

Aesculap[®] S4[®] Element MIS

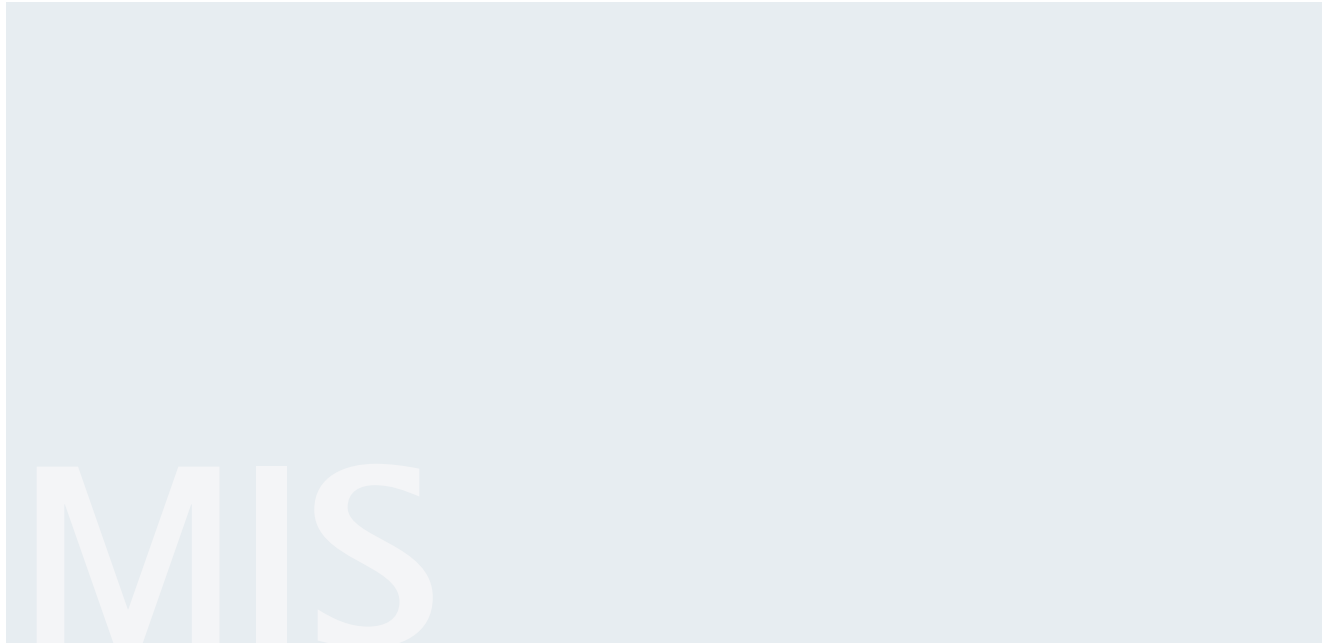
Surgical Technique



Aesculap Spine

S4[®] Element MIS

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System Overview

A



S4[®] Element MIS is a percutaneous spinal system based on Aesculap's already successful S4[®] Element spinal system. The S4[®] Element MIS system's unique design and complementary endoscope technology is designed to increase direct surgical site visibility during minimally invasive procedures and minimize your exposure to risk. The streamlined design and easy-to-use instrumentation provide a minimal learning curve and easier transition to MIS.

Design Advantages

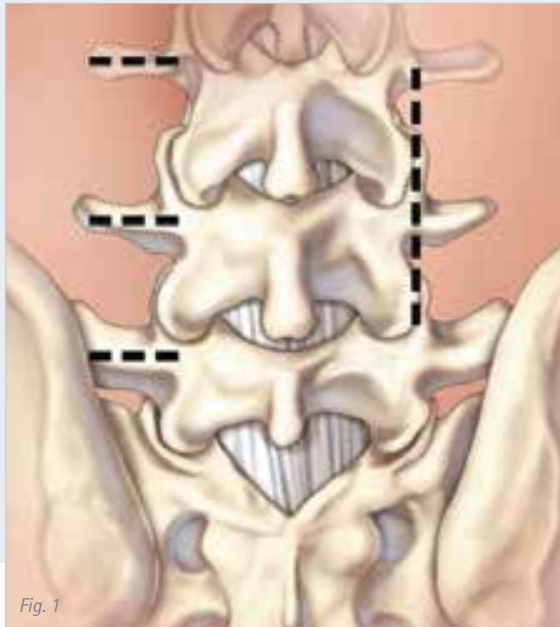
The design advantages of the S4[®] Element MIS system are the result of proven success with the S4[®] Element pedicle screw technology, offering maximum construct stability in an ultra-slim profile, and over 30 years of innovation in spine technology.

- **Direct Visualization:**
The use of S4[®] Element MIS provides a direct view of the surgical site through the use of endoscope technology, providing the ability to troubleshoot and minimize guesswork associated with MIS spine surgery while reducing exposure to radiation.
- **Minimal Surgical Conversion Risk:**
Industry leading rescue technique and instrumentation minimizes risk of converting to an open procedure during MIS.
- **Operational Simplicity:**
S4[®] Element MIS offers intuitive, streamlined instrumentation to facilitate efficiency in the OR workflow.
- **Ultra-Slim Profile Technology:**
Slim profile of instruments allows for a smaller incision and easy instrument manipulation in tight anatomical spaces, while the ultra low profile screw minimizes anatomical impingement.

