

Side-opening screws and hooks for thoracolumbar spine

# USS™ Universal Spine System

Surgical Technique



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 Image intensifier control

This description alone does not provide sufficient background for direct use of DePuy Synthes products. Instruction by a surgeon experienced in handling these products is highly recommended.

**Processing, Reprocessing, Care and Maintenance**

For general guidelines, function control and dismantling of multi-part instruments, as well as processing guidelines for implants, please contact your local sales representative or refer to:

<http://emea.depuyshthes.com/hcp/reprocessing-care-maintenance>

For general information about reprocessing, care and maintenance of Synthes reusable devices, instrument trays and cases, as well as processing of Synthes non-sterile implants, please consult the Important Information leaflet (SE\_023827) or refer to:

<http://emea.depuyshthes.com/hcp/reprocessing-care-maintenance>

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For product catalog contact your local DePuy Synthes representative.

# AO Spine Principles

The four principles to be considered as the foundation for proper spine patient management underpin the design and delivery of the Curriculum: Stability – Alignment – Biology – Function.<sup>1,2</sup>

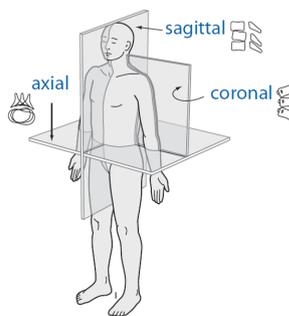
## Stability

Stabilization to achieve a specific therapeutic outcome



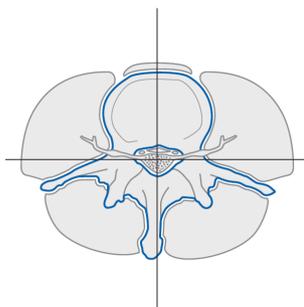
## Alignment

Balancing the spine in three dimensions



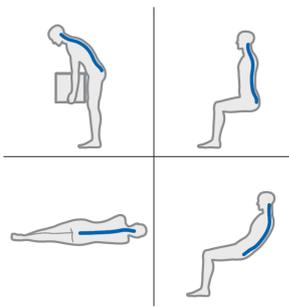
## Biology

Etiology, pathogenesis, neural protection, and tissue healing



## Function

Preservations and restoration of function to prevent disability



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# Picking up implants

The side-opening pedicle screws have the same head as the hooks. Therefore, the following handling instructions apply to both pedicle screws and hooks (called side-opening implants in the following).

## 1. Attach handle to stick

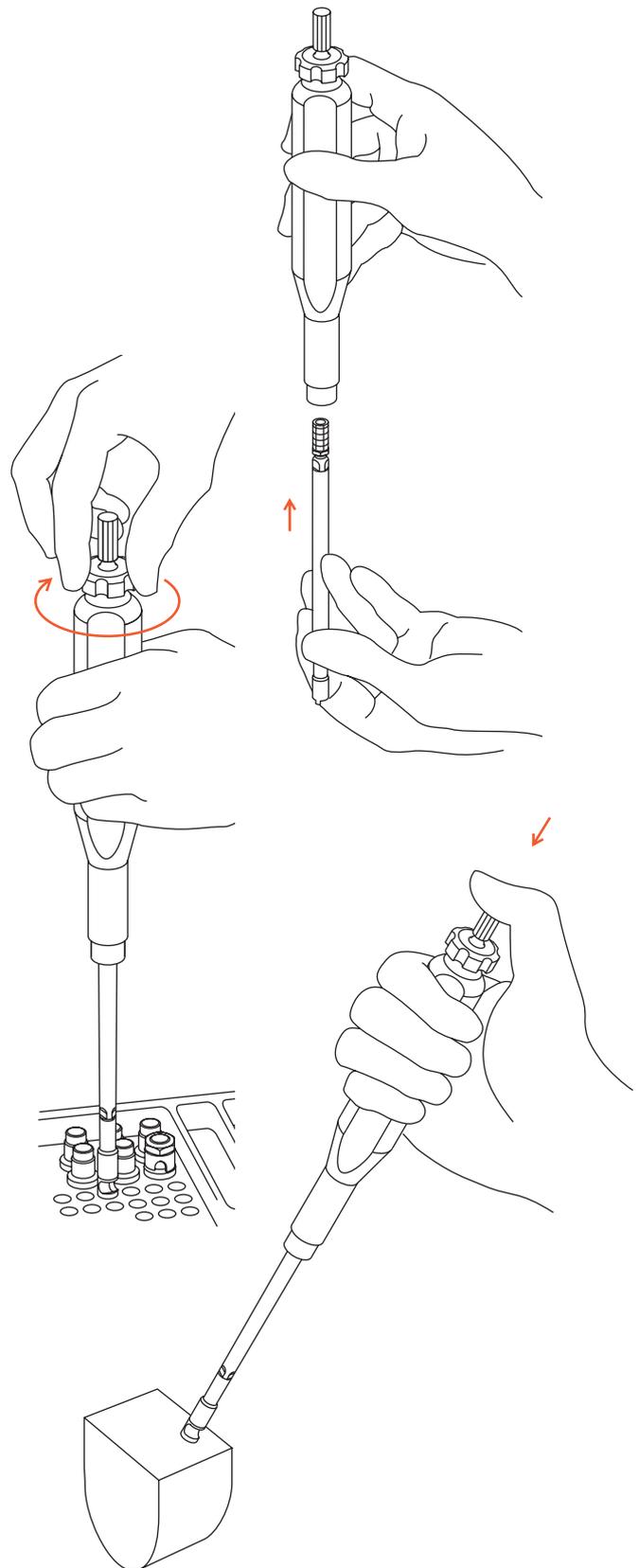
Attach the USS Handle (388.640) to the Hook and Screw Holder, the "stick" (388.610).

## 2. Pick up implant

Connect the side-opening implant to the stick by rotating the cog-wheel of the handle.

## 3. Release handle from stick

Insert the implant. To release the handle from the stick, press the release mechanism on top of the handle.



# Pedicle screw positioning (posterior instrumentation)

## 1. Open pedicle and determine screw length

Use the Pedicle Awl (1) (388.550) to open the cortex of the pedicle to a depth of 10 mm. Continue opening the pedicle using the USS Pedicle Probe  $\varnothing$  3.8 mm (2) (388.540) with markings at 30, 40 and 50 mm.

Determine the length of the pedicle screw using the Depth Gauge for Screws (319.100).

