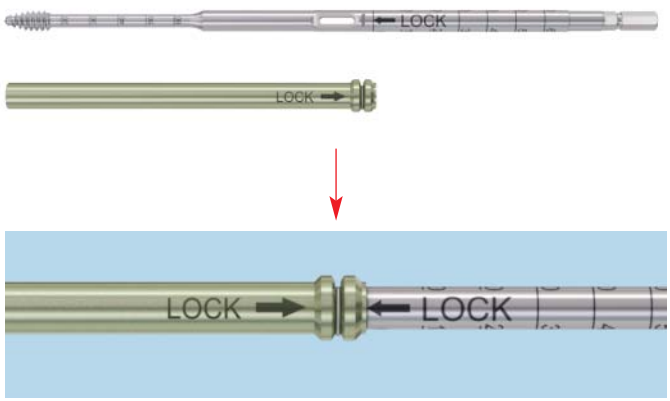
4
Tap pedicle (optional)

Instruments

	Cannulated Taps, 6.0 mm hex coupling
03.620.205	For 5.0 mm Dual Core Screws
03.620.206	For 6.0 mm Dual Core Screws
03.620.207	For 7.0 mm Dual Core Screws
03.620.208	For 8.0 mm Dual Core Screws
03.620.209	For 9.0 mm Dual Core Screws
	Protection Sleeves, for Cannulated Taps
03.620.225	For 5.0 mm Dual Core Screws
03.620.226	For 6.0 mm Dual Core Screws
03.620.227	For 7.0 mm Dual Core Screws
03.620.228	For 8.0 mm Dual Core Screws
03.620.229	For 9.0 mm Dual Core Screws
03.632.090	Ratchet T-Handle, 6.0 mm quick coupling
or	
388.654	Palm Ratchet Handle



Prepare a pathway for the dual core screws with the cannulated taps by penetrating the pedicle prior to screw insertion. To minimize trauma to surrounding soft tissues, protection sleeves cover the proximal tip of the tap. To lock the protection sleeve onto the cannulated tap shaft, align the arrows and push together. To unlock the protection sleeve, hold the knurled portion of the protection sleeve and advance the tap clockwise. Depth graduations are provided at both ends of the tap to estimate depth measurement for proper implant sizing.



Note: To prevent inadvertent advancement of the K-wire, align the trajectory of the tap with the K-wire and monitor the K-wire position using fluoroscopy.

1
Select tissue retractor

Instruments	
03.610.001	Dilator, 10 mm/1.8 mm
03.616.035	Tissue Retractor, center
03.616.036	Tissue Retractor, end
03.616.037	Tissue Retractor, center, long
03.616.038	Tissue Retractor, end, long

The correct length (standard or long) and type (center or end) tissue retractor must be determined after the K-wires have been placed and pedicles have been prepared.

Insert the 10 mm dilator over the K-wire until the tip reaches the pedicle entry point.

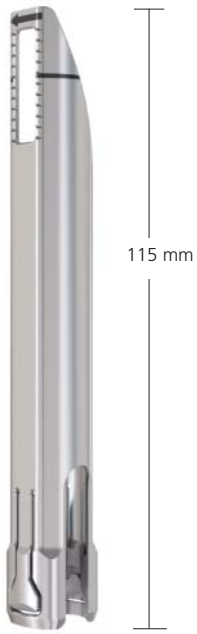
To prevent inadvertent advancement of the K-wire while inserting the dilator, monitor the K-wire position using fluoroscopy.

Etch markings on the side of the dilator indicate tissue depth. Use the standard tissue retractor for approaches up to 80 mm. Use the long tissue retractor for any approach greater than 80 mm.

Notes:
For the mini-open method, a single level construct will utilize only end-type tissue retractors. For multilevel constructs, the end-type tissue retractors are placed on the most cranial and most caudal screws. The center-type tissue retractors are placed in pairs on the remaining screws.

For the percutaneous method, use center-type tissue retractors at all levels.

Standard tissue retractor, end (03.616.036)



Long tissue retractor, end (03.616.038)

2

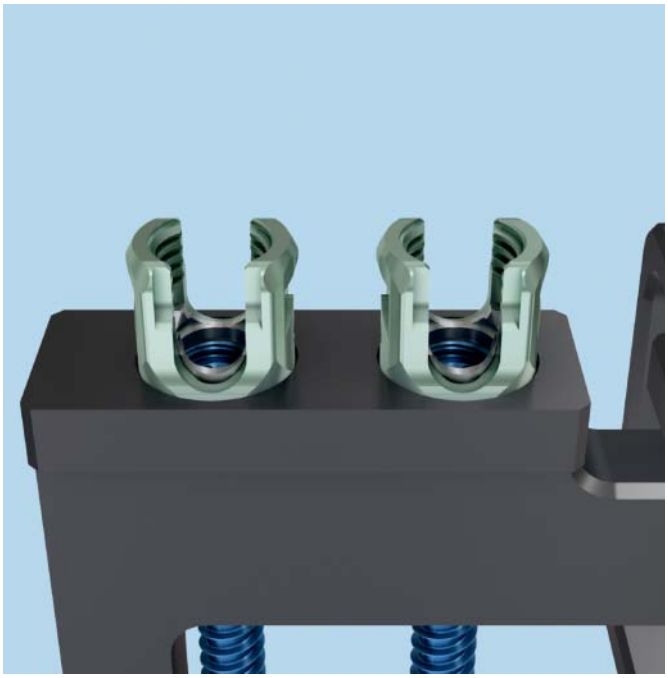
Mount tissue retractor to pedicle screw in loading post

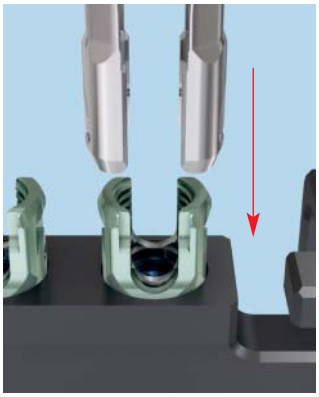
Set up the mounting fixture on the OR table or use the fixture present on the screw graphic case.

