

TRUSTED  
EXPERIENCE

DEGENERATIVE  
SPINAL DISORDERS



# AESCULAP<sup>®</sup> S4<sup>®</sup>

## MODULAR OPEN PEDICLE SCREW SYSTEM

SURGICAL TECHNIQUE

# DEGENERATIVE SPINAL DISORDERS

## PROTECTING AND PRESERVING SPINAL STABILITY

Modern life style has resulted in increasing physical inactivity among people all over the world. Of the many medical problems associated with this, spinal disorders are among the most critical. This is even more significant as the spinal column is one of the most important structures in the human body. It supports and stabilizes the upper body and is the center of our musculoskeletal system, which gives the body movement.

Our work in the field of degenerative spinal disorders is dedicated to protecting the spinal column and preserving its stability. We support spine surgeons with durable, reliable products and partner services for safe procedures and outstanding clinical outcomes.<sup>1-6</sup> Our philosophy of sharing expertise with healthcare professionals and patients allows us to develop innovative implant and instrument systems that help to preserve stability and stabilize the cervical and thoracolumbar spine.

<sup>1</sup> MacDonald J. Management of spondylolisthesis. *European Musculoskeletal Review*. 2006;1-4.

<sup>2</sup> Tangviriyapaiboon T. Mini-open transforaminal lumbar interbody fusion. *J Med Assoc Thai*. 2008;91(9):1-9.

<sup>3</sup> Stulik J, Nesnidal P, Kryl J, Vyskocil T, Barna M. Kyphotic deformities of the cervical spine. 28th Annual Meeting of the AANS/CNS Section on Disorders of the cervical Spine and peripheral Nerves. March 2012 Orlando, Florida.

<sup>4</sup> Weib T, Hauck S, Bühren V, Gonschorek O. Repositioning options with percutaneous dorsal stabilization. For burst fractures of the thoracolumbar junction. *Unfallchirurg*. 2014 May;117(5):428-36. doi: 10.1007/s00113-013-2364-7. German.

<sup>5</sup> Finger T, Bayerl S, Onken J, Czabanka M, Woitzik J, Vajkoczy P. Sacropelvic fixation versus fusion to the sacrum for spondylodesis in multilevel degenerative spine disease. *Eur Spine J*. 2014;23:1013-20.

<sup>6</sup> Vanek P, Bradac O, Konopkova R, de Lacy P, Lacman J, Benes V. Treatment of thoracolumbar trauma by short-segment percutaneous transpedicular screw instrumentation: prospective comparative study with a minimum 2-year follow-up. *J Neurosurg Spine*. 2014;20:150-6.



# AESCULAP THORACOLUMBAR SPINE

## PORTFOLIO OVERVIEW

### IMPLANT SYSTEMS

posterior



S4° Element MIS



S4° Element Open



Hydrolift®

anterior



MacS II



S4° Element Augmentation



S4° Element Multilevel



S4° Long Tab



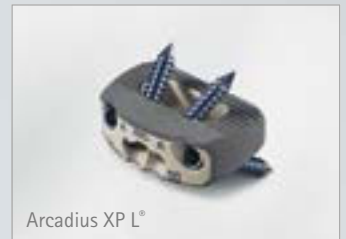
S4° Spinal System



PROSPACE® XP/PEEK/Titanium



TSPACE® XP/PEEK/Titanium



Arcadius XP L®

### INSTRUMENT SYSTEMS

posterior



Spine Classics MLD System



Mini-Open Retractor System



CLR

anterior



activ 0

# AESCULAP® S4®

CONTENT





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The versatile and modular portfolio of S<sup>4</sup>, enables you to master the challenges in degenerative spine, making it to your partner.

### **B** Osteoporotic Spine **Page 16**

Our dedicated solution provides fixation capabilities to achieve improved anchorage and stability within the bone, allowing to respond to a reduced bone quality.

### **C** Spinal Fractures and Trauma **Page 24**

The unique reduction instruments allow correction of spinal deformities, caused by fractures and trauma, in a simplified way.

### **D** Spondylolisthesis **Page 34**

This powerful module reduces listhetic vertebral bodies by simultaneously correcting the translation and slip angle of the segment.

### **E** Connector Application **Page 44**

Whether enhancing construct stability or extending constructs, the variety of S<sup>4</sup> connectors match your surgical needs.

### **F** Hook Application **Page 50**

The S<sup>4</sup> hooks complement the S<sup>4</sup> implant portfolio in order to adapt the treatment concept to the patients need.

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# AESCULAP® S4®

## SYSTEM OVERVIEW

## TRUSTED EXPERIENCE

The unique slim profile technology of S4 blends the experience of more than ten years of clinical application and continuously updated technologies, making it a reliable posterior spinal fixation system for a vast range of indications.

### ➤ MODULAR VERSATILITY

The S4 is based on Aesculap's proven and versatile platform technologies that are especially designed for the requirements and needs in spinal surgery. As a result, the system is individually configurable and adaptable to a comprehensive range of pathologies and approach techniques, giving you the benefit to work with one system.

### ➤ CUTTING-EDGE DIMENSIONS

The outstanding slim profile technology allows for a implant diameter of only 10.5 mm and a lean instrument design for true MIS skin incisions and effective instrument manipulation in tight anatomical spaces.

### ➤ LEAN SURGICAL WORKFLOW

The contents of the individual implant and instrument modules are defined in a way that an intuitive and streamlined instrumentation can be supported throughout the whole hospital workflow.





# AESCULAP® S4®

A | SURGICAL TECHNIQUE – DEGENERATIVE SPINE

## TRUSTED EXPERIENCE DEGENERATIVE SPINE

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# AESCULAP® S4®

## A | SURGICAL TECHNIQUE – DEGENERATIVE SPINE



Fig. 1

### A.1. PEDICLE PREPARATION

- Determine the pedicle entry point and perforate the cortex using the Bone Awl (FW190R).
- Use the Pedicle Probe to open the pedicle canal. The Pedicle Probes are available straight or curved blunt-tip (FW188R or FW189R) and straight or curved Lenke (FW248R or FW249R).
- The Pedicle Probes have ruled markings to determine the depth measurement in the pedicle canal.
- If necessary, single or dual band Pedicle Markers (FW191R or FW192R) can be used to identify proper anatomic location on intra-operative imaging.
- Utilize the straight or curved Pedicle Sounder (FW146R or FW147R) to confirm the patency of the pedicle and vertebral body cortex.



Fig. 2

### A.2. PEDICLE TAPPING

Although the S<sup>4</sup> Spine System screws are self-tapping, Screw Taps are available in all diameters if desired.

- To tap, attach the straight Ratchet Handle or the T-Handle (FW165R or FW167R) to the appropriate Screw Tap (FW194R – FW198R or FW356R – FW357R) based on the screw diameter.

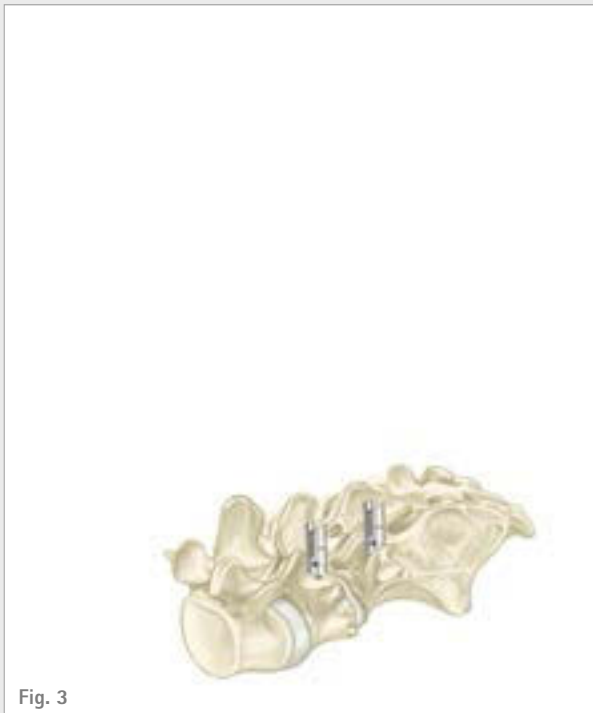


Fig. 3

### A.3. SCREW PLACEMENT

- For polyaxial screws, attach and fully engage the hexagonal tip of the Screw Driver (FW270R) into the body of the screw.
- For monoaxial screws, insert and fully seat the rounded tip of the Screw Driver (FW262R) into the slot of the monoaxial screw.
- Thread the screw into the prepared pedicle and release the Screw Driver from the screw body by pulling it back.
- If needed, the Screw Body Manipulator (FW180R) can be used to adjust the height of monoaxial screws as well as the alignment of the polyaxial screw bodies.
- In case of soft tissue impingement, the Marnay Lever (FW154R) can be used to retract soft tissue.
- If revision is necessary, use the Screw Body Manipulator to release the axial lock of the screw body and then use the Screw Driver (FW174R) for the removal of polyaxial screws. Monoaxial screws can be removed using the Screw Driver (FW262R).



Fig. 4

### A.4. ROD PLACEMENT

- The flexible Rod Trial (FW185R) can be used as a guide for rod bending and measuring correct rod length.
- Both pre-bent and straight rods are available.
- If needed, the rod length can be adapted using the Rod Cutter (FW206R).
- All rods may be contoured using the French Rod Bender (FW024R).
- To contour the rod, place the rod on the French Rod Bender and squeeze the handle until the desired curvature is achieved. If needed, the Rod Holding Forceps (FW012R) can be used for rotational stability.
- Use the Rod Holding Forceps to assist with rod placement or rod manipulation.

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## A | SURGICAL TECHNIQUE – DEGENERATIVE SPINE

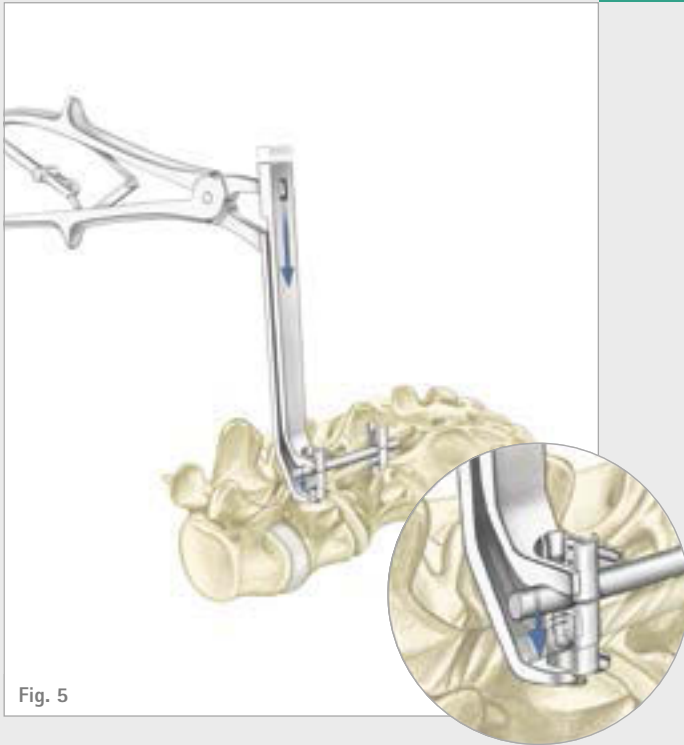


Fig. 5

### A.5. ROD REDUCTION

#### a) Reduction by Rod Persuader

- Place the Rod Persuader (FW208R) under the screw body and ensure the tip of the Rod Persuader is fully engaged to the body of the implant.
- Squeeze the handle of the Rod Persuader to seat the rod into the body of the pedicle screw.

#### b) Reduction by Rod Pusher

- Place the Rod Pusher (FW513R) on the rod and push the rod manually into the screw body.