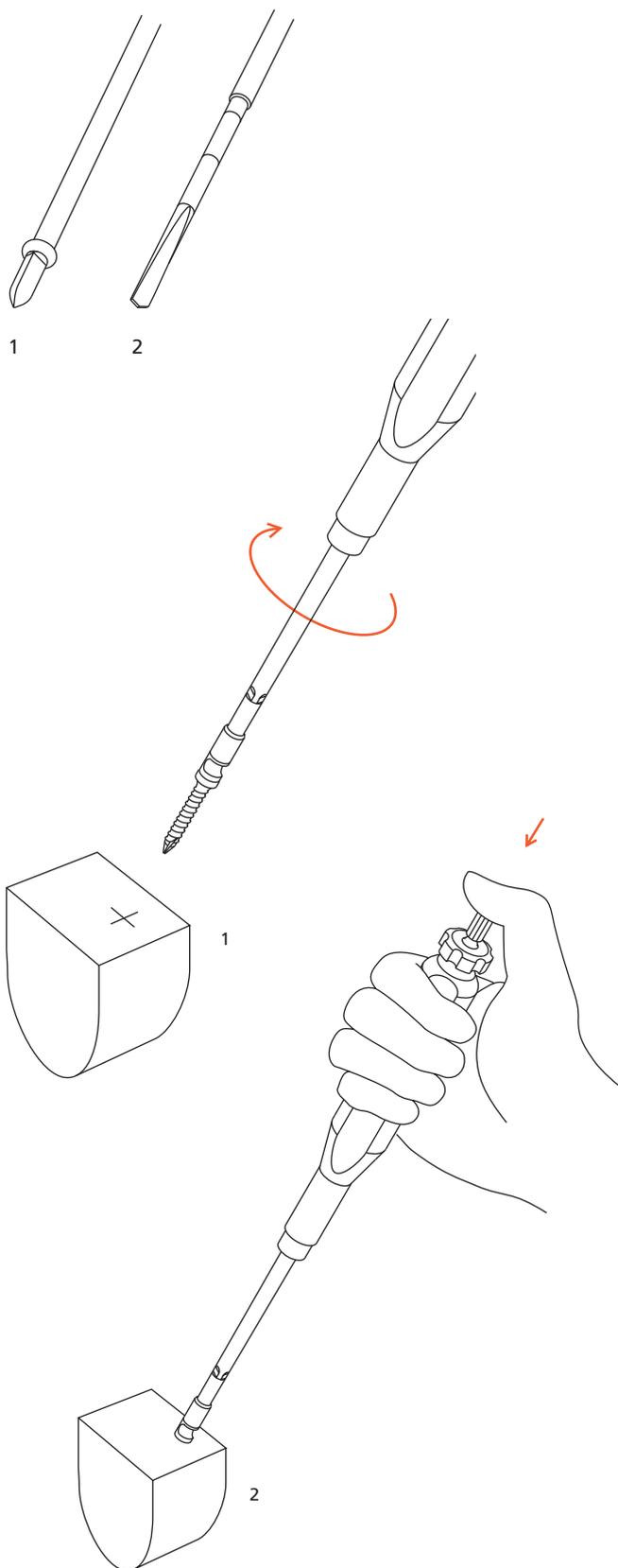
**Note:** For  $\varnothing$  4.0 mm or  $\varnothing$  5.0 mm pedicle screws use the Pedicle Probe  $\varnothing$  2.8 mm (388.538).

## 2. Insert pedicle screw into pedicle

Pick up a side-opening pedicle screw as described on page 3.

**Note:** If a rod connector is needed, align the screw head by turning it 90°. The opening has to be perpendicular to the rod.

Insert the pedicle screw into the prepared pedicle until the screw head is well seated (1). To disassemble the stick from the handle press the button on the handle (2).



# Pedicle screw positioning with washers (anterior instrumentation only)

Flat (1) and angled (2) washers can be used with anterior fixation constructs to distribute the force of the screw over the bone. The angled washers form a fixed angle with the screw.

## 1. Open pedicle and determine screw length

Determine the entry point for the screw, preferably at the junction of the pedicle and the vertebral body.

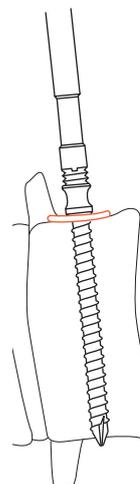
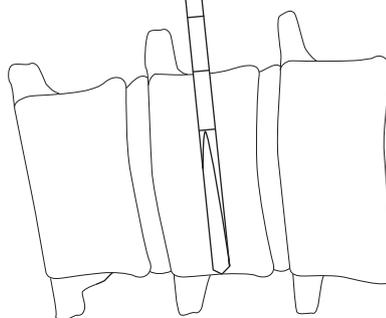
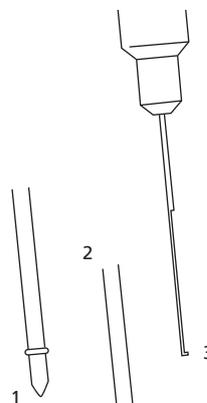
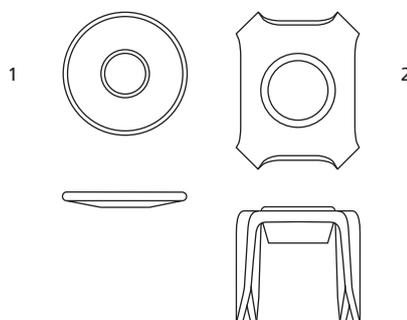
Use the Pedicle Awl (1) (388.550) to prepare the screw hole, directing it perpendicularly to the contralateral side. Enlarge the screw hole using the USS Pedicle Probe (2) (388.540), until it penetrates the contralateral cortex.

Determine the length of the pedicle screw using the Depth Gauge for Screws (3) (319.100). The actual length of the screw is chosen 5 mm longer than measured in order to enable the positioning of a washer.

## 2a. Insert screw and flat washer

Place flat washers with the convex side down onto the concavity of the vertebral body.

Pick up a side-opening pedicle screw as described on page 3. Insert the pedicle screw into the prepared vertebral body until the screw head is well seated. To disassemble the stick from the handle press the button on the handle.



## 2b. Insert angled washer

### a. Pick up screw and washer

Slide an appropriate-size pedicle screw into a washer and pick it up with a stick. Insert the screw until the washer slightly touches the bone surface.