Place the correct MATRIX pedicle screw into the fixture.

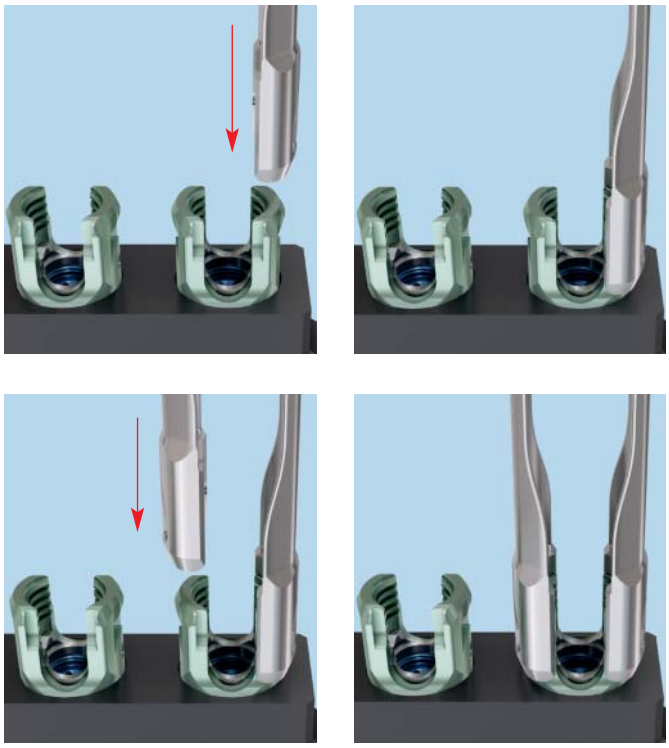
Press the tissue retractor onto the pedicle screw until they snap together.

Note: To ensure proper fit of pedicle screws, verify the diameter of the pedicle awl/probe and the selected screw correspond to each other.





Center type



End type

Alternative technique:
Mount tissue retractor by hand

To connect an end tissue retractor to the screw, hold the pedicle screw and the tissue retractor in opposite hands, and align the slots. Pinch the tissue retractor as shown in Figure 1 while pressing the tissue retractor onto the pedicle screw until they snap together.

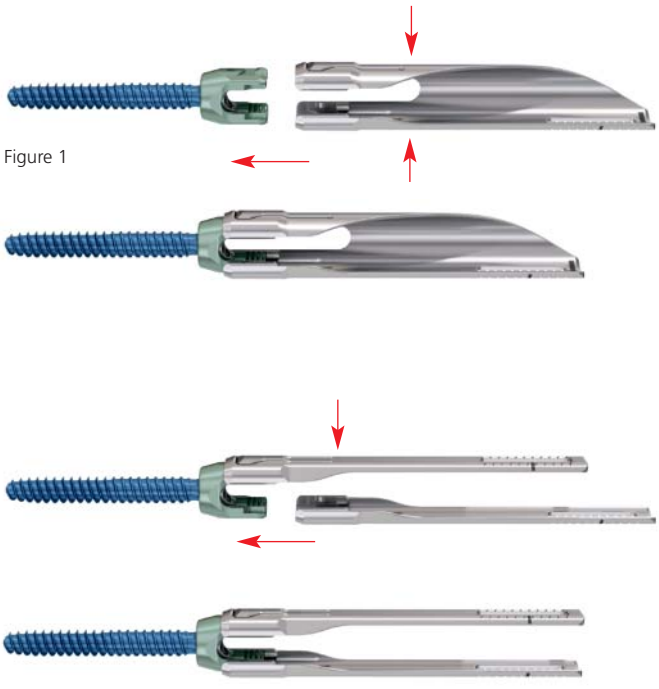


Figure 1

To connect a center tissue retractor to the screw, snap the first center tissue retractor onto one side of the pedicle screw.

Snap a second center tissue retractor onto the opposite side of the pedicle screw.

Note: To avoid glove damage, do not hold the tissue retractor near the bottom of the deflecting tab.

Check the push and pull of the tissue retractor/screw construct to ensure a secure attachment.

3
Load tissue retractor/screw onto holding sleeve

Instruments	
03.632.001	Holding Sleeve, standard
or	
03.632.036	Holding Sleeve, long
03.632.003	T25 StarDrive Shaft, cannulated, standard
or	
03.632.073	T25 StarDrive Shaft, cannulated, long
03.632.090	Ratchet T-Handle, 6 mm quick coupling
or	
388.654	Palm Ratchet Handle

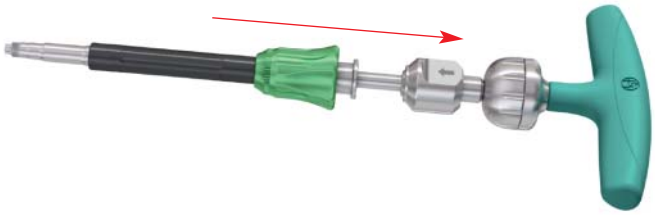
Assemble a ratchet handle to a cannulated shaft.