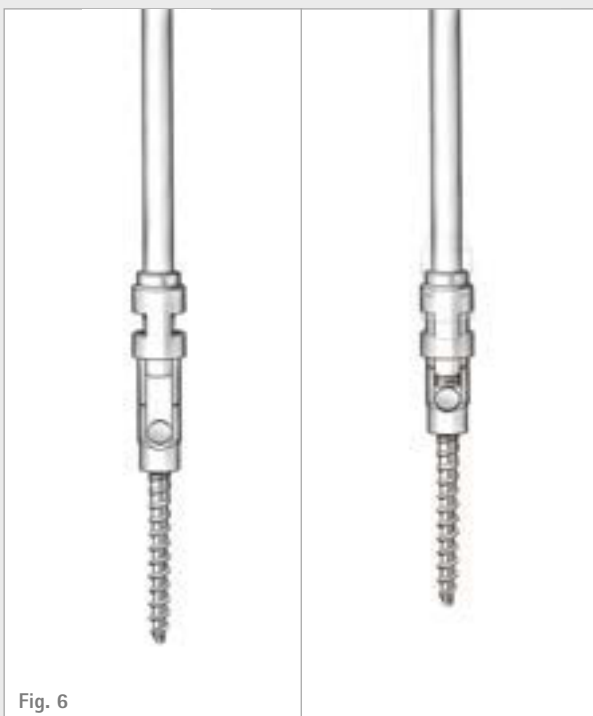


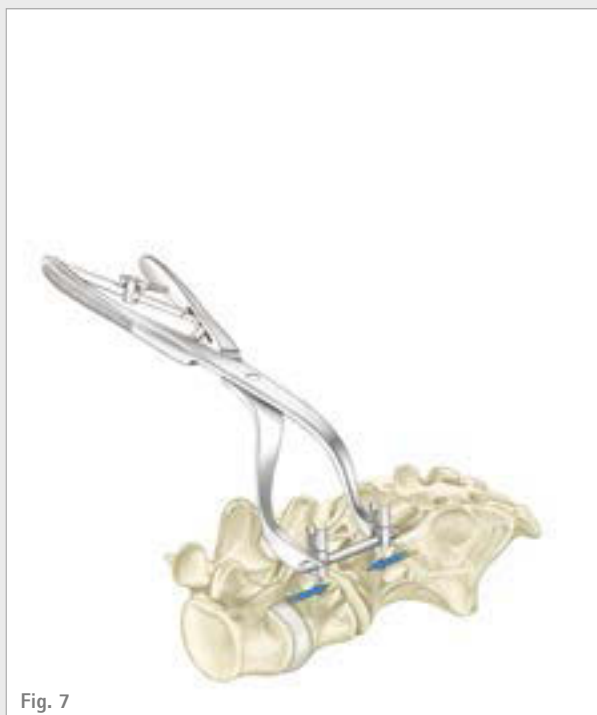
Fig. 6

### A.6. SET SCREW PLACEMENT

- Insert the Set Screw Starter (FW177R) firmly into the set screw and remove the set screw from the caddy. Ensure the set screw is fully engaged to the Set Screw Starter.
- The outer ring of the Set Screw Starter fits onto the flanks of the screw body to ensure the set screw trajectory is correct during initial threading.
- Finger tighten the set screw into the screw body until it contacts the rod.
- Use the Set Screw Revision Screw Driver (FW193R) to remove a tightened set screw.

#### Note:

The Set Screw Starter is designed to tighten the Set Screw to a depth that still allows compression and distraction maneuvers to be performed.



#### A.7. COMPRESSION MANEUVER

Use the Compression Forceps (FW184R or FW210R) to compress the construct.

- Fully tighten one set screw to create a fixed point for compression.
- Fully seat the Counter Torque Handle (FW178R) on the unlocked screw body and perform the compression maneuver.
- Once the desired compression is achieved, fully tighten the remaining set screw.



#### A.8. DISTRACTION MANEUVER

Use the Distraction Forceps (FW181R or FW023R) to distract the construct.

- Fully tighten one set screw to create a fixed point for distraction.
- Fully seat the Counter Torque Handle (FW178R) on the unlocked screw body and perform the distraction maneuver.
- Once the desired distraction is achieved, fully tighten the remaining set screw.

# AESCALAP<sup>®</sup> S4<sup>®</sup>

## A | SURGICAL TECHNIQUE – DEGENERATIVE SPINE

### A.9. DEROTATION MANEUVER

Use the Derotation Sleeves (FW183R) and the Counter Torque Handle (FW178R) to rotate the rod.

- Place the Derotation Sleeves over the pedicle screws that contain the rod to be rotated.
- Connect the Counter Torque Handle to one of the Derotation Sleeves to perform the rotation maneuver.
- Once the desired rotation is achieved, fully tighten the set screws.

### A.10. FINAL TIGHTENING

Final tightening of each set screw is completed using the Torque Wrench (FW170R) along with the Counter Torque Handle (FW178R).

- Insert the Torque Wrench through the tube of the Counter Torque so the tip is exposed.
- Fully seat the tip of the Torque Wrench into the socket of the set screw. Engage the Counter Torque tip with the rod.
- Turn the Torque Wrench in a clockwise direction while firmly holding the Counter Torque. Ensure the arrows on the Torque Wrench line up with each other.

#### Caution:

Do not use the Torque Wrench without the Counter Torque Handle. Over tightening the set screw more than the specified setting of 10 Nm (90 in/lbs) could lead to implant failure. Damaged set screws must be replaced.



Fig. 9

#### A.11. TAB REMOVAL

- After verifying that all screws are placed and tightened, remove the tabs with the Tab Breaker (FW179R).

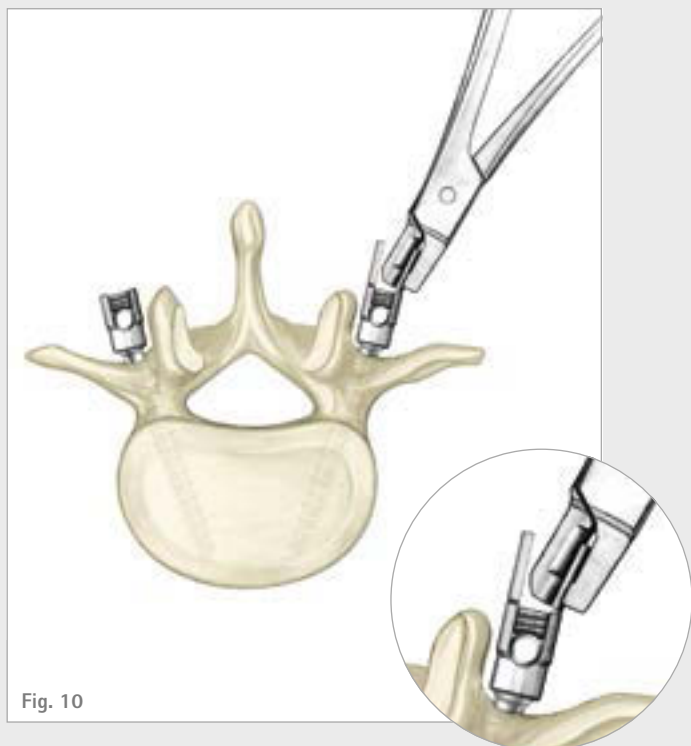


Fig. 10

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B | SURGICAL TECHNIQUE – OSTEOPOROTIC SPINE

## TRUSTED EXPERIENCE OSTEOPOROTIC SPINE

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# AESCULAP® S4®

## B | SURGICAL TECHNIQUE – OSTEOPOROTIC SPINE



### B.1. PEDICLE PREPARATION

- Determine the pedicle entry point and perforate the cortex using the Bone Awl (FW190R).
- Use the Pedicle Probe to open the pedicle canal. The Pedicle Probes are available straight or curved blunt-tip (FW188R or FW189R) and straight or curved Lenke (FW248R or FW249R).
- The Pedicle Probes have ruled markings to determine the depth measurement in the pedicle canal.
- If necessary, single or dual band Pedicle Markers (FW191R or FW192R) can be used to identify proper anatomic location on intra-operative imaging.
- Utilize the straight or curved Pedicle Sounder (FW146R or FW147R) to confirm the patency of the pedicle and vertebral body cortex.



### B.2. PEDICLE TAPPING

Although the S4 Spine System screws are self-tapping, Screw Taps are available in all diameters if desired.

- To tap, attach the straight Ratchet Handle or the T-Handle (FW165R or FW167R) to the appropriate Screw Tap (FW194R – FW198R or FW356R – FW357R) based on the screw diameter.

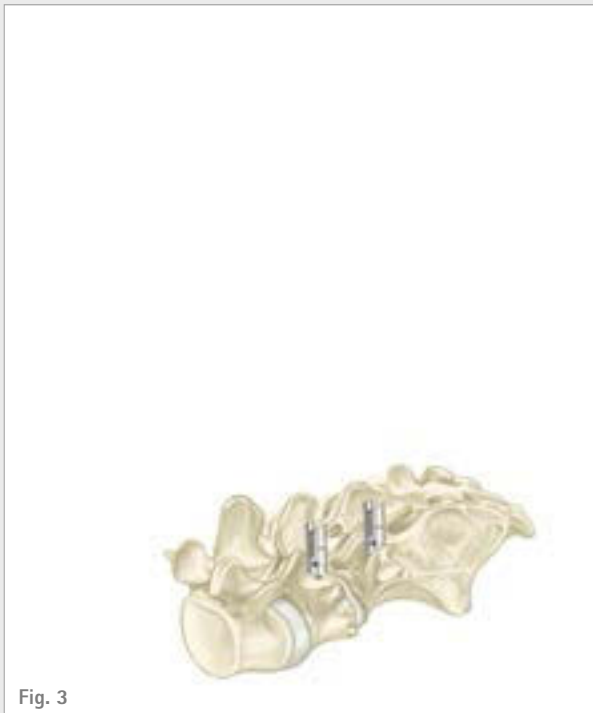


Fig. 3

### B.3. SCREW PLACEMENT

- For polyaxial screws, attach and fully engage the hexagonal tip of the Screw Driver (FW270R) into the body of the augmentation screw.
- For monoaxial screws, insert and fully seat the rounded tip of the Screw Driver (FW262R) into the slot of the monoaxial augmentation screw. Ensure that the Screw Driver is fully engaged onto the screw.
- Thread the screw into the prepared pedicle and release the Screw Driver from the screw body by pulling it back.
- Slide the K-Wire (FW247S) into the cannulation of the screw and check its patency, in order to avoid unwanted penetration of bone into the augmentation area of the screw.
- If needed, the Screw Body Manipulator (FW180R) can be used to adjust the height of the monoaxial screws as well as the alignment of the polyaxial screw bodies.



Fig. 4

### B.4. CANNULA ATTACHMENT

- The Augmentation Cannula (SR146SU) is placed over the K-Wire, connected with the augmentation screw and hand tightened. The K-Wire is removed afterwards.
- When introducing the Augmentation Cannula it is important to align the polyaxial screw vertically in order to avoid cross threading.
- In order to avoid unwanted cement leakage make sure that there is a tight connection between Augmentation Cannula and the augmentation screw.

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## B | SURGICAL TECHNIQUE – OSTEOPOROTIC SPINE

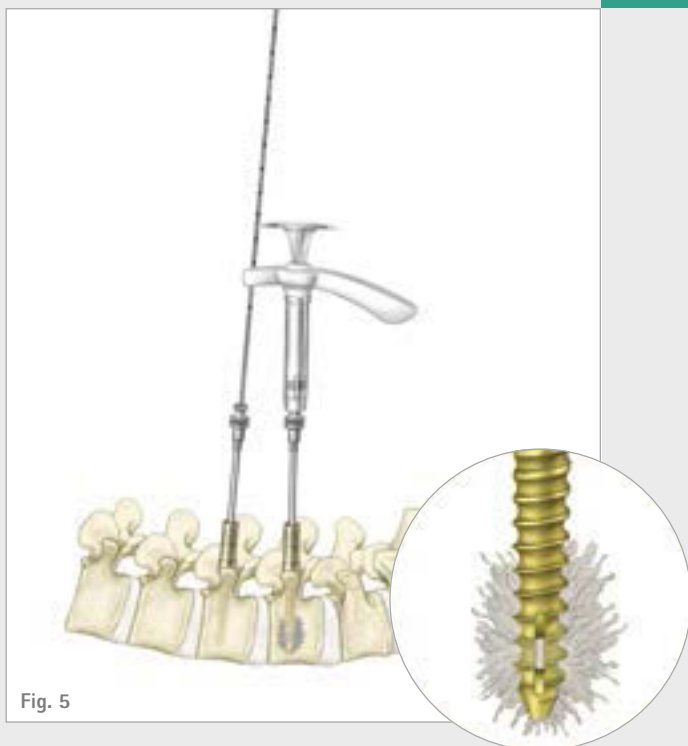


Fig. 5

### B.5. CEMENT APPLICATION

- Ensure, that there is no cement at the connection between the Cement Applicator and Augmentation Cannula.
- Attach the Cement Applicator to the Augmentation Cannula. For cement application make sure that the consistency of the cement is pasty (see manufacturers specifications).
- Inject cement until it extrudes from the slots. Check that no cement leakage occurs. Cement injection should be effected under real time image intensifier control.
- Continue the injection until the adequate quantity of cement is introduced and shows a cloud pattern.
- The manufacturers specifications for the cement hardening times have to be observed.
- The Augmentation Cannula remains in the pedicle screw until the cement has hardened. Otherwise there is a risk of contamination of the screw body.



