Aesculap® S4® Cervical System

Posterior Occipital Cervical Thoracic Stabilization System
Surgical Technique

Aesculap Spine

B BRAUN
SHARING EXPERTISE

Aesculap® S4® Cervical System

Meeting the Challenge – Posterior Cervical Spine Surgery

S4 C

The special needs of the cervical spine make posterior cervical stabilization a challenging procedure. High construct stability combined with minimal implant size make the S4 Cervical System the partner to rely on.

By combining the exceptionally small yet stable design of the screw construct with simple instrumentation, the S4 Cervical System is a remarkably innovative system for posterior cervical column stabilization.

The S4 Cervical System fulfills these aims with its four key features:

- **Small** size
- **Stable** construct
- **Simple** insertion
- **Safe** procedure

The S4 Cervical System efficiently transfers these features to its wide implant and instrument versatility to meet the special needs of the cervical and thoracic spine.

S4 mall

- Revolutionary undercut thread for miniature size of the screw head, especially important in small bony structures
- Wide screw angle and low profile for adaptation of the construct to patient anatomy
- Minimal access instruments for subcutaneous approach

S4 table

- Unique S4 closure mechanism with undercut thread stabilizes polyaxial construct
- Special shaped seat inside the screw body creates pressure vessel effect
- Provides high overall biomechanical stability

S4 imple

- Specialized instruments for easy screw and hook placement in various anatomical situations
- Color-coded implants and instruments for ease of use
- Guiding instruments for minimal access and soft tissue and nerve root protection

S4 afe

- Small implant volume, overall biomechanical strength, and easy access instruments help to achieve a fast and efficient surgical procedure and excellent patient outcome

Aesculap® S4® Cervical System

Content

S4 C

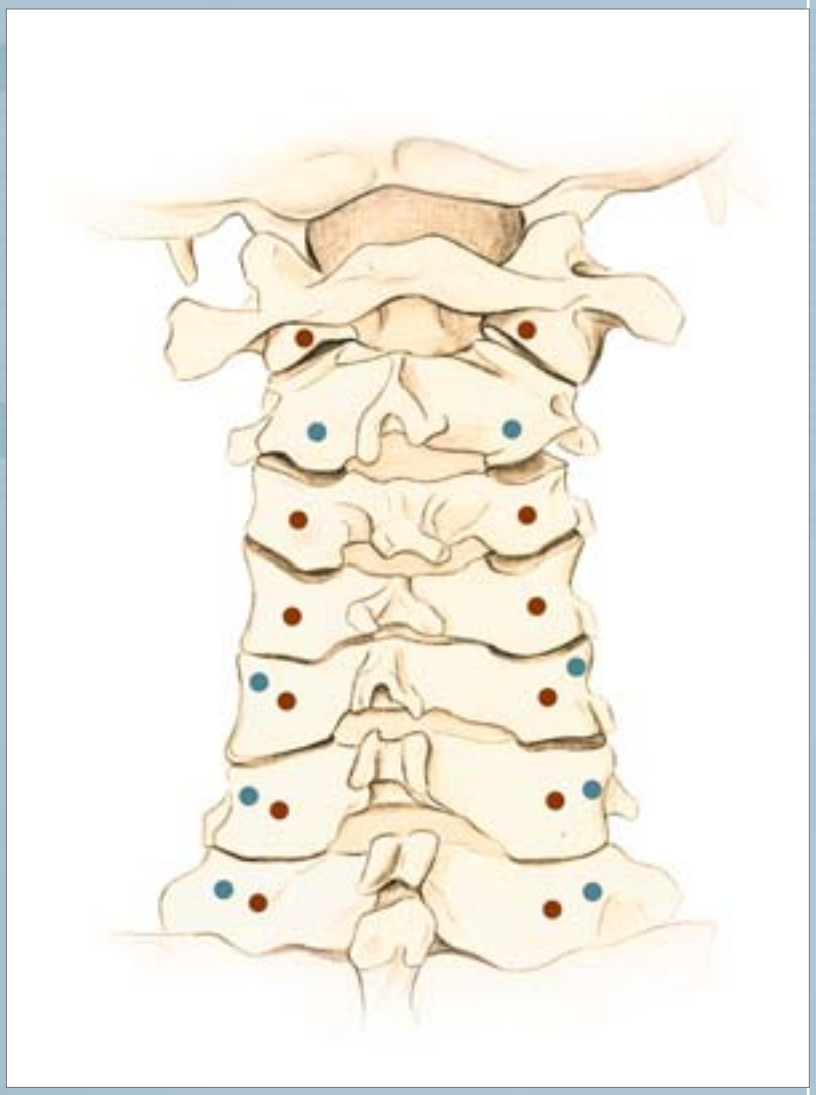
Aesculap® S4® Cervical System

1. Screw Entry Points and Trajectory

1

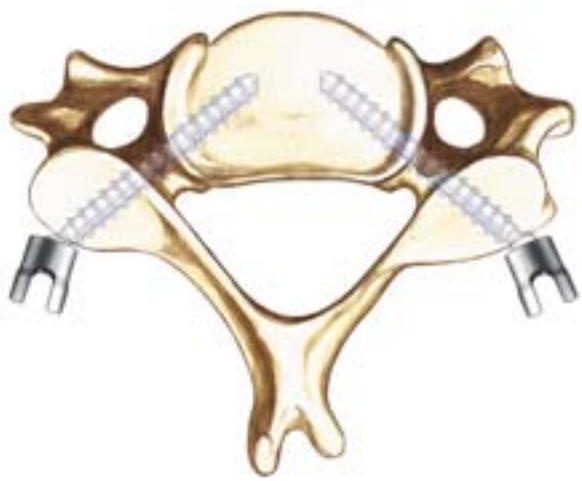
Depending on the anatomy, different entry points for the Polyaxial Screws might have to be chosen.

The entry point for Lateral Mass Screws (red) is more medial than the entry point for Pedicle Screws (blue).



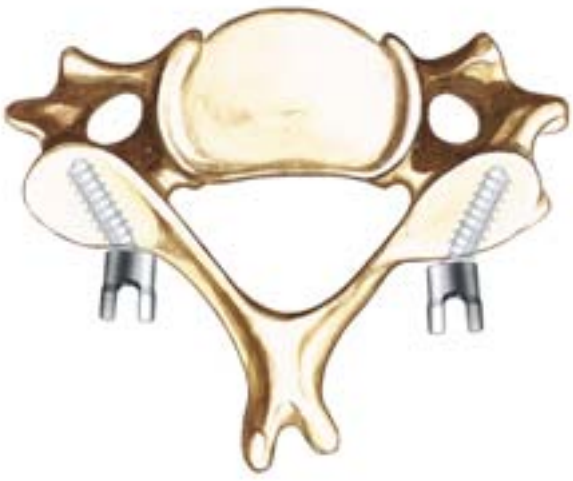
A – Pedicle Screw
Pedicle Screws go from lateral to medial through the pedicle.

A



B – Lateral Mass Screw
Lateral Mass Screws go from medial to upper lateral.

B



2. Pre-Operative and Exposure

2.1 Pre-Operative Planning

A detailed discussion of the factors involved in the strategy of cervical and upper thoracic posterior segmental instrumentation is beyond the intent of this document and is available in current published articles.
Consideration as to obtaining a CT for the pre-operative planning should be made.
CT helps to examine anatomical variation, confirm pedicle orientation, and provides an indication of suitable implant sizes for maximum safety and stability. The entire construct should be planned pre-operatively, identifying all the system components required for the final construct.

2.2 Patient Positioning

The patient is placed on the operating table in the prone position and secured with the desired sagittal alignment. The head and neck are also held securely in proper alignment. Whenever it is safe to do so, position the spine in physiological alignment.
Accurate positioning is especially important when fixing the occiput to the cervical and thoracic spine. Confirm proper alignment using an image intensifier or radiograph prior to draping. The neck and shoulders are prepared and draped in the usual manner.

2.3 Exposure

A cross table lateral x-ray is taken to confirm the appropriate position.
The initial incision is made in the midline of the back and taken down through the subcutaneous tissue, e.g. with electrocautery, to expose the area of the cervical and upper thoracic spine to be stabilized.
A wide exposure extending to the lateral aspect of the facet joints in the cervical spine and the transverse processes in the thoracic spine is achieved.
Extend the exposure to the external occipital protuberance (EOP) if the fusion will include the occiput.
Attention:
Care must be taken to avoid injury to the spinal cord, nerve roots and vertebral arteries as well as to the interspinous ligaments and the facet capsules at adjacent levels that will not be fused.
This procedure should be modified according to specific surgical requirements.

3.1 Preparation for Drilling

To prepare for the Polyaxial Screws, remove all soft tissue and prepare the site.
The Awl may be used to open the cortex. A raised edge is provided on the Awl to indicate when the ideal depth has been reached.

Alternatively, a 1 - 2 mm drill hole can be made using a small decortication burr.

Attention:
Never insert the Awl beyond the raised edge.

Set the desired depth to be drilled on the variable Drill Guide by rotating the inner sleeve.
The variable Drill Guide offers a range of up to 35 mm.
A fixed 14 mm Drill Guide is also available. The same Drill Guide can be used for the ø 3.5 mm and the ø 4.0 mm screws.

■ Awl – FW041R

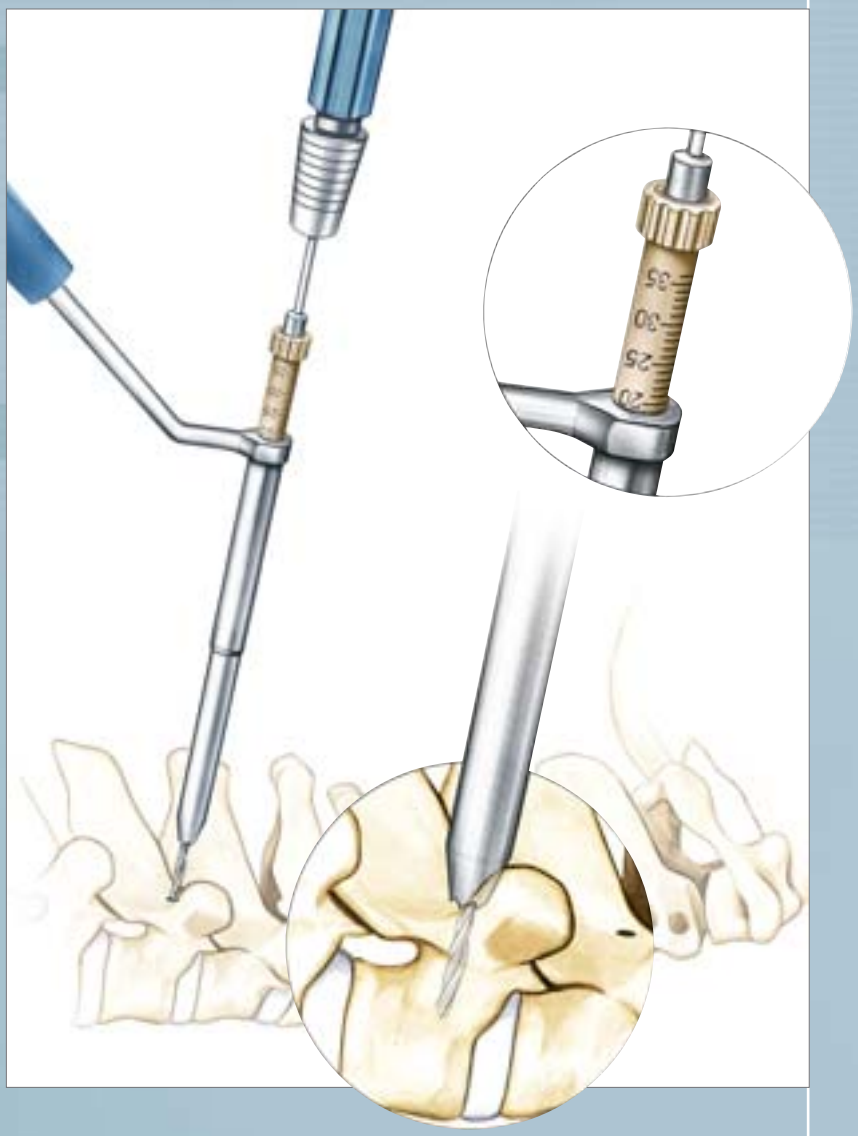
3. Polyaxial Screw Fixation

3.2 Drilling

The ø 2.4 mm drill is required for the ø 3.5 mm Polyaxial Screws.
The ø 2.9 mm drill is required for the ø 4.0 mm Polyaxial Screws.

The positive stop of the drills is color-coded to match the screw head color of the screw being used. The silver drill stop is used for the ø 3.5 mm screws and the purple stop is used for the ø 4.0 mm screws. Each drill is sterile packed for single use.

Insert the required drill into the guide up to the positive stop and verify the exposed length of the drill. Position the guide at the desired entry site and advance the drill until the stop is reached.



- Drill, ø 2.4 mm (ø 3.5 mm screws) – FW051SU
- Drill, ø 2.9 mm (ø 4.0 mm screws) – FW052SU
- Variable Drill Guide – FW053R
- Fixed Drill Guide, 14 mm – FW049R

3.3 Confirming Depth

Confirm the depth of the drilled hole and the integrity of the wall using the Sounder.
The Depth Gauge is marked in 2 mm increments and can be used to measure the desired depth of the hole by using the retractable sleeve.

The depth displayed reflects the actual screw thread length to be used as well as the depth of the hole, e.g. 24 mm depth gauge reading represents not only 24 mm drill depth but also 24 mm polyaxial screw selection.

- Depth Gauge – FW042R
- Sounder – FW044R

3. Polyaxial Screw Fixation

3.4 Tapping

The next step is to tap the pre-drilled hole. Although the screws are equipped with a self-tapping tip, to ensure optimal bone purchase of the screws, tapping is recommended for the first 3 mm in unicortical screw placement or through the second cortex in bi-cortical screw placement screws.
The tap does not need to be inserted through the drill sleeve. It is equipped with a self-retracting sleeve which prevents the risk of damaging surrounding tissue during tapping.

For the ø 3.5 mm Polyaxial Screw, the ø 3.5 mm tap is used.
For the ø 4.0 mm Polyaxial Screw, the ø 4.0 mm tap is used.

The taps, like the drills, are color-coded in accordance to the screw size. The appropriate tap is inserted manually into the pre-drilled hole. While maintaining the appropriate trajectory, tap the hole. In the same manner, the remaining holes are drilled and tapped.