To assemble the polyaxial screwdriver, retract the green knob distally, then slide the sleeve toward the handle on the cannulated shaft until it stops.

Load a tissue retractor and pedicle screw onto the holding sleeve by inserting the tip of the holding sleeve through the tissue retractor and into the polyaxial screw.

Place the screwdriver tip securely into the T25 StarDrive recess of the polyaxial pedicle screw and rotate the green knob of the holding sleeve clockwise. Firmly tighten to secure the implant.

Set the ratchet handle to the forward setting to insert the screw. To release the sleeve, rotate the green knob counter-clockwise and remove the screwdriver.



4

Insert screw

Instrument

03.616.070	K-Wire Tool

- Match the screw axis to the Kirschner wire axis by passing the holding sleeve assembly over the Kirschner wire until the tip of the screw reaches the pedicle entry point. Prior to advancing the screw, fluoroscopy should be used to ensure proper placement.

- **Warning:** Do not advance the screw into the pedicle until the screw axis is aligned with the Kirschner wire, to prevent kinking or unintended advancement. Monitor the tip of the Kirschner wire under fluoroscopy to ensure it does not penetrate the anterior wall of the vertebral body.

Advance the screw into the pedicle by turning the ratchet handle clockwise.

The shaft portion of the holding sleeve below the green knob can be held during insertion to guide trajectory.

Do not grasp the green knob during insertion as it will cause the holding sleeve to disengage from the screw.

Control the Kirschner wire exiting the proximal end of the ratchet handle.

Remove the Kirschner wire once the tip of the screw enters the vertebral body. The K-wire tool can be used.

Notes:

- During insertion, use fluoroscopy to confirm screw trajectory and depth.

Polyaxial screwheads need to remain free and mobile after insertion to allow accurate alignment to the rod during locking cap insertion and final tightening. The mobility of the screwhead cannot be assessed while the holding sleeve is attached.

4. Insert screw continued

Detach the screwdriver and holding sleeve by rotating the green knob on the holding sleeve counterclockwise while holding the ratchet handle as countertorque.

Remove the holding sleeve and screwdriver.

The tissue retractor and polyaxial head should now pivot freely.

Insert all remaining screws in the same manner.

Note: After insertion, use fluoroscopy to confirm final screw placement is correct.

5

Orient tissue retractor

Instrument	
03.616.050	Polyaxial Head Alignment Tool

Option A: For end-type tissue retractors
Visually assess tissue retractor orientation after screw insertion is complete. Insert the alignment tool through the tissue retractor and seat in the polyaxial head (Figure 1).

Figure 1

Rotate the tissue retractors as needed to achieve proper orientation. **Arrows should point toward each other into the middle of the constructs**.

Use the alignment tool on the center tissue retractors to orient the rod slots as needed.

Mobilize polyaxial heads (optional)
Insert the alignment tool through the tissue retractor and seat it in the polyaxial head.

Note: Use the head alignment tool to confirm that the head is still mobile and free from the surrounding anatomy prior to inserting the rod.

Correct orientation

Incorrect orientation

5. Orient tissue retractor continued

Option B: For center-type tissue retractors
Visually assess tissue retractor orientation after screw insertion is complete. Insert the alignment tool through the tissue retractor and seat it in the polyaxial head.

Rotate the tissue retractor as needed to achieve proper orientation.

Use the alignment tool on the center tissue retractors to orient rod slots as needed.

Mobilize polyaxial heads (optional)
Insert the alignment tool through the tissue retractor and seat it in the polyaxial head.

Note: Use the head alignment tool to confirm that the head is still mobile and free from the surrounding anatomy prior to inserting the rod.

1
Determine rod length

Instrument	
03.616.003	Rod Length Template

Insert the ball tips of the rod length template through the tissue retractors until seated in the polyaxial heads.

The scale on the top of the instrument indicates which MIS rod to select. After selecting the rod, verify the length chosen against the caliper scale to ensure proper selection.

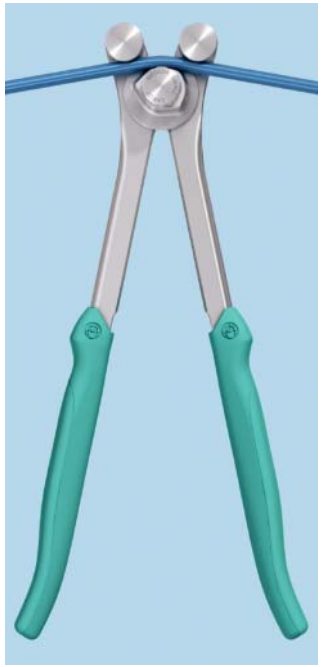
Important: Do not force open or distract the natural position of the tissue retractors by expanding the tips of the template.

2

Contour rod (optional)

Contour the rod, as needed, before insertion.

Note: Do not reverse bend rods. Reverse bending may produce internal stresses which may become the focal point for eventual breakage of the implants.