Fig. 6

### B.6. ROD PLACEMENT

- The flexible Rod Trial (FW185R) can be used as a guide for rod bending and measuring correct rod length.
- Both pre-bent and straight rods are available.
- If needed, the rod length can be adapted using the Rod Cutter (FW206R).
- All rods may be contoured using the French Rod Bender (FW024R).
- To contour the rod, place the rod on the French Rod Bender and squeeze the handle until the desired curvature is achieved. If needed, the Rod Holding Forceps (FW012R) can be used for rotational stability.
- Use the Rod Holding Forceps to assist with rod placement or rod manipulation.

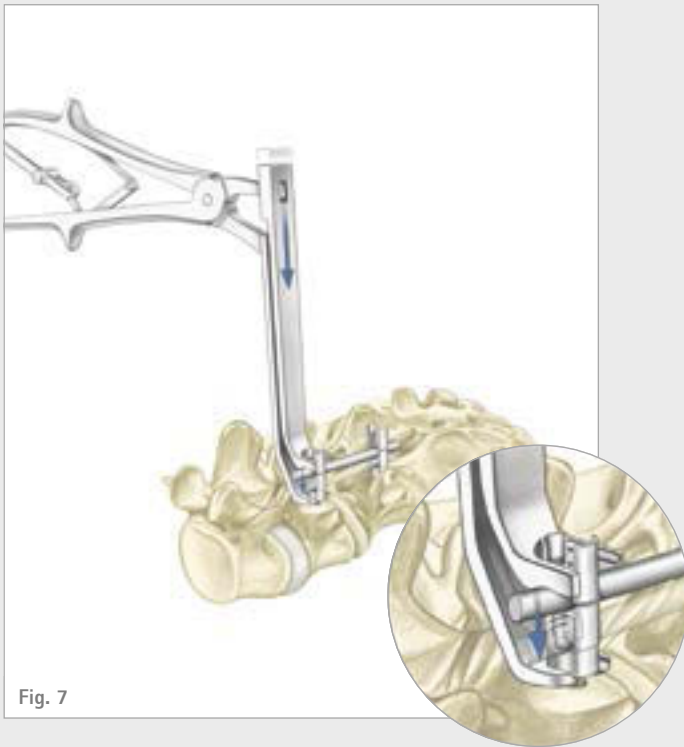


Fig. 7

## B.7. ROD REDUCTION

### a) Reduction by Rod Persuader

- Place the Rod Persuader (FW208R) under the screw body and ensure the tip of the Rod Persuader is fully engaged to the body of the implant.
- Squeeze the handle of the Rod Persuader to seat the rod into the body of the pedicle screw.

### b) Reduction by Rod Pusher

- Place the Rod Pusher (FW513R) on the rod and push the rod manually into the screw body.



Fig. 8

## B.8. SET SCREW PLACEMENT

- Insert the Set Screw Starter (FW177R) firmly into the set screw and remove the set screw from the caddy. Ensure the set screw is fully engaged to the Set Screw Starter.
- The outer ring of the Set Screw Starter fits onto the flanks of the screw body to ensure the set screw trajectory is correct during initial threading.
- Finger tighten the set screw into the screw body until it contacts the rod.
- Use the Set Screw Revision Screw Driver (FW193R) to remove a tightened set screw.

### Note:

The Set Screw Starter is designed to tighten the Set Screw to a depth that still allows compression and distraction maneuvers to be performed.

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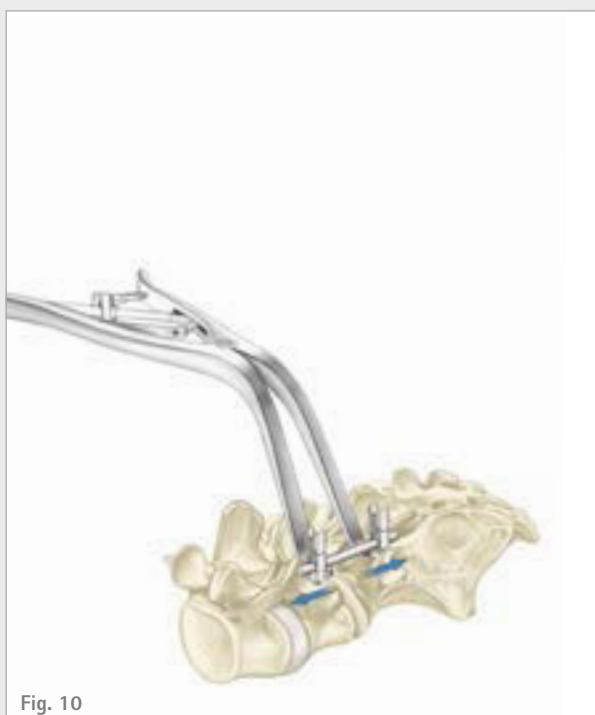
## B | SURGICAL TECHNIQUE – OSTEOPOROTIC SPINE



### B.9. COMPRESSION MANEUVER

Use the Compression Forceps (FW184R or FW210R) to compress the construct.

- Fully tighten one set screw to create a fixed point for compression.
- Fully seat the Counter Torque Handle (FW178R) on the unlocked screw body and perform the compression maneuver.
- Once the desired compression is achieved, fully tighten the remaining set screw.



### B.10. DISTRACTION MANEUVER

Use the Distraction Forceps (FW181R or FW023R) to distract the construct.

- Fully tighten one set screw to create a fixed point for distraction.
- Fully seat the Counter Torque Handle (FW178R) on the unlocked screw body and perform the distraction maneuver.
- Once the desired distraction is achieved, fully tighten the remaining set screw.



Fig. 11

### B.11. FINAL TIGHTENING

Final tightening of each set screw is completed using the Torque Wrench (FW170R) along with the Counter Torque Handle (FW178R).

- Insert the Torque Wrench through the tube of the Counter Torque so the tip is exposed.
- Fully seat the tip of the Torque Wrench into the socket of the set screw. Engage the Counter Torque tip with the rod.
- Turn the Torque Wrench in a clockwise direction while firmly holding the Counter Torque. Ensure the arrows on the Torque Wrench line up with each other.

#### Caution:

Do not use the Torque Wrench without the Counter Torque Handle. Over tightening the set screw more than the specified setting of 10 Nm (90 in./lbs) could lead to implant failure. Damaged set screws must be replaced.

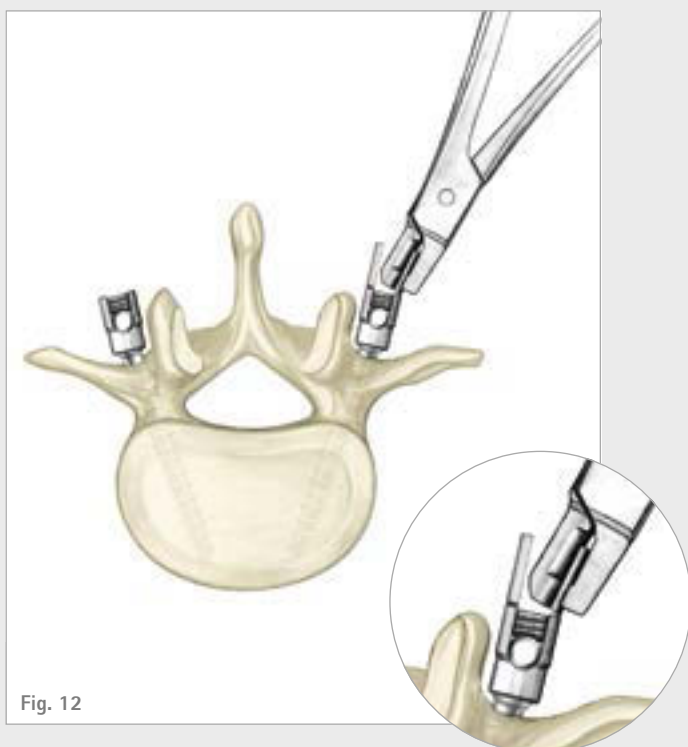


Fig. 12

### B.12. TAB REMOVAL

- After verifying that all screws are placed and tightened, remove the tabs with the Tab Breaker (FW179R).

# AESCULAP® S4®

C | SURGICAL TECHNIQUE – SPINAL FRACTURES AND TRAUMA

## TRUSTED EXPERIENCE

### SPINAL FRACTURES AND TRAUMA

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# AESCULAP® S4®

## C | SURGICAL TECHNIQUE – SPINAL FRACTURES AND TRAUMA



### C.1. PEDICLE PREPARATION

- Determine the pedicle entry point and perforate the cortex using the Bone Awl (FW190R).
- Use the Pedicle Probe to open the pedicle canal. The Pedicle Probes are available straight or curved blunt-tip (FW188R or FW189R) and straight or curved Lenke (FW248R or FW249R).
- The Pedicle Probes have ruled markings to determine the depth measurement in the pedicle canal.
- If necessary, single or dual band Pedicle Markers (FW191R or FW192R) can be used to identify proper anatomic location on intra-operative imaging.
- Utilize the straight or curved Pedicle Sounder (FW146R or FW147R) to confirm the patency of the pedicle and vertebral body cortex.



### C.2. PEDICLE TAPPING

Although the S4 Spine System screws are self-tapping, Screw Taps are available in all diameters if desired.

- To tap, attach the straight Ratchet Handle or the T-Handle (FW165R or FW167R) to the appropriate Screw Tap (FW194R – FW198R or FW356R – FW357R) based on the screw diameter.

### C.3. SCREW PLACEMENT

- For polyaxial screws, attach and fully engage the hexagonal tip of the Screw Driver (FW270R) into the body of the screw.
- For monoaxial screws, insert and fully seat the rounded tip of the Screw Driver (FW262R) into the slot of the monoaxial screw.
- Thread the screw into the prepared pedicle and release the Screw Driver from the screw body by pulling it back.
- If needed, the Screw Body Manipulator (FW180R) can be used to adjust the height of monoaxial screws as well as the alignment of the polyaxial screw bodies.
- In case of soft tissue impingement, the Marnay Lever (FW154R) can be used to retract soft tissue.
- If revision is necessary, use the Screw Body Manipulator to release the axial lock of the screw body and then use the Screw Driver (FW174R) for the removal of polyaxial screws. Monoaxial screws can be removed using the Screw Driver (FW262R).



# AESCULAP® S4®

## C | SURGICAL TECHNIQUE – SPINAL FRACTURES AND TRAUMA



### C.4. ROD PLACEMENT

- The flexible Rod Trial (FW185R) can be used as a guide for rod bending and measuring correct rod length.
- Both pre-bent and straight rods are available.
- If needed, the rod length can be adapted using the Rod Cutter (FW206).
- All rods may be contoured using the French Rod Bender (FW024R).
- To contour the rod, place the rod on the French Rod Bender and squeeze the handle until the desired curvature is achieved. If needed, the Rod Holding Forceps (FW012R) can be used for rotational stability.
- The locking mechanism of the Rod Insertion Instrument (FW240R) is released by turning the distal knob counter clockwise. The rod can now be inserted. By turning the knob clockwise the rod becomes fixed.
- The FRI Outer Sleeves (FW235R) are now placed on the screws with the long slot placed caudally.
- The rod is now inserted through the long slot of the Outer Sleeve. Make sure to press the Outer Sleeve slightly onto the screws in order to give them a firm seat during the rod insertion.
- Repeat this process on the contra-lateral side.



Fig. 6

### C.5. LEVER PLACEMENT

- The Screw Driver (FW228R) is now inserted into the Lever Threadpipe (FW734R) and fixed with the Spacer (FW143P).
- Pick up the set screw (SW790T or SW375T) from the storage with the Screw Driver.
- The construct is now inserted through the Outer Sleeve (FW235R) until it touches the screw body. Then screw the construct down until it blocks.
- For further manipulation of the set screw the Spacer has to be removed.