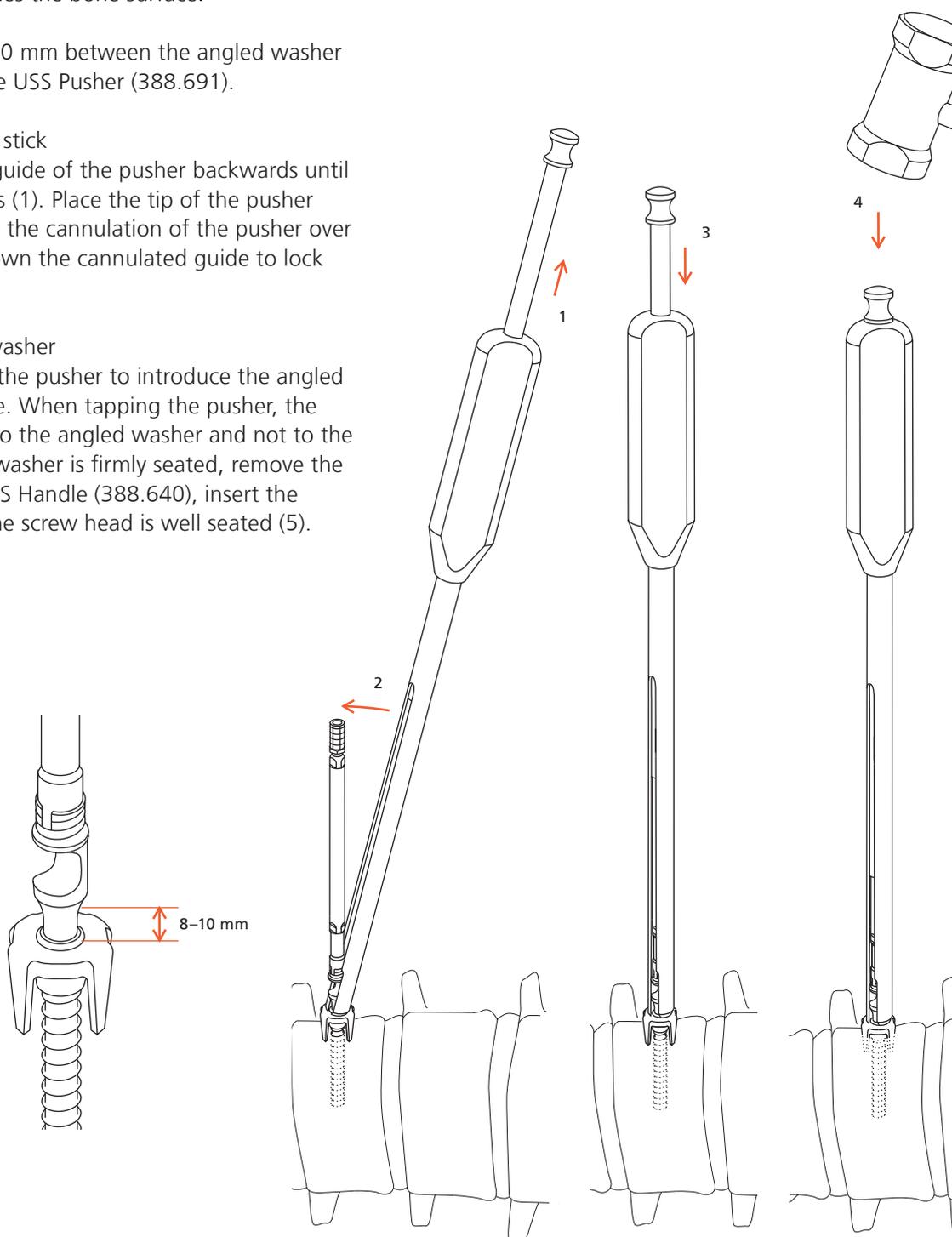
Leave a space of 8–10 mm between the angled washer and the screw for the USS Pusher (388.691).

### b. Place pusher onto stick

Pull the cannulated guide of the pusher backwards until the ringmark appears (1). Place the tip of the pusher onto the washer and the cannulation of the pusher over the stick (2). Push down the cannulated guide to lock the stick in place (3).

### c. Insert screw and washer

Tap onto the end of the pusher to introduce the angled washer into the bone. When tapping the pusher, the force is transmitted to the angled washer and not to the screw (4). Once the washer is firmly seated, remove the pusher. Using the USS Handle (388.640), insert the screw further until the screw head is well seated (5).



# Pedicle hook positioning

The USS Pedicle Hooks can be anchored in the pedicle with a single  $\varnothing$  3.2 mm USS Screw for Pedicle Hook.

## 1. Prepare seat for pedicle hook

Prepare the pedicle using the Pedicle Feeler (1) (388.510). Place the pedicle feeler between the inferior and superior facet joints.

**Precaution:** Make sure to place it in the articular space and not into the bone of the inferior facet.

To facilitate the insertion of the pedicle feeler, a small portion of the inferior facet is removed with an osteotome (2). The pedicle feeler has six lines on the blade. When the last line is reached, sufficient bone has been removed to accommodate the hook around the pedicle.

Check the optimal position of the pedicle feeler by moving it laterally and cranially (3).

**Precaution:** Do not push medially.

Remove the pedicle feeler.

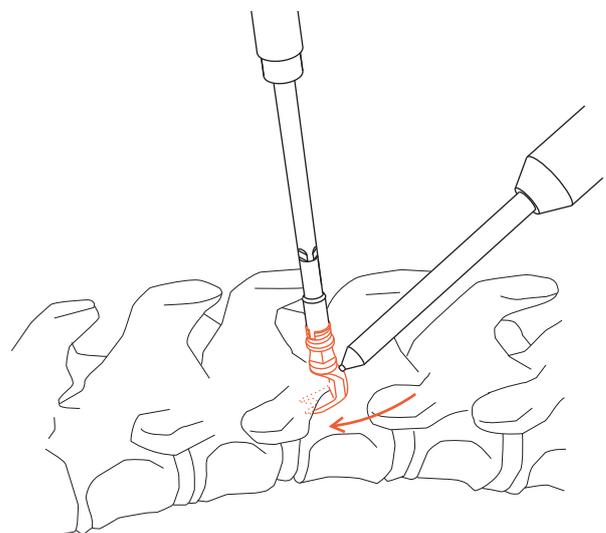
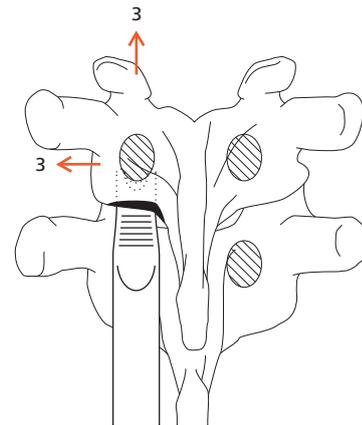
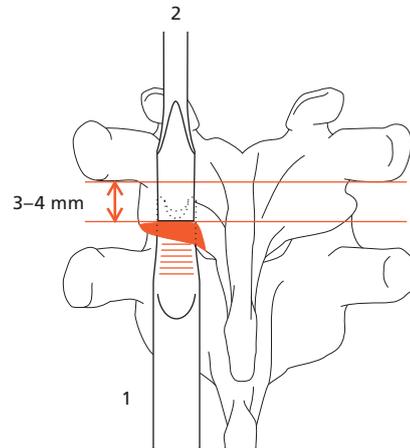
## 2. Position pedicle hook

Pick up a pedicle hook from the tray with the hook and screw holder as described on page 3.

**Note:** Use a front-opening hook if a rod connector is needed.

Insert the USS Hook Positioner (388.630) into the screw hole of the hook and ease the pedicle hook into the previously prepared seat. Check if the pedicle hook is snug around the pedicle by axial loading of the hook positioner and also by pushing laterally. The pedicle hook should not move. Gently tap the hook positioner with a hammer to firmly seat the hook.

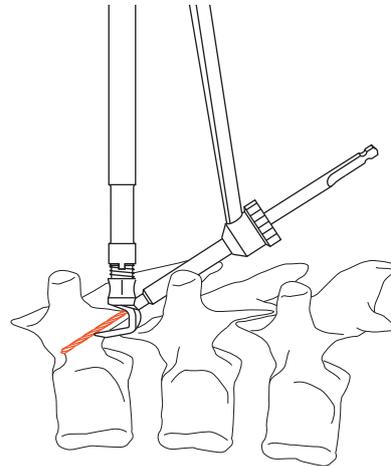
Remove the hook positioner and the USS handle. The stick remains attached to the hook.



### 3. Drill hole for Ø 3.2 mm screw

To anchor the pedicle hook to the pedicle screw, a Ø 3.2 mm cortical screw can be inserted through the hole at the back of the pedicle hook.