3a

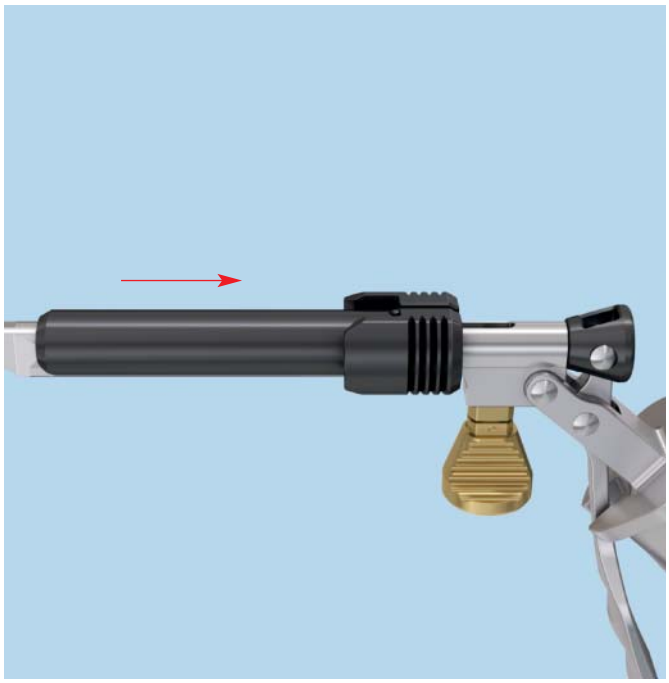
Prepare rod introducer—attach centering sleeve

Instruments	
03.616.044	Centering Sleeve, long, for Rod Introducer
or	
03.616.047	Centering Sleeve, for Rod Introducer
03.616.048	Rod Introducer

Assemble the rod introducer prior to use in the wound. Use the centering sleeve length that corresponds to the tissue retractor length.

Snap the centering sleeve onto the rod introducer along the entire length. Slide the centering sleeve up the post toward the handle until it stops.

The centering sleeve is removed by pushing off from the back side of the knob until it detaches.



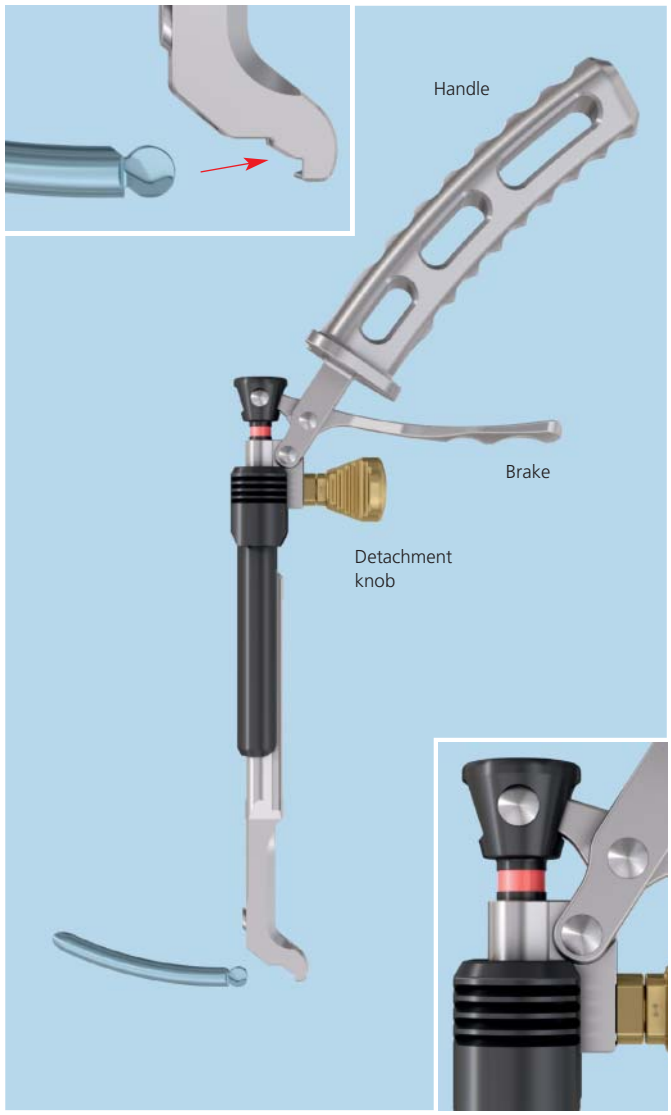
3b

Prepare rod introducer—load rod

Instrument

03.616.048	Rod Introducer

Pull the detachment knob to open the capture mechanism. The red line near the handle indicates the mechanism is open.



Place the proximal machined end of the selected MIS rod onto the receiving features at the distal tip of the rod introducer.

Squeeze the brake lever to close the capture mechanism. The red line should no longer be visible.

Squeeze the brake lever to maintain the rod at a desired insertion angle. Ensure the rod is securely attached.

Note: The rod can be released if the rod introducer is in the open position and the rod is perpendicular to the shaft of the instrument (the "end" position).

4

Place rod

Option A: For end-type tissue retractors

Instrument	
03.616.048	Rod Introducer

The rod may be inserted from either the cranial or caudal direction.

With the rod pointed down, position the bullet nose of the rod against the inside wall of the cranial or caudal tissue retractor (Figure 1).

Slide the rod down until it passes through the window and slightly past the head of the MATRIX implant (Figure 2).

Drag the heel of the rod introducer into the inside wall of the opposite tissue retractor (Figure 3).

Push the heel down into the head of the opposite MATRIX implant.

Notes:

- Verify final rod position using lateral fluoroscopy.

Once the rod is perpendicular to the introducer shaft, **keep finger pressure on the trigger**.