Fig. 7

### C.6. DISTRACTOR ASSEMBLY

- Place the first distraction nut on the rear parallel guide of the frame (A).
- Position the free distraction portion (B) on the parallel guide.
- Place the second distraction nut on the rear parallel guide.
- Attach the Distraction Arms (FW239R) (C) on the connection parts of the Distractor (FW238R).

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## C | SURGICAL TECHNIQUE – SPINAL FRACTURES AND TRAUMA

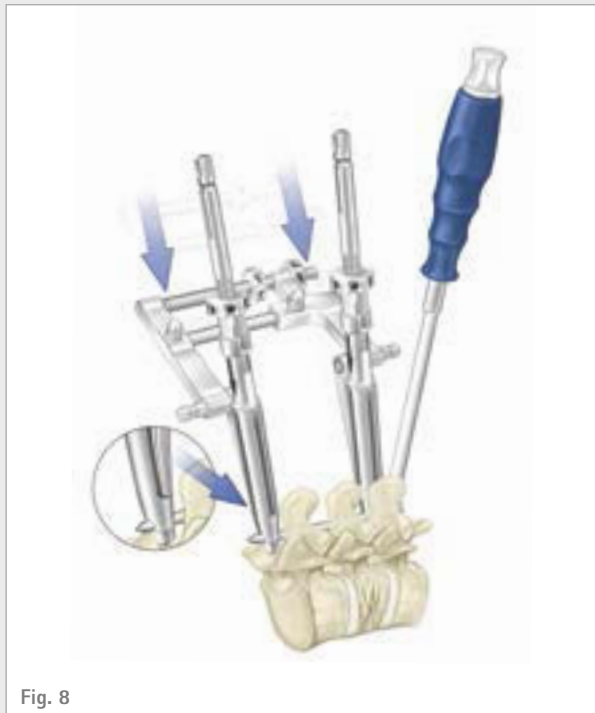


Fig. 8

### C.7. DISTRACTOR PLACEMENT

- The Distractor (consisting of FW238R and FW239R) is now fixed to the cranial and caudal Outer Sleeves by sliding the pivots down the guiding groove. Ensure that the distraction arms are inserted parallel to the Outer Sleeve.
- Repeat this process on the contra-lateral side.



Fig. 9

- Distraction can be effected using the distraction nut. The distraction nut can be manipulated by hand or with the Fixation Nut Wrench (FW237R).
- If preferred, distraction may take place under fluoroscopic control.

## C.8. SPINDLE DISTRACTOR ASSEMBLY

- If necessary, the natural lordosis can be restored with the Distraction Spindle (FW241R).
- The attachment jig (A) is placed on the spindle (B) with the pivot inward and fixed with the distraction nut (C).



Fig. 10

## C.9. SPINDLE DISTRACTOR PLACEMENT

- The pins of the spindle are inserted into the groove on the upper part of the Outer Sleeves. Ensure that the Distraction Spindle is placed parallel to the Outer Sleeve to avoid tilting.
- Repeat this process on the contra-lateral side.
- Lordosis can be corrected using the distraction nut. The distraction nut can be manipulated by hand or with the Fixation Nut Wrench (FW237R).



Fig. 11

# AESFULAP<sup>®</sup> S4<sup>®</sup>

## C | SURGICAL TECHNIQUE – SPINAL FRACTURES AND TRAUMA



Fig. 12

### C.10. FINAL TIGHTENING

- With the regulating screw of the Lever Threadpipe the Outer Sleeve is threaded down until it blocks. The rod is now seated in the screw head.
- The regulating screw of the Lever Threadpipe has to be threaded back by a quarter turn in order not to block the Screw Driver.
- Attach the Ratchet Handle to the Screw Driver and remove the Spacer. Finger tighten the set screw by turning the Ratchet Handle.
- Remove the instruments by pulling the Screw Driver out and unscrewing the Lever Threadpipe.
- Final tightening of each set screw is completed using the Torque Wrench (FW170R) along with the Counter Torque (FW236R).
- The Counter Torque is attached to the hexagonal bolt of the Outer Sleeve. Insert the Torque Wrench through the Outer Sleeve into the socket of the set screw.
- Turn the Torque Wrench in a clockwise direction while firmly holding the Counter Torque. Ensure the arrows on the Torque Wrench line up with each other.
- The locking mechanism of the Rod Inserter is opened and the rod released.

#### Caution:

Do not use the Torque Wrench without the Counter Torque Handle. Over tightening the set screw more than the specified setting of 10 Nm (90 in/lbs) could lead to implant failure. Damaged set screws must be replaced.



### C.11. TAB REMOVAL

- After verifying that all screws are placed and tightened, dismantle the Outer Sleeve from the screws and remove the tabs with the Tab Breaker (FW179R).

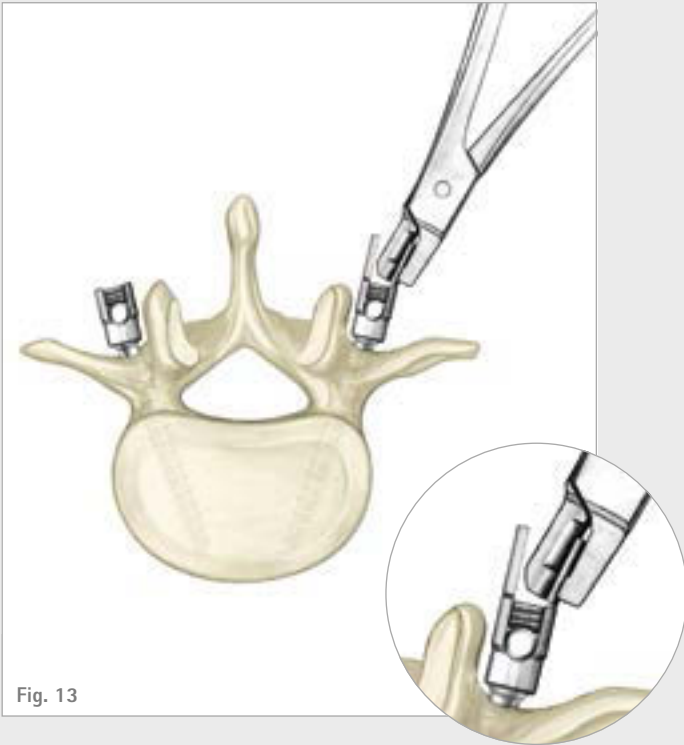


Fig. 13

# AESCULAP® S4®

D | SURGICAL TECHNIQUE – SPONDYLOLISTHESIS

## TRUSTED EXPERIENCE SPONDYLOLISTHESIS

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### D SURGICAL TECHNIQUE

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# AESCULAP® S4®

## D | SURGICAL TECHNIQUE – SPONDYLOLISTHESIS



### D.1. PEDICLE PREPARATION

- Determine pedicle entry point and perforate the cortex using the Bone Awl (FW190R).
- Use the Pedicle Probe to open the pedicle canal. The Pedicle Probes are available straight or curved blunt-tip (FW188R or FW189R) and straight or curved Lenke (FW248R or FW249R).
- The Pedicle Probes have ruled markings to determine the depth measurement in the pedicle canal.
- If necessary, single or dual band Pedicle Markers (FW191R or FW192R) can be used to identify proper anatomic location on intra-operative imaging.
- Utilize the straight or curved Pedicle Sounder (FW146R or FW147R) to confirm the patency of the pedicle and vertebral body cortex.



### D.2. PEDICLE TAPPING

Although the S4 Spine System screws are self-tapping, Screw Taps are available in all diameters if desired.

- To tap, attach the straight Ratchet Handle or the T-Handle (FW165R or FW167R) to the appropriate Screw Tap (FW194R – FW198R or FW356R – FW357R) based on the screw diameter.

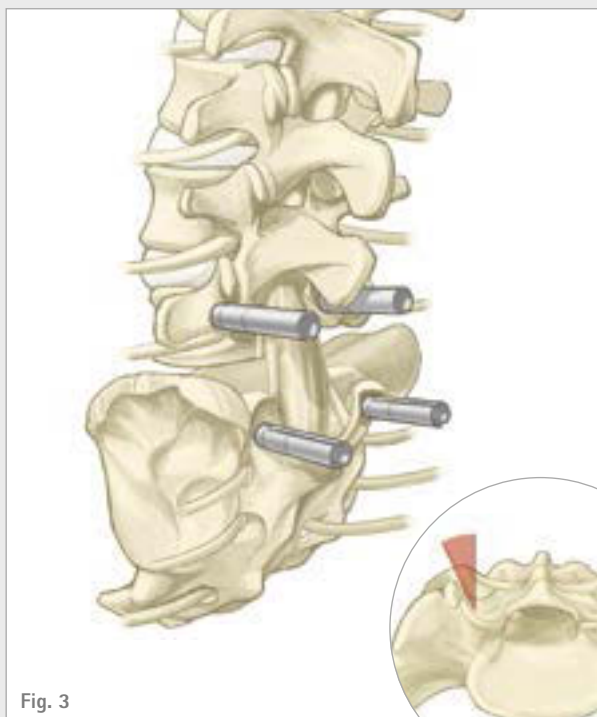


Fig. 3

### D.3. SCREW PLACEMENT

Within the limits of the patient's anatomy, the screws in the cephalad vertebral body are best placed parallel to its superior endplate and as parallel to each other as possible.

Place the caudal screws (monoaxial screws should be used) so that they are parallel to the cephalad screws (polyaxial screws should be used) in both planes (as compared to the standard convergent manner). Placement of screws in this way allows for optimal operation of the reduction instrument and provides for easier rod placement.

- In the case of an L5/S1 reduction, the chosen length at S1 should achieve bi-cortical purchase.

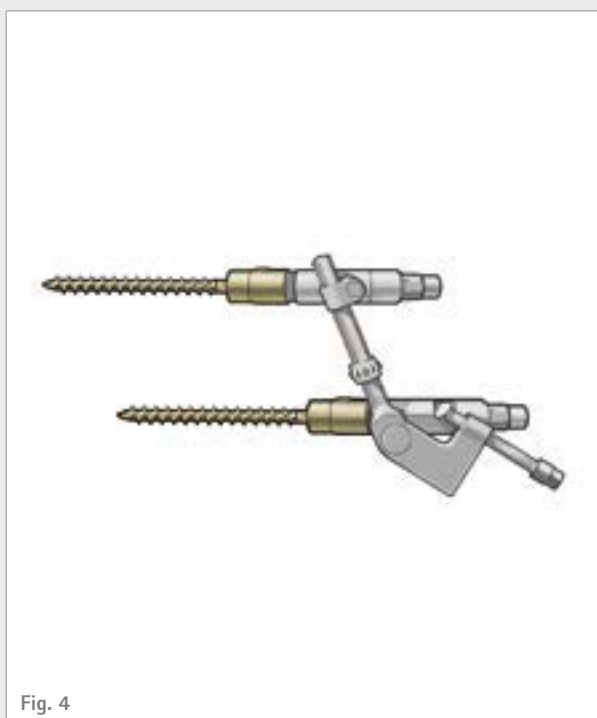


Fig. 4

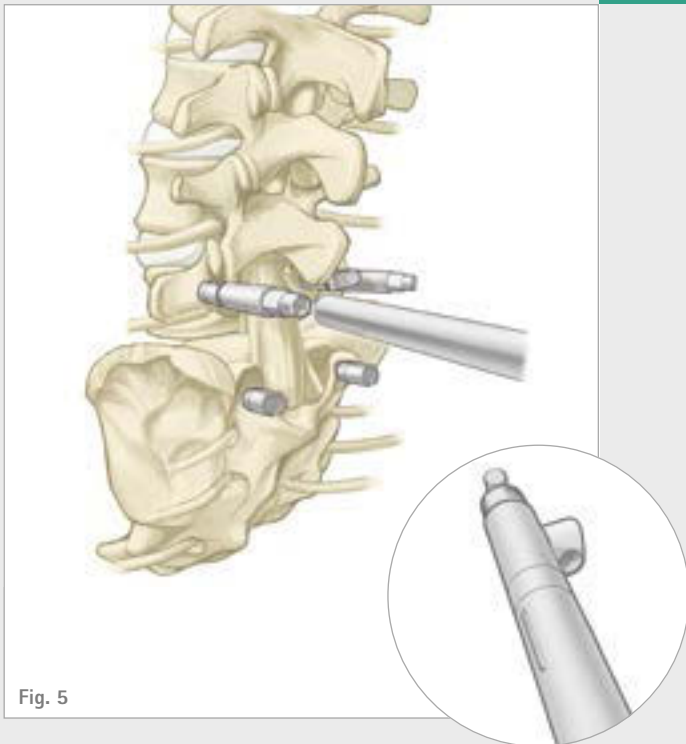
### D.4. SRI ATTACHMENT

The instrument has two components: a right and a left one. Each component has two pedicle screw attachments: one attaches to the cephalad screw that will be repositioned, and the other to the caudal vertebral screw.