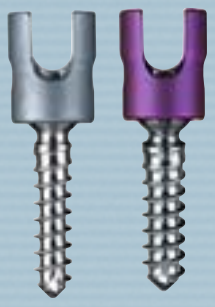
- Tap, ø 3.5 mm – FW046R
- Tap, ø 4.0 mm – FW047R
- Non-ratchet Handle – FW067R or Ratchet Handle – FW165R

3.5 Screw Selection

S[4] Cervical provides a variety of screw choices:

ø 3.5 mm and ø 4.0 mm Polyaxial Screws:

- Lengths beginning at 10 mm and extending to 30 mm in 2 mm increments
- +/-35° conical angulation
- Silver screw head for ø 3.5 mm
- Purple screw head for ø 4.0 mm

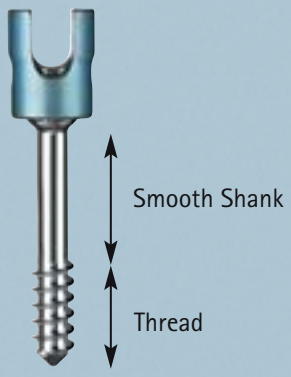


ø 4.0 mm Favored Angle Screws:

- Lengths beginning at 10 mm and extending to 56 mm in 2 mm increments
- +/-35° regular angulation
- With additional angulation in the cephalad and caudal directions for an angulation of 45° in either direction
- Gold screw head

ø 4.0 mm Smooth Shank Screws:

- Lengths beginning at 16 mm thread (18 mm, 20 mm, 22 mm, 24 mm and 26 mm) and 8 mm smooth shank (up to 18 mm).
- +/-35° conical angulation
- Blue screw head



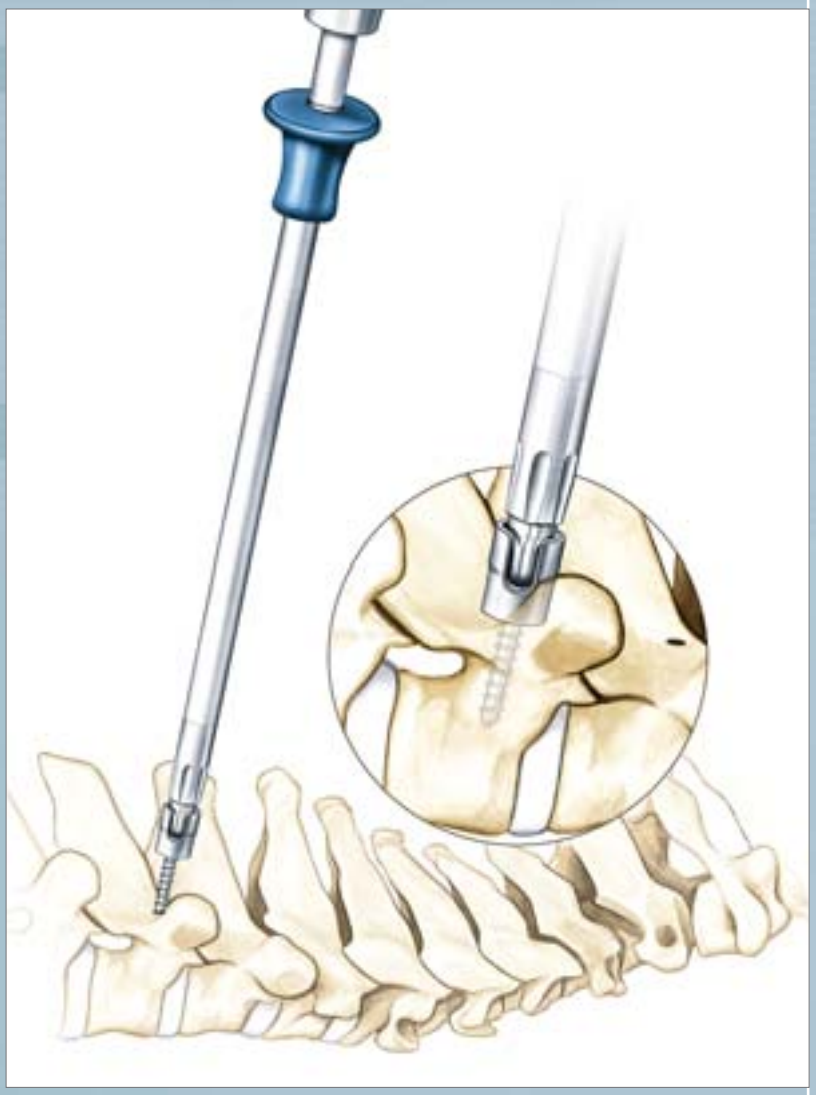
3. Polyaxial Screw Fixation

3.6 Screw Insertion

With the pedicles or lateral mass prepared and the proper screw length determined, the appropriate screws are threaded into the pre-drilled holes bilaterally, using the Self Holding Polyaxial Screwdriver.
To attach the screwdriver to the Handle, pull back on the spring mechanism of the handle and insert the screwdriver into the opening, release the spring to lock the screwdriver onto the handle. Give a tug on the screwdriver to ensure it is locked securely onto the handle.
To attach the screw onto the screwdriver, pull the blue trigger towards the handle, insert the screw on the end of the screwdriver while the trigger is retracted, then release the blue trigger. The screw should now be securely locked on the screwdriver. While the tip of the screw stays firmly in position axially to the screwdriver, thread the screw into the bone.

Note:
The hex end of the Polyaxial Screwdriver must be fully inserted into the spherical head of the screw. The pins of the head of the screwdriver create the self holding tip feature.

To disengage the screwdriver from the screw, pull back on the blue trigger, and maintain this while extracting the driver from the screw.
To ensure maximum polyaxicity with the screw, do not tighten the screw down completely to the bone. Leave a small gap below the head to allow rotation and angulation of the screw head.



- Self Holding Polyaxial Screwdriver – FW070R
- Non-Ratchet Handle – FW067R or
  Ratchet Handle – FW165R

3.7 Lamina Preparation

In case hooks are placed, the Lamina Preparator can be used.
The instrument has a bent tip to ensure an easy and safe instrumentation.

The choice of the correct hook size and its positioning can be evaluated using the Lamina Preparator.

■ Lamina Preparator – FW071R

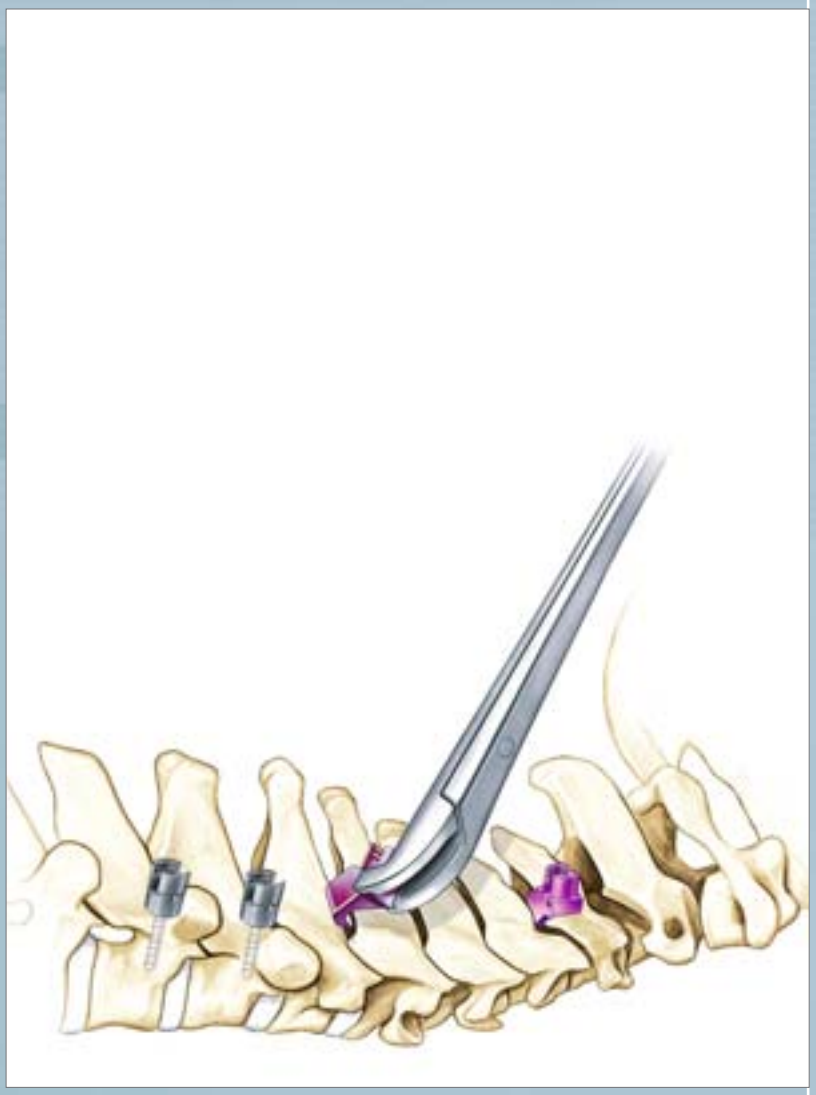
3. Polyaxial Screw Fixation

3.8 Hook Insertion

S4 Cervical offers four hook options: thick right, thick left, thin right, and thin left.
The choice of the hook used depends on the thickness of the lamina. The thin throat size is 4.5 mm and the thick throat is 6.0 mm.

The right or left thick or thin Lamina Hook is then selected and positioned on the lamina using the straight or curved Hook Holder. The process is repeated where other hooks are required as determined by the surgeon.

Note:
Hooks are color-coded:
purple for the left; gold for the right



- Straight Hook Holder – FW422R
- Curved Hook Holder – FW528R

3.9 Screw Head Alignment

Once the screw is inserted, the position of the polyaxial head is optimized for rod insertion using the Screw Body Manipulator.

To facilitate rod placement, the polyaxial screw body can be rotated 360° and angled up to +/-35° in any direction. The ø 4.0 mm Favored Angle Screws provide additional angulation in the cephalad and caudal directions for a total of +/-45°.

In general, if the screw is inserted too far, polyaxial movement of the screw body will be impeded due to bone contact. In such a case, the screw should be turned counter clockwise using either the Ball-headed Screwdriver or the Self Holding Screwdriver until full polyaxial motion is achieved.

In the same manner, all the Polyaxial Screws are inserted.

- Screw Body Manipulator – FW065R
- Ball-headed Screwdriver – FJ968R

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4. Pre-Rod-Insertion

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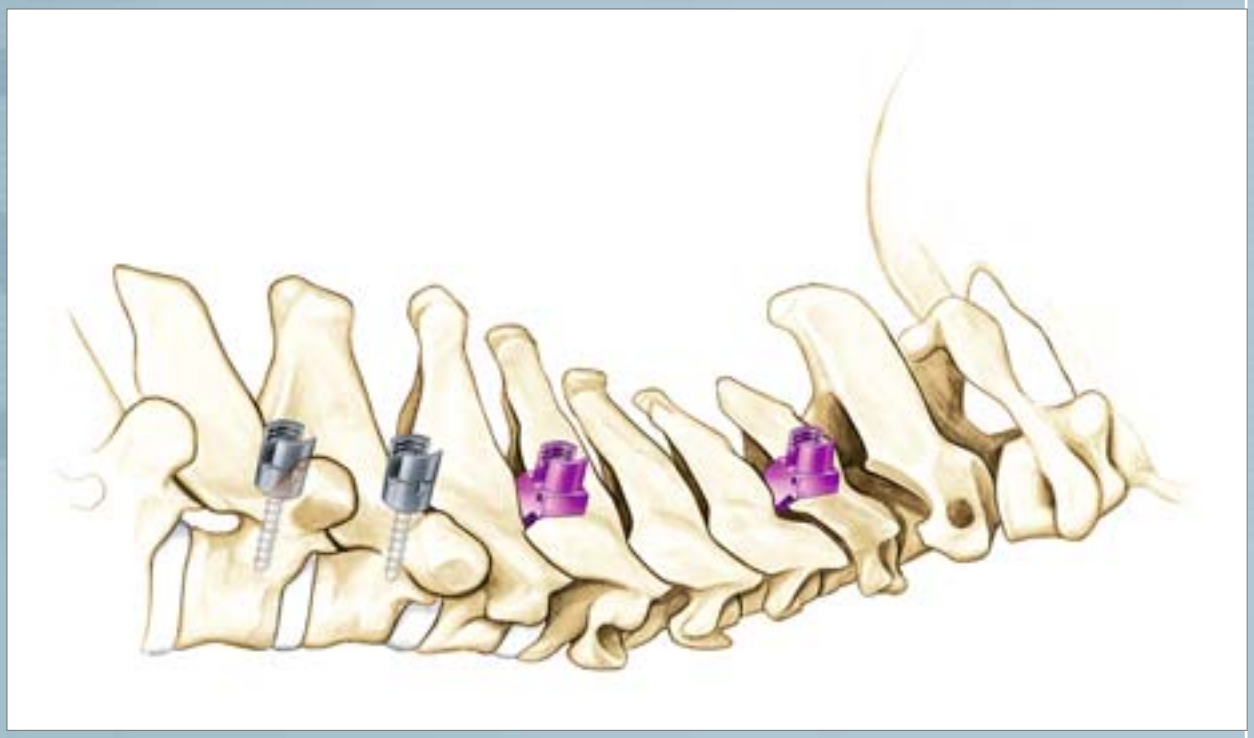


After all screws and hooks are placed and the screw heads are aligned, the construct is ready for the rod insertion.

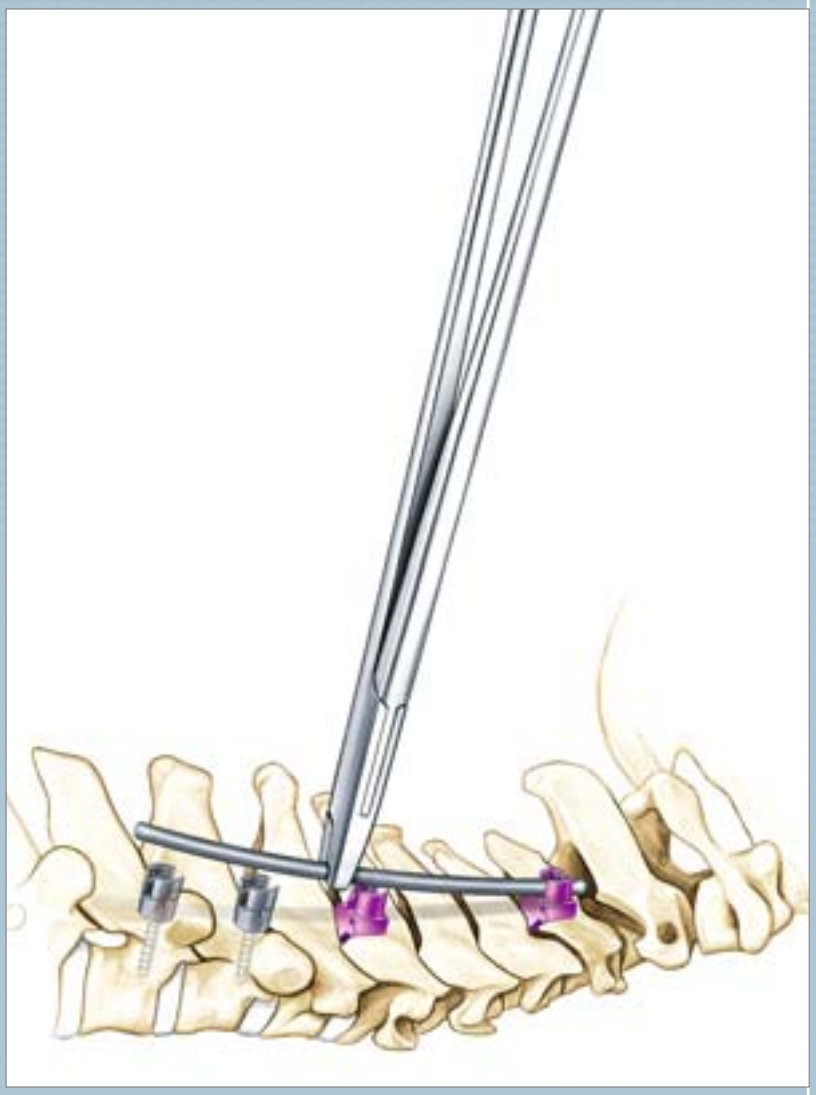
5. Rod Insertion

After the insertion of the Polyaxial Screws and hooks, and prior to inserting the rods, the lordotic alignment of the cervical spine and the kyphotic alignment of the upper thoracic spine should be verified via intraoperative lateral x-ray or c-arm.
The A-P height of the screws can be adjusted to simplify insertion of the ø 3.5 mm rod therefore reducing the need for rod contouring.

A trial rod template can be used to aid in rod contouring or trimming to the required length.
Rod templates exist in lengths of 60 mm, 120 mm and 290 mm.

The Rod Cutter can be used to cut the rod. To avoid projection of the small piece to be cut, grasp it with the Rod Holding Forceps.

The rod is inserted with the Rod Holding Forceps.