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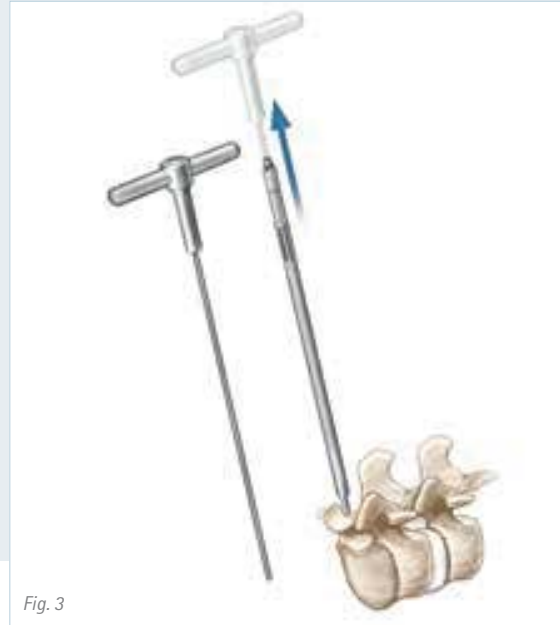
B.1.



B.1. Patient Positioning, Monitoring, and Incision

- Position the patient on a radiolucent OR table in the prone position. The OR table should have enough clearance available for a fluoroscopic C-arm to rotate freely.
- Locate the pedicles of interest through A/P and lateral X-ray and mark appropriate incision areas on skin.
- On the ipsilateral side, make an incision of at least 17 mm at the location where each pedicle screw will be placed.
- Ensure the incision is located to allow proper trajectory for percutaneous pedicle screw insertion.
- Ensure the fascia is cut to the same length.
- On the contralateral side, the mini-open TLIF technique (MOTLIF) can be used to adequately decompress and insert TLIF interbody to augment the percutaneous side.

B.2.



B.2. Pedicle Preparation

- After determination of the screw entry point the guiding instrument consisting of trocar FW271R and K-Wire aiming device FW258R is introduced at the junction of the facet to the processus transversus.

Note:

- The K-Wire aiming device should be placed at the pedicle-vertebral body junction to facilitate the placement of the K-Wire.

Note:

- Alternatively a Jamshidi Needle can be used instead of Trocar FW271R and K-Wire Aiming Device FW258R.
- The trocar FW271R is removed while the K-Wire aiming device FW258R remains in position.

Caution:

- Use fluoroscopy to monitor position of the trocar during insertion.
- Avoid inserting the needle too deep into the vertebral body as there is danger of perforating the large vessels!

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B.3.



B.3. K-Wire Insertion

- The laser etchings on the K-Wire need to be placed away from the patient. Monitor the K-Wire tip to ensure it does not penetrate the anterior wall of the vertebral body.
- Repeat the steps for each K-Wire to be placed.
- The K-Wire FW758S is now introduced through the K-Wire aiming device.

Note:

- The K-Wire should be introduced in a way that its distal tip represents the end position of the pedicle screw tip. This is essential for the determination of the screw length.

Danger:

- It has to be avoided that the K-Wire is pushed too far forward because there is potential risk of perforating the large vessels!

B.4.



B.4. Soft Tissue Dialation

- Fascia and muscle should be dialated to allow for screw and downtube placement.
- Remove the remaining trocar while holding the K-Wire firmly in place and slide the three dialators over the K-Wire in a sequence.

Note:

- The diameters of the three sequential dialators are: FW814T (10 mm), FW815T (14 mm), and FW816T (18.5 mm).
- Dialators should be docked on bony anatomy to minimize tissue creepage.
- A dialator is not required while passing the downtube but if preferred, the PEEK dialation sleeve (FW749P) in the *AUX Rescue Set* can be used.

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B.5.



Fig. 7

B.5. Bone Probing

- If additional bone probing is preferred, the straight cannulated bone probe (FW263R) can be used.
- Remove the two inner dialators.
- Leaving the third dialator (FW816T) in place, hold the K-Wire firmly and slide the cannulated bone probe over the K-Wire and probe to the desired depth.

B.6



B.6. Screw Length Measuring

- Under fluoroscopic guidance, ensure the K-Wire is at an adequate depth, approximating the final screw location in the bone.
- Remove the two inner dialators.
- Leaving the third dialator (FW816T) in place, hold the K-Wire firmly and slide the screw length measuring device (FW351R) over the K-Wire.
- Read the screw length at the bottom of the widest laser marking on the K-Wire.

Caution:

- Avoid inserting the K-Wire too deep into the vertebral body as there is danger of perforating the large vessels!
- The reading is an approximation, depending the depth of the K-Wire in bone.

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B.7



B.7. Tapping Pedicle

- The pedicle is prepared by tapping with the screw tap over the K-Wire.
- The K-Wire can also be used to evaluate the tapped pedicle.
- Remove the third dilator, leaving only the K-Wires in place.

Note:

- The included screw taps range from 4.5 mm to 8.5 mm in 1 mm increments and each are undersized by 0.5 mm.

Caution:

- If desired, the surgeon could further evaluate the tapped pedicle by using either straight or curved ball tip probes (FW146R, FW147R) while keeping the third dilator in place.
- When doing so, the K-Wire needs to be removed to insert the ball tip probes and reinserted for subsequent steps.

B.8.



Fig. 10



Fig. 11

B.8. Downtube Assembly and Screw Insertion

- Before a screw can be inserted into the pedicle, the screw must be mounted onto the downtube.
- To attach a screw to the downtube, slide the insertion key (FW755R) into the S⁴ Element MIS downtube (FW752R).
- While firmly holding the downtube, rotate the T-handle clockwise to expand the downtube tip.

Note:

- Insertion key T-handle (FW755R) is gold for quick identification.

- The downtube needs to be coaxial to the pedicle screw tulip head to correctly attach the screw to the downtube.
- Place the preferred screw size in the screw dispenser tray (ME836) and lower the expanded downtube assembly onto the screw's tulip head coaxially.
- While applying a downward force, firmly grab the downtube with one hand and rotate the insertion key T-handle counter clockwise to clamp the downtube onto the screw.

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B.8.