On the caudal components, make sure the distraction nuts are at a point of minimal distraction (toward the most caudal position of the S<sup>4</sup> SRI). Also, on the caudal components, make sure the reduction bolts are backed out to the point of minimal reduction.

# AESCULAP® S4®

## D | SURGICAL TECHNIQUE – SPONDYLOLISTHESIS



- Attach the cephalad component first. Insert the mounting post into the body of the screw and finger tighten.
- Ensure that the articulated head is positioned inferiorly and insert the distraction spindle (caudal component) into the articulated head of the cephalad component.
- At the same time, insert the mounting post into the body of the pedicle screw of the caudal vertebra and finger tighten.



- Once the instrument is attached and positioned properly tighten the caudal and cephalad components using the T-Handles. Hold the smaller inner T-Handle (FW232R) and use it to apply counter torque while tightening with the larger outer T-Handle (FW231R).
- The mounting post on polyaxial screws should be tightened enough to lock the polyaxial screw body. The mounting post on monoaxial screws need to be tightened enough to cover the break-off tabs and part of the screw body.

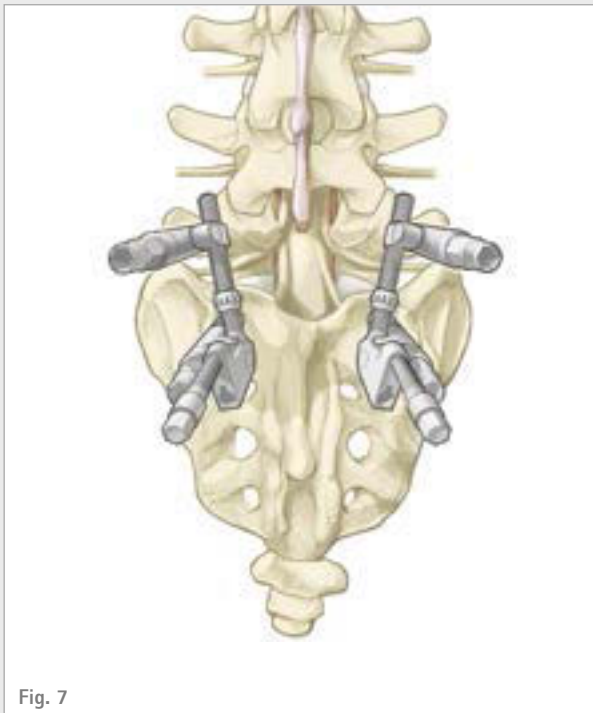


Fig. 7

- The caudal components are labeled "R" for right and "L" for left. Following this labeling leads to lateral placement of the reduction instruments. Alternatively, the devices can be placed medially to the pedicle screws by putting the right on the left and the left on the right.

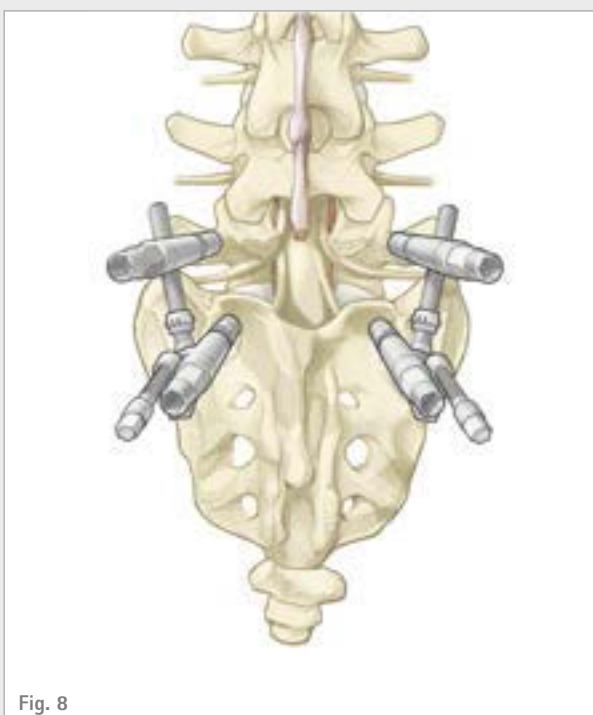
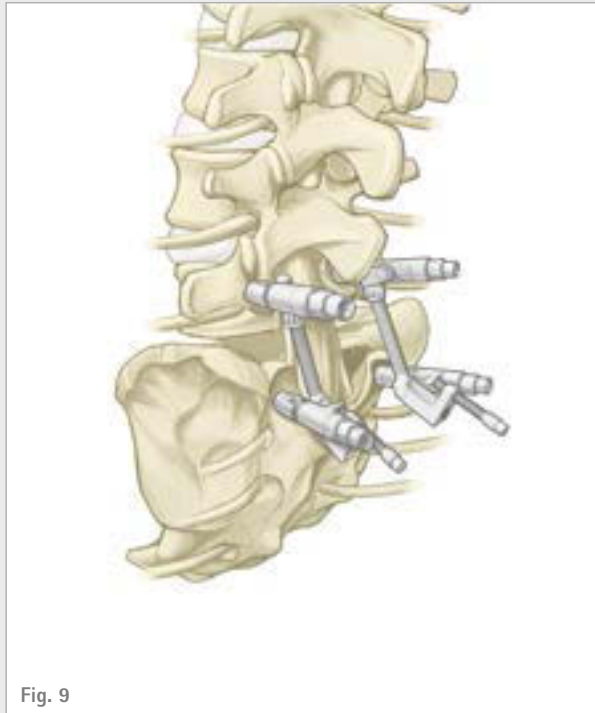


Fig. 8

- Medial placement of the reduction instrument is the preferred method because it usually allows for easier reduction and less soft tissue impingement from the device itself. Lateral placement sometimes allows an easier interbody placement, but can make the reduction maneuver more difficult.
- In order to avoid breaking of the tab during reduction, make sure to fully tighten the SRI device to the pedicle screw prior to performing the reduction.

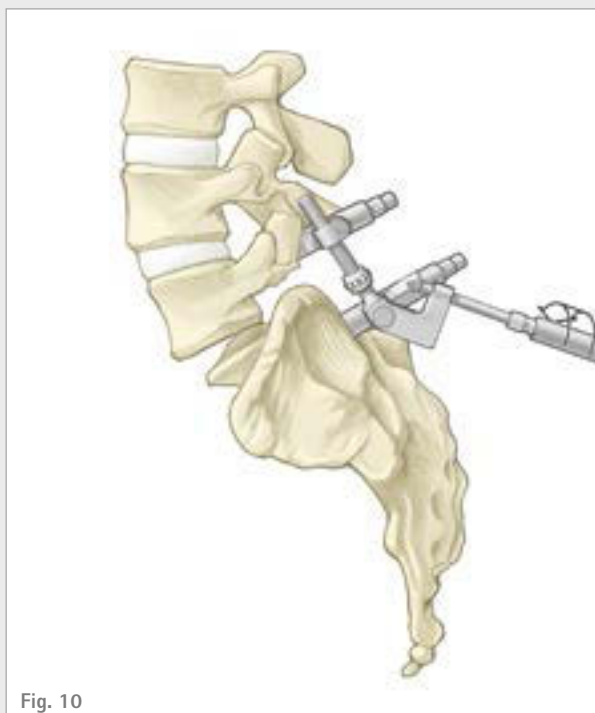
# AESCULAP® S4®

## D | SURGICAL TECHNIQUE – SPONDYLOLISTHESIS



### D.5. DISTRACTION MANEUVER

- Using the S4 Distraction Forceps (FW181R) slowly spread the S4 SRI device to achieve the desired distraction and then lock the distraction in place with the distraction nut on the threaded distraction spindle.



### D.6. SPONDYLOLISTHESIS REDUCTION

- Using the large outer T-Handle (FW231R) on the reduction bolt, turn clockwise to carefully reduce the spondylolisthesis under C-arm control.
- Best results are usually achieved by one or two turns of the reduction bolt on alternating sides.
- Monitor the nerve root tension during reduction – typically, a decrease in the nerve root tension will be observed.



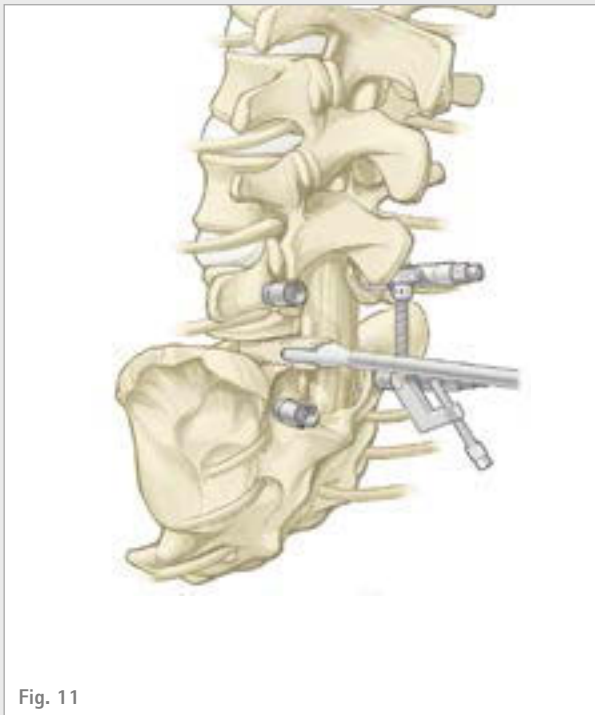


Fig. 11

#### D.7. INTERBODY PLACEMENT

- Using the T-Handles and applying counter torque, remove the S<sup>4</sup> SRI from one side (if required to provide room to work) and perform a routine TLIF or PLIF with the Aesculap PROSPACE or TSPACE interbody fusion implant systems.
- If the S<sup>4</sup> SRI was not removed from one side during the previous step, remove one side.

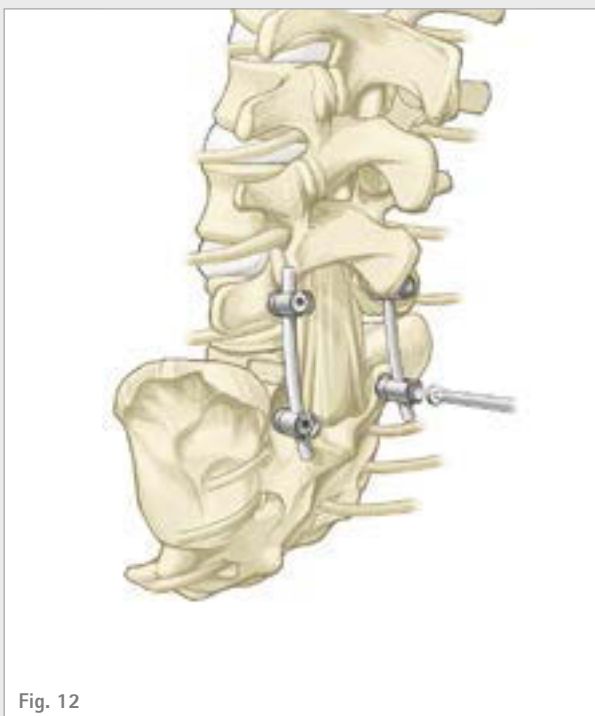


Fig. 12

#### D.8. ROD PLACEMENT

- The flexible Rod Trial (FW185R) can be used as a guide for rod bending and measuring correct rod length.
- Both pre-bent and straight rods are available.
- If needed, the rod length can be adapted using the Rod Cutter (FW206).
- All rods may be contoured using the French Rod Bender (FW024R).
- To contour the rod, place the rod on the French Rod Bender and squeeze the handle until the desired curvature is achieved. If needed, the Rod Holding Forceps (FW012R) can be used for rotational stability.
- Use the Rod Holding Forceps to assist with rod placement or rod manipulation.