- Rod Template, 60 mm – FW078R
- Rod Template, 120 mm – FW080R
- Rod Template, 290 mm – FW081R
- Rod Cutter – FW082R
- Rod Holding Forceps – FW076R

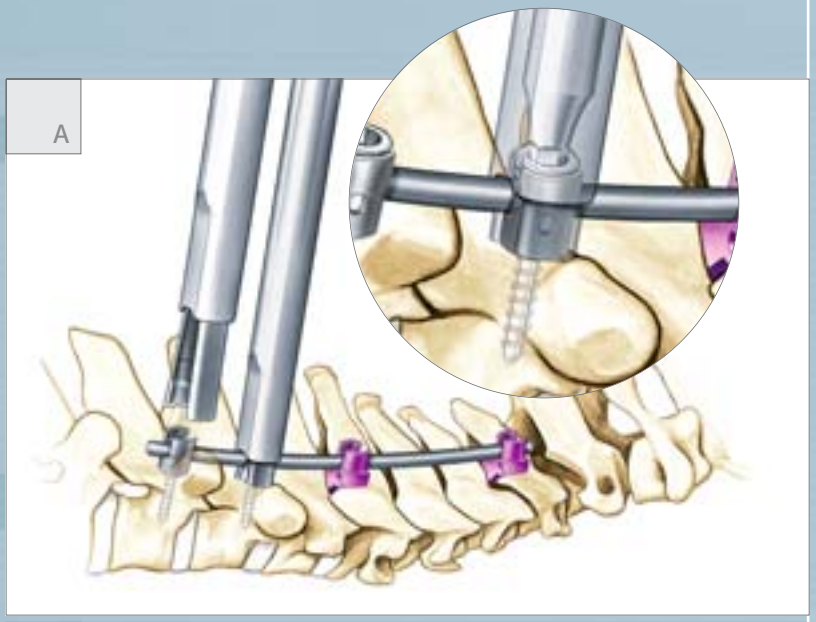
6. Set Screw

6.1

6.1 Set Screw Insertion

A
If required, the rod can be held down in the polyaxial body or hook using the Rod Holding Forceps or the Rod Persuader.

While the Rod Persuader is applied, the Set Screw can be inserted through the Rod Persuader.



B
Start the Set Screw in the polyaxial body or hook by first turning the instrument counter clockwise until a click is heard or felt.
Then rotate the instrument clockwise until the Set Screw is hand-tightened.
Starting the Set Screw in this manner ensures cross-threading is minimized.

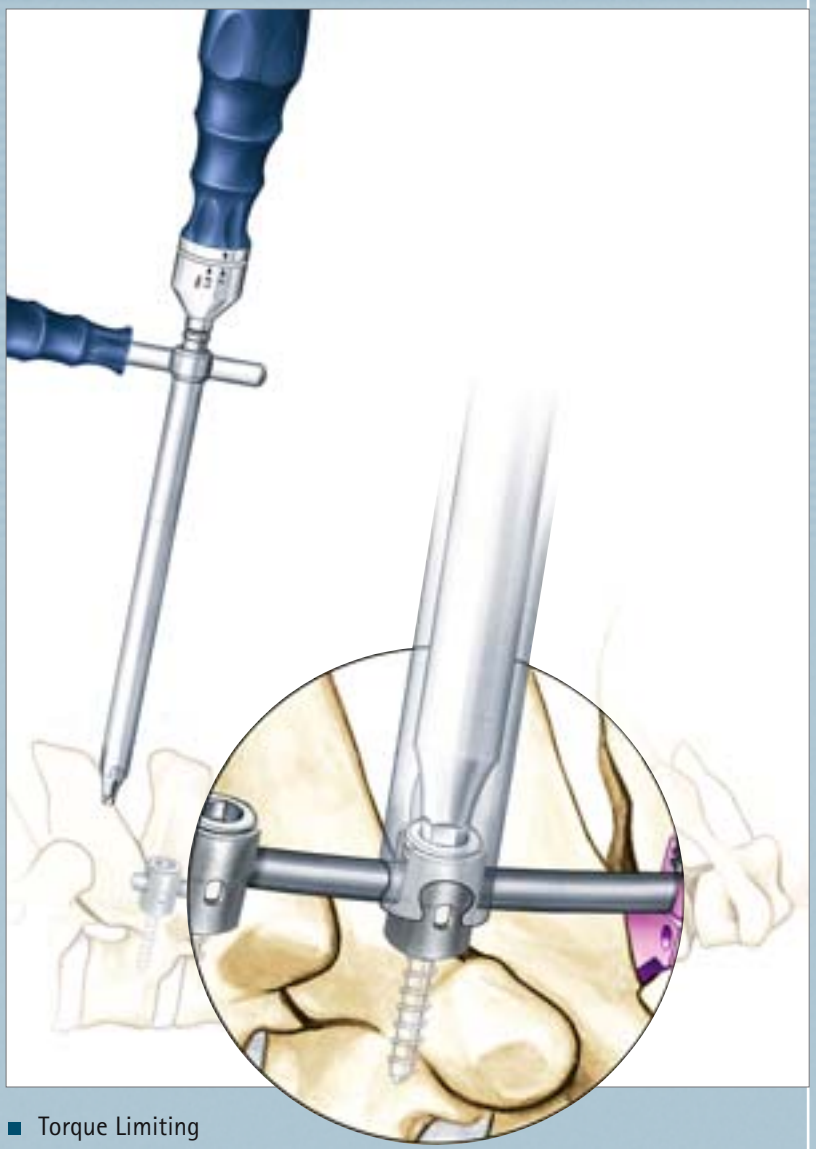
- Rod Holding Forceps – FW076R
- Rod Persuader – FW084R
- Set Screw Starter – FW058R
- Double Ended Set Screw Starter – FW059R

6.2 Final Tightening

The Torque Limiting Screwdriver is used with the Counter Torque Instrument to tighten the loaded Set Screw to the pre-defined optimum torque of 2.8 Nm.

It is imperative to use the Counter Torque Instrument to prevent applying the torque directly to the patient's spine, and also to ensure perpendicular placement of the screwdriver thus simplifying correct tightening of the Set Screw. The torque requirement corresponds to 2.8 Nm. A mark is present on the screwdriver that illustrates to the surgeon when the specified torque has been applied.
Since optimal strength is achieved at 2.8 Nm, over-tightening is unnecessary and should be avoided to prevent damage to the implants.

The final tightening to the specified torque of 2.8 Nm is the last stage of the instrumentation if no cross connectors are used.



- Torque Limiting Screwdriver – FW061R
- Counter Torque Handle – FW062R

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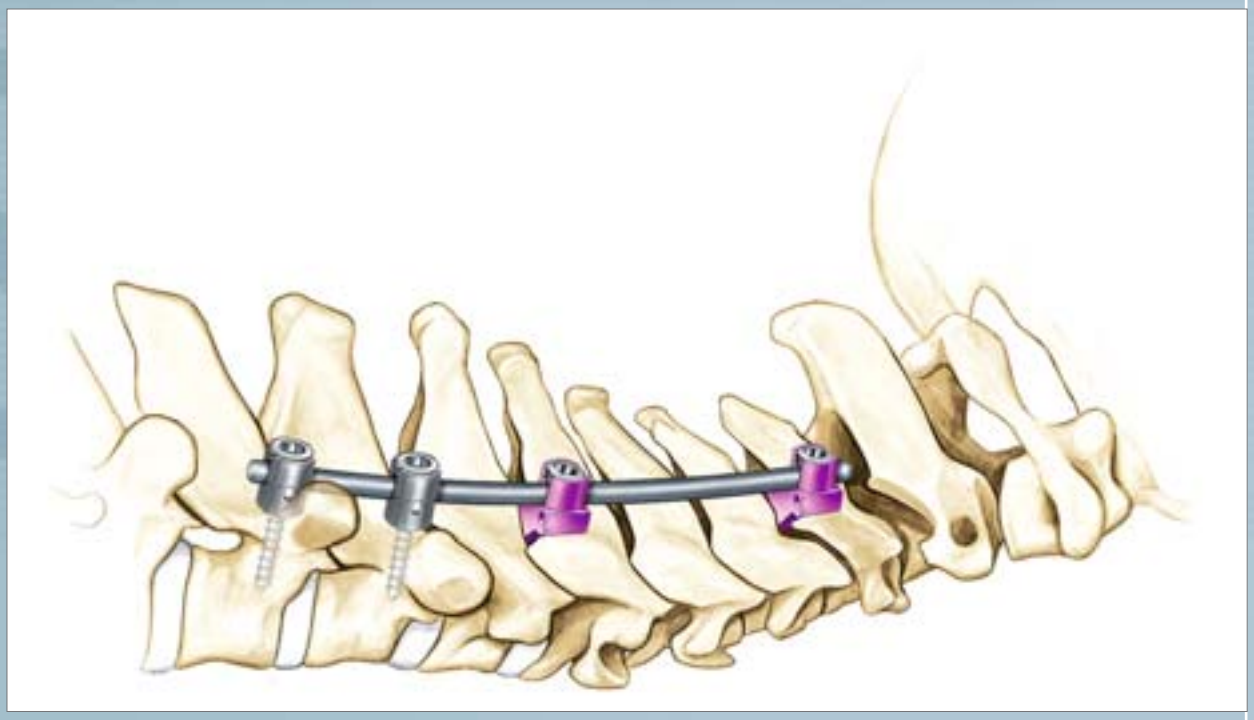
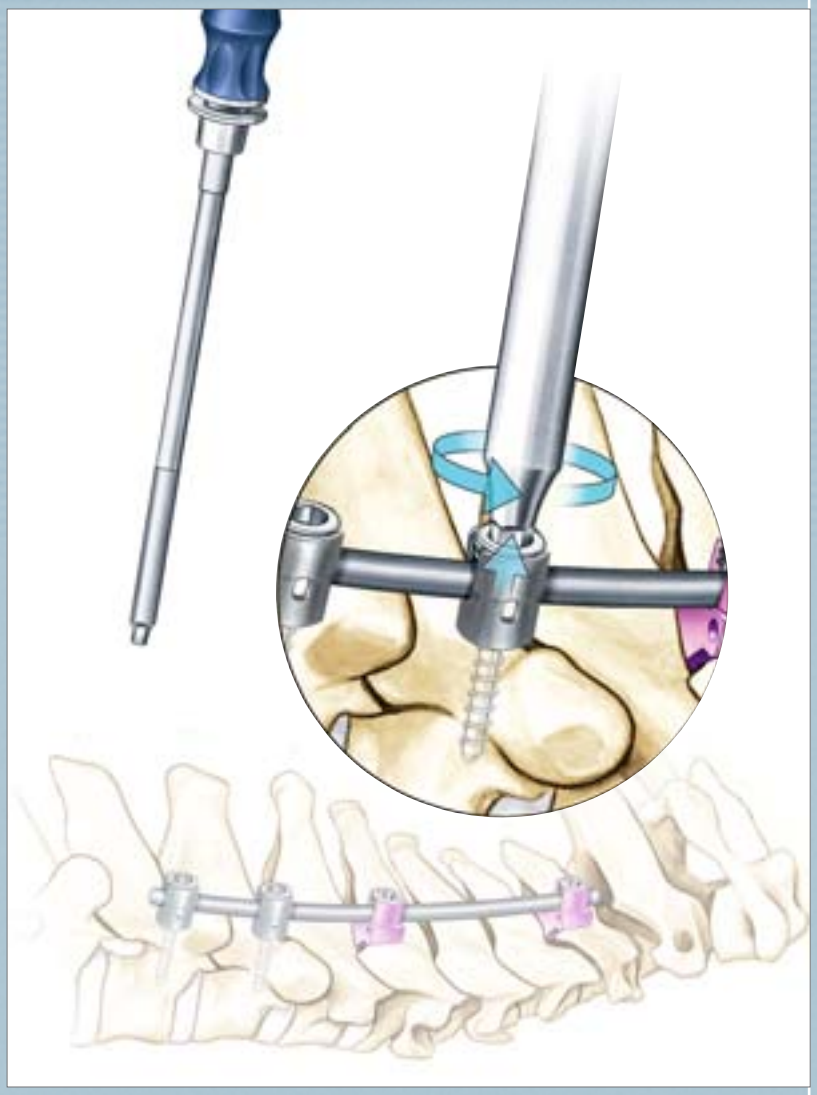
7. Final Construct / Long Distance Stabilization

7



8. Set Screw – Removal

In case of removal of the Set Screw, the Set Screw Removal Screwdriver is recommended.

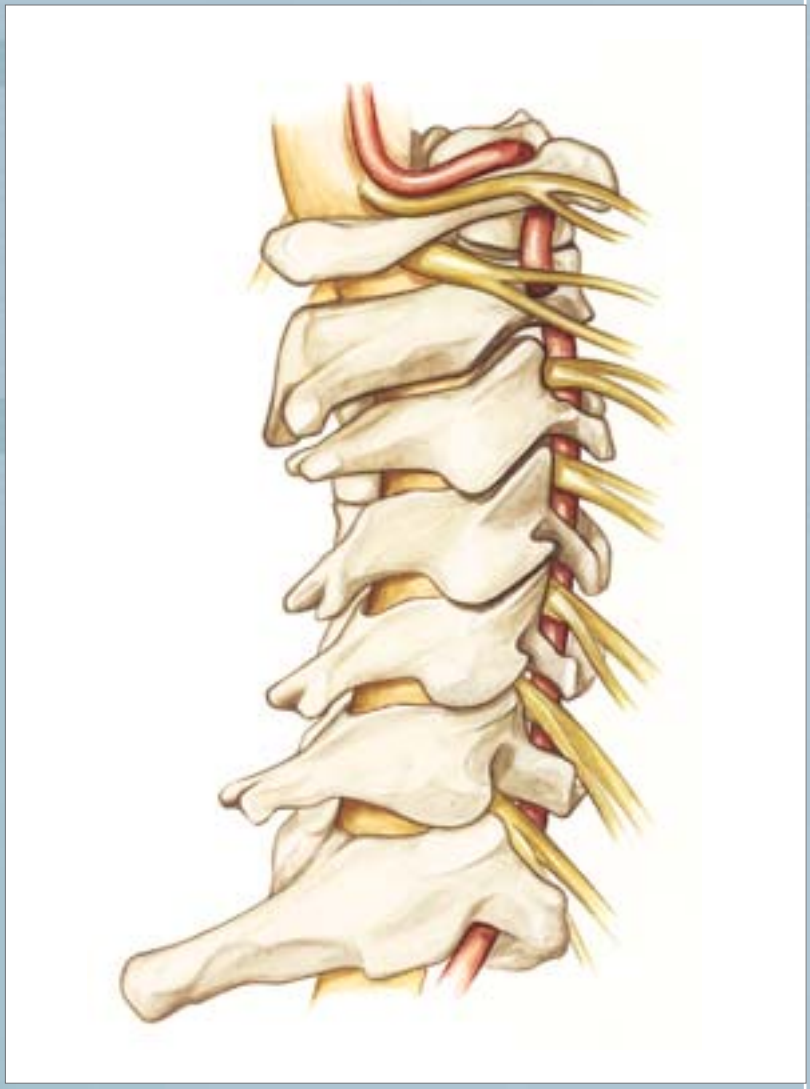


- Non-ratchet Handle – FW067R
- Ratchet Handle – FW165R
- Set Screw Removal Screwdriver – FW064R
- Counter Torque Handle – FW062R

9. C1-C2 Surgical Technique

9.1 Introduction

Since the anatomy at C1 is very challenging Aesculap has developed special instruments and implants to meet those special anatomical challenges.
The occipital nerve as well as the vertebral artery lie very close to the entry point of the polyaxial Smooth Shank Screw!
To protect those structures, a special guiding sleeve with a window was designed. Through this sleeve, the opening of the cortical bone, the drilling, tapping and screw insertion can be performed.



9.2 Preparation for Drilling

To ensure a safe procedure at the challenging anatomy of C1, the use of the Screw Starter Guide Tube is recommended.

The cortical bone can be opened by using the Smooth Shank Bone Awl through the Screw Starter Guide Tube.

Note:
The bone Awl has a safety stop to prevent too deep insertion!