B.8. Downtube Assembly and Screw Insertion

- Extract the insertion key from the downtube and remove the screw-downtube assembly from the screw dispenser tray.
- Ensure proper attachment of the screw by sliding the confirmation gauge block (FW773R) up and down the downtube.
- If the gauge block does not slide freely on the downtube, repeat the Step 8 as the screw is not properly attached to the downtube.
- If the gauge block does not slide on the downtube, wiggle the screw head lightly, perpendicular to the tulip head opening as the screw could "snap" itself into place.
- Attempt to slide the gauge block again to confirm proper attachment. If not repeat Step 8.

B.9



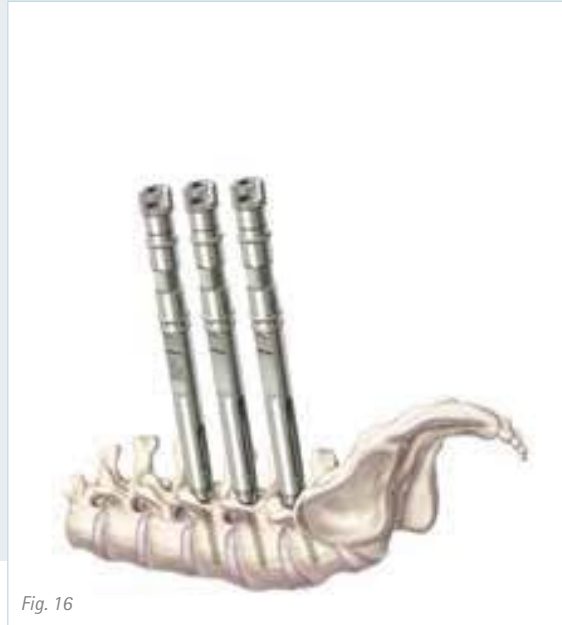
B.9. Screwdriver Attachment and Insertion

- For polyaxial screws, insert the polyaxial screwdriver (FW750R) into the downtube while ensuring the hexagonal tip is aligned to the bone screw.
- Thread the collar of the polyaxial screwdriver (FW750R) onto the threads located at the top of the downtube. If the collar does not connect to the threads, the hex tip is not properly seated in the bone screw.
- When using monoaxial screws, use monoaxial screwdriver (FW751R) instead.
- Attach either the Ratcheting straight handle (FW165R) or Ratcheting T-handle (FW167R) to the screwdriver.
- Slide the assembled screw and driver assembly over the K-Wire.
- Under fluoroscopic guidance, insert screw to the appropriate depth.
- Remove the K-Wire after an appropriate amount of bone purchase is established to avoid driving the K-Wire into a vertebral artery.
- Once the screw is fully inserted, remove the screwdriver from the downtube.
- Repeat the steps for all subsequent screws.

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B.9.



B.10.



B.10. Rod Measurement

- The rod caliper (FW774R) is used to approximate necessary rod length.
- Ensure the caliper is seated fully to the screw prior to taking measurements. The length indicated by the caliper is the minimum recommended rod length.

Option:

- The rod length measurement tool (FW759R) can also be used to approximate rod length.
- Fully seat the cylinder blocks into the most cranial and caudal downtubes while keeping both downtubes parallel.

Option:

- The rod trial (FW185R) is another alternative for approximating rod length and rod bend.
- Lay the rod trial on the skin next to the downtubes and bend the trial accordingly to ensure all portions are in close contact with the skin prior to reading the scale.

Caution:

- When using the rod length measurement tool (FW759R), ensure the most cranial and caudal downtubes are parallel prior to reading the scale.
- The length indicated is the minimum recommended rod length.

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B.11.



B.11. Aligning Downtubes for Rod Passage

- Once the rod measurements are taken, rotate the downtubes appropriately to align the downtube slots. Ensure the longer slot of the most cranial or caudal downtube is facing the rod entry point.
- The rod length measurement tool (FW759R) has a dual function which can also be used to align downtubes.
- Flip the rod length measurement tool upside down and insert the instrument into the grove on the top of the downtubes.

Optional

B.12



B.12. Endoscope Assisted Rod Passage

- The endoscope can be used to directly visualize the rod passage without reliance on fluoroscopy, minimizing radiation.
- Preassemble the Aesculap MINOP Trend endoscope using the MIS endoscope adapter (FW745P) and insert the assembled endoscope (FH610R and PE487A) into the downtube directly adjacent to the rod entry downtube.
- The endoscope adapter mates with the downtube for axial control.
- Slide in the endoscope adapter into the groove located on the top of the downtube to positively mate the two instruments.
- If needed, wiggle the endoscope adapter as the rod approaches distally to ease rod passage while providing visual confirmation of rod position, orientation, and length.

Note:

- The endoscope set only includes the 0° endoscope and its adapter. It does not include either light source or camera.

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B.13



B.13. Rod Insertion

- Both 30° (FW760R) and 60° (FW240R) fixed angle rod inserters can be used for rod passing.
- The MIS rod has a bullet tip to ease passage through soft tissue and a hex end geometry to engage with the rod inserters. Unscrew the knob on top of the respective rod inserter handle and slide in the hex end into the distal opening of the instrument. Firmly tighten the knob clockwise to secure the rod in place.
- When using the 30° rod inserter, a distal incision away from the downtube may be required.
- When using a 60° rod inserter, incision length may need to be increased to facilitate rod passage.
- Guide the rod down the outer perimeter of the downtube until the rod passes through the slot opening.

Note:

- When using the 30° rod inserter (FW760R), a distal incision away from the downtube may be required.
- To estimate correct rod bend, place the rod inserter lateral to the patient and take a lateral fluoroscopy.

Caution:

- The rod inserter knob must be firmly tightened to prevent premature in-situ release of the rod.
- Do not bend the rod hex end prior to connecting it to the rod inserter.
- Use caution not to force the rod inserter tip into the downtube slots. Doing so may splay the downtube open.
- Ensure that rods are inserted below muscle fascia.
- Rod inserter may be removed only after provisional tightening of set screws.

B.14.