# AESCULAP® S4®

## D | SURGICAL TECHNIQUE – SPONDYLOLISTHESIS



Fig. 13

### D.9. SET SCREW PLACEMENT

- Insert the Set Screw Starter (FW177R) firmly into the set screw and remove the set screw from the caddy. Ensure the set screw is fully engaged to the Set Screw Starter.
- The outer ring of the Set Screw Starter fits onto the flanks of the screw body to ensure the set screw trajectory is correct during initial threading.
- Finger tighten the set screw into the screw body until it contacts the rod.
- Use the Set Screw Revision Screw Driver (FW193R) to remove a tightened set screw.

#### Note:

The Set Screw Starter is not designed for final tightening of the construct. It is designed to tighten the Set Screw to a depth that still allows compression and distraction maneuvers to be performed.

### D.10. FINAL TIGHTENING

Final tightening of each set screw is completed using the Torque Wrench (FW170R) along with the Counter Torque Handle (FW178R).

- Insert the Torque Wrench through the tube of the Counter Torque so the tip is exposed.
- Fully seat the tip of the Torque Wrench into the socket of the set screw. Engage the Counter Torque tip with the rod.
- Turn the Torque Wrench in a clockwise direction while firmly holding the Counter Torque. Ensure the arrows on the Torque Wrench line up with each other.

#### Caution:

Do not use the Torque Wrench without the Counter Torque Handle. Over tightening the set screw more than the specified setting of 10 Nm (90 in/lbs) could lead to implant failure. Damaged set screws must be replaced.



Fig. 14

#### D.11. TAB REMOVAL

- After verifying that all screws are placed and tightened, remove the tabs with the Tab Breaker (FW179R).

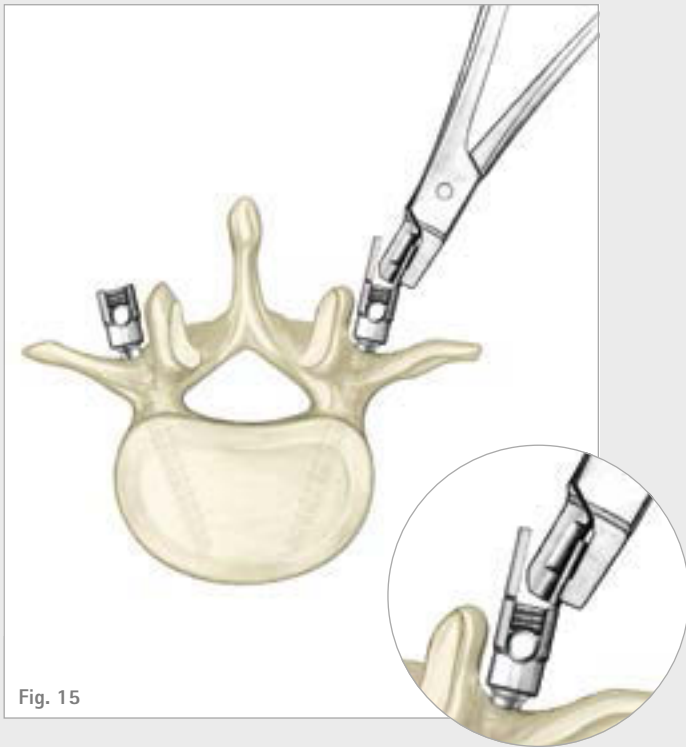


Fig. 15

# AESCALAP<sup>®</sup> S4<sup>®</sup>

E | SURGICAL TECHNIQUE – CONNECTOR APPLICATION

## TRUSTED EXPERIENCE CONNECTOR APPLICATION

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### E SURGICAL TECHNIQUE

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| E.2. | Rod Connector Application   | 47 |
- 





# AESFULAP<sup>®</sup> S4<sup>®</sup>

## E | SURGICAL TECHNIQUE – CONNECTOR APPLICATION



Fig. 1

### E.1. CROSS CONNECTOR APPLICATION

In the event that additional rotational stability of the construct is required, a cross connector may be used.

- Determine the appropriate size using the Cross Connector Sizing Template (FW202R).
- Verify there are no obstructions, then insert the cross connector.
- If the cross connector fits properly and is fully seated onto both rods, final tightening can be accomplished by applying 4 Nm (36 in/lbs) of torque to the locking screw using the Cross Connector Torque Wrench (FW207R) and the Cross Connector Counter Torque (FW204R).

If necessary, the optional "bar" style adjustable cross connector can be used.

- The bar style adjustable cross connectors can be contoured using the Cross Connector Bender (FW203R).
- Place the cross connector face-up in the bender and apply the necessary force required to achieve appropriate angle. The maximum angle allowed by the Cross Connector Bender is 20°.



Fig. 2

## E.2. ROD CONNECTOR APPLICATION

A Rod Connector may be used to extend an existing construct in the event of a revision surgery or for a new multilevel construct or to connect to an offset screw.

### a) Axial Rod Connector Application

- To place the axial rod connector, first determine required length (short or long).
- Use the Rod Connector Inserter (FW493R) to grab the connector and fully seat the rods inside the connector and confirm adequate rod placement using the provided window on the connector.
- Final tighten by applying 4 Nm (36 in/lbs) of torque using the Torque Wrench (FW207R) and the Rod Connector Counter Torque Device (FW495R).

### b) Domino Rod Connector Application

- To place the domino rod connector, first determine required length (7 mm or 11 mm) and desired connector type (open / closed or closed).
- For open / closed style, use the Rod Connector Inserter (FW493R) to grab the connector and slide a rod into the closed hole and then connect to the other rod using the open hole.
- For closed style, use the Rod Connector Inserter to grab the connector and slide both rods into the closed holes prior to placing the rods into the pedicle screw bodies.
- Final tighten by applying 4 Nm (36 in/lbs) of torque using the Torque Wrench (FW207R) and Rod Connector Counter Torque Device (FW495R).



Fig. 3

# AESCULAP® S4®

## E | SURGICAL TECHNIQUE – CONNECTOR APPLICATION

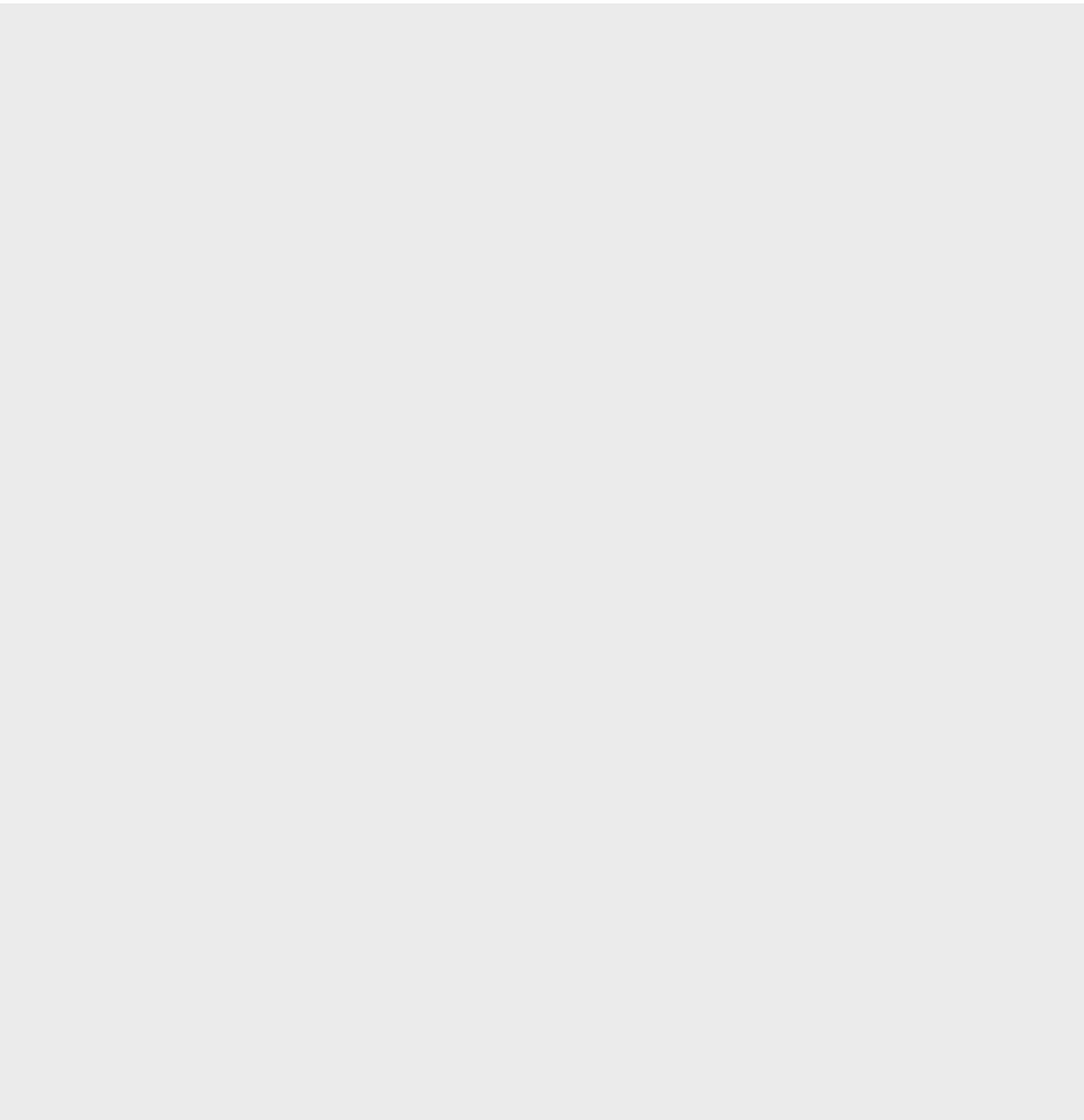


Fig. 4

### c) Lateral Offset Rod Connector Application

- Determine offset distance between the desired screw and the rod from the main construct and choose desired lateral offset connector type (open/closed or closed).
- Use the Rod Connector Inserter (FW493R) to grab the lateral offset connector and attach it to the rod from the main construct.
- Final tighten by applying 4 Nm (36 in/lbs) of torque using the Torque Wrench (FW207R) and Rod Connector Counter Torque Device (FW495R).





# AESCALAP<sup>®</sup> S4<sup>®</sup>

F | SURGICAL TECHNIQUE – HOOK APPLICATION

## TRUSTED EXPERIENCE HOOK APPLICATION

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### F.1. PEDICLE HOOK APPLICATION

Pedicle hooks are available in right and left configuration along with two different blade opening sizes.

#### a) Preparation of Pedicle

- The tip of the inferior part of the articular process of the vertebra is resected using an Osteotome.
- The bed for the pedicle hook is prepared with the Pedicle Preparator (FW151R).
- The Pedicle Preparator crosses the capsule of the facet joint and its fork-shaped tip is set around the inferior part of the pedicle. Ensure that the blade of the Pedicle Preparator does fit to the pedicle, in order to guarantee proper hook placement.

#### b) Pedicle Hook Insertion

- The hook is attached to the facet joint using the Hook Holder (FW211R) supported by the Hook Pusher (FW212R).
- The hook can be impacted with the Hook Pusher.



Fig. 2

## F.2. LAMINA HOOK APPLICATION

Lamina hooks are available in right and left configurations and also an offset type.

### a) Preparation of Lamina

- The spinal lumbar canal has to be opened by incision and resection of the ligamentum flavum. Check the spinal canal with a Dura Palpator before placing the hook.
- The lamina has to be horizontalized to create a bed for the blade of the lamina hook. If lamina hooks are placed on each side, the resection has to be lateralized to avoid contact between the right and the left hook.
- The Lamina Preparator (FW152R) is carefully inserted in the canal to prepare the bed for the lamina hook blade.

### b) Lamina Hook Insertion

- The hook is maintained in a horizontal position using the Hook Holder (FW211R) and carefully rotated around the edge of the lamina into a vertical position supported by the Hook Pusher (FW212R).