Figure 1

Figure 2

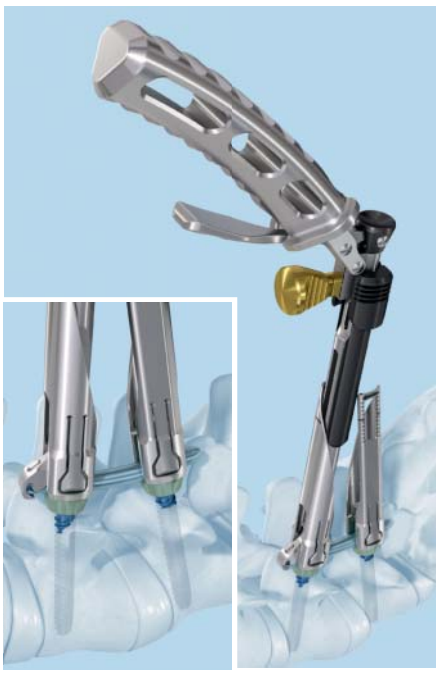


Figure 3

Option B: For center-type tissue retractors

Instrument	
03.616.048	Rod Introducer

The rod may be inserted from either direction.

Align the slots of the tissue retractors prior to rod insertion.

With the rod pointed down, insert the rod through the tissue retractor. With the tip below the fascia and near the head of the screw, push the rod through the muscle toward the adjacent tissue retractor.

Verify rod placement through adjacent tissue retractors by attempting to rotate the tissue retractor. If the tissue retractor will not rotate, then the rod has passed through properly.

Once the bullet nose of the rod is past the last adjacent tissue retractor of the construct, push the heel of the rod introducer down into the head of the first MATRIX implant.

Notes:

- Verify final rod position using lateral fluoroscopy.

Once the rod is perpendicular to the introducer shaft, **keep finger pressure on the trigger**.

5
Secure rod introducer

Instruments	
03.616.044	Centering Sleeve, long for Rod Introducer
or	
03.616.047	Centering Sleeve, for Rod Introducer
03.616.048	Rod Introducer

The post of the rod introducer should be coaxial with the tissue retractor.

Slide the centering sleeve down the post and into the tissue retractor.

The line on the post of the rod introducer indicates the centering sleeve is inserted completely.

Do not remove the rod introducer until the rod is secured by a locking cap.

Alternative technique (mini-open): Introduce rod using rod forceps

Instruments

03.616.053	Rod Forceps

Clasp the selected rod with the forceps.

The rod may be inserted from either the cranial or caudal direction.

The rod can pivot while attached to the rod forceps (Figure 1).

With the rod pointed down, introduce the rod until it passes through the window of the first tissue retractor (Figure 2).

Pass the opposite end of the rod through the window of the opposite tissue retractor (Figure 3).

Push down on the forceps to seat the rod in the MATRIX implants (Figure 4).

Do not remove the forceps until the rod is secured by a locking cap.

Note: Use lateral fluoroscopy to verify final rod position.

Figure 1

Figure 2

Figure 3

Figure 4

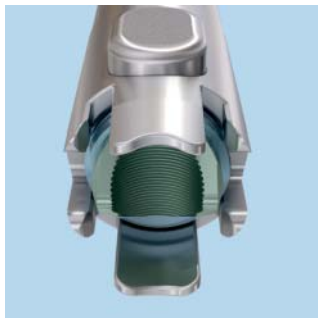
1
Load locking cap

Instruments	
03.616.051	Bottom Loading Cap Guide
or	
03.616.052	Bottom Loading Cap Guide, long

Properly orient and position the cap guide over the locking cap on the holding tray.

Press down firmly to capture the locking cap.

The locking cap will snap into the distal tip of the cap guide.



2
Insert cap

Instruments	
03.616.051 or 03.616.052	Bottom Loading Cap Guide Bottom Loading Cap Guide, long
03.620.061	10 Nm Torque Limiting Ratchet Handle, 6 mm hex coupling
03.632.072	T25 StarDrive Shaft, long

Insert the cap guide into the tissue retractor with the black indicator facing the middle of the construct.

Insert the screwdriver until it is seated in the locking cap. Persuasion may be needed (Step 3).

Seat the locking cap with a light downward pressure.

Apply a light torque to provisionally tighten the locking cap and maintain the desired rod position. Place the remaining locking caps and provisionally tighten.

Remove the driver or proceed to final tightening (Step 4).

After rod position has been secured, detach the rod introducer (Step 5).

3
Rod reduction with persuader (optional)

Instruments	
03.616.051 or 03.616.052	Bottom Loading Cap Guide Bottom Loading Cap Guide, long
03.616.056	Persuader
03.632.090 or 388.654 or 03.620.061	Ratchet T-Handle, 6 mm quick coupling Palm Ratchet Handle 10 Nm Torque Limiting Ratchet Handle, 6 mm hex coupling
03.632.072	T25 StarDrive Shaft, long

When the etch lines on the cap guide and the tissue retractor are not aligned, rod persuasion is required.

Attach the top fork of the persuader to the cap guide, then pivot down to engage the tissue retractor.

Squeeze the handle to persuade the rod. Once reduction has been achieved, the handle will remain in the reduced position.

Proceed with cap insertion as indicated in Step 2.

Reduction required

Reduction achieved

4
Final tighten locking cap

Instruments	
03.616.057	Countertorque
03.620.061	10 Nm Torque Limiting Ratchet Handle, 6 mm hex coupling
03.632.072	T25 StarDrive Shaft, long

Slide the countertorque down the driver shaft and seat it in the proximal socket on the cap guide.

Adjust the orientation of the countertorque handle as desired. Final tighten the locking cap, using the 10 Nm torque limiting rachet handle.

Warning: Refer to the torque limiting handle package and labeling for the recommended calibration maintenance.