B.14. Rod Persuasion

- Once the rod has passed through all downtubes, insert the rod persuader (FW762R) into the downtubes where rod persuasion is desired.
- Tighten the persuader knob to persuade the rod down to position. The rod persuader handle (FW763R) may be used for additional torque during rotations.
- The rod is fully persuaded once the bottom of the knob reaches the upper etched line on the downtube.

Note:

- The persuader handle has two sides, 'IN' and 'OUT'. The corresponding side needs to be legible when persuading or removing the instrument.
- Recommend using countertorque instrument when using rod persuader to prevent torsional loading of the patient.
- Allow free movement of downtubes when persuading rod.

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Surgical Technique

B.15



B.15. Set Screw Insertion

- Load a set screw (SW790T) on the set screw starter (FW757R) and insert it through the rod persuader (FW762R).
- Hand tighten the set screw, turning clockwise. If resistance is felt during set screw insertion, turn the starter one full revolution, counter-clockwise, and repeat the step.

Caution:

- Do not over tighten the set screw. A torque wrench along with a countertorque should be used for final tightening.

B.16



B.16. Final Tightening

- Assemble the torque limiting driver (FW778R) by attaching the torque shaft (FW776R).
- Insert the torque limiting driver into the downtube and engage the setscrew. Attach the countertorque wrench (FW777R) and final tighten the set screw to 10 Nm, the torque limiting driver will provide an audible click once 10 Nm is reached.

Caution:

- Ensure the tip of the torque wrench is fully seated into the set screw during final torque.
- Only tighten the setscrew (SW790T) to the specified setting of 10 Nm (90/in/lbs). Over tightening will lead to damaging of the implant and could lead to implant failure.
- Never use the torque limiting wrench without the counter torque handle.

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B.17



B.17. Compression and Distraction

B.17.1. Compression

- Final tighten one setscrew prior to compressor maneuvers. The compression maneuver should be made with the locked downtube and the unlocked downtube immediately adjacent to it.
- Attach the downtube connector (FW753R) on the upper ring of the respective downtubes.
- Attach the rack compressor (FW765R) in between the lower rings of the respective downtubes.
- Compress as needed. The rack handle (FW744P) can be attached to allow additional torque during compression.
- Follow up with final tightening of the setscrews as described in the final tightening section.

B.17.2. Distraction

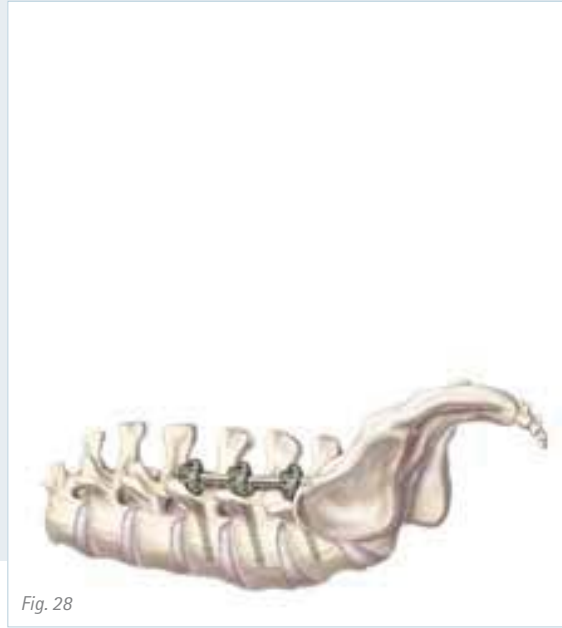
- Final tighten one setscrew prior to distraction maneuvers. The distraction maneuver should be made with the locked downtube and the unlocked downtube immediately adjacent to it.
- Attach the rack compressor (FW765R) on the upper ring of the respective downtubes.
- Attach the downtube connector (FW753R) in between the lower rings of the respective downtubes.
- Distract as needed. The rack handle (FW744P) can be attached to allow additional torque during distraction.
- Follow up with final tightening of the setscrews as described in the final tightening section.

Note:

If preferred, alternate style compressor (FW764R) is available.

B.18.

B.19.



B.18. Downtube Removal

- Once all set screws have been tightened to 10 Nm, disengage the rod holder, insert the removal key (FW756R) into each downtube, turn clockwise to splay the downtube open and remove the entire assembly from the operative site.

Note:

The removal key T-handle (FW756R) is silver for quick identification.

B.19. Final Construct

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Rescue Procedure



C.1. In-situ Downtube Reattachment

- If in-situ downtube reattachment is desired, use the instruments included in the AUX Rescue Set.
- Remove rod from pedicle screws.
- Under fluoroscopic guidance, rest the polyaxial screw removal driver (FW770R) on top of the pedicle screw that requires the downtube to be reattached.
- Slide the metal dialator (FW768R) onto the polyaxial screw removal driver.



- Slide the PEEK dialation sleeve (FW749P) over the metal dialator.

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Rescue Procedure



C.1. In-situ Downtube Reattachment

- Remove the polyaxial screw removal driver and the metal dialator while firmly grabbing on the PEEK sleeve, leaving it in place.
- Using the MIS endoscope adapter (FW745P) and the endoscope assembly, view the access to the pedicle screw.
- Engage the pedicle screw and place the opening of the screw body in a cranial/caudal direction with the use of alignment tool (FW769R).
- Slide in the K-Wire through the alignment tool securing the pedicle screw to alignment tool connection.