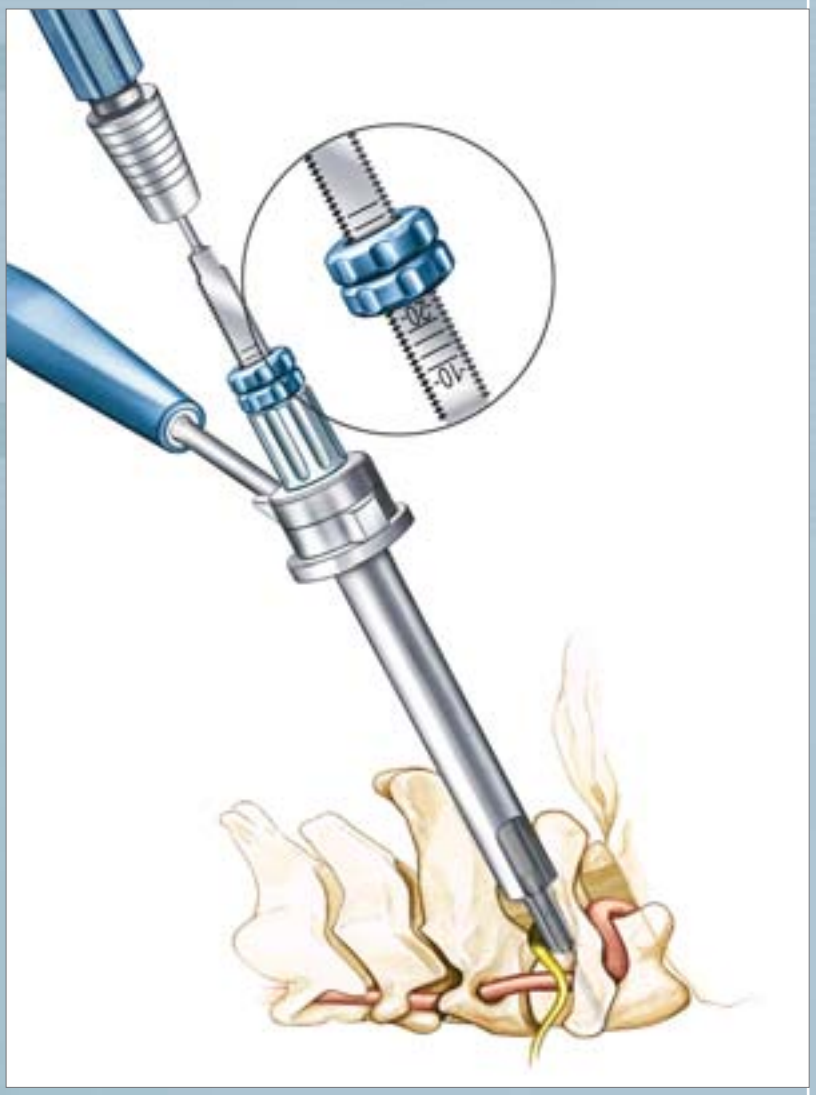
- Screw Starter Guide Tube – FW054R
- Smooth Shank Bone Awl – FW085R

9. C1-C2 Surgical Technique

9.3 Drilling

To drill the hole, the Smooth Shank Screw Drill is recommended.
The drill has a scale and two wheels to adjust the drill depth.

Attention:
Drilling must only be performed through the guiding sleeve!

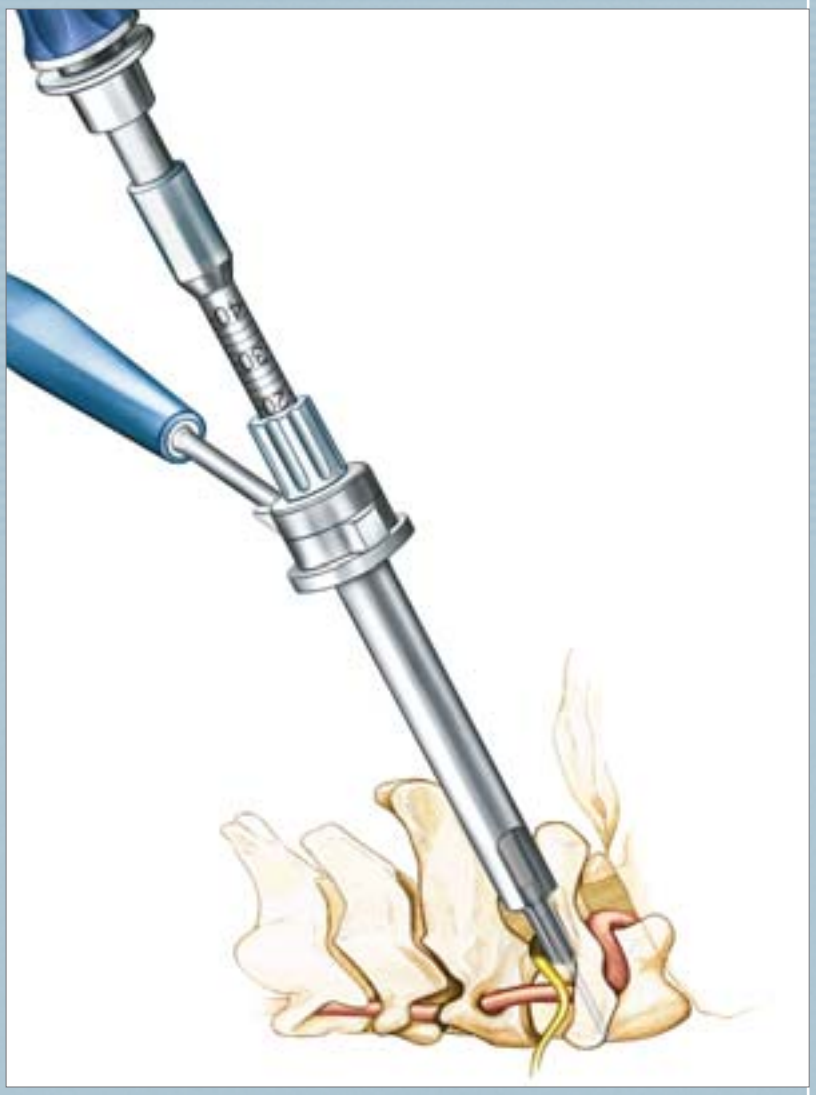


■ Smooth Shank Screw Drill – FW086SU

9.4 Tapping

To tap the pre-drilled hole use the Smooth Shank Screw Tap through the guiding sleeve. The tap has a scale to reconfirm the depth.

Like all S^4 Cervical Screws, the Smooth Shank Screws are equipped with a self-tapping tip. To ensure optimal bone purchase tapping is recommended for the first 3 mm in unicortical screw placement or through the second cortex in bi-cortical screw placement.



- Smooth Shank Screw Tap – FW087R
- Non-ratchet Handle – FW067R
- Ratchet Handle – FW165R

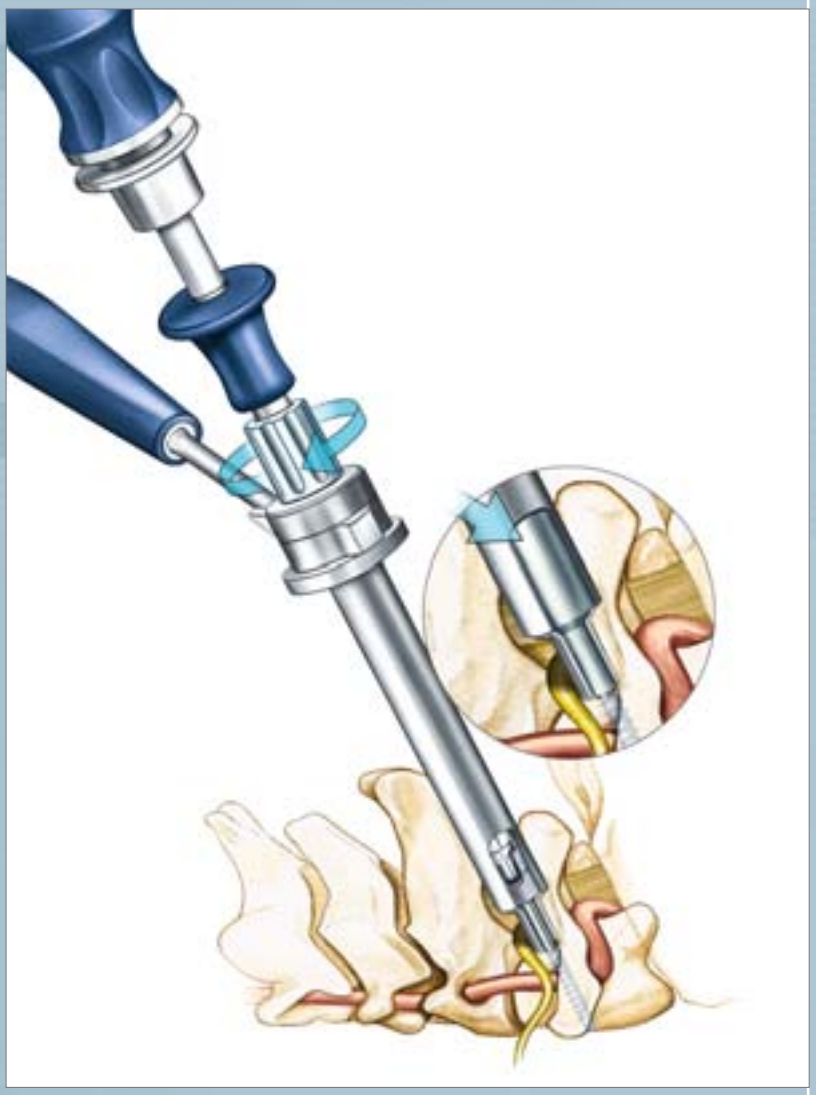
9. C1-C2 Surgical Technique

9.5 Screw Insertion

With the guiding sleeve still attached and the window closed, the Smooth Shank Screw can be inserted. To screw down, the standard Self Holding Polyaxial Screwdriver is recommended.

The window can be opened after the screw is started to ensure a perfect sight onto the screw.

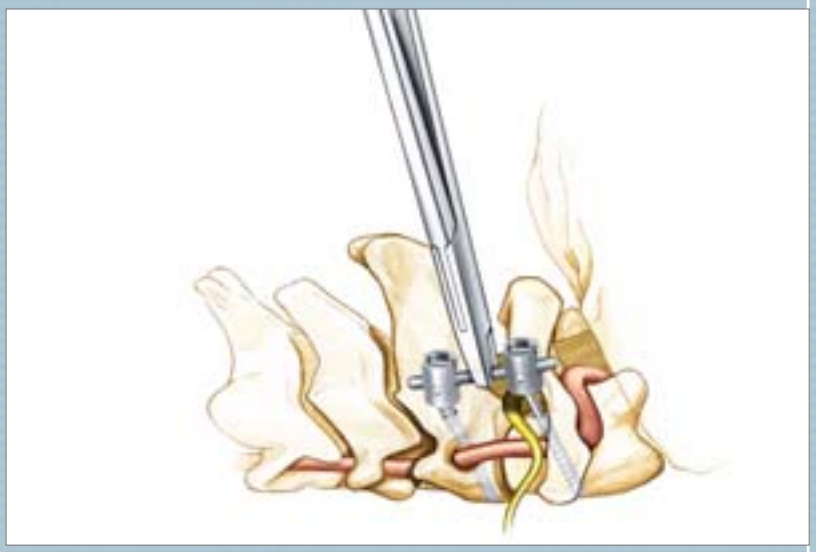
When the desired depth is reached and all thread is inside the bone and only the smooth shank is sticking out, the Screw Starter Guide Tube can be removed.



- Self Holding Polyaxial Screwdriver – FW070R
- Non-ratchet Handle – FW067R
- Ratchet Handle – FW165R

9.6 Rod Insertion

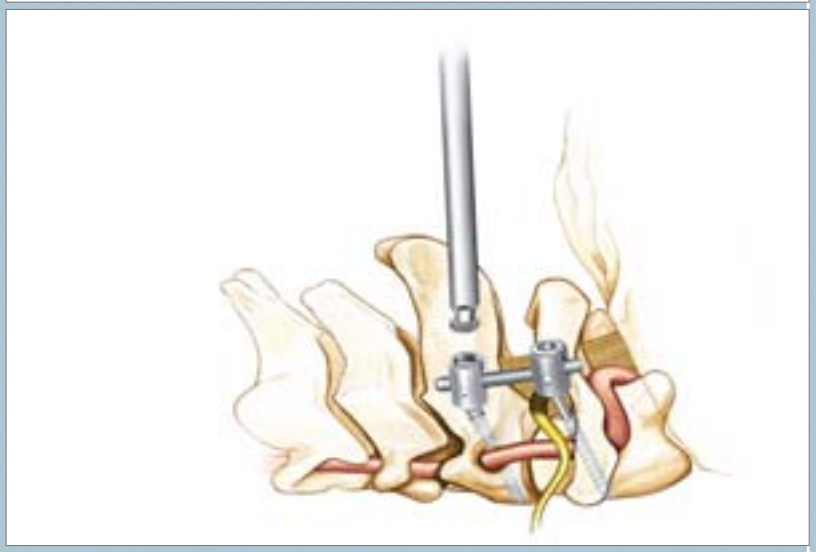
After placing the screws, the rod can be inserted.
To insert the rod use the Rod Holding Forceps.



9.7 Set Screw Insertion

With the rod in place the Set Screws can now be inserted to fix the rod onto the polyaxial screws.

If required, a Rod Persuader can be used to assist the insertion of the Set Screw.



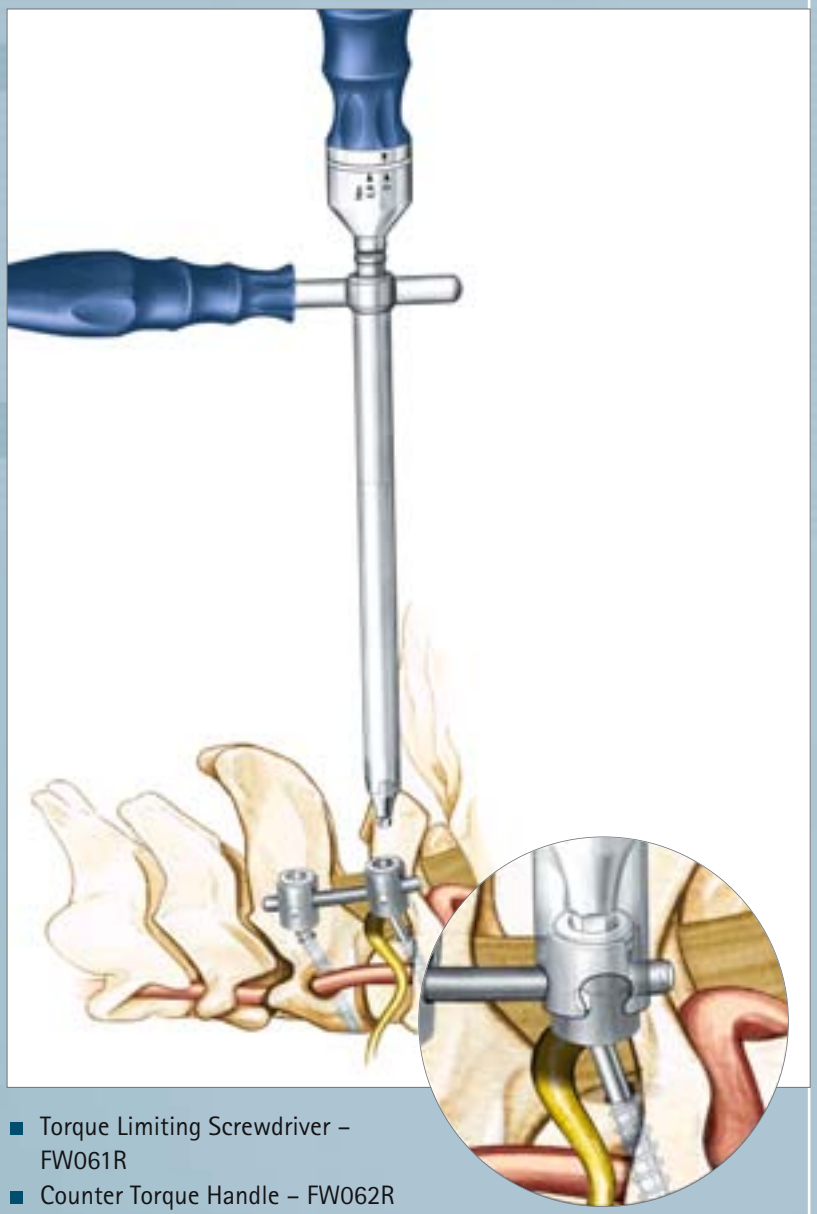
- Rod Holding Forceps – FW076R
- Set Screw Starter – FW058R
- Double Ended Set Screw Starter – FW059R

9.8 Set Screw Tightening

Finally, the Set Screws have to be tightened with the Torque Limiting Screwdriver in combination with the Counter Torque Handle.