Fig. 3

### F.3. THORACIC HOOK APPLICATION

The smooth, slim design of the thoracic hook is adapted to the shape of the thoracic lamina.

#### a) Preparation of Lamina

- The spinal lumbar canal has to be opened by incision and resection of the ligamentum flavum. Check the spinal canal with a Dura Palpator before placing the hook.
- The lamina has to be horizontalized to create a bed for the blade of the lamina hook. If lamina hooks are placed on each side, the resection has to be lateralized to avoid contact between the right and the left hook.
- The Lamina Preparator (FW152R) is carefully inserted in the canal to prepare the bed for the lamina hook blade.

#### b) Thoracic Hook Insertion

- The hook is maintained in a horizontal position using the Hook Holder (FW211R) and carefully rotated around the edge of the lamina into a vertical position supported by the Hook Pusher (FW212R).



# AESCULAP® S4®

G | IMPLANTS AND INSTRUMENTS OVERVIEW

## TRUSTED EXPERIENCE

### IMPLANTS AND INSTRUMENTS

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# AESFULAP® S4®






G | BASIC IMPLANTS AND INSTRUMENTS

## FW259P – S4® Implant Tray for Open Approach

PINS FOR POLYAXIAL SCREWS (FOR IMPLANT TRAY)			
	Article No.	Description	Quantity
	TE854P	Pin for Polyaxial Screw, Ø 4.5 mm, Blue	1 Pack contains 10 pieces
	TE855P	Pin for Polyaxial Screw, Ø 5 mm, Yellow	
	TE856P	Pin for Polyaxial Screw, Ø 6 mm, Grey	
	TE857P	Pin for Polyaxial Screw, Ø 7 mm, Light Blue	
	TE858P	Pin for Polyaxial Screw, Ø 8 mm, Purple	
PINS FOR MONOAXIAL SCREWS (FOR IMPLANT TRAY)			
	Article No.	Description	Quantity
	TE864P	Pin for Monoaxial Screw, Ø 4.5 mm, Blue	1 Pack contains 10 pieces
	TE865P	Pin for Monoaxial Screw, Ø 5 mm, Yellow	
	TE866P	Pin for Monoaxial Screw, Ø 6 mm, Grey	
	TE867P	Pin for Monoaxial Screw, Ø 7 mm, Light Blue	
	TE868P	Pin for Monoaxial Screw, Ø 8 mm, Purple	
SET SCREW			
	Article No.	Description	
	SW790T	S4 Set Screw for Monoaxial/Polyaxial Screws	
	SW375T	S4 Set Screw for Monoaxial/Polyaxial Screws cannulated	








FW259P  
Set





MONOAXIAL PEDICLE SCREWS	Article No.	Size	Description
	SW701T	4.5 x 25 mm	S4 Monoaxial Screw, Ø 4.5 mm, non-cannulated
	SW702T	4.5 x 30 mm	
	SW703T	4.5 x 35 mm	
	SW704T	4.5 x 40 mm	
	SW706T	4.5 x 45 mm	
	SW707T	4.5 x 50 mm	
		SW711T	
SW712T		5.0 x 30 mm	
SW713T		5.0 x 35 mm	
SW714T		5.0 x 40 mm	
SW716T		5.0 x 45 mm	
SW717T		5.0 x 50 mm	
	SW721T	6.0 x 25 mm	S4 Monoaxial Screw, Ø 6.0 mm, non-cannulated
	SW722T	6.0 x 30 mm	
	SW723T	6.0 x 35 mm	
	SW724T	6.0 x 40 mm	
	SW726T	6.0 x 45 mm	
	SW727T	6.0 x 50 mm	
	SW728T	6.0 x 55 mm	
	SW729T	6.0 x 60 mm	
		SW731T	
SW732T		7.0 x 30 mm	
SW733T		7.0 x 35 mm	
SW734T		7.0 x 40 mm	
SW736T		7.0 x 45 mm	
SW737T		7.0 x 50 mm	
SW738T		7.0 x 55 mm	
SW739T		7.0 x 60 mm	
	SW742T	8.0 x 30 mm	S4 Monoaxial Screw, Ø 8.0 mm, non-cannulated
	SW743T	8.0 x 35 mm	
	SW744T	8.0 x 40 mm	
	SW746T	8.0 x 45 mm	
	SW747T	8.0 x 50 mm	
	SW748T	8.0 x 55 mm	
	SW749T	8.0 x 60 mm	

# AESCALAP<sup>®</sup> S4<sup>®</sup>

G | BASIC IMPLANTS AND INSTRUMENTS

## FW259P – S4<sup>®</sup> Implant Tray for Open Approach











POLYAXIAL PEDICLE SCREWS	Article No.	Size	Description
	SW751T	4.5 x 25 mm	S4 Polyaxial Screw, Ø 4.5 mm, non-cannulated
	SW752T	4.5 x 30 mm	
	SW753T	4.5 x 35 mm	
	SW754T	4.5 x 40 mm	
	SW756T	4.5 x 45 mm	
	SW757T	4.5 x 50 mm	
	SW761T	5.0 x 25 mm	S4 Polyaxial Screw, Ø 5.0 mm, non-cannulated
	SW762T	5.0 x 30 mm	
	SW763T	5.0 x 35 mm	
	SW764T	5.0 x 40 mm	
	SW766T	5.0 x 45 mm	
	SW767T	5.0 x 50 mm	
	SW771T	6.0 x 25 mm	S4 Polyaxial Screw, Ø 6.0 mm, non-cannulated
	SW772T	6.0 x 30 mm	
	SW773T	6.0 x 35 mm	
	SW774T	6.0 x 40 mm	
	SW776T	6.0 x 45 mm	
	SW777T	6.0 x 50 mm	
	SW778T	6.0 x 55 mm	
	SW779T	6.0 x 60 mm	
	SW781T	7.0 x 25 mm	S4 Polyaxial Screw, Ø 7.0 mm, non-cannulated
	SW782T	7.0 x 30 mm	
	SW783T	7.0 x 35 mm	
	SW784T	7.0 x 40 mm	
	SW786T	7.0 x 45 mm	
	SW787T	7.0 x 50 mm	
	SW788T	7.0 x 55 mm	
	SW789T	7.0 x 60 mm	
	SW792T	8.0 x 30 mm	S4 Polyaxial Screw, Ø 8.0 mm, non-cannulated
	SW793T	8.0 x 35 mm	
	SW794T	8.0 x 40 mm	
	SW796T	8.0 x 45 mm	
	SW797T	8.0 x 50 mm	
	SW798T	8.0 x 55 mm	
SW799T	8.0 x 60 mm		

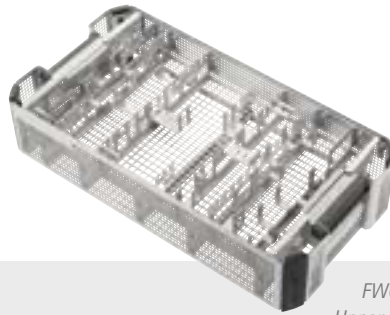
POLYAXIAL PEDICLE SCREWS	Article No.	Size	Description
	SW802T	9.0 x 30 mm	S <sup>4</sup> Polyaxial Screw, Ø 9.0 mm, non-cannulated
	SW803T	9.0 x 35 mm	
	SW804T	9.0 x 40 mm	
	SW806T	9.0 x 45 mm	
	SW807T	9.0 x 50 mm	
	SW808T	9.0 x 55 mm	
	SW809T	9.0 x 60 mm	
	SW812T	10.0 x 30 mm	S <sup>4</sup> Polyaxial Screw, Ø 10.0 mm, non-cannulated
	SW813T	10.0 x 35 mm	
	SW814T	10.0 x 40 mm	
	SW816T	10.0 x 45 mm	
	SW817T	10.0 x 50 mm	
RODS	Article No.	Size	Description
	SW653T	5.5 x 30 mm	Rod, pre-bent, Ø 5.5 mm
	SW654T	5.5 x 35 mm	
	SW655T	5.5 x 40 mm	
	SW656T	5.5 x 45 mm	
	SW657T	5.5 x 50 mm	
	SW658T	5.5 x 55 mm	
	SW659T	5.5 x 60 mm	
	SW661T	5.5 x 70 mm	
	SW662T	5.5 x 80 mm	
	SW663T	5.5 x 90 mm	
	SW684T	5.5 x 100 mm	Rod, straight, Ø 5.5 mm
	SW674T	5.5 x 35 mm	
	SW675T	5.5 x 40 mm	
	SW676T	5.5 x 45 mm	
	SW677T	5.5 x 50 mm	
	SW678T	5.5 x 55 mm	
	SW679T	5.5 x 60 mm	
	SW681T	5.5 x 70 mm	
	SW682T	5.5 x 80 mm	
	SW664T	5.5 x 100 mm	
SW666T	5.5 x 120 mm		
SW667T	5.5 x 150 mm		
SW668T	5.5 x 180 mm		
SW669T	5.5 x 200 mm		
SW670T	5.5 x 300 mm		
SW671T	5.5 x 400 mm		
SW672T	5.5 x 500 mm		

# AESCULAP® S4®

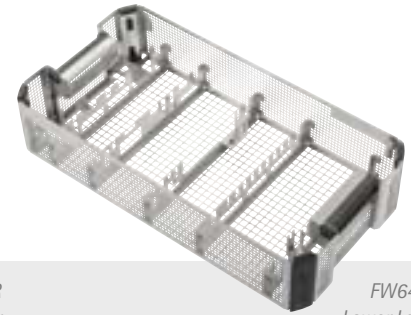
## G | BASIC IMPLANTS AND INSTRUMENTS

### FW610 – S4® Basic Instruments









UPPER LAYER	Article No.	Description	Quantity
	FW692R	Percutaneous Cleaning Device	1
	FW170R	Torque Wrench	1
	FW179R	Tab Breaker	1
	FW188R	Bone Probe, straight	1
	FW165R	Ratchet Handle, straight	2
	FW258M	K-Wire Aiming Device	2
	FW271M	Trocar	1
	FW352R	K-Wire Protection Tube	1
	FW351R	Screw Length Measuring Device	1
	FW167R	Ratchet Handle, T-Shaped	1*



FW649R  
Upper Layer



FW649R  
Lower Layer






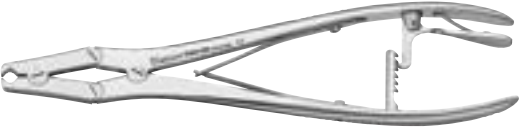





LOWER LAYER	Article No.	Description	Quantity
	FW194R	Screw Tap, Ø 4.5 mm	1
	FW195R	Screw Tap, Ø 5.0 mm	1
	FW196R	Screw Tap, Ø 6.0 mm	1
	FW197R	Screw Tap, Ø 7.0 mm	1
	FW198R	Screw Tap, Ø 8.0 mm	1
	FW356R	Screw Tap, Ø 9.0 mm	1*
	FW357R	Screw Tap, Ø 10.0 mm	1*
	FW240R	Rod Insertion Instrument	2
	FW242R	Rod Length Measuring Instrument	1
	FW024R	French Rod Bender	1
	FW174R	Screw Driver with 3.5 mm hex tip	1
	FW193R	Set Screw Revision Screw Driver 4 mm hex tip	1
	FW247S	K-Wire, blunt	8
	FW274M	Handle for removal of FW258R	1
TRAY AND OTHERS	Article No.	Description	Quantity
	FW649R	Tray Basic Instruments	1
	JA455R	Lid for Aesculap OrthoTray DIN w/o handle	1
	TF139	Graphic Template f/FW649R	1*
	TF129	Packing Stencil f/FW649R	1

\* This article is optional.