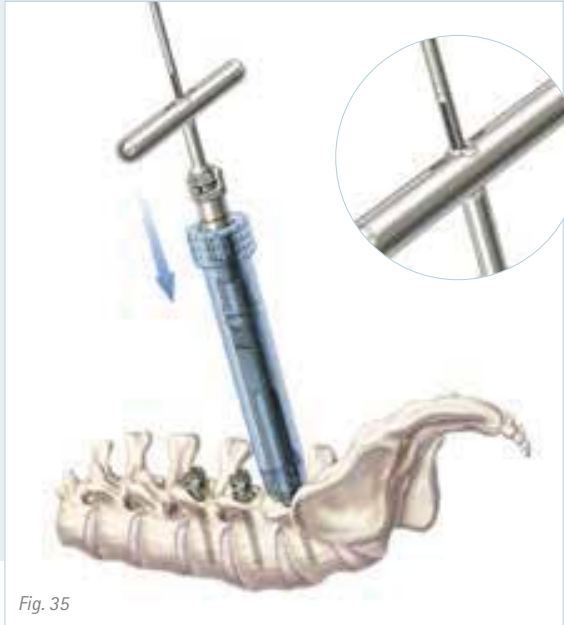


Fig. 35

- Slide the removal key into the downtube and turn the T-handle clockwise to splay the downtube open.
- Slide the expanded downtube down the alignment tool.
- Pay close attention to the line etchings on the shaft of the alignment tool and etchings on top of the removal key T-handle. These are visual markers to show proper orientation of the screw to the downtube.
- When properly engaged, the etched lines on the two instruments should be aligned and the groove on the realignment tool visible on top of the removal T-handle.
- While applying downward force, turn the removal key counter clockwise to have the downtube fully engage the pedicle screw geometry. Confirm proper engagement with the endoscope assembly or turn tower 90° to check connection under fluoroscopy.

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Rescue Procedure



C.1. In-situ Downtube Reattachment

- Remove PEEK dialation sleeve and slide on the derotation sleeve (FW766R) to reconfirm proper reattachment.
- When properly reattached, the T-handle of the derotation sleeve should be at or below the etched line of the portion of the downtube.

- Reattached downtube.





Note:

Derotation sleeves can also be attached to the downtube to reduce the possibility of detachment of the downtube during a spine de-rotation maneuver.




S4[®] Element MIS

Implant Options

Implants – Overview

S4 [®] Element MIS Polyaxial Screws			
 <p>ø 4.5 mm</p>	ST040T	S4 [®] Element MIS Polyaxial screw, ø 4.5 mm	4.5 x 25 mm
	ST041T	S4 [®] Element MIS Polyaxial screw	4.5 x 30 mm
	ST042T	S4 [®] Element MIS Polyaxial screw	4.5 x 35 mm
	ST043T	S4 [®] Element MIS Polyaxial screw	4.5 x 40 mm
	ST044T	S4 [®] Element MIS Polyaxial screw	4.5 x 45 mm
	ST045T	S4 [®] Element MIS Polyaxial screw	4.5 x 50 mm
 <p>ø 5.5 mm</p>	ST050T	S4 [®] Element MIS Polyaxial screw, ø 5.5 mm	5.5 x 25 mm
	ST051T	S4 [®] Element MIS Polyaxial screw	5.5 x 30 mm
	ST052T	S4 [®] Element MIS Polyaxial screw	5.5 x 35 mm
	ST053T	S4 [®] Element MIS Polyaxial screw	5.5 x 40 mm
	ST054T	S4 [®] Element MIS Polyaxial screw	5.5 x 45 mm
	ST055T	S4 [®] Element MIS Polyaxial screw	5.5 x 50 mm
 <p>ø 6.5 mm</p>	ST060T	S4 [®] Element MIS Polyaxial screw, ø 6.5 mm	6.5 x 25 mm
	ST061T	S4 [®] Element MIS Polyaxial screw	6.5 x 30 mm
	ST062T	S4 [®] Element MIS Polyaxial screw	6.5 x 35 mm
	ST063T	S4 [®] Element MIS Polyaxial screw	6.5 x 40 mm
	ST064T	S4 [®] Element MIS Polyaxial screw	6.5 x 45 mm
	ST065T	S4 [®] Element MIS Polyaxial screw	6.5 x 50 mm
	ST066T	S4 [®] Element MIS Polyaxial screw	6.5 x 55 mm
	ST067T	S4 [®] Element MIS Polyaxial screw	6.5 x 60 mm
 <p>ø 7.5 mm</p>	ST070T	S4 [®] Element MIS Polyaxial screw, ø 7.5 mm	7.5 x 25 mm
	ST071T	S4 [®] Element MIS Polyaxial screw	7.5 x 30 mm
	ST072T	S4 [®] Element MIS Polyaxial screw	7.5 x 35 mm
	ST073T	S4 [®] Element MIS Polyaxial screw	7.5 x 40 mm
	ST074T	S4 [®] Element MIS Polyaxial screw	7.5 x 45 mm
	ST075T	S4 [®] Element MIS Polyaxial screw	7.5 x 50 mm
	ST076T	S4 [®] Element MIS Polyaxial screw	7.5 x 55 mm
	ST077T	S4 [®] Element MIS Polyaxial screw	7.5 x 60 mm
	ST030T	S4 [®] Element MIS Polyaxial screw	7.5 x 70 mm
	ST031T	S4 [®] Element MIS Polyaxial screw	7.5 x 80 mm
ST032T	S4 [®] Element MIS Polyaxial screw	7.5 x 90 mm	
ST033T	S4 [®] Element MIS Polyaxial screw	7.5 x 100 mm	
ST034T	S4 [®] Element MIS Polyaxial screw	7.5 x 110 mm	