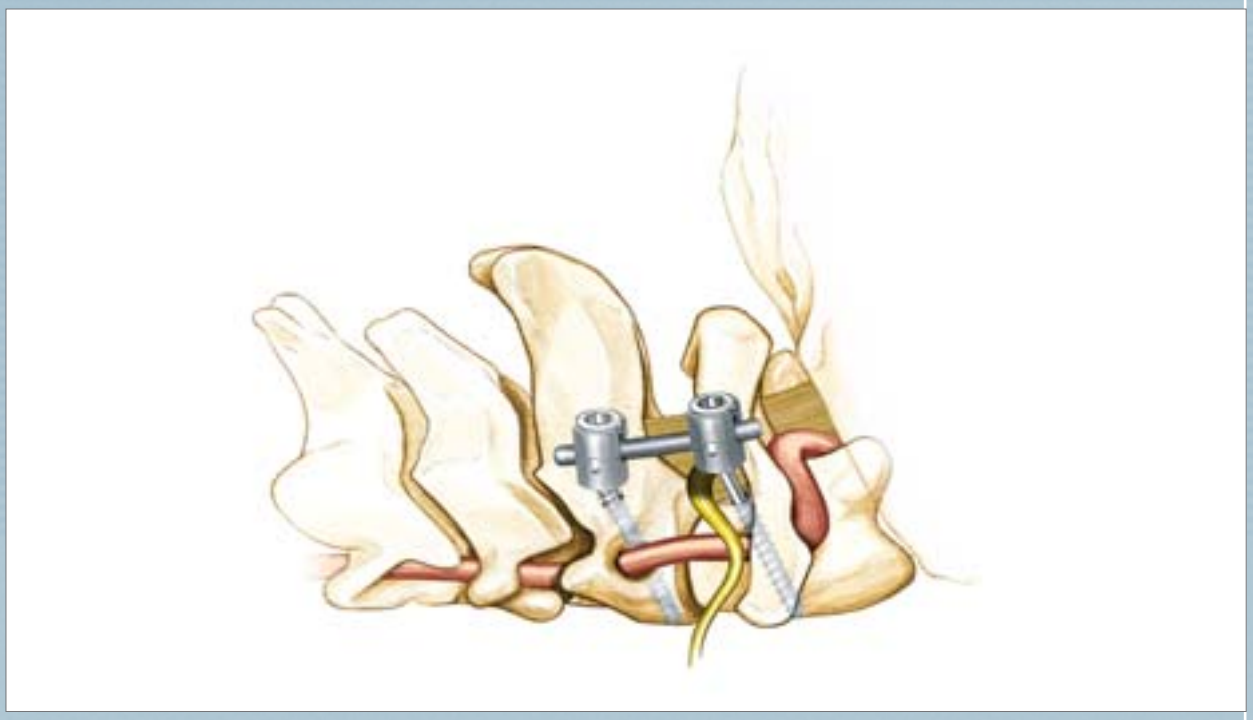
Note:
It is important to use the Counter Torque Instrument to prevent applying the torque directly to the patient's spine, and also to ensure perpendicular placement of the screwdriver thus simplifying correct tightening of the Set Screw.

Since optimal strength is achieved at 2.8 Nm, over-tightening is unnecessary and should be avoided to prevent damage to the implants.



- Torque Limiting Screwdriver – FW061R
- Counter Torque Handle – FW062R

9.9 Final Construct



10. Occiput – Surgical Technique

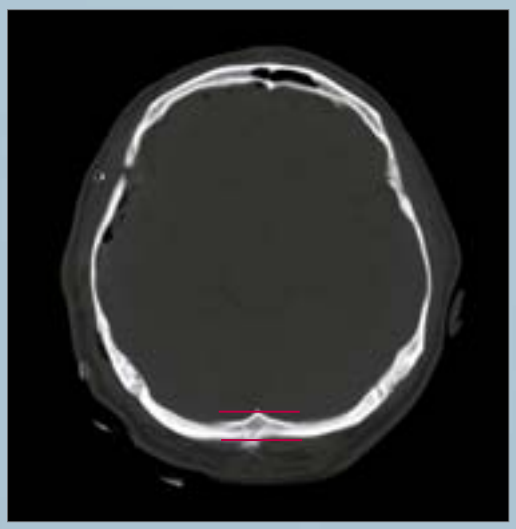
10.1

10.1 Pre-Operative Planning

To ensure a safe procedure, it is recommended to measure the thickness of the occipital bone with the help of x-rays or other imaging possibilities. The thickness indicates the length of the Occipital Screws that will be implanted later.

Midline marking is recommended to ensure an optimal placement of the plate during the surgery.

The strongest fixation can be achieved at the inion which is the highest point of the external occipital protuberance.



10.2 Size Verification / Plate Placement

The S^4 Cervical System offers two different sizes of occipital plates (small & large) and two different types of designs (4-hole & 5-hole plates).

The plate size and design is chosen according to the anatomy of the respective patient.
After choosing the appropriate size the plate can be contoured to accommodate the occipital anatomy.
The plate can be bent **between** the holes using the Occipital Plate Bending Pliers.

Attention:
Do not deform the holes with the Bending Pliers. Bending on the holes would destroy the locking mechanism of the Occipital Screws.

The Occiput Plate should be placed midline to the EOP (External Occipital Protuberance) and the Foramen Magnum. The highest stability of the plate is achieved by midline fixation where the bone thickness is highest.

■ Occipital Plate Bending Pliers – FW090R

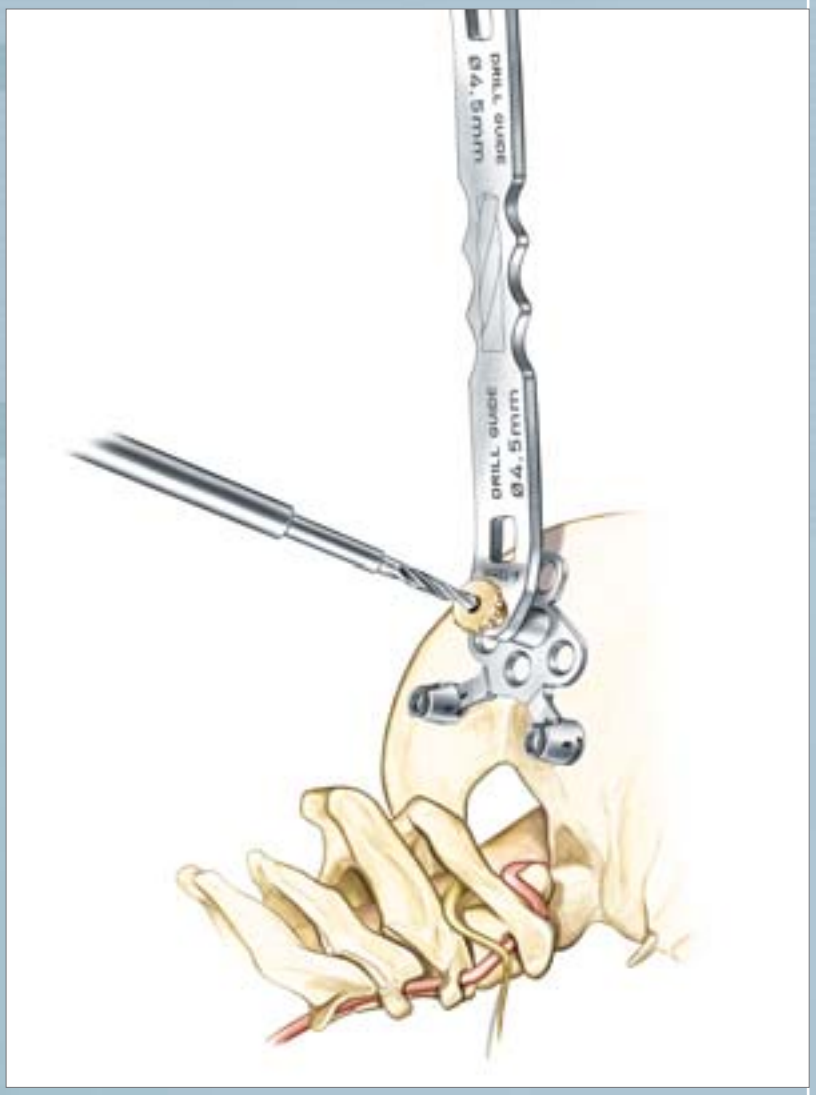
10. Occiput – Surgical Technique

10.3 Drilling

After the plate design and size is determined, the holes can be drilled. There are two Drill Guides available and recommended for use. One for the ø 4.5 mm screws and one for the ø 5.5 mm screws.
The Drill Guide can be used to hold the plate onto the Occiput. The desired drill depth can be determined by turning the inlay at the end of the guide.
The two ends of the Drill Guide cover different depths. One side can be set from 6 - 10 mm and the other side from 11 - 16 mm.

Attention:
It is recommended, that the first hole is prepared including tapping and the first screw is inserted before the other screws are implanted. The first screw holds the plate in place while drilling and tapping the other holes!

Even though the drill depth was measured before the surgery, proceed with care to prevent damage to the dura.



- Occipital Drill Bit, ø 2.9 mm (ø 4.5 mm screws) – FW091SU
- Occipital Drill Bit, ø 3.9 mm (ø 5.5 mm screws) – FW092SU
- Occiptial Drill Guide Double-ended, ø 4.5 mm - FW095R
- Occiptial Drill Guide Double-ended, ø 5.5 mm - FW096R

10.4 Tapping

After removing the Drill Guide the Tap Guide is used to tap the hole. By using the Tap Guide the drilled hole will be further prepared for insertion of the Occiput Screws.

Like the Drill Guides, the two ends of the Tap Guide cover different depths. One side can be set from 6 - 10 mm and the other side from 11 - 16 mm.

- Occipital Tap, ø 4.5 mm – FW093R
- Occipital Tap, ø 5.5 mm – FW094R
- Occiptial Tap Guide Double-ended, ø 4.5 mm - FW097R
- Occiptial Tap Guide Double-ended, ø 5.5 mm - FW098R

10. Occiput – Surgical Technique

10.5 Screw Insertion

The Occiput Screws can now be inserted in the appropriate holes using the occipital Screw Driver.

Since the bone thickness is highest at the EOP (External Occipital Protuberance) it is recommended to place the first screw in the EOP at the midline of the Occiput.

Two types of screws are available. Silver ø 4.5 mm screws and purple ø 5.5 mm screws which are backup or rescue screws for the silver ø 4.5 mm screws.

- Occipital Screw Driver – FW213R
- Non-ratchet Handle – FW067R
- Ratchet Handle – FW165R

10.6 Screw Locking

After all screws are inserted and hand-tightened, they need to be locked with either the Occipital Screwdriver or the Occipital Torque Wrench.

You must not lock the Occiput Screws until all screws are inserted and hand-tightened to prevent dislocation and twisting of the Occiput Plate!

Attention:
Locking the occipital screws firmly in the plate with the the occipital screw-driver (FW213R) may be sufficient. Do not overtighten the screws to prevent free spinning screw.

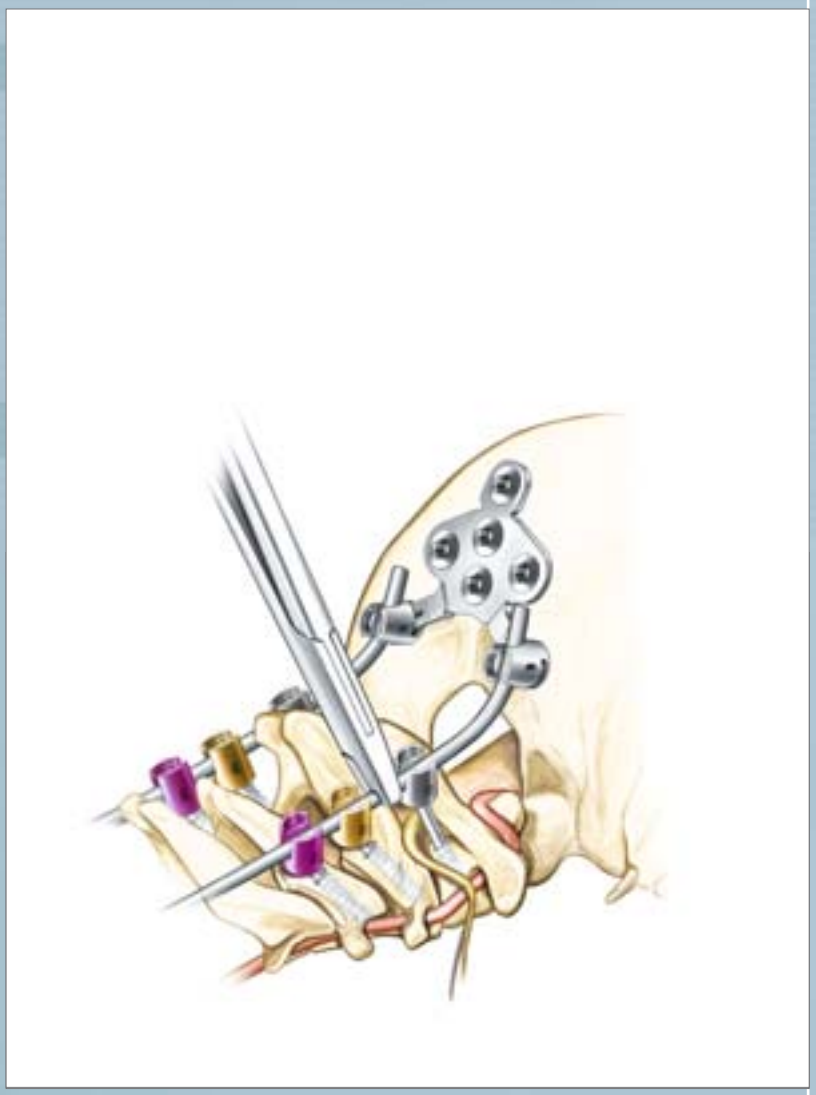
- Occipital Screw Driver – FW213R
- Non-ratchet Handle – FW067R
- Ratchet Handle – FW165R
- Occipital Torque Wrench – FW103R

10. Occiput – Surgical Technique

10.7 Rod Insertion

To connect the Occiput Plate to the cervical spine, the ø 3.5 mm Pre-Bent Rod is inserted into the rod receptacles.

If needed, the Rod Holding Forceps can be used to assist the rod insertion.