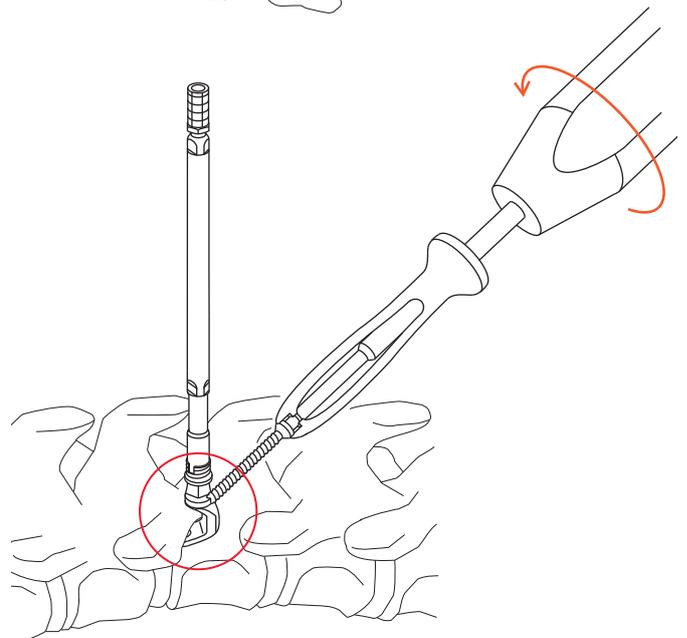
Use a three-fluted drill bit Ø 2.0 mm (315.190) together with the USS drill sleeve 2.0 and an oscillating drill to drill the screw hole. The drill sleeve consists of two components, the drill sleeve (388.581) and the handle (387.060). These two components must be screwed together before use. Advance the tip of the drill until it passes through the vertebral endplate.



**Warning:** Do not start the power drill if the drill does not hit bone after passing through the drill sleeve.

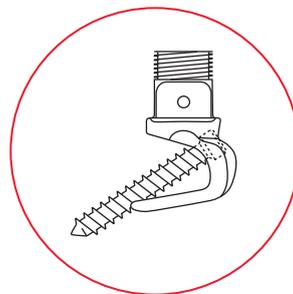
### 4. Determine screw length

Remove the drill sleeve and determine the depth with the Depth Gauge for Screws Ø 1.5 to 2.0 mm (319.060).



### 5. Insert Ø 3.2 mm screw

Pick up an appropriate length USS Screw for Pedicle Hooks using the Holding Sleeve (314.060) using the Holding Sleeve (314.060) and Screwdriver (314.070) and insert it into the previously prepared drill hole. The pedicle hook is now attached to the pedicle and the endplate.

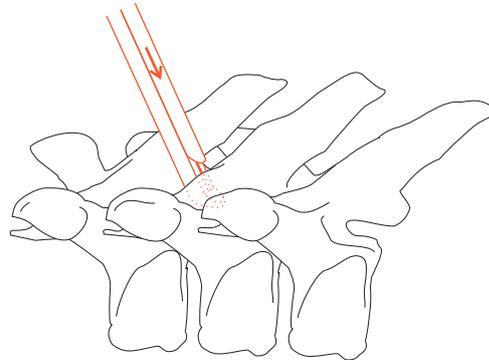


# Lamina hook positioning

## 1. Prepare seat for lamina hook

The lamina hook can be placed around either the superior or inferior portion of the lamina. Prepare the seat for the lamina hook using the Lamina Feeler (388.520). To ensure a good seating of the hook, carefully remove the ligamentum flavum and a small portion of the lamina with a rongeur.

Remove the lamina feeler.



## 2. Position lamina hook

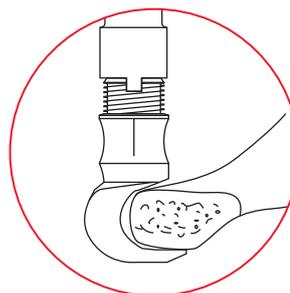
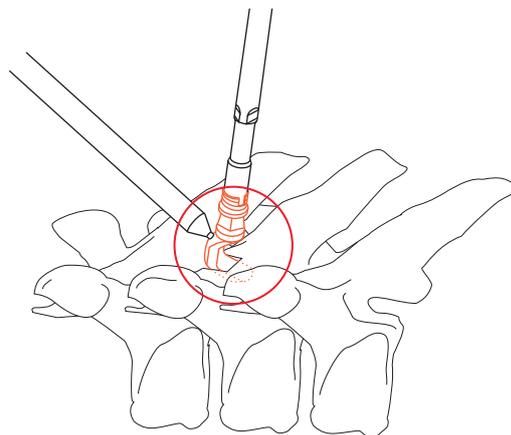
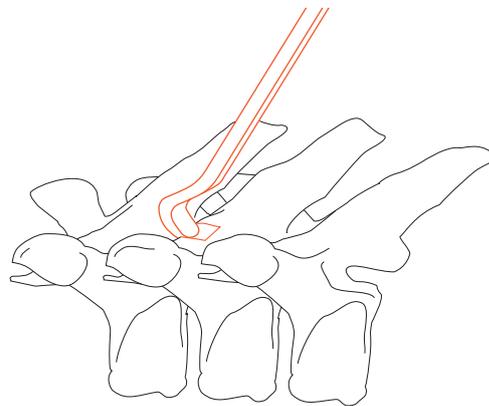
Pick up an appropriate-size lamina hook from the tray with the hook and screw holder as described on page 6.

**Note:** Use a front-opening hook if a rod connector is needed.

Insert the Hook Positioner (388.630) into the screw hole of the hook and ease the lamina hook into the previously prepared seat. The inferior part of the lamina hook must fit snugly to the lamina.

**Warning:** Make sure the foot of the lamina hook does not lie too deep or presses upon the spinal cord.

Remove the hook positioner and the handle. The stick remains attached to the hook.



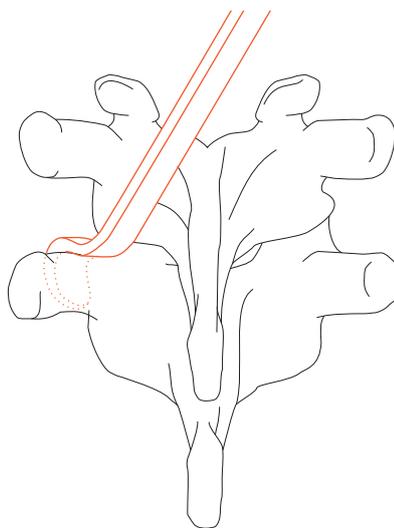
# Angled lamina hook positioning

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## 1. Prepare seat for angled lamina hook

Remove the soft tissue of the transverse process. Place the lamina feeler (388.520) around the transverse process elevating the soft tissue attachment from the anterior portion of the transverse process.

Remove the lamina feeler.



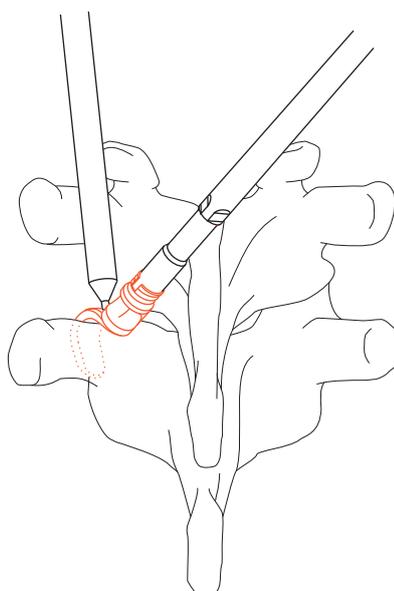
## 2. Position angled lamina hook

Pick up an appropriate-size angled lamina hook from the tray with the hook and screw holder as described on page 3.