Implants – Overview

S4® Element MIS Polyaxial Screws			
 <p> ø 8.5 mm</p>	ST081T	S4® Element MIS Polyaxial screw, ø 8.5 mm	8.5 x 30 mm
	ST082T	S4® Element MIS Polyaxial screw	8.5 x 35 mm
	ST083T	S4® Element MIS Polyaxial screw	8.5 x 40 mm
	ST084T	S4® Element MIS Polyaxial screw	8.5 x 45 mm
	ST085T	S4® Element MIS Polyaxial screw	8.5 x 50 mm
	ST086T	S4® Element MIS Polyaxial screw	8.5 x 55 mm
	ST087T	S4® Element MIS Polyaxial screw	8.5 x 60 mm
	ST035T	S4® Element MIS Polyaxial screw	8.5 x 70 mm
	ST036T	S4® Element MIS Polyaxial screw	8.5 x 80 mm
	ST037T	S4® Element MIS Polyaxial screw	8.5 x 90 mm
 <p> ø 9.5 mm</p>	ST091T	S4® Element MIS Polyaxial screw, ø 9.5 mm	9.5 x 30 mm
	ST092T	S4® Element MIS Polyaxial screw	9.5 x 35 mm
	ST093T	S4® Element MIS Polyaxial screw	9.5 x 40 mm
	ST094T	S4® Element MIS Polyaxial screw	9.5 x 45 mm
	ST095T	S4® Element MIS Polyaxial screw	9.5 x 50 mm
	ST096T	S4® Element MIS Polyaxial screw	9.5 x 55 mm
	ST097T	S4® Element MIS Polyaxial screw	9.5 x 60 mm
 <p> ø 10.5 mm</p>	ST101T	S4® Element MIS Polyaxial screw, ø 10.5 mm	10.5 x 25 mm
	ST102T	S4® Element MIS Polyaxial screw	10.5 x 30 mm
	ST103T	S4® Element MIS Polyaxial screw	10.5 x 35 mm
	ST104T	S4® Element MIS Polyaxial screw	10.5 x 40 mm
	ST105T	S4® Element MIS Polyaxial screw	10.5 x 45 mm
	ST106T	S4® Element MIS Polyaxial screw	10.5 x 50 mm
	ST107T	S4® Element MIS Polyaxial screw	10.5 x 55 mm




S⁴® Element MIS

Implant Options

Implants – Overview

S ⁴ ® Element MIS Monoaxial Screws			
 <p>ø 4.5 mm</p>	ST140T	S⁴® Element MIS Monoaxial screw, ø 4.5 mm	4.5 x 25 mm
	ST141T	S ⁴ ® Element MIS Monoaxial screw	4.5 x 30 mm
	ST142T	S ⁴ ® Element MIS Monoaxial screw	4.5 x 35 mm
	ST143T	S ⁴ ® Element MIS Monoaxial screw	4.5 x 40 mm
	ST144T	S ⁴ ® Element MIS Monoaxial screw	4.5 x 45 mm
	ST145T	S ⁴ ® Element MIS Monoaxial screw	4.5 x 50 mm
 <p>ø 5.5 mm</p>	ST150T	S⁴® Element MIS Monoaxial screw, ø 5.5 mm	5.5 x 25 mm
	ST151T	S ⁴ ® Element MIS Monoaxial screw	5.5 x 30 mm
	ST152T	S ⁴ ® Element MIS Monoaxial screw	5.5 x 35 mm
	ST153T	S ⁴ ® Element MIS Monoaxial screw	5.5 x 40 mm
	ST154T	S ⁴ ® Element MIS Monoaxial screw	5.5 x 45 mm
	ST155T	S ⁴ ® Element MIS Monoaxial screw	5.5 x 50 mm
 <p>ø 6.5 mm</p>	ST160T	S⁴® Element MIS Monoaxial screw, ø 6.5 mm	6.5 x 25 mm
	ST161T	S ⁴ ® Element MIS Monoaxial screw	6.5 x 30 mm
	ST162T	S ⁴ ® Element MIS Monoaxial screw	6.5 x 35 mm
	ST163T	S ⁴ ® Element MIS Monoaxial screw	6.5 x 40 mm
	ST164T	S ⁴ ® Element MIS Monoaxial screw	6.5 x 45 mm
	ST165T	S ⁴ ® Element MIS Monoaxial screw	6.5 x 50 mm
	ST166T	S ⁴ ® Element MIS Monoaxial screw	6.5 x 55 mm
	ST167T	S ⁴ ® Element MIS Monoaxial screw	6.5 x 60 mm
 <p>ø 7.5 mm</p>	ST170T	S⁴® Element MIS Monoaxial screw, ø 7.5 mm	7.5 x 25 mm
	ST171T	S ⁴ ® Element MIS Monoaxial screw	7.5 x 30 mm
	ST172T	S ⁴ ® Element MIS Monoaxial screw	7.5 x 35 mm
	ST173T	S ⁴ ® Element MIS Monoaxial screw	7.5 x 40 mm
	ST174T	S ⁴ ® Element MIS Monoaxial screw	7.5 x 45 mm
	ST175T	S ⁴ ® Element MIS Monoaxial screw	7.5 x 50 mm
	ST176T	S ⁴ ® Element MIS Monoaxial screw	7.5 x 55 mm
	ST177T	S ⁴ ® Element MIS Monoaxial screw	7.5 x 60 mm
	ST130T	S ⁴ ® Element MIS Monoaxial screw	7.5 x 70 mm
	ST131T	S ⁴ ® Element MIS Monoaxial screw	7.5 x 80 mm
ST132T	S ⁴ ® Element MIS Monoaxial screw	7.5 x 90 mm	
ST133T	S ⁴ ® Element MIS Monoaxial screw	7.5 x 100 mm	
ST134T	S ⁴ ® Element MIS Monoaxial screw	7.5 x 110 mm	