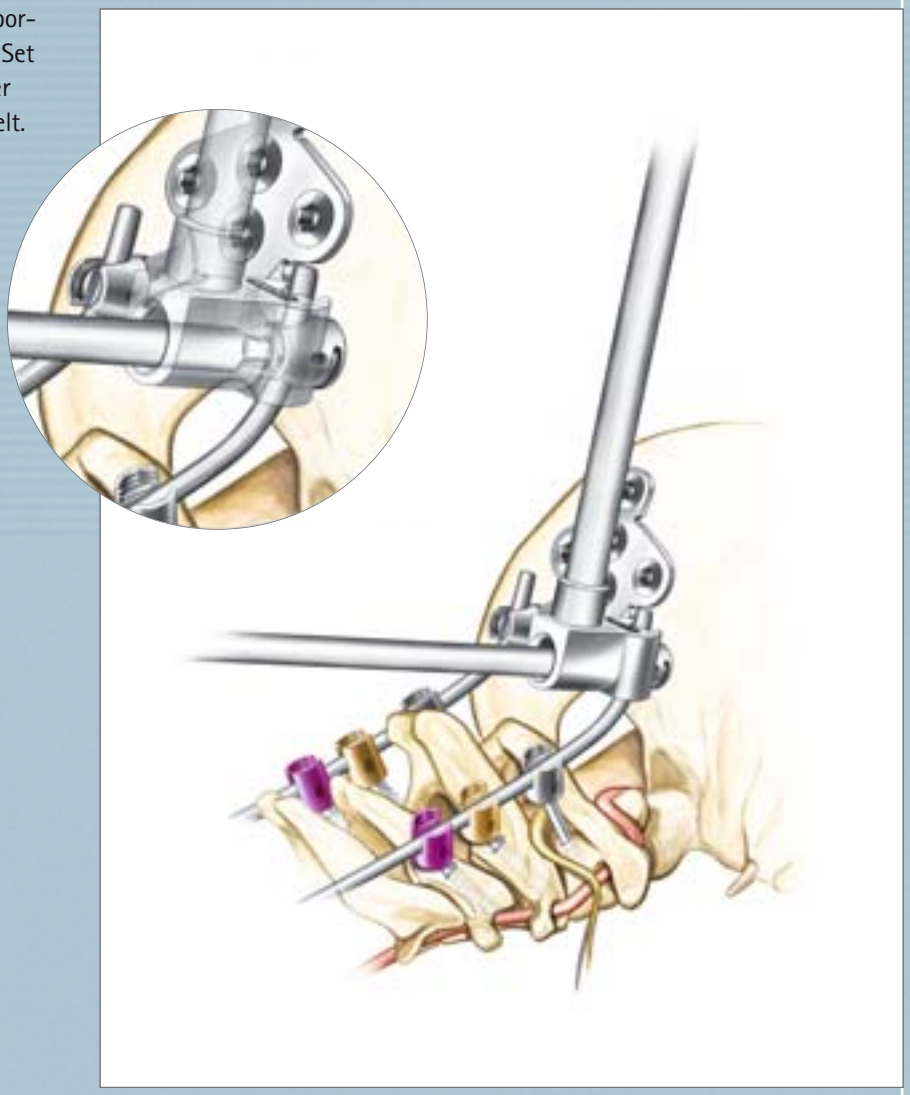


- Rod Holding Forceps – FW076R

10.8 Set Screw Insertion

Start the Set Screw in the threaded portion of the rod receptacles using the Set Screw Starter by first turning counter clockwise until a click is heard or felt. Then rotate the instrument clockwise until the Set Screw is hand-tightened. Starting the Set Screw in this manner ensures cross-threading is minimized.

If needed, the Occipital Counter Torque Handle can be used to persuade the rod and guide the Set Screw into the rod receptacles.

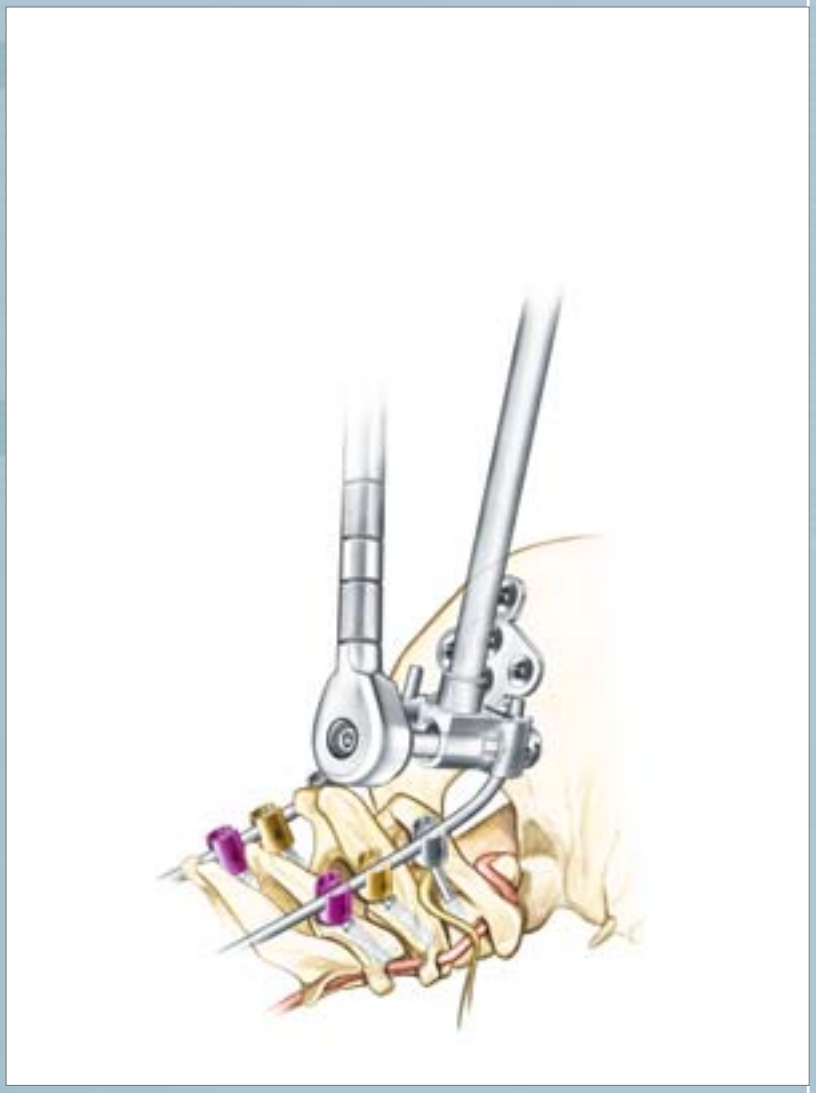


- Occipital Counter Torque Handle – FW104R
- Set Screw Starter – FW058R

10. Occiput – Surgical Technique

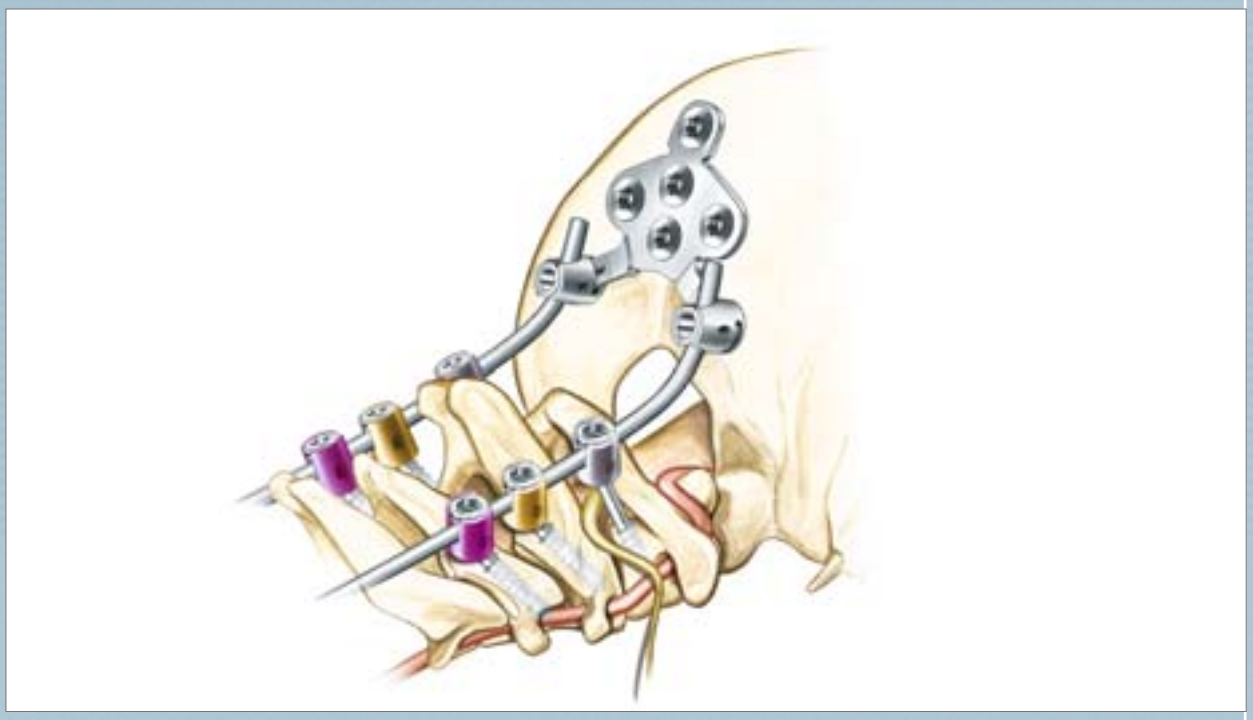
10.9 Set Screw Tightening

Finally the Set Screws have to be locked using the Occipital Torque Wrench.
The force (2.8 Nm) has to be countered with the Occipital Counter Torque Handle.



- Occipital Counter Torque Handle – FW104R
- Occipital Torque Wrench – FW103R

10.10 Final Construct



11. Options

11.1 Lateral Offsets, L-Shaped

Lateral Offset Connectors are available to offer variable placement of the hooks or Polyaxial Screws.

The lateral offset must first be placed onto the ø 3.5 mm rod and then secured using the same Set Screw as for the hooks and Polyaxial Screws. Tighten to the same 2.8 Nm of torque as required for other components.

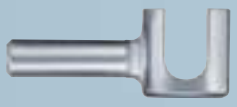
Note:
Lateral Offset Connectors are color-coded: Purple for the left; gold for the right.

There are three left and right sizes available:

- 7 mm left, right
- 9 mm left, right
- 11 mm left, right

11.2 Lateral Offset Connectors

Offset Connectors can be used if a Polyaxial Screw must be placed lateral to the longitudinal axis of the rod. The Offset Connector must first be placed onto the ø 3.5 mm rod and then secured using the same Set Screw as used for the Polyaxial Screw. Final tightening to 2.8 Nm of torque is the same as all other components.



The Offset Connectors are not color-coded since right and left differentiation is not necessary.

11.3 Rod Bending

The rod can be contoured to fit into the heads of the screws or hooks.

There are three bending options:

- Pair of Rod Plate Benders – FW036R
- In-Situ Benders – FW074R, FW073R
- Rod Bending Forceps – FW037R

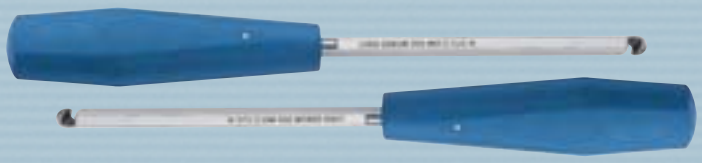
Note:
Titanium is highly notch sensitive and therefore care must be taken during rod contouring to ensure that surface damage to the rod is minimal. This is necessary to avoid potential fatigue failure of the implant.

Cut and bend the rod as necessary to fit smoothly inside the heads of the hooks and/or Polyaxial Screws. Only approximately 1 mm of rod settling will occur during assembly, so exact contour of the rods is essential to the successful assembly of the system.

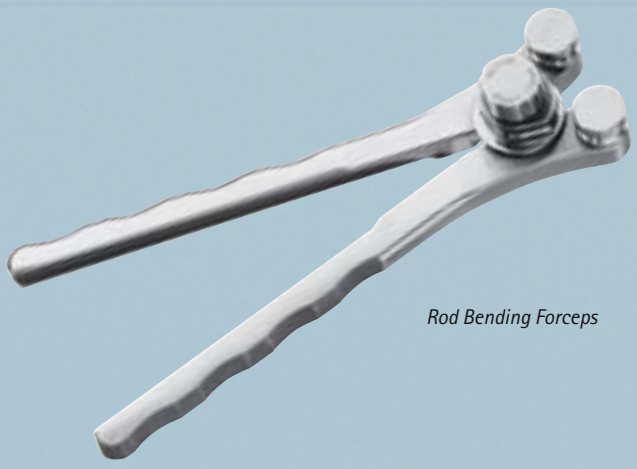
Beginning from either the cephalad or caudal directions, place the rod into the top loading screws and hooks.

The rod is best inserted using the Rod Holding Forceps (FW076R).

Pair of Rod Plate Benders



In-Situ Benders



Rod Bending Forceps

11. Options

11.4 Cross Connectors

Cross Connector placement is based on specific case requirements and is recommended in cases where additional torsional stability may be required.
A measurement is made between the two ø 3.5 mm longitudinal Rods at the position where the Cross Connector is to be applied.

Choose the appropriate sized connector and lay it on the two Longitudinal Rods. Once correctly placed, tighten the Set Screws to the pre-defined torque of 2.8 Nm using the Torque Measuring Screwdriver (FW061R).

Note:
The Cross Connectors should not be bent.

The following sizes are available:

- **Fixed:**
  22 mm, 24 mm, 26 mm
- **Adjustable:**
  28 mm – 33 mm, 33 mm – 42 mm,
  42 mm – 58 mm

11.5 Cable Connectors

The Cable Connector is placed onto the ø 3.5 mm Rod and then secured by using the same Set Screw as for the Polyaxial Screw assembly.
Tighten the Set Screw to the same 2.8 Nm of torque as the Polyaxial Screws.

The angled Cable Connectors are inserted in the same manner as the straight Cable Connector.

90° *45°*

There are three different Cable Connectors available:

- Straight Cable Connector (silver)
- Left 45° Cable Connector (purple)
- Right 45° Cable Connector (gold)

11.6 Parallel Rod Connectors

The parallel Rod Connectors are used when the surgeon needs to connect an existing (pre-instrumented) spinal rod construct to a new spinal rod construct. They have been designed to be clamped onto the spinal rods and then tightened down by one central Set Screw.
The connectors are secured by tightening the central Set Screw to 2.8 Nm of torque using the pre-defined Torque Limiting Screw Driver (FW061R).

ø 3.5 mm to ø 3.5 mm

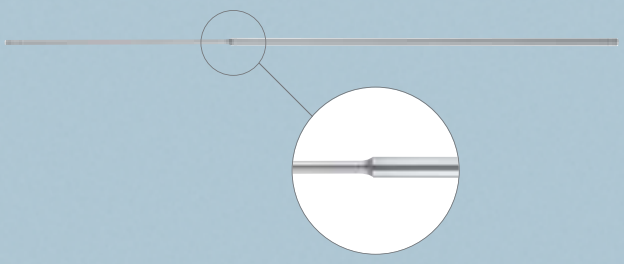
ø 3.5 mm to ø 5.5 mm

The parallel Rod Connectors are available in the following sizes:

- ø 3.5 mm to ø 3.5 mm
  (connects S4 Cervical to previously implanted S4 Cervical levels)
- ø 3.5 mm to ø 5.5 mm
  (connects S4 Cervical to S4 Thoracolumbar)

11.7 Dual Diameter Rod

The Dual Diameter Rod allows to form a construct that passes over the cervicothoracic junction from a S4 Cervical construct to a S4 thoracolumbar construct using only one rod.