**Note:** Use a front-opening hook if a rod connector is needed.

Insert the Hook Positioner (388.630) into the screw hole of the hook and ease the angled lamina hook into the previously prepared seat.

Remove the hook positioner and the handle. The stick remains attached to the hook.



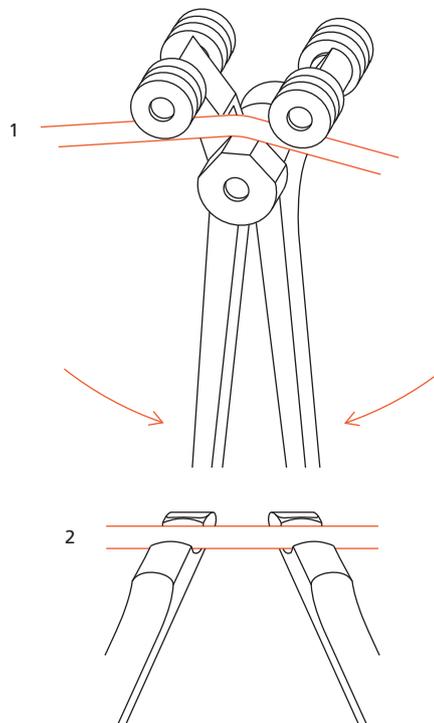
# Rod contouring

Use the Rod Template for USS Rods  $\varnothing$  6.0 mm (388.870/880) to determine the proper rod contour and length.

Contour the rod using either the Bending Pliers with Rolls (1) (388.960) or the USS Bending Irons (2) (388.910 left, and 388.920 right).

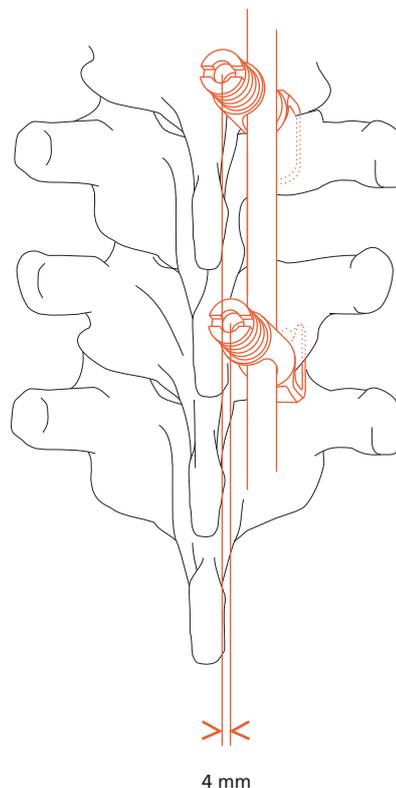
**Warning:** Do not bend titanium rods backwards and do not bend rods more than  $45^\circ$ .

If necessary, the construct can be extended by connecting two rods with a parallel or extension connector.



## Note: Hook/screw offset.

Anatomical conditions sometimes result in the implants not being aligned in a straight line. The screws and hooks have a 4-mm offset. If the implants are not aligned during rod insertion it may be necessary to rotate the screw by 180 degrees or choose a different hook (i.e. left or right side opening).



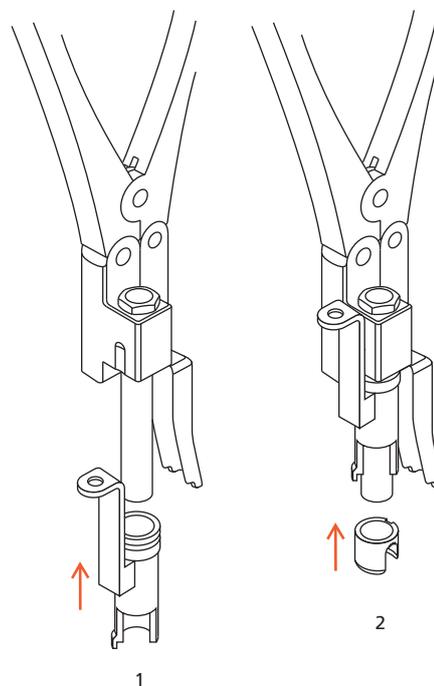
# Introducing rods into side-opening implants

## Using USS rod introduction pliers, “persuader”

It is sometimes not possible to easily introduce a rod into a side-opening implant as a result of the distance between the rod and the side-opening implant. When using the Rod Introduction Pliers (388.500), the persuader, the side-opening implant can be lifted and pulled towards the rod.

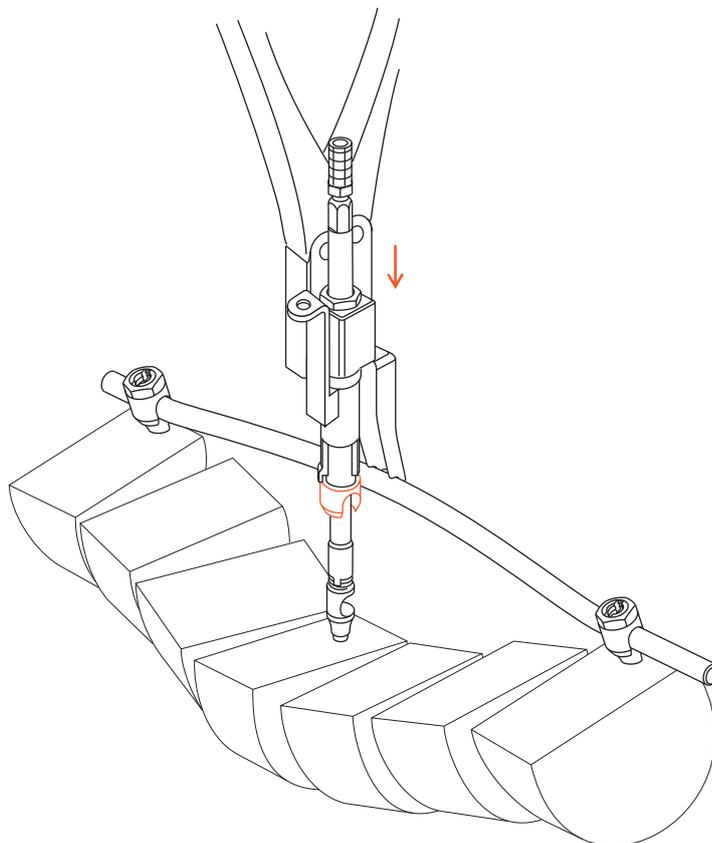
### 1. Mount sleeve pusher onto persuader

Place the Sleeve Pusher (388.502) onto the cylinder of the persuader (1). Place a sleeve onto the cylinder so that the short leg of the sleeve faces in direction of the rod (2).



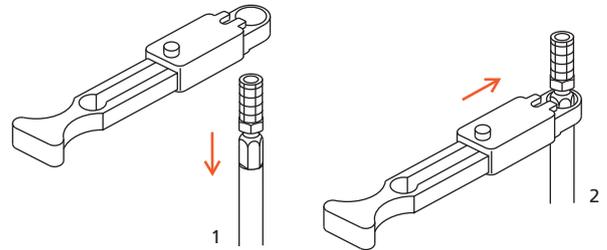
### 2. Place persuader onto implants

Slide the cylinder of the persuader over the hook and screw holder and the limb of the pliers on the rod.