Implants – Overview

S4® Element MIS Monoaxial Screws			
 <p> ø 8.5 mm</p>	ST181T	S4® Element MIS Monoaxial screw, ø 8.5 mm	8.5 x 30 mm
	ST182T	S4® Element MIS Monoaxial screw	8.5 x 35 mm
	ST183T	S4® Element MIS Monoaxial screw	8.5 x 40 mm
	ST184T	S4® Element MIS Monoaxial screw	8.5 x 45 mm
	ST185T	S4® Element MIS Monoaxial screw	8.5 x 50 mm
	ST186T	S4® Element MIS Monoaxial screw	8.5 x 55 mm
	ST187T	S4® Element MIS Monoaxial screw	8.5 x 60 mm
	ST135T	S4® Element MIS Monoaxial screw	8.5 x 70 mm
	ST136T	S4® Element MIS Monoaxial screw	8.5 x 80 mm
	ST137T	S4® Element MIS Monoaxial screw	8.5 x 90 mm
 <p> ø 9.5 mm</p>	ST191T	S4® Element MIS Monoaxial screw, ø 9.5 mm	9.5 x 30 mm
	ST192T	S4® Element MIS Monoaxial screw	9.5 x 35 mm
	ST193T	S4® Element MIS Monoaxial screw	9.5 x 40 mm
	ST194T	S4® Element MIS Monoaxial screw	9.5 x 45 mm
	ST195T	S4® Element MIS Monoaxial screw	9.5 x 50 mm
	ST196T	S4® Element MIS Monoaxial screw	9.5 x 55 mm
	ST197T	S4® Element MIS Monoaxial screw	9.5 x 60 mm
 <p> ø 10.5 mm</p>	ST201T	S4® Element MIS Monoaxial screw, ø 10.5 mm	10.5 x 30 mm
	ST202T	S4® Element MIS Monoaxial screw	10.5 x 35 mm
	ST203T	S4® Element MIS Monoaxial screw	10.5 x 40 mm
	ST204T	S4® Element MIS Monoaxial screw	10.5 x 45 mm
	ST205T	S4® Element MIS Monoaxial screw	10.5 x 50 mm
	ST206T	S4® Element MIS Monoaxial screw	10.5 x 55 mm
	ST207T	S4® Element MIS Monoaxial screw	10.5 x 60 mm

S4[®] Element MIS

Implant Options

D

Implants – Overview



S4[®] Element MIS Rod with hexagonal connection, pre-bent, ø 5.5 mm

SW554T	with tip and hexagonal connection	5.5 x 35 mm
SW555T	with tip and hexagonal connection	5.5 x 40 mm
SW556T	with tip and hexagonal connection	5.5 x 45 mm
SW557T	with tip and hexagonal connection	5.5 x 50 mm
SW558T	with tip and hexagonal connection	5.5 x 55 mm
SW559T	with tip and hexagonal connection	5.5 x 60 mm
SW561T	with tip and hexagonal connection	5.5 x 70 mm
SW562T	with tip and hexagonal connection	5.5 x 80 mm
SW563T	with tip and hexagonal connection	5.5 x 90 mm
SW564T	with tip and hexagonal connection	5.5 x 100 mm
SW566T	with tip and hexagonal connection	5.5 x 110 mm
SW567T	with tip and hexagonal connection	5.5 x 120 mm



S4[®] Element MIS Rod with hexagonal connection, straight, ø 5.5 mm



SW573T	with tip and hexagonal connection	5.5 x 35 mm
SW574T	with tip and hexagonal connection	5.5 x 40 mm
SW576T	with tip and hexagonal connection	5.5 x 45 mm
SW577T	with tip and hexagonal connection	5.5 x 50 mm
SW578T	with tip and hexagonal connection	5.5 x 55 mm
SW579T	with tip and hexagonal connection	5.5 x 60 mm
SW581T	with tip and hexagonal connection	5.5 x 70 mm
SW582T	with tip and hexagonal connection	5.5 x 80 mm
SW583T	with tip and hexagonal connection	5.5 x 90 mm
SW584T	with tip and hexagonal connection	5.5 x 100 mm
SW585T	with tip and hexagonal connection	5.5 x 110 mm
SW586T	with tip and hexagonal connection	5.5 x 120 mm
SW587T	with tip and hexagonal connection	5.5 x 150 mm
SW588T	with tip and hexagonal connection	5.5 x 180 mm
SW589T	with hexagonal connection	5.5 x 200 mm
SW590T	with hexagonal connection	5.5 x 300 mm
SW591T	with hexagonal connection	5.5 x 400 mm
SW592T	with hexagonal connection	5.5 x 500 mm



Set Screw

SW790T	Set Screw
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Instrument Overview

Pedicle Preparation		
	Item No.	Description
	FW258R	K-Wire Aiming Device
	FW271R	Trocar
	FW274R	Handle for removal of FW258R
	FW758S	Stainless Steel K-Wire 1.5 mm x 540 mm
Bone Awl		
	Item No.	Description
	FW263R	S4° Bone Probe Straight for Cannulated Screws
Tissue Dialators		
	Item No.	Description
	FW814T	S4° Element MIS Tissue Dialator 10.0 mm
	FW815T	S4° Element MIS Tissue Dialator 14.0 mm
	FW816T	S4° Element MIS Tissue Dialator 18.5 mm
K-Wire Insertion / Removal		
	Item No.	Description
	BM178R	TC Needle Holder Double Action Heavy 200 mm




S⁴® Element MIS

Instruments

Instrument Overview

Mallet	Item No.	Description
	FL036R	Mallet, Removable Discs, 135 g
Screw Length Measuring Device	Item No.	Description
	FW351R	S ⁴ ® Screw Length Measuring Device
Pedicle Probe	Item No.	Description
	FW146R	Pedicle Probe with Button Straight
	FW147R	Pedicle Probe with Button Curved
Screw Taps	Item No.	Description
	FW264R	S ⁴ ® Screw Tap for Cannulated Screws 4.5 mm
	FW265R	S ⁴ ® Screw Tap for Cannulated Screws 5.5 mm
	FW266R	S ⁴ ® Screw Tap for Cannulated Screws 6.5 mm
	FW267R	S ⁴ ® Screw Tap for Cannulated Screws 7.5 mm
	FW268R	S ⁴ ® Screw Tap for Cannulated Screws 8.5 mm