Aesculap® S4® Cervical System

12. Implants

12.1 S4 C Implant Description

Screws		
SW161T	**S4 C Polyaxial Screw, ø 3.5 mm**	3.5 x 10 mm
SW162T	S4 C Polyaxial Screw	3.5 x 12 mm
SW163T	S4 C Polyaxial Screw	3.5 x 14 mm
SW164T	S4 C Polyaxial Screw	3.5 x 16 mm
SW165T	S4 C Polyaxial Screw	3.5 x 18 mm
SW166T	S4 C Polyaxial Screw	3.5 x 20 mm
SW167T	S4 C Polyaxial Screw	3.5 x 22 mm
SW168T	S4 C Polyaxial Screw	3.5 x 24 mm
SW169T	S4 C Polyaxial Screw	3.5 x 26 mm
SW170T	S4 C Polyaxial Screw	3.5 x 28 mm
SW171T	S4 C Polyaxial Screw	3.5 x 30 mm

SW141T	**S4 C Favored Angle Screw, ø 4.0 mm**	4.0 x 10 mm
SW142T	S4 C Favored Angle Screw	4.0 x 12 mm
SW143T	S4 C Favored Angle Screw	4.0 x 14 mm
SW144T	S4 C Favored Angle Screw	4.0 x 16 mm
SW145T	S4 C Favored Angle Screw	4.0 x 18 mm
SW146T	S4 C Favored Angle Screw	4.0 x 20 mm
SW147T	S4 C Favored Angle Screw	4.0 x 22 mm
SW148T	S4 C Favored Angle Screw	4.0 x 24 mm
SW149T	S4 C Favored Angle Screw	4.0 x 26 mm
SW150T	S4 C Favored Angle Screw	4.0 x 28 mm
SW151T	S4 C Favored Angle Screw	4.0 x 30 mm
SW152T	S4 C Favored Angle Screw	4.0 x 32 mm
SW153T	S4 C Favored Angle Screw	4.0 x 34 mm
SW154T	S4 C Favored Angle Screw	4.0 x 36 mm
SW155T	S4 C Favored Angle Screw	4.0 x 38 mm
SW156T	S4 C Favored Angle Screw	4.0 x 40 mm
SW157T	S4 C Favored Angle Screw	4.0 x 42 mm
SW158T	S4 C Favored Angle Screw	4.0 x 44 mm
SW159T	S4 C Favored Angle Screw	4.0 x 46 mm
SW160T	S4 C Favored Angle Screw	4.0 x 48 mm
SW121T	S4 C Favored Angle Screw	4.0 x 50 mm
SW122T	S4 C Favored Angle Screw	4.0 x 52 mm
SW123T	S4 C Favored Angle Screw	4.0 x 54 mm
SW124T	S4 C Favored Angle Screw	4.0 x 56 mm

SW182T	**S⁴C Polyaxial Screw, ø 4.0 mm**	4.0 x 10 mm
SW172T	S⁴C Polyaxial Screw	4.0 x 12 mm
SW173T	S⁴C Polyaxial Screw	4.0 x 14 mm
SW174T	S⁴C Polyaxial Screw	4.0 x 16 mm
SW175T	S⁴C Polyaxial Screw	4.0 x 18 mm
SW176T	S⁴C Polyaxial Screw	4.0 x 20 mm
SW177T	S⁴C Polyaxial Screw	4.0 x 22 mm
SW178T	S⁴C Polyaxial Screw	4.0 x 24 mm
SW179T	S⁴C Polyaxial Screw	4.0 x 26 mm
SW180T	S⁴C Polyaxial Screw	4.0 x 28 mm
SW181T	S⁴C Polyaxial Screw	4.0 x 30 mm

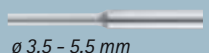
SW061T	**S⁴C Smooth Shank Screw, ø 4.0 mm**	4.0 x 8 sm.sh. x 16 mm thread
SW062T	S⁴C Smooth Shank Screw	4.0 x 11 sm.sh. x 16 mm thread
SW063T	S⁴C Smooth Shank Screw	4.0 x 14 sm.sh. x 16 mm thread
SW066T	S⁴C Smooth Shank Screw	4.0 x 8 sm.sh. x 18 mm thread
SW067T	S⁴C Smooth Shank Screw	4.0 x 11 sm.sh. x 18 mm thread
SW068T	S⁴C Smooth Shank Screw	4.0 x 14 sm.sh. x 18 mm thread
SW069T	S⁴C Smooth Shank Screw	4.0 x 17 sm.sh. x 18 mm thread
SW071T	S⁴C Smooth Shank Screw	4.0 x 9 sm.sh. x 20 mm thread
SW072T	S⁴C Smooth Shank Screw	4.0 x 12 sm.sh. x 20 mm thread
SW073T	S⁴C Smooth Shank Screw	4.0 x 15 sm.sh. x 20 mm thread
SW074T	S⁴C Smooth Shank Screw	4.0 x 18 sm.sh. x 20 mm thread
SW076T	S⁴C Smooth Shank Screw	4.0 x 9 sm.sh. x 22 mm thread
SW077T	S⁴C Smooth Shank Screw	4.0 x 12 sm.sh. x 22 mm thread
SW078T	S⁴C Smooth Shank Screw	4.0 x 15 sm.sh. x 22 mm thread
SW081T	S⁴C Smooth Shank Screw	4.0 x 10 sm.sh. x 24 mm thread
SW082T	S⁴C Smooth Shank Screw	4.0 x 13 sm.sh. x 24 mm thread
SW083T	S⁴C Smooth Shank Screw	4.0 x 16 sm.sh. x 24 mm thread
SW086T	S⁴C Smooth Shank Screw	4.0 x 10 sm.sh. x 26 mm thread
SW087T	S⁴C Smooth Shank Screw	4.0 x 13 sm.sh. x 26 mm thread
SW088T	S⁴C Smooth Shank Screw	4.0 x 16 sm.sh. x 26 mm thread

SW003T	S⁴C Set Screw for ø 3.5 and ø 4.0 mm Ployaxial Screws.

Aesculap® S4® Cervical System

12. Implants

12.1 S4 C Implant Description


ø 3.5 - 5.5 mm


ø 3.5 mm

Rod

SW192T	S4 C Dual Diameter Rod, ø 3.5 mm - 5.5 mm	400 mm
SW194T	S4 C Rod, Straight	ø 3.5 x 30 mm
SW195T	S4 C Rod, Straight	ø 3.5 x 60 mm
SW196T	S4 C Rod, Straight	ø 3.5 x 90 mm
SW197T	S4 C Rod, Straight	ø 3.5 x 120 mm
SW198T	S4 C Rod, Straight	ø 3.5 x 150 mm
SW200T	S4 C Rod, Prebent for occipital plate	ø 3.5 x 240 mm


Fixed


Variable

Cross Connector

SW112T	S4 C Cross Connector, Fixed	22 mm
SW113T	S4 C Cross Connector, Fixed	24 mm
SW114T	S4 C Cross Connector, Fixed	26 mm
SW115T	S4 C Cross Connector, Adjustable	28 - 33 mm
SW116T	S4 C Cross Connector, Adjustable	33 - 42 mm
SW117T	S4 C Cross Connector, Adjustable	42 - 58 mm

Lateral Offset Connector

SW005T	S4 C Lateral Offset Connector	
SW007T	S4 C Lateral Offset Con., L-shaped, Left	7 mm
SW009T	S4 C Lateral Offset Con., L-shaped, Left	9 mm
SW011T	S4 C Lateral Offset Con., L-shaped, Left	11 mm
SW013T	S4 C Lateral Offset Con., L-shaped, Right	7 mm
SW019T	S4 C Lateral Offset Con., L-shaped, Right	9 mm
SW021T	S4 C Lateral Offset Con., L-shaped, Right	11 mm


ø 3.5 mm


45°

Other Connectors

SW110T	S4 C Rod Connector, Parallel	3.5 - 3.5 mm
SW111T	S4 C Rod Connector, Parallel	3.5 - 5.5 mm
SW049T	S4 C Cable Connector	90°
SW054T	S4 C Cable Connector, Left	45°
SW056T	S4 C Cable Connector, Right	45°

Lamina Hook

SW015T	S4 C Lamina Hook, Left	thin
SW017T	S4 C Lamina Hook, Left	thick
SW025T	S4 C Lamina Hook, Right	thin
SW027T	S4 C Lamina Hook, Right	thick

Occiput Plate

SW202T	S⁴C Occiput Plate, Small	5-hole
SW203T	S⁴C Occiput Plate, Small	4-hole
SW204T	S⁴C Occiput Plate, Large	5-hole
SW205T	S⁴C Occiput Plate, Large	4-hole

ø 4.5 mm

Occiput Plate Screw

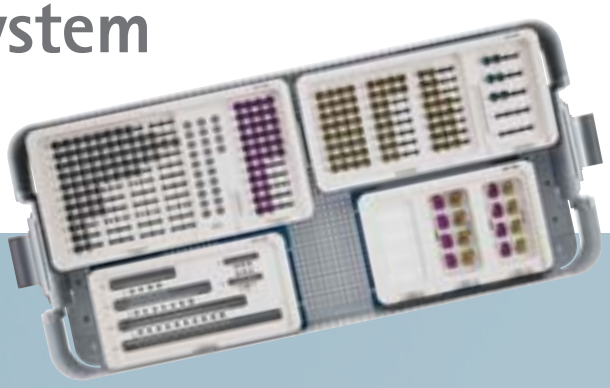
SW126T	**S⁴C Occiput Plate Screw, ø 4.5 mm**	4.5 x 6 mm
SW127T	S⁴C Occiput Plate Screw	4.5 x 7 mm
SW128T	S⁴C Occiput Plate Screw	4.5 x 8 mm
SW129T	S⁴C Occiput Plate Screw	4.5 x 9 mm
SW130T	S⁴C Occiput Plate Screw	4.5 x 10 mm
SW131T	S⁴C Occiput Plate Screw	4.5 x 11 mm
SW132T	S⁴C Occiput Plate Screw	4.5 x 12 mm
SW133T	S⁴C Occiput Plate Screw	4.5 x 13 mm
SW134T	S⁴C Occiput Plate Screw	4.5 x 14 mm
SW135T	S⁴C Occiput Plate Screw	4.5 x 15 mm
SW136T	S⁴C Occiput Plate Screw	4.5 x 16 mm

ø 5.5 mm

SW206T	**S⁴C Occiput Plate Screw, ø 5.5 mm**	5.5 x 6 mm
SW207T	S⁴C Occiput Plate Screw	5.5 x 7 mm
SW208T	S⁴C Occiput Plate Screw	5.5 x 8 mm
SW209T	S⁴C Occiput Plate Screw	5.5 x 9 mm
SW210T	S⁴C Occiput Plate Screw	5.5 x 10 mm
SW211T	S⁴C Occiput Plate Screw	5.5 x 11 mm
SW212T	S⁴C Occiput Plate Screw	5.5 x 12 mm
SW213T	S⁴C Occiput Plate Screw	5.5 x 13 mm
SW214T	S⁴C Occiput Plate Screw	5.5 x 14 mm
SW215T	S⁴C Occiput Plate Screw	5.5 x 15 mm
SW216T	S⁴C Occiput Plate Screw	5.5 x 16 mm

Aesculap® S4® Cervical System

12. Implants



12.2 Implant Sets

S4 C Screw Set

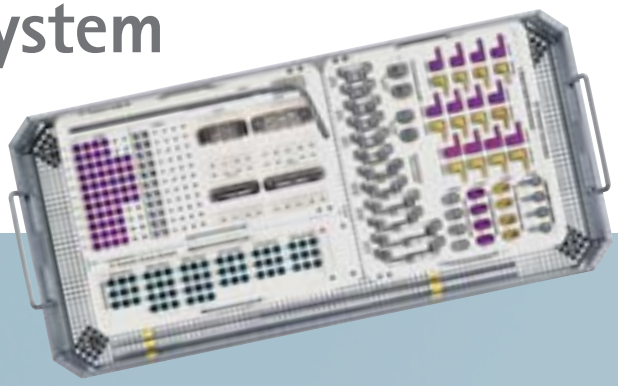
Art. No.	Component	Set Proposal
SW161T	S4 C Polyaxial Screw ø 3.5 x 10 mm	8
SW162T	S4 C Polyaxial Screw ø 3.5 x 12 mm	12
SW163T	S4 C Polyaxial Screw ø 3.5 x 14 mm	12
SW164T	S4 C Polyaxial Screw ø 3.5 x 16 mm	10
SW165T	S4 C Polyaxial Screw ø 3.5 x 18 mm	8
SW166T	S4 C Polyaxial Screw ø 3.5 x 20 mm	8
SW167T	S4 C Polyaxial Screw ø 3.5 x 22 mm	8
SW168T	S4 C Polyaxial Screw ø 3.5 x 24 mm	8
SW169T	S4 C Polyaxial Screw ø 3.5 x 26 mm	4
SW170T	S4 C Polyaxial Screw ø 3.5 x 28 mm	4
SW171T	S4 C Polyaxial Screw ø 3.5 x 30 mm	6
SW182T	S4 C Polyaxial Screw ø 4.0 x 10 mm	4
SW172T	S4 C Polyaxial Screw ø 4.0 x 12 mm	6
SW173T	S4 C Polyaxial Screw ø 4.0 x 14 mm	6
SW174T	S4 C Polyaxial Screw ø 4.0 x 16 mm	6
SW175T	S4 C Polyaxial Screw ø 4.0 x 18 mm	4
SW176T	S4 C Polyaxial Screw ø 4.0 x 20 mm	2
SW177T	S4 C Polyaxial Screw ø 4.0 x 22 mm	2
SW178T	S4 C Polyaxial Screw ø 4.0 x 24 mm	2
SW179T	S4 C Polyaxial Screw ø 4.0 x 26 mm	2
SW180T	S4 C Polyaxial Screw ø 4.0 x 28 mm	2
SW181T	S4 C Polyaxial Screw ø 4.0 x 30 mm	3
SW141T	S4 C Favored Angle Screw ø 4.0 x 10 mm	2
SW142T	S4 C Favored Angle Screw ø 4.0 x 12 mm	4
SW143T	S4 C Favored Angle Screw ø 4.0 x 14 mm	4
SW144T	S4 C Favored Angle Screw ø 4.0 x 16 mm	4
SW145T	S4 C Favored Angle Screw ø 4.0 x 18 mm	4
SW146T	S4 C Favored Angle Screw ø 4.0 x 20 mm	4
SW147T	S4 C Favored Angle Screw ø 4.0 x 22 mm	2
SW148T	S4 C Favored Angle Screw ø 4.0 x 24 mm	2
SW149T	S4 C Favored Angle Screw ø 4.0 x 26 mm	2
SW150T	S4 C Favored Angle Screw ø 4.0 x 28 mm	4
SW151T	S4 C Favored Angle Screw ø 4.0 x 30 mm	4

Art. No.	Component	Set Proposal
SW152T	S4C Favored Angle Screw ø 4.0 x 32 mm	4
SW153T	S4C Favored Angle Screw ø 4.0 x 34 mm	4
SW154T	S4C Favored Angle Screw ø 4.0 x 36 mm	4
SW155T	S4C Favored Angle Screw ø 4.0 x 38 mm	4
SW156T	S4C Favored Angle Screw ø 4.0 x 40 mm	2
SW157T	S4C Favored Angle Screw ø 4.0 x 42 mm	2
SW158T	S4C Favored Angle Screw ø 4.0 x 44 mm	2
SW159T	S4C Favored Angle Screw ø 4.0 x 46 mm	2
SW160T	S4C Favored Angle Screw ø 4.0 x 48 mm	2
SW121T	S4C Favored Angle Screw ø 4.0 x 50 mm	2
SW194T	S4C Rod ø 3.5 x 30 mm	4
SW195T	S4C Rod ø 3.5 x 60 mm	4
SW196T	S4C Rod ø 3.5 x 90 mm	4
SW197T	S4C Rod ø 3.5 x 120 mm	4
SW198T	S4C Rod ø 3.5 x 150 mm	4
SW192T	S4C Dual Diameter Rod ø 3.5 - 5.5 mm	2
SW003T	S4C Set Screw for ø 3.5 and ø 4.0 mm polyaxial screws	24
SW015T	S4C Thin Lamina Hook, Left	2
SW017T	S4C Thick Lamina Hook, Left	2
SW025T	S4C Thin Lamina Hook, Right	2
SW027T	S4C Thick Lamina Hook, Right	2
FW038P	S4C Implant Tray with lid for Screws, Rods, Hooks	1
FW039P	Lid for FW038P	1