### 3. Attach support for rod introduction pliers

Slide the Support for Rod Introduction Pliers (388.501) over the protruding end of the stick (1) and click the stopping lever into place (2). The support for rod introduction pliers is used to prevent rotation of the side-opening implant.



**Note:** Alternatively, the Holding Forceps (388.440) can be used.

### 4. Bring rod towards side-opening implant

Gently close the persuader to bring the side-opening implant towards the rod.

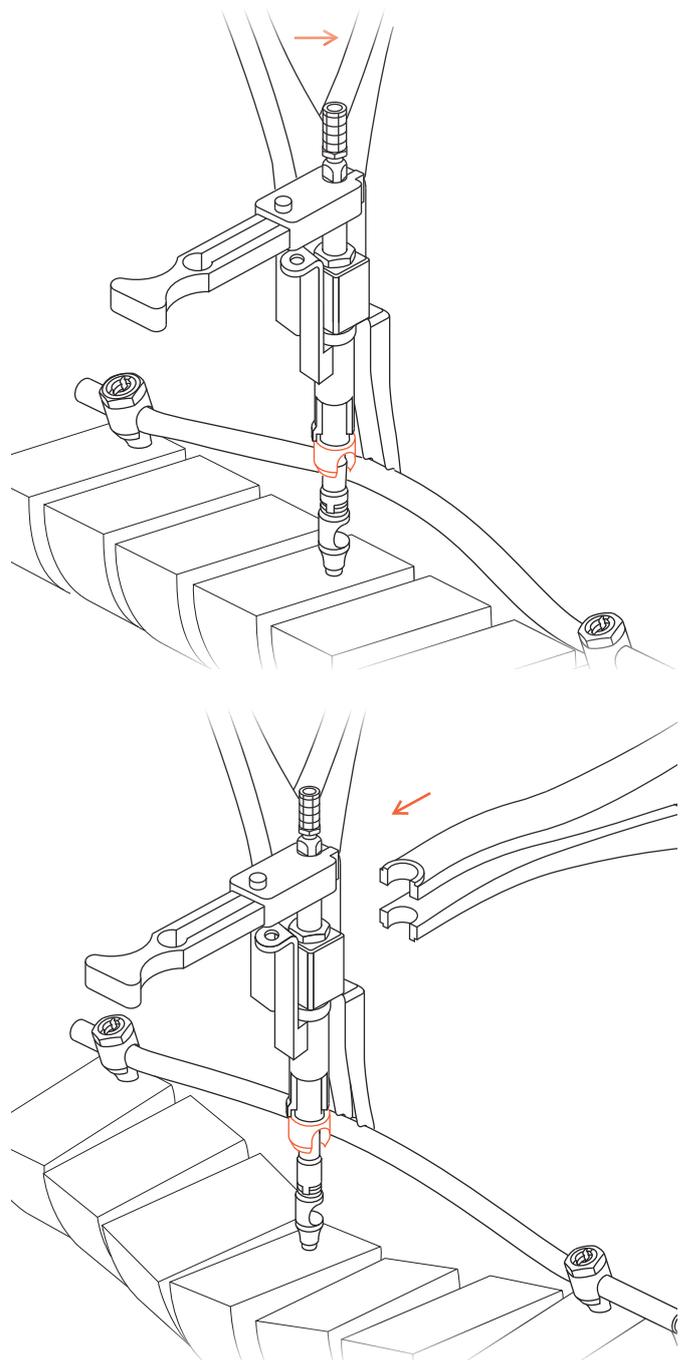
**Precaution:** Do not completely close the persuader, as this is a very powerful instrument.

### 5. Lift implant up towards rod

Place the Spreader Forceps (388.410) between the support for rod introduction pliers and the cylinder. Slowly open the spreader to bring the implant up towards the rod. When the opening of the implant is opposite the rod, close the persuader to engage the rod.

**Warning:** Do not apply too much force on the anchorage, it will tear out of the bone.

Remove the support for rod introduction pliers.



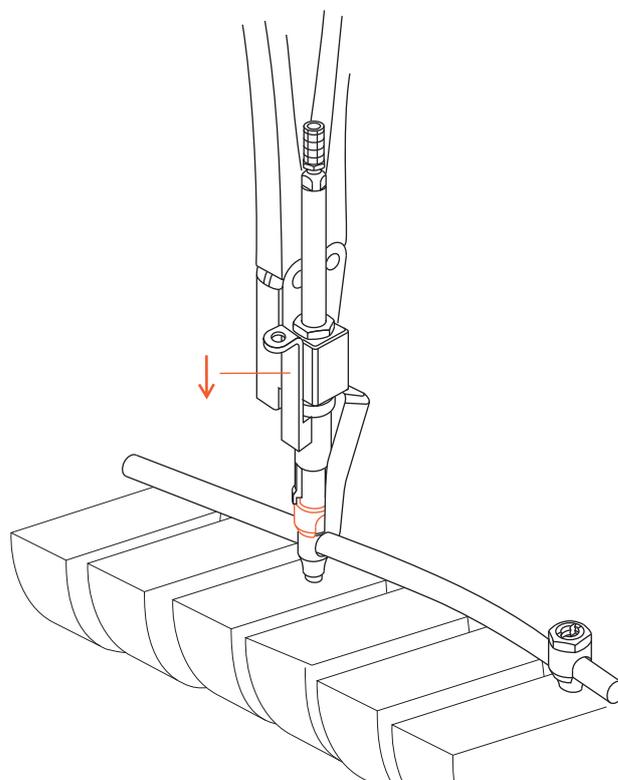
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## 6. Place sleeve over implant and rod

Push the sleeve pusher down the cylinder and place the sleeve over the rod and implant.

## 7. Place sleeve using rod pusher (optional)

If the sleeve cannot be engaged, place the Rod Pusher (388.940) onto the sleeve and gently tap the sleeve into place.



## 8. Attach rod to implant

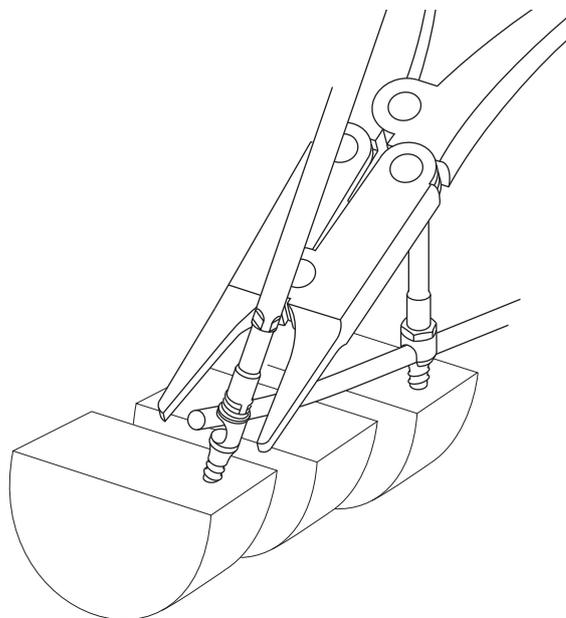
Remove the persuader. Pick up a nut, drop it over the stick and attach it loosely to the implant.

### Alternative

#### Using rod crimping pliers

Use the Rod Crimping Pliers (380.490) to ease the rod into the side-opening implants.

Pick up a sleeve and nut with the USS Handle (388.640) as described on page 16 and drop them over the construct.