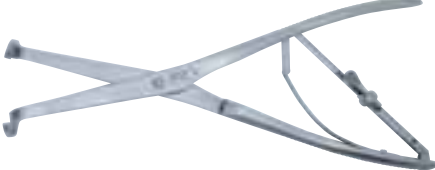


Instrument Overview

Handles	Item No.	Description
	FW165R	S4° Ratchet Handle Blue Straight
	FW167R	S4° Cannulated T-Handle for Screw Driver
Rod Caliper	Item No.	Description
	FW774R	S4° Element MIS Rod Caliper
Rod Length Measurement Tool	Item No.	Description
	FW774R	S4° Element MIS Rod Length Measurement Tool
Rod Inserters	Item No.	Description
	FW240R	S4° Rod Insertion Instrument with Hexagon Jaws
	FW760R	S4° MIS Element Freehand Rod Inserter
Set Screw Inserter	Item No.	Description
	FW757R	S4° Element MIS Set Screw Inserter








S⁴® Element MIS

Instruments

Instrument Overview

Torque/Countertorque	Item No.	Description
	FW777R	S ⁴ Element MIS Counterhold Handle
	FW776R	S ⁴ Snap Torque Wrench Shaft
	FW778R	Snap Torque Wrench
	FW170R	Line-to-Line Torque Wrench
Compressor	Item No.	Description
	FW764R	S ⁴ Element MIS Compressor
Downtubes	Item No.	Description
	FW752R	S ⁴ Element MIS Downtubes
Insertion Key	Item No.	Description
	FW755R	S ⁴ Element MIS Insertion Key










Instrument Overview

Screwdrivers	Item No.	Description
	FW750R	S4° Element MIS Polyaxial Screwdriver
	FW751R	S4° Element MIS Monoaxial Screwdriver
Gauge Block	Item No.	Description
	FW773R	Gauge Block
Persuader/Handle	Item No.	Description
	FW762R	S4° Element MIS Rod Persuader
	FW763R	S4° Element MIS Rod Persuader Handle
Rack Compressor	Item No.	Description
	FW765R	S4° Element MIS Rack Compressor
Fulcrum	Item No.	Description
	FW753R	Downtube Fulcrum

S⁴® Element MIS

Instruments




Instrument Overview





Rack Handle	Item No.	Description
	FW744P	S ⁴ Element MIS Rack Handle
Removal Key	Item No.	Description
	FW756R	S ⁴ Element MIS Removal Key
Rod Trial	Item No.	Description
	FW185R	S ⁴ Rop Trial
Auxillary Rescue Instrumentation	Item No.	Description
	FW766R	S ⁴ Element MIS De-Rotation Sleeves
	FW769R	Rescue Alignment Tool
	FW749P	Peek Dialation Sleeve
	FW768R	S ⁴ Element MIS Rescue Instrument
	FW772R	S ⁴ Element MIS Setscrew Removal Driver
	FW771R	S ⁴ Element MIS Mono Removal Driver

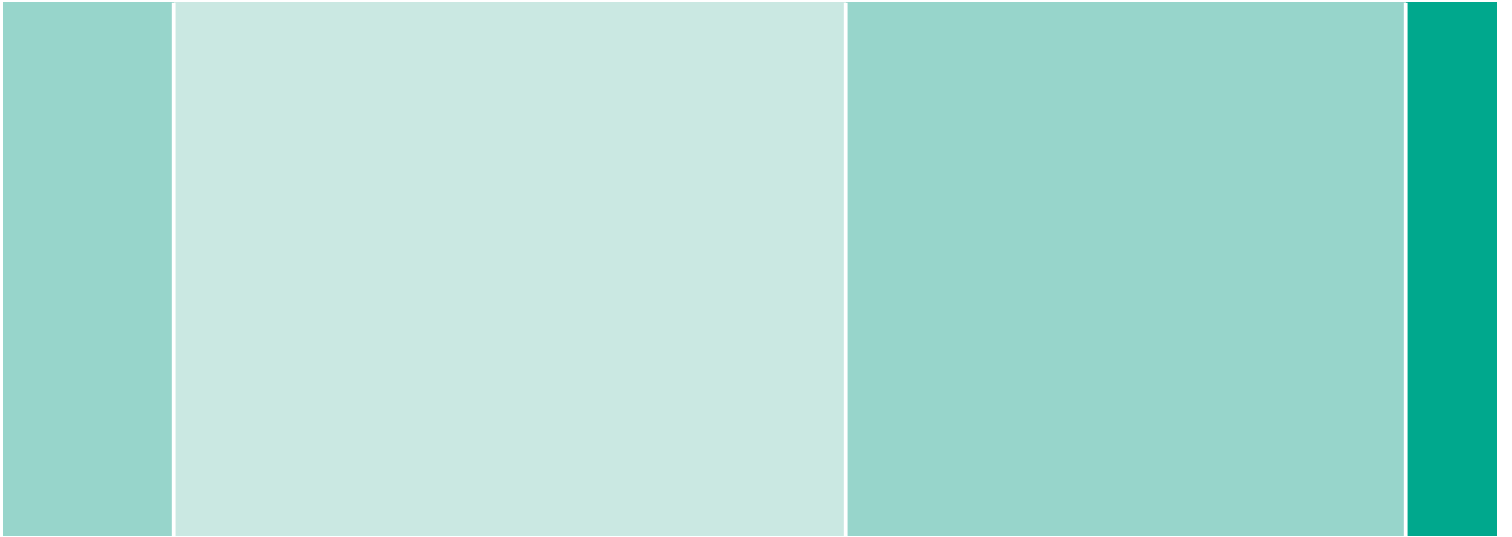
S⁴ Spinal System

F

Instrument Overview

Auxillary Rescue Instrumentation (continued)	Item No.	Description
	FW770R	S ⁴ Element MIS Poly Removal Driver
	FW775R	Locked Head Removal Driver
	FW024R	Rod Bending Forceps Adjustable

S ⁴ Element MIS Aux Vision Set	Item No.	Description
	GF385R	Long Frasier Tip
	FW745P	S ⁴ Element MIS Endoscope Adapter
	FH610R	Irrigation/Suction Trocar for 0 Degree Scope
	PE487A	0° Degree Endoscope, 4.0 mm



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Brochure No. 082002

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