Notes: Ensure the required torque of 10 Nm is applied to each locking cap by using the torque limiting handle.

If a locking cap needs to be loosened or removed after having been tightened to 10 Nm, use a countertorque and solid screwdriver shaft with torque limiting handle.

If there is difficulty in loosening the locking cap, refer to Loosen Locking Cap section.

Caution: Never use a fixed or ratcheting T-handle screw-driver for this technique. If the torque limiting attachment is not used, breakage of the driver may occur and could potentially harm the patient.

5
Detach rod introducer

Ensure the first locking cap is provisionally tightened prior to rod introducer detachment.

Slide the centering sleeve up and out of the tissue retractor (Figure 1).

Pull the knob to open the capture mechanism on the rod introducer.

The red line indicates the tool is ready to be detached from the rod (Figure 2).

Remove the rod introducer from the tissue retractor.

Figure 1

Figure 2

1

Compress construct (optional)

Instruments	
03.616.057	Countertorque
03.616.059	Compressor
03.620.061	10 Nm Torque Limiting Ratchet Handle, 6 mm hex coupling
03.632.072	T25 StarDrive Shaft, long

To prepare the compressor for use, insert the first locking cap and final tighten, following the procedure outlined in Steps 1 through 4 of Rod Reduction and Cap Introduction.

Properly orient and position the compressor over the locking cap on the holding tray. Press down firmly to capture the locking cap. The locking cap will snap into the distal tip of the compressor.

With the compressor foot retracted into the cannula shaft, insert the cannula of the compressor into the other tissue retractor. Place the driver through the compressor cannula and seat it into the socket of the untightend locking cap

1. Compress construct (optional) continued

With the K-bar in the unlocked position, lift the K-bar arm while moving toward the cannula of the compressor. Lower the arm and slide outward until the K-bar arm catches on the locked locking cap.

- Lock the K-bar and turn the knob to desired compression. Perform compression unnder fluoroscopy. Attach the countertorque and final tighten the locking cap.

2
Distract construct (optional)

Instruments	
03.616.057	Countertorque
03.616.058	Distractor
03.620.061	10 Nm Torque Limiting Ratchet Handle, 6 mm hex coupling
03.632.072	T25 StarDrive Shaft, long

To prepare the distractor for use, insert the first locking cap and final tighten. Following the procedure outlined in Steps 1 through 4 of Rod Reduction and Cap Introduction, insert the second locking cap, but do not tighten.

Insert the cannula of the distractor into the tissue retractor with the locking cap inserted, but not tightened.

Insert the driver through the cannula of the distractor and seat it into the socket of the untightened locking cap.

2. Distract construct (optional) continued

Position the K-bar next to the adjacent implant.

Set the rack to lock and turn the knob to distract. Perform distraction under fluoroscopy.

Attach the countertorque and final tighten the locking cap.

Locking Cap Loosening

Loosen locking cap (optional)

Instruments	
03.620.061	10 Nm Torque Limiting Ratchet Handle
03.632.002	T25 StarDrive Shaft, standard
03.632.049	Countertorque, for T25, standard
03.632.080	Detachable Handle

If a locking cap needs to be loosened after tightened to 10 Nm, use a countertorque with detachable handle, MATRIX screwdriver shaft, and a 10 Nm torque limiting handle to loosen the locking cap.

Note: Locking caps are designed to lock the construct and resist postoperative loosening and rod push through. Therefore, in certain cases, the loosening torque may be higher than 10 Nm. In such cases, apply the following technique to loosen a locking cap.

Place the torque handle in the neutral position and begin to sequentially tighten and then immediately loosen the locking cap. Turn until tactile or audible feedback from the implants is experienced. It is important to approach the torque limit of the handle, but not exceed through the limit. Repeat the tightening/loosening steps until the locking cap is loose. To ensure the screwdriver shaft is protected from damage, always use the 10 Nm torque limiting handle.

Caution: Never use a fixed or ratcheting T-handle screwdriver for this technique. If the torque limiting attachment is not used, breakage of the driver may occur and could potentially harm the patient.

Tissue Retractor Removal

Remove tissue retractors

Instruments

03.616.039	Tissue Retractor Remover
or	
03.616.040	Tissue Retractor Remover, long

Insert the tissue retractor remover with tabs facing the windows on the tissue retractor.

Apply light pressure until the tabs snap into the windows.

Pull the remover with the attached tissue retractor from the incision.

Revision/Removal

Construct revision/removal

Instruments	
03.616.053	Rod Forceps
03.620.061	10 Nm Torque Limiting Ratchet Handle
03.632.072	T25 StarDrive Shaft, long
03.632.076	Rod Pusher Countertorque, long
03.632.080	Detachable Handle

If the construct requires revision or removal, use a minimally invasive approach to gain access to the construct.

Insert the rod pusher countertorque, with detachable handle attached.

Refer to Loosen Locking Cap section for instructions on loosening of locking caps for removal.

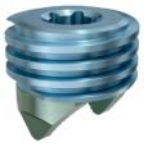
Remove the 10 Nm torque limiting ratchet handle with locking cap from the incision site. Use the rod forceps to recover the rod once the setscrews are removed.

Once the rod has been recovered, use the ratchet T-handle/ driver construct to back out each screw.