# AESCULAP® S4®

## G | BASIC IMPLANTS AND INSTRUMENTS

### FW610 – S4® Open Approach Instruments I

UPPER LAYER	Article No.	Description	Quantity
	FW146R	Pedicle Sounder, straight	1
	FW147R	Pedicle Sounder, curved	1
	FW191R	Pedicle Marker, single band	4
	FW192R	Pedicle Marker, dual band	4
	FW208R	Rod Persuader	1*
LOWER LAYER	Article No.	Description	Quantity
	FW012R	Rod Holding Forceps	1
	FW154R	Marnay Lever	2
	FW270R	Screw Driver for Polyaxial Screws	2
	FW262R	Screw Driver for Monoaxial Screws	2
	FW177R	Set Screw Starter	2
	FW178R	Counter Torque L-Handle	1











FW377R  
Upper Layer



FW377R  
Lower Layer








LOWER LAYER	Article No.	Description	Quantity
	FW180R	Screw Body Manipulator	1
	FW190R	Bone Awl	1
	FW188R	Bone Probe, straight	1*
	FW189R	Bone Probe, curved	1
	FW248R	Bone Probe, Lenke, straight	1*
	FW249R	Bone Probe, Lenke, curved	1*
TRAY AND OTHERS	Article No.	Description	Quantity
	FW377R	Tray Instruments f/Open Approach I	1
	JA455R	Lid for Aesculap OrthoTray DIN w/o handle	1
	TE993	Graphic Template f/FW377R	1*
	TF127	Packing Stencil f/FW377R	1

\* This article is optional.

# AESCULAP® S4®

## G | BASIC IMPLANTS AND INSTRUMENTS

### FW610 – S4® Open Approach Instruments II

INSTRUMENTS	Article No.	Description	Quantity
	FW513R	Rod Pusher	1
	FW185R	Rod Trial, Single-Use	2
	FW183R	De-Rotation Sleeves	6
	FW210R	Compression Forceps	1
	FW184R	Compression Forceps	1*
	FW181R	Distraction Forceps	1*
	FW023R	Distraction Forceps, small	2



FW378R  
Tray


TRAY AND OTHERS	Article No.	Description	Quantity
	FW378R	Tray Instruments f/Open Approach II	1
	JA455R	Lid for Aesculap OrthoTray DIN w/o handle	1
	TE994	Graphic Template f/FW378R	1*
	TF128	Packing Stencil f/FW378R	1



\* This article is optional.

# AESCALAP® S4®

G | CEMENT APPLICATION – IMPLANTS AND INSTRUMENTS

## Additional to FW259P – Implants






MONOAXIAL PEDICLE SCREWS (STERILE PACKED)	Article No.	Size	Description
	SW510TS	5.5 x 35 mm	S4 Monoaxial Pedicle Screw, Ø 5.5 mm, cannulated
	SW515TS	5.5 x 40 mm	
	SW518TS	5.5 x 45 mm	
	SW519TS	5.5 x 50 mm	S4 Monoaxial Pedicle Screw, Ø 6.5 mm, cannulated
	SW531TS	6.5 x 35 mm	
	SW532TS	6.5 x 40 mm	
	SW533TS	6.5 x 45 mm	
	SW534TS	6.5 x 50 mm	
	SW536TS	6.5 x 55 mm	
	SW537TS	6.5 x 60 mm	S4 Monoaxial Pedicle Screw, Ø 7.5 mm, cannulated
	SW538TS	6.5 x 70 mm	
	SW539TS	6.5 x 80 mm	
	SW541TS	7.5 x 35 mm	S4 Monoaxial Pedicle Screw, Ø 7.5 mm, cannulated
	SW542TS	7.5 x 40 mm	
	SW543TS	7.5 x 45 mm	
	SW544TS	7.5 x 50 mm	
	SW546TS	7.5 x 55 mm	
	SW547TS	7.5 x 60 mm	
	SW548TS	7.5 x 70 mm	
	SW549TS	7.5 x 80 mm	

POLYAXIAL PEDICLE SCREWS (STERILE PACKED)	Article No.	Size	Description
	SW621TS	5.5 x 35 mm	S <sup>4</sup> Polyaxial Pedicle Screw, Ø 5.5 mm, cannulated
	SW622TS	5.5 x 40 mm	
	SW623TS	5.5 x 45 mm	
	SW624TS	5.5 x 50 mm	
	SW631TS	6.5 x 35 mm	S <sup>4</sup> Polyaxial Pedicle Screw, Ø 6.5 mm, cannulated
	SW632TS	6.5 x 40 mm	
	SW633TS	6.5 x 45 mm	
	SW634TS	6.5 x 50 mm	
	SW636TS	6.5 x 55 mm	
	SW637TS	6.5 x 60 mm	
	SW638TS	6.5 x 70 mm	
	SW639TS	6.5 x 80 mm	S <sup>4</sup> Polyaxial Pedicle Screw, Ø 7.5 mm, cannulated
	SW641TS	7.5 x 35 mm	
	SW642TS	7.5 x 40 mm	
	SW643TS	7.5 x 45 mm	
	SW644TS	7.5 x 50 mm	
	SW646TS	7.5 x 55 mm	
	SW647TS	7.5 x 60 mm	
	SW648TS	7.5 x 70 mm	
SW649TS	7.5 x 80 mm		
<p><b>Additional to FW649R, FW377R and FW378R – Instruments</b></p>			
INSTRUMENT (STERILE PACKED)	Article No.	Description	Quantity
	SR146SU	S <sup>4</sup> Injection Cannula, short, 100 mm	1

# AESCALAP® S4®

## G | CONNECTOR APPLICATION – IMPLANTS AND INSTRUMENTS


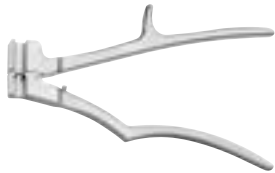





### Additional to FW259P – Implants

CROSS CONNECTORS	Article No.	Size	Description		
	SW690T	21 mm	S <sup>4</sup> Cross Connector, straight		
	SW691T	25 mm			
	SW692T	29 mm			
	SW693T	32 mm			
	SW694T	35 mm			
	SW695T	38 mm			
	SW696T	41 mm			
	SW490T	28 mm			
	SW491T	30 mm			
	SW492T	32 mm			
	SW493T	34 mm			
		SW488T		35-36 mm	S <sup>4</sup> Cross Connector, adjustable
		SW489T		36-38 mm	
SW494T		38-42 mm			
SW495T		42-50 mm			
SW496T		50-60 mm			
SW497T		60-77 mm			
SW498T		77-107 mm			
SW697T		43-49 mm			
SW698T		49-60 mm			
SW699T		60-75 mm			
ROD-TO-ROD CONNECTORS <sup>1</sup>		Article No.	Size	Description	
	SW821T		S <sup>4</sup> Parallel Rod Connector		
	SW842T/TS	7 mm	S <sup>4</sup> Domino Connector, closed		
SW844T/TS	11 mm				
SW841T/TS	7 mm				
SW843T/TS	11 mm				
	SW838T/TS	19 mm	S <sup>4</sup> Axial Connector, short		
	SW839T/TS	34.2 mm	S <sup>4</sup> Axial Connector, long		
	SW847T/TS	20 mm	S <sup>4</sup> Lateral Offset Connector, closed		
	SW849T/TS	35 mm			
	SW872T/TS	50 mm			
	SW846T/TS	20 mm	S <sup>4</sup> Lateral Offset Connector, open		
	SW848T/TS	35 mm			
	SW871T/TS	50 mm			

## FW610 – S4® Open Approach Extension



FW489R  
Tray


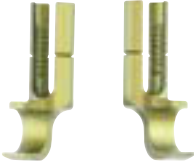


S4 EXTENSION INSTRUMENTS	Article No.	Description	Quantity
	FW202R	Cross Connector Sizing Template	1
	FW203R	Cross Connector Bender	1
	FW204R	Counter-Torque for Cross Connectors	1
	FW207R	Cross Connector Torque Wrench (4 Nm)	1
	FW491R	Rod-To-Rod Connector Revis. Screw Driver	1
	FW493R	Rod-To-Rod Connector Inserter	1
	FW495R	Rod-To-Rod Connector Counter Torque	1
	FW489R	Tray Instruments f/Extensions	1
	JA455R	Lid for Aesculap OrthoTray DIN w/o handle	1
	TF144	Graphic Template f/FW489R	1*
	TF134	Packing Stencil f/FW489R	1

\*This article is optional.

# AESCALAP® S4®







## G | HOOK APPLICATION – IMPLANTS AND INSTRUMENTS

### Additional to FW259P – Implants

HOOKS	Article No.	Size	Description
	SW831T	6 mm	S4 Pedicle Hook
	SW832T	10 mm	S4 Pedicle Hook
	SW827T	6 mm	S4 Lamina Hook, right
	SW829T	10 mm	S4 Lamina Hook, right
	SW826T	6 mm	S4 Lamina Hook, left
	SW828T	10 mm	S4 Lamina Hook, left
	SW833T	6 mm	S4 Thoracic Hook
	SW834T	8 mm	S4 Thoracic Hook
	SW837T	10 mm	S4 Offset Hook, right
	SW836T	10 mm	S4 Offset Hook, left
	FW160P		Tray for Hook System











INSTRUMENTS FOR HOOK APPLICATION	Article No.	Description
	FW211R	Hook Holder
	FW212R	Hook Pusher
	FW227R	In-situ-Bender, right
	FW226R	In-situ-Bender, left
	FW151R	Pedicule Preparator
	FW152R	Lamina Preparator

# AESCALAP® S4®


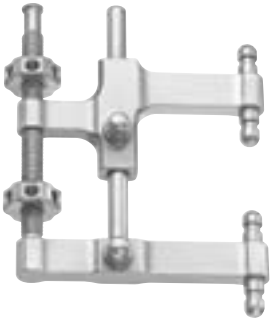







## G | SPONDYLOLISTHESIS REDUCTION – INSTRUMENTS

### Additional to FW610

S4 SRI INSTRUMENTS	Article No.	Description	Quantity
	FW225R	Reduction Instrument, left and right incl. 2 reduction levers	1
	FW231R	Outer T-Handle for S4 SRI locking sleeve	2
	FW232R	Inner T-Handle for S4 SRI screw attachment	2
	FG321R	Tightening Key	1*
	FG322R	Fast Tightening Key	1*
	FW246R	Tray for SRI instruments	1

## G | FRACTURE REDUCTION – INSTRUMENTS

### Additional to FW610



S4 OPEN FRI INSTRUMENTS			
UPPER LAYER	Article No.	Description	Quantity
	FW237R	Fixation Nut Wrench	2
	FW238R	Distractor	2
	FW239R	Distraction Arm	4
	FW241R	Distraction Spindle	2
LOWER LAYER	Article No.	Description	Quantity
	FW143P	Spacer	2
	FW228R	Screw Driver	2
	FW235R	Outer Sleeve	4
	FW236R	Counter Torque	1
	FW734R	Rep. Lever Threadpipe Percutaneous	4

\*This article is optional.

# AESFULAP® S4®

G | FRACTURE REDUCTION – INSTRUMENTS

## Additional to FW610

RODS**	Article No.	Size	Description
	SW554T	5.5 x 35 mm	Rod with tip and hexagonal connection, pre-bent, Ø 5.5 mm
	SW555T	5.5 x 40 mm	
	SW556T	5.5 x 45 mm	
	SW557T	5.5 x 50 mm	
	SW558T	5.5 x 55 mm	
	SW559T	5.5 x 60 mm	
	SW561T	5.5 x 70 mm	
	SW562T	5.5 x 80 mm	
	SW563T	5.5 x 90 mm	
	SW564T	5.5 x 100 mm	
	SW566T	5.5 x 110 mm	
	SW567T	5.5 x 120 mm	
		SW573T	
SW574T		5.5 x 40 mm	
SW576T		5.5 x 45 mm	
SW577T		5.5 x 50 mm	
SW578T		5.5 x 55 mm	
SW579T		5.5 x 60 mm	
SW581T		5.5 x 70 mm	
SW582T		5.5 x 80 mm	
SW583T		5.5 x 90 mm	
SW584T		5.5 x 100 mm	
SW585T		5.5 x 110 mm	
SW586T		5.5 x 120 mm	
SW587T		5.5 x 150 mm	
SW588T		5.5 x 180 mm	
SW589T		5.5 x 200 mm	
SW590T	5.5 x 300 mm	Rod with hexagonal connection, straight, Ø 5.5 mm	
SW591T	5.5 x 400 mm		
SW592T	5.5 x 500 mm		



FW473R  
Upper Layer



FW473R  
Lower Layer

TRAY AND OTHERS	Article No.	Description	Quantity
	FW473R	Tray FRI Instruments Open Approach	1
	JA455R	Lid for Aesculap OrthoTray DIN w/o handle	1
	TF143	Graphic Template f/FW473R	1*
	TF133	Packing Stencil f/FW473R	1

\* This article is optional.

\*\* Are not included in standard implant tray.

# AESCULAP® – a B. Braun brand

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