* Recommended container: Please refer to page 53

Aesculap® S4® Cervical System

12. Implants



12.2 Implant Sets

S4C Occiput / C1 Screw / Connector Set

Art. No.	Component	Set Proposal
SW202T	S4C Occiput Plate, Small 5-hole	1
SW203T	S4C Occiput Plate, Small 4-hole	1
SW204T	S4C Occiput Plate, Large 5-hole	1
SW205T	S4C Occiput Plate, Large 4-hole	1
SW126T	S4C Occiput Plate Screw ø 4.5 x 6 mm	6
SW127T	S4C Occiput Plate Screw ø 4.5 x 7 mm	4
SW128T	S4C Occiput Plate Screw ø 4.5 x 8 mm	6
SW129T	S4C Occiput Plate Screw ø 4.5 x 9 mm	4
SW130T	S4C Occiput Plate Screw ø 4.5 x 10 mm	6
SW131T	S4C Occiput Plate Screw ø 4.5 x 11 mm	6
SW132T	S4C Occiput Plate Screw ø 4.5 x 12 mm	6
SW133T	S4C Occiput Plate Screw ø 4.5 x 13 mm	3
SW134T	S4C Occiput Plate Screw ø 4.5 x 14 mm	3
SW135T	S4C Occiput Plate Screw ø 4.5 x 15 mm	3
SW136T	S4C Occiput Plate Screw ø 4.5 x 16 mm	3
SW206T	S4C Occiput Plate Screw ø 5.5 x 6 mm	3
SW207T	S4C Occiput Plate Screw ø 5.5 x 7 mm	2
SW208T	S4C Occiput Plate Screw ø 5.5 x 8 mm	3
SW209T	S4C Occiput Plate Screw ø 5.5 x 9 mm	2
SW210T	S4C Occiput Plate Screw ø 5.5 x 10 mm	3
SW211T	S4C Occiput Plate Screw ø 5.5 x 11 mm	3
SW212T	S4C Occiput Plate Screw ø 5.5 x 12 mm	3
SW213T	S4C Occiput Plate Screw ø 5.5 x 13 mm	2
SW214T	S4C Occiput Plate Screw ø 5.5 x 14 mm	2
SW215T	S4C Occiput Plate Screw ø 5.5 x 15 mm	2
SW216T	S4C Occiput Plate Screw ø 5.5 x 16 mm	2
SW200T	S4 Rod ø 3.5 x 240 mm prebent for occipital plate	4
SW061T	S4C Smooth Shank Screw ø 4.0 x 8 sm. sh. x 16 mm thread	2
SW062T	S4C Smooth Shank Screw ø 4.0 x 11 sm. sh. x 16 mm thread	2
SW063T	S4C Smooth Shank Screw ø 4.0 x 14 sm. sh. x 16 mm thread	2
SW066T	S4C Smooth Shank Screw ø 4.0 x 8 sm. sh. x 18 mm thread	2
SW067T	S4C Smooth Shank Screw ø 4.0 x 11 sm. sh. x 18 mm thread	2

Art. No.	Component	Set Proposal
SW068T	S⁴C Smooth Shank Screw ø 4.0 x 14 sm. sh. x 18 mm thread	2
SW069T	S⁴C Smooth Shank Screw ø 4.0 x 17 sm. sh. x 18 mm thread	2
SW071T	S⁴C Smooth Shank Screw ø 4.0 x 9 sm. sh. x 20 mm thread	2
SW072T	S⁴C Smooth Shank Screw ø 4.0 x 12 sm. sh. x 20 mm thread	2
SW073T	S⁴C Smooth Shank Screw ø 4.0 x 15 sm. sh. x 20 mm thread	2
SW074T	S⁴C Smooth Shank Screw ø 4.0 x 18 sm. sh. x 20 mm thread	2
SW076T	S⁴C Smooth Shank Screw ø 4.0 x 9 sm. sh. x 22 mm thread	2
SW077T	S⁴C Smooth Shank Screw ø 4.0 x 12 sm. sh. x 22 mm thread	2
SW078T	S⁴C Smooth Shank Screw ø 4.0 x 15 sm. sh. x 22 mm thread	2
SW081T	S⁴C Smooth Shank Screw ø 4.0 x 10 sm. sh. x 24 mm thread	2
SW082T	S⁴C Smooth Shank Screw ø 4.0 x 13 sm. sh. x 24 mm thread	2
SW083T	S⁴C Smooth Shank Screw ø 4.0 x 16 sm. sh. x 24 mm thread	2
SW086T	S⁴C Smooth Shank Screw ø 4.0 x 10 sm. sh. x 26 mm thread	2
SW087T	S⁴C Smooth Shank Screw ø 4.0 x 13 sm. sh. x 26 mm thread	2
SW088T	S⁴C Smooth Shank Screw ø 4.0 x 16 sm. sh. x 26 mm thread	2
SW112T	S⁴C Cross Connector Fixed 22 mm	1
SW113T	S⁴C Cross Connector Fixed 24 mm	1
SW114T	S⁴C Cross Connector Fixed 26 mm	1
SW115T	S⁴C Cross Connector Variable 28 - 33 mm	2
SW116T	S⁴C Cross Connector Variable 33 - 42 mm	2
SW117T	S⁴C Cross Connector Variable 42 - 58 mm	2
SW005T	S⁴C Lateral Offset Connector	4
SW007T	S⁴C Lateral Offset Connector, L-shaped, Left ø 7 mm	2
SW009T	S⁴C Lateral Offset Connector, L-shaped, Left ø 9 mm	2
SW011T	S⁴C Lateral Offset Connector, L-shaped, Left ø 11 mm	2
SW013T	S⁴C Lateral Offset Connector, L-shaped, Right ø 7 mm	2
SW019T	S⁴C Lateral Offset Connector, L-shaped, Right ø 9 mm	2
SW021T	S⁴C Lateral Offset Connector, L-shaped, Right ø 11 mm	2
SW110T	S⁴C Rod Connector, Parallel, ø 3.5 - ø 3.5 mm	2
SW111T	S⁴C Rod Connector, Parallel, ø 3.5 - ø 5.5 mm	2
SW049T	S⁴C Cable Connector, 90°	2
SW054T	S⁴C Cable Connector, Left 45°	2
SW056T	S⁴C Cable Connector, Right 45°	2
FW040P	S⁴C Implant Tray with lid for Occiput, C1 Screws, Connectors	1

* Recommended container: 1 x JK446 Container and 1 x JK489 corresponding lid (sufficient for two Implant trays; e.g. screw set and Occiput / C1 Screw / Connector Set together in one container).

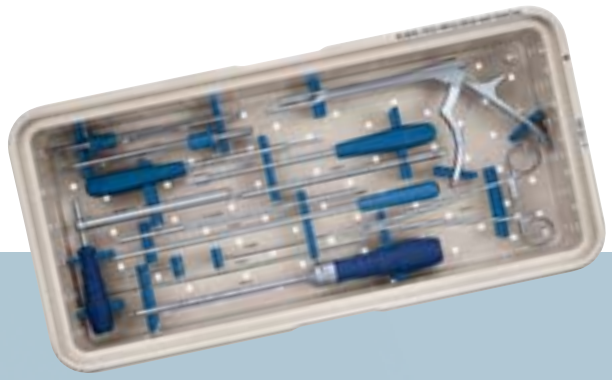
Aesculap® S4® Cervical System

13. Instruments

13.1 Bone Preparation

S4 C Tray I: Preparation / Application

	Art. No.	Component	Set Proposal
	FW165R	S4 C Ratchet Handle	2
	FW067R	S4 C Handle, Without Ratchet	1
	FW041R	S4 C Awl	1
	FW042R	S4 C Depth Gauge	1
	FW046R	S4 C Screw Tap, ø 3.5 mm	1
	FW047R	S4 C Screw Tap, ø 4.0 mm	1
	FW051SU	S4 C Drill, ø 2.4 mm	2
	FW052SU	S4 C Drill, ø 2.9 mm	2
	FW049R	S4 C Fixed Drill Guide, 14 mm	1
	FW053R	S4 C Variable Drill Guide	1
	FJ839R	ABC Twist Drill Handle	1
	FW044R	S4 C Sounder	1
	FW045R	S4 C Bone Probe	optional



13.2 Screw / Rod Application and Removal

S4C Tray I: Preparation / Application

	Art. No.	Component	Set Proposal
	FW070R	S4C Self Holding Polyaxial Screwdriver	2
	FW061R	S4C Torque Limiting Screwdriver	1
	FW062R	S4C Counter Torque Handle	1
	FW058R	S4C Set Screw Starter	1
	FW059R	S4C Double Ended Set Screw Starter	1
	FW064R	S4C Set Screw Removal Screwdriver	1
	FW076R	S4C Rod Holding Forceps	1
	FW065R	S4C Screw Body Manipulator	1
	FW077R	S4C Rod Persuader	1
	FW084R	S4C Rod Persuader	1
	FW078R FW080R	S4C Rod Template, 60 mm S4C Rod Template, 120 mm	1 1
	FW081R	S4C Rod Template, 290 mm	1
	FJ968R	Apfelbaum Ball End Screwdriver Short	1

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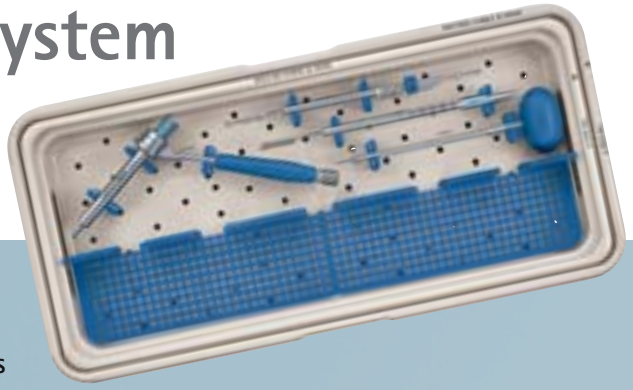

13.3 Smooth Shank Screws

S4 C Tray II: Smooth Shank / Favored Angle Screws

	Art. No.	Component	Set Proposal
	FW054R	S4 C Screw Starter Guide Tube	1
	FW085R	S4 C Smooth Shank Bone Awl	1
	FW086SU	S4 C Smooth Shank Screw Drill	1
	FW087R	S4 C Smooth Shank Screw Tap	1

13.4 Favored Angle Screws

S⁴C Tray II: Smooth Shank / Favored Angle Screws

	Art. No.	Component	Set Proposal
	FW066R	S⁴C Sleeve Guide with Inner Sleeve	1
	FW069R	S⁴C Favored Angle Screwdriver C1/C2	1
	FW089R	S⁴C Favored Angle Screw Tap, ø 4.0 mm	1
	FW088SU	S⁴C Favored Angle Screw Drill (2.9 mm Long Drill)	1
	FJ988R	Apfelbaum Ball End Screwdriver	1
	FJ983R	Apfelbaum C1/C2 Obturator	1
	FJ984R	Apfelbaum Trocar	1
	FJ985R	Apfelbaum Inner Sleeve Guide	1

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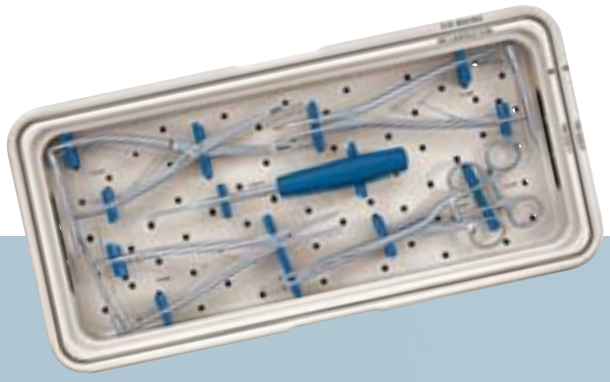
13.5 Rod Bending

S4 C Tray III: Rod Bending / Reconstruction

	Art. No.	Component	Set Proposal
	FW037R	S4 C Rod Bending Forceps	1
	FW074R	S4 C In-Situ Bender, Right	1
	FW073R	S4 C In-Situ Bender, Left	1
	FW036R	S4 C Pair of Rod Bender Plates, ø 3.5 mm	1
	FW082R	Rod Cutter	1

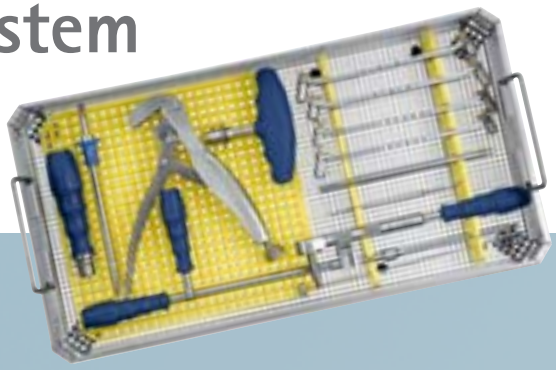


13.6 Reconstruction

S4C Tray III: Rod Bending / Reconstruction

	Art. No.	Component	Set Proposal
	FW071R	S4C Lamina Preparator	1
	FW422R	Cervical Counter Hook Holding Forceps, Straight	1
	FW528R	Cervical Counter Hook Holding Forceps, Curved	1
	FW523R	Cervical Distraction Forceps, Straight	1
	FW428R	Cervical Distraction Forceps, Curved	1
	FW427R	Cervical Compression Forceps	1

Aesculap® S4® Cervical System

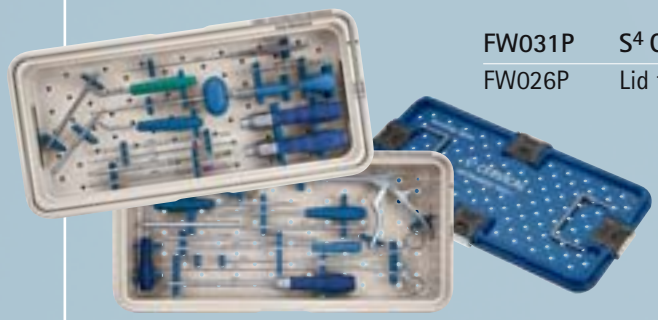


13.7 Occiput Instruments

S4 C Tray IV: Occiput Instruments

	Art. No.	Component	Set Proposal
	FW213R	S4 Screwdriver	1
	FW090R	S4 C Occipital Plate Bending Pliers	1
	FW091SU	S4 C Occipital Drill Bit, ø 2.9 mm	1
	FW092SU	S4 C Occipital Drill Bit, ø 3.9 mm	1
	FW093R	S4 C Occipital Tap, ø 4.5 mm	1
	FW094R	S4 C Occipital Tap, ø 5.5 mm	1
	FW095R FW096R	S4 C Occipital Drill Guide Double Ended, ø 4.5 mm S4 C Occipital Drill Guide Double Ended, ø 5.5 mm	1 1
	FW097R FW098R	S4 C Occipital Tap Guide Double Ended, ø 4.5 mm S4 C Occipital Tap Guide Double Ended, ø 5.5 mm	1 1
	FW099R	S4 C Occipital Screw Remover	1
	FW101R	S4 C Shaft for Occipital Screw Remover	1
	FW116R	S4 C Occiput T-handle for screw removal	1
	FW103R	S4 C Occipital Torque Wrench	1
	FW104R	S4 C Occipital Counter Torque Handle	1

13.8 Trays



Art. No.	Component	Set Proposal
FW031P	**S4 C Instrument Tray I: Preparation / Application**	**1**
FW026P	Lid for FW031P	1

FW032P	**S4 C Instrument Tray II: Smooth Shank / Favored Angle Screws**	**1**
FW028P	Lid for FW032P	1

FW033P	**S4 C Instrument Tray III: Rod Bending / Reconstruction**	**1**
FW029P	Lid for FW033P	1

	S4 C Instrument Tray IV: Occiput Instruments	
JF223R	Aesculap Standard metal tray	1
JF227R	Lid for tray	1
JG310	Inlays (Yellow 240 x 40 mm)	2
JF945	Mattress (Yellow 248 x 237 mm)	1
JG300	Plastic Fixation Pins (10 per pack, black)	1

* Recommended containers: 2 x JK446 Container and 2 x JK489 corresponding lids (each for two instrument trays; e.g. tray I and II / tray III and IV together in one container)

Aesculap® S4® Cervical System

14. S4®C Construct Overview

1. Occiput Plate
2. Pre-Bent-Rod
3. Smooth Shank Screw
4. Favored Angle Screw
5. L-shaped Offset Connector
6. Hook
7. Cross Connector
8. Offset Connector
9. Rod-to-Rod Connector
10. S^4 Cervical Polyaxial Screw
11. S^4 Thoracolumbar Screw
12. Dual Diameter Rod

Aesculap AG | Am Aesculap-Platz | 78532 Tuttlingen | Germany
Phone +49 7461 95-0 | Fax +49 7461 95-26 00 | www.aesculap.com

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