Implants

Locking Cap

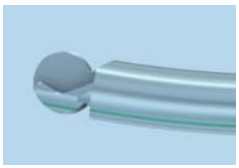
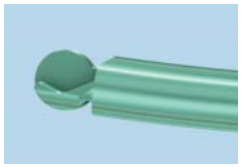
04.632.000	Titanium MATRIX Locking Cap



Cannulated Preassembled Screws

04.606.525– 04.606.555	5.0 mm Titanium Cannulated MATRIX Polyaxial Screws, 25 mm–55 mm thread lengths
04.606.625– 04.606.665	6.0 mm Titanium Cannulated MATRIX Polyaxial Screws, 25 mm–65 mm thread lengths
04.606.725– 04.606.765	7.0 mm Titanium Cannulated MATRIX Polyaxial Screws, 25 mm–65 mm thread lengths
04.606.835– 04.606.850	8.0 mm Titanium Cannulated MATRIX Polyaxial Screws, 35 mm–50 mm thread lengths

Rods

04.651.035– 04.651.085	5.5 mm Titanium Minimally Invasive Curved Soft Rods, 100 mm radius, 35 mm–85 mm lengths	 
04.651.260– 04.651.330	5.5 mm Titanium Minimally Invasive Curved Soft Rods, 200 mm radius, 60 mm–130 mm lengths	 

03.616.003	Rod Length Template	
03.616.035	Tissue Retractor, center	
03.616.036	Tissue Retractor, end	
03.616.037	Tissue Retractor, center, long	
03.616.038	Tissue Retractor, end, long	
03.616.039	Tissue Retractor Remover	
03.616.040	Tissue Retractor Remover, long	

03.616.044	Centering Sleeve, for Rod Introducer, long	
03.616.047	Centering Sleeve, for Rod Introducer	
03.616.048	Rod Introducer	
03.616.050	Polyaxial Head Alignment Tool	
03.616.051	Bottom Loading Cap Guide	
03.616.052	Bottom Loading Cap Guide, long	
03.616.053	Rod Forceps	

03.616.055	Rod Pusher	
03.616.056	Persuader	
03.616.057	Countertorque	
03.616.058	Distractor	
03.616.059	Compressor	
03.620.061	10 Nm Torque Limiting Ratchet Handle, 6 mm hex coupling	

03.632.003	T25 StarDrive Shaft, cannulated, standard	
	Holding Sleeves	
03.632.001	Standard (shown)	
03.632.036	Long	
03.632.072	T25 StarDrive Shaft, long	
03.632.073	T25 StarDrive Shaft, cannulated, long	
03.632.076	Rod Pusher Countertorque, long	
03.632.080	Detachable Handle	
03.632.090	Ratchet T-Handle, 6 mm quick coupling	

Instruments—Pedicle Preparation

02.606.003	1.6 mm Kirschner Wire, with blunt tip, 480 mm	
	Cannulated Awls	
03.600.030	For 8.0 mm and 9.0 mm screws	
03.600.032	For 5.0 mm, 6.0 mm and 7.0 mm screws	
	Cannulated Probes	
03.600.031	For 8.0 mm and 9.0 mm screws	
03.600.033	For 5.0 mm, 6.0 mm and 7.0 mm screws	
03.606.021	Trocar Holding Sleeve, for Cannulated Awls	
03.610.001	Dilator, 10 mm/1.8 mm	
03.611.035	4.0 mm Setscrew Extractor, square coupling	

03.611.059	Extender, 6 mm hex coupling	
03.616.046	Blunt Dissector	
03.616.062	Trocar, for Cannulated Awls/Probes	
03.616.070	K-Wire Tool	
	Cannulated Taps, 6 mm hex coupling	
03.620.205	for 5.0 mm Dual Core Screws	
03.620.206	for 6.0 mm Dual Core Screws (shown)	
03.620.207	for 7.0 mm Dual Core Screws	
03.620.208	for 8.0 mm Dual Core Screws	
03.620.209	for 9.0 mm Dual Core Screws	
	Protection Sleeves for Cannulated Taps	
03.620.225	for 5.0 mm Dual Core Screws	
03.620.226	for 6.0 mm Dual Core Screws	
03.620.227	for 7.0 mm Dual Core Screws (shown)	
03.620.228	for 8.0 mm Dual Core Screws	
03.620.229	for 9.0 mm Dual Core Screws	
388.654	Palm Ratchet Handle	

MATRIX MIS Titanium Cannulated Polyaxial Screw Set (01.616.014)

Graphic Case

60.616.009 Graphic Case, for Titanium Cannulated MATRIX MIS Polyaxial Screws

Implants

5.0 mm Titanium Cannulated MATRIX Polyaxial Screws

	Thread Length (mm)	Qty.		Thread Length (mm)	Qty.
04.606.525	25	8	04.606.545	45	8
04.606.530	30	8	04.606.550	50	4
04.606.535	35	8	04.606.555	55	4
04.606.540	40	8			

6.0 mm Titanium Cannulated MATRIX Polyaxial Screws

	Thread Length (mm)	Qty.		Thread Length (mm)	Qty.
04.606.625	25	6	04.606.650	50	12
04.606.630	30	6	04.606.655	55	6
04.606.635	35	6	04.606.660	60	6
04.606.640	40	12	04.606.665	65	6
04.606.645	45	12			

7.0 mm Titanium Cannulated MATRIX Polyaxial Screws

	Thread Length (mm)	Qty.		Thread Length (mm)	Qty.
04.606.725	25	8	04.606.750	50	4
04.606.730	30	8	04.606.755	55	4
04.606.735	35	8	04.606.760	60	4
04.606.740	40	8	04.606.765	65	4
04.606.745	45	8			

8.0 mm Titanium Cannulated MATRIX Polyaxial Screws

	Thread Length (mm)	Qty.		Thread Length (mm)	Qty.
04.606.835	35	4	04.606.845	45	4
04.606.840	40	4	04.606.850	50	4