# Distraction or compression of adjacent implants

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## Using the spreader or compression forceps

Once the rod has been introduced and loosely attached to the implant, carry out distraction or compression if necessary.

Before tightening the nut of the implant, use the Spreader Forceps (388.410) for distraction or the Compression Forceps (388.422) for compression.

## Using the fixation ring (optional)

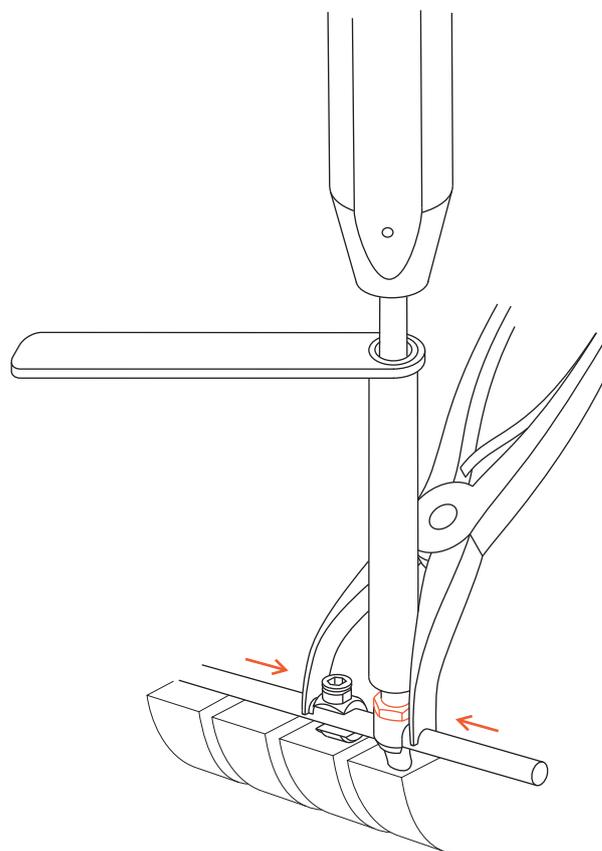
If the two implants are placed too far from each other, use the Fixation Ring (498.911). Place the small hexagonal screwdriver (314.070) with the Holding Sleeve (388.363) onto the fixation ring and place it next to the screw. During this procedure, the screw-to-rod connection has to be loose. Carry out distraction or compression.

Remove the fixation ring and tighten the nut of the implant.

## Alternative

### Using the holding forceps for rods

Instead of using the fixation ring, place the Holding Forceps for Rods (388.440) next to a screw and carry out distraction or compression.



# Locking side-opening implants to a rod

The Ø 6.0 mm rod is held in place with a sleeve and nut. If the sleeve has not been placed while introducing the rod into the implant using the persuader as described on page 14, proceed as follows:

## 1. Pick up sleeve and nut

Pick up a sleeve and a nut with the USS Handle (388.640).

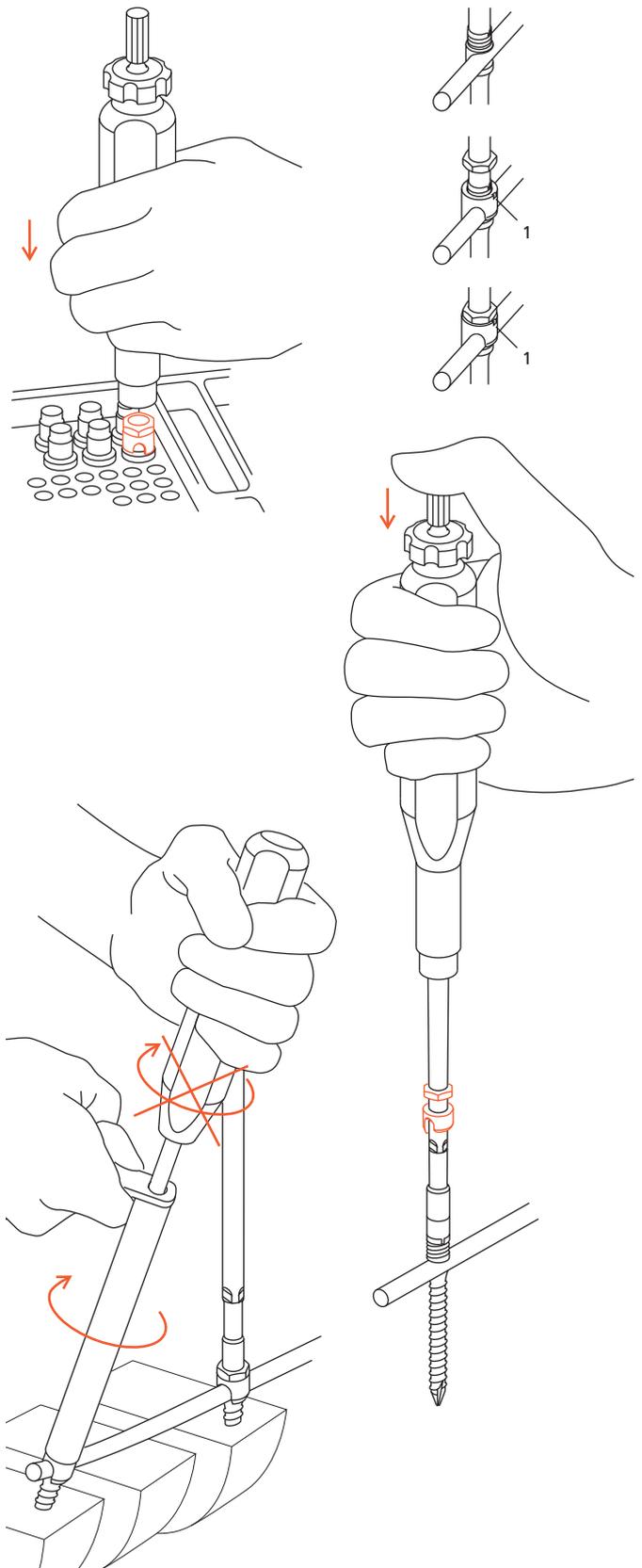
## 2. Place sleeve and nut over implant

Place the handle over the stick and press the top of the handle to release the sleeve and nut.

The sleeve has a long and a short leg. The short leg slides over the open side of the implant and has a small mark on the top for identification (1).

## 3. Tighten nut

Tighten the construction with the nut using the Socket Wrench 11.0 mm with L-Handle (388.130). Use the Socket Wrench 6.0 mm (388.140) mounted on the stick to counteract torque.



# Connecting a rod to an implant with closed rod connectors

Rod connectors can be used to bridge distances between rod and implant. When using rod connectors, frontal opening hooks must be used or the pedicle screw turned by 90°. Rod connector bars are introduced into the implant at a right angle to the rod.

Closed rod connectors can be used at either end of the USS construct. They can be added at the end of a procedure.