Note: For additional information, please refer to package insert.
For detailed cleaning and sterilization instructions, please refer to http://us.synthes.com/Medical+Community/Cleaning+and+Sterilization.htm or to the below listed inserts, which will be included in the shipping container:

- Processing Synthes Reusable Medical Devices—Instruments, Instrument Trays and Graphic Cases—DJ1305
- Processing Non-sterile Synthes Implants—DJ1304

MATRIX MIS Pedicle Preparation Instrument Set (01.616.015)

Graphic Case

60.616.007	Graphic Case, for MATRIX MIS Pedicle Preparation

Instruments

02.606.003	1.6 mm Kirschner Wire, with blunt tip, 480 mm, 10 ea.
03.600.030	Cannulated Awl, with 1.8 mm cannula, for 8.0 mm and 9.0 mm screws
03.600.031	Cannulated Probe, with 1.8 mm cannula, for 8.0 mm and 9.0 mm screws
03.600.032	Cannulated Awl, with 1.8 mm cannula, for 5.0 mm, 6.0 mm and 7.0 mm screws
03.600.033	Cannulated Probe, with 1.8 mm cannula, for 5.0 mm, 6.0 mm and 7.0 mm screws
03.606.021	Trocar Holding Sleeve, for Cannulated Awls
03.610.001	Dilator, 10 mm/1.8 mm
03.611.035	4.0 mm Setscrew Extractor, square coupling
03.611.059	Extender, 6 mm hex coupling
03.616.046	Blunt Dissector
03.616.062	Trocar, for Cannulated Awls/Probes, 5 ea.
03.616.070	K-Wire Tool
	Cannulated Taps, 6 mm hex coupling
03.620.205	for 5.0 mm Dual Core Screws
03.620.206	for 6.0 mm Dual Core Screws
03.620.207	for 7.0 mm Dual Core Screws
03.620.208	for 8.0 mm Dual Core Screws
03.620.209	for 9.0 mm Dual Core Screws
	Protection Sleeves, for Cannulated Taps
03.620.225	for 5.0 mm Dual Core Screws
03.620.226	for 6.0 mm Dual Core Screws
03.620.227	for 7.0 mm Dual Core Screws
03.620.228	for 8.0 mm Dual Core Screws
03.620.229	for 9.0 mm Dual Core Screws
388.654	Palm Ratchet Handle

MATRIX MIS Standard Instrument Set (01.616.016)

Graphic Case

60.616.005	Graphic Case, for MATRIX MIS Standard Instruments

Instruments

03.616.035	Tissue Retractor, center, 8 ea.
03.616.036	Tissue Retractor, end, 4 ea.
03.616.039	Tissue Retractor Remover, 2 ea.
03.616.044	Centering Sleeve, for Rod Introducer, long
03.616.047	Centering Sleeve, for Rod Introducer
03.616.048	Rod Introducer
03.616.050	Polyaxial Head Alignment Tool
03.616.051	Bottom Loading Cap Guide, 2 ea.
03.616.056	Persuader
03.616.057	Countertorque
03.616.059	Compressor
03.620.061	10 Nm Torque Limiting Ratchet Handle, 6 mm hex coupling
03.632.001	Holding Sleeve, standard, 2 ea.
03.632.003	T25 StarDrive Shaft, cannulated, standard, 2 ea.
03.632.090	Ratchet T-Handle, 6 mm quick coupling, 2 ea.

MATRIX MIS Long Instrument Set (1.616.017)

Graphic Case

60.616.006	Graphic Case, for MATRIX MIS Long Instruments

Instruments

03.616.037	Tissue Retractor, center, long, 8 ea.
03.616.038	Tissue Retractor, end, long, 4 ea.
03.616.040	Tissue Retractor Remover, long, 2 ea.
03.616.052	Bottom Loading Cap Guide, long, 2 ea.
03.616.053	Rod Forceps
03.616.055	Rod Pusher
03.616.058	Distractor
03.632.036	Holding Sleeve, long, 2 ea.
03.632.072	T25 StarDrive Shaft, long, 2 ea.
03.632.073	T25 StarDrive Shaft, cannulated, long, 2 ea.

MATRIX MIS 5.5 mm Titanium Rods and Caps (01.616.018)

Graphic Case

60.616.011	Graphic Case, for MATRIX MIS 5.5 mm Titanium Rods and Caps

Instruments

03.616.003	Rod Length Template
03.632.076	Rod Pusher Countertorque, long
03.632.080	Detachable Handle

Implants

04.632.000	Titanium MATRIX Locking Cap, 20 ea.

5.5 mm Titanium Minimally Invasive Curved Soft Rods, 100 mm radius

	Length (mm)	Qty.		Length (mm)	Qty.
04.651.035	35	4	04.651.065	65	4
04.651.040	40	4	04.651.070	70	2
04.651.045	45	4	04.651.075	75	2
04.651.050	50	4	04.651.080	80	2
04.651.055	55	4	04.651.085	85	2
04.651.060	60	4			

5.5 mm Titanium Minimally Invasive Curved Soft Rods, 200 mm radius, 2 ea.

	Length (mm)		Length (mm)
04.651.260	60	04.651.300	100
04.651.265	65	04.651.305	105
04.651.270	70	04.651.310	110
04.651.275	75	04.651.315	115
04.651.280	80	04.651.320	120
04.651.285	85	04.651.325	125
04.651.290	90	04.651.330	130
04.651.295	95		

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