## 1. Select closed rod connector

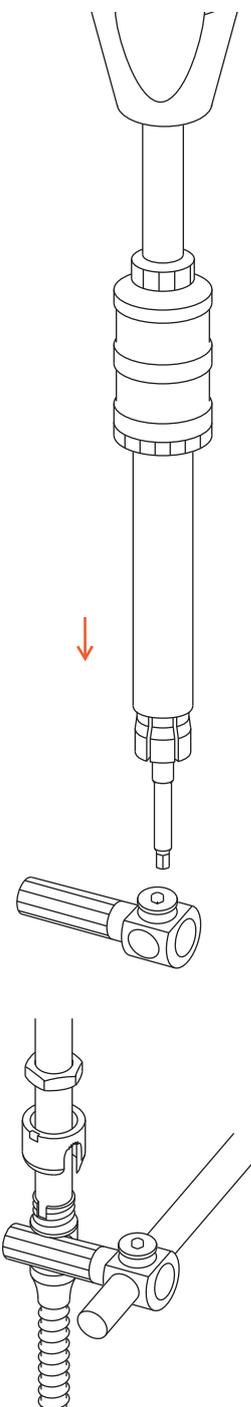
Select the appropriate length of the closed rod connector bar. Introduce the small Hexagonal Screwdriver (314.070) and the USS Holding Sleeve (388.360) into the set screw of the rod connector clamp.

## 2. Place rod connector onto rod and into implant

Slide the closed rod connector onto the rod and introduce the rod connector bar into the front-opening hook or screw. If necessary, use the Rod Crimping Pliers (388.490) or the persuader (Rod Introduction Pliers, 388.500) as described on pages 12–14.

## 3. Secure rod connector

Tighten the set screw of the rod connector clamp. Place the sleeve and nut onto the side-opening implant and tighten it using the Socket Wrench 11.0 mm with L-Handle (388.130) and the Socket Wrench 6.0 mm (388.140) mounted on the stick to counteract torque.

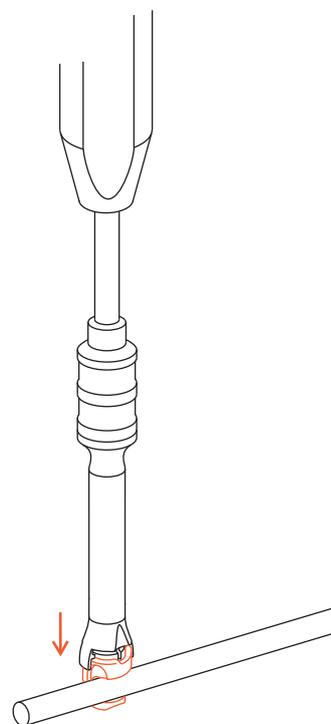


# Connecting two rods with cross-link clamps

Cross-link clamps are designed to connect the two longitudinal rods.

## 1. Mount first cross-link clamp

Assemble the small Hexagonal Screwdriver (314.070) and the Holding Sleeve with Catches (388.363). Pull back the holding sleeve. To pick up the Pre-assembled Cross-link Clamp, insert the hexagonal screwdriver into the set screw of the clamp, push down the holding sleeve and clip the catches onto the sleeve of the pre-assembled clamp. Pull the holding sleeve back slightly, place the clamp onto the rod and release the holding sleeve.

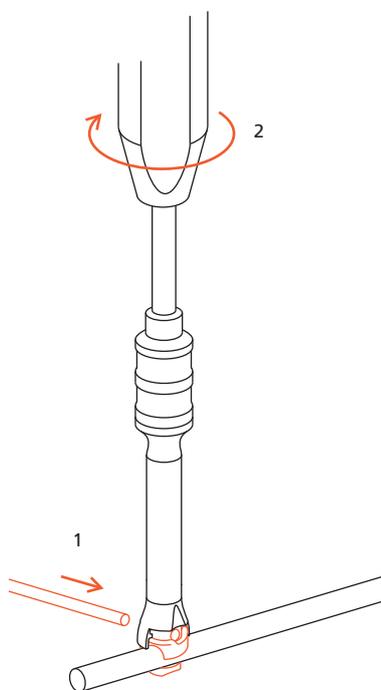


## 2. Introduce cross-link rod

The design of the cross-link sleeve with its two recesses on top allows the cross-link rod to be angled up to  $\pm 20^\circ$  as necessary.

Determine the appropriate length of the  $\varnothing 3.5$  mm cross-link rod. If necessary, cut to length using the USS Rod Cutting and Bending Device (388.750).

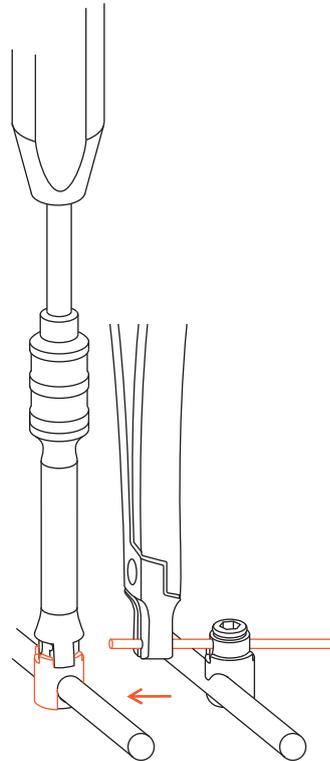
Hold the clamp with the small hexagonal screwdriver and introduce the  $\varnothing 3.5$  mm cross-link rod through the hole in the cross-link clamp (1). If necessary, use the Holding Forceps (388.450) to introduce the cross-link rod. Tighten the set screw of the cross-link clamp with the small hexagonal screwdriver (2).



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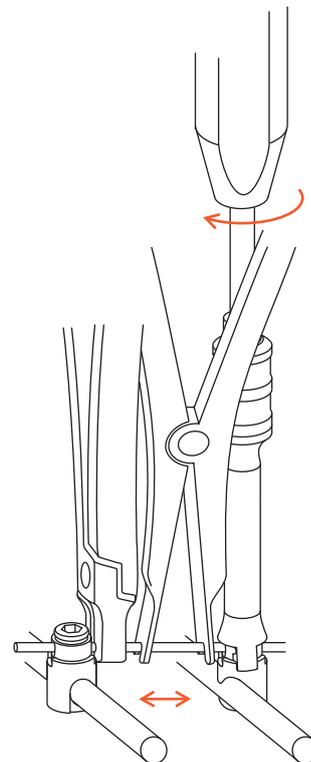
### 3. Mount second cross-link clamp

Repeat the procedure of step 1 for the second clamp on the opposite rod. Introduce the  $\varnothing$  3.5 mm cross-link rod through the second clamp, so that it protrudes by 0.5 cm beyond the clamp. Tighten the set screw with the small hexagonal screwdriver.



### 4. Distract cross-link assembly (optional)

Loosen one of the set screws. Place the Holding Forceps (388.450) next to the clamp and use the Spreader Forceps (388.410) to apply distraction. Tighten the set screw of the clamp with the small hexagonal screwdriver.



# Indications and Contraindications

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Please refer to the corresponding Instructions for Use for specific information on Intended use, Indications, Contraindications, Warnings and Precautions, Potential Adverse Events, Undesirable Side Effects and Residual Risks. Instructions for Use are available at [www.e-ifu.com](http://www.e-ifu.com) and/or [www.depuysynthes.com/ifu](http://www.depuysynthes.com/ifu).

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1. Aebi M, JS Thalgott, JK Webb. (1998). AO ASIF Principles in Spine Surgery. Berlin: Springer-Verlag.
2. Aebi M, Arlet V, Webb JK (2007). AOSPINE Manual (2 vols), Stuttgart, New York: Thieme.
3. Modular Stabilization System: The Universal Spine System, in Aebi M, Thalgott JS, Webb JK (1998) AO ASIF Principles in Spine Surgery. Springer Berlin, Heidelberg. This chapter provides additional background and details on the USS system.

