USS Small Stature/Pediatric.
A multifaceted deformity system for use in patients of small stature.
Warning
This description alone does not provide sufficient background for direct use of the instrument set. Instruction by a surgeon experienced in handling these instruments is highly recommended.

Note: For correction of scoliosis with the USS Universal Spine System, the segmental correction approach can be used as well as the classic de-rotation method using the Cotrel-Dubousset technique.

Reprocessing, Care and Maintenance of Synthes Instruments
For general guidelines, function control and dismantling of multi-part instruments, please refer to: www.synthes.com/reprocessing
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System Description and Indications

This is a surgical technique for instruments and implants. The USS Small Stature/Pediatric System is a development of the Synthes System, "USS Universal Spine System, Pedicle Screws and Hooks with a Lateral Opening." It was developed specially for children and adults of small stature.

User-friendly implant design protective of soft-tissue
- Low, soft-tissue protecting profile
- 5 mm diameter rods

Pedicle screws and hooks
- Dual-opening screws and hooks
  - Simplify the controlled joining of rod and implant using the “Persuader”
  - More flexibility since the rod can be affixed to both sides of the implant
- Double thread which runs to the tip
  - Fast insertion of the pedicle screws
  - Screw immediately engages in the bone
- Rounded tip of the screw also makes it suitable for anterior fixation
- Reliable anchoring of the pedicle hooks with a patented screwing technique

Proven corrective technique
- In the correction of a side deformity, the rod can be gently inserted laterally into the screw or hook openings.

Indications (in children and adults of small stature)
- Spinal column deformities
  (congenital, idiopathic, neuromuscular)
- Tumors
- Fractures

Note: In comparison to the USS with 6 mm diameter rods, the mechanical strength of the USS Small Stature/Pediatric System with 5.0 mm diameter rods is 50% less.
Handling the Implants with a Stick

The dual-opening pedicle screws have exactly the same head as the pedicle, lamina and angled hooks. The following handling instructions hence refer to both the pedicle screws and all three hook types (termed “implants” in the following).

1
Attach handle to stick

Press the knurled release button on the upper end of the handle (388.622), and simultaneously attach the hook and screw holder with hexagonal 4.0 mm (388.612) (also termed the “stick”) to the handle.

2
Pick up implant

Pick up the dual-opening implant with the stick and handle by rotating the release button on the handle.

3
Release handle from stick

Insert the implant. To release the handle from the stick, press the release button on the handle.
Insert Pedicle Screws
(Posterior Approach)

1

Determine entry point and position of pedicle screws

a. Thoracic spine

The entry point is just below the rim of the upper facet joint (1). The screws should be inserted at an angle of 7–10° towards the midline (2) and 10–20° caudally (3).

b. Lumbar spine

The entry point is at the intersection of a vertical line tangential to the lateral border of the superior articular process and the horizontal line bisecting the transverse processes (4).

At the thoracolumbar junction, the screws should be inserted at an angle of 5–10° towards the midline (5). At L2 they should converge by 10°, increasing to 15° at L5 (6).

c. Sacrum

The entry point for S1 is located at the intersection of the vertical line tangential to the lateral border of the superior articular process and the horizontal line tangential to its inferior border (7).

Insert the screws converging towards the midline (8) so that they aim towards the anterior corner of the promontorium (9).

Note: Ensure that laterally exiting pedicle screws do not injure the L5 nerve root. Avoid the S1 foramen.
2
Open pedicle and determine screw length

Use one of the pedicle awls (1) (388.551 for screws Ø 4.2 mm, 388.550 for larger screws) to open the cortex of the pedicle to a depth of 10 mm. Continue opening the pedicle using one of the pedicle probes (2) (see p. 25) with markings at 30, 40 and 50 mm.

Determine the length of the pedicle screws with the depth gauge for pedicle screws (357.789).

3
Probe pedicle channel

Using the straight feeler Ø 2.3 mm (388.545) or the curved feeler Ø 2.3 mm (388.546), probe the pedicle screw channel in order to check for perforations in the walls.
4

Insert pedicle screw into pedicle

Pick up the pedicle screw as described on page 3.

Insert the pedicle screw into the prepared pedicle until the screw head is well seated and one of the openings points towards the rod that is to be subsequently inserted (1). To disconnect the stick from the handle, press the release button on the handle (2).

Note: If using a rod connector, align the screw head such that one of the openings is perpendicular to the rod.
Insert Pedicle Screws with Washers
(Only for Anterior Approach)

Flat (1) and angled (2) washers can be used to reinforce the seating of screws in an end vertebra for anterior stabilization. The washer distributes the force exerted by the screw to the bone. The angled washers provide a fixed angle with the screw and prevent the screw from pulling out.

1
Prepare screw hole and determine screw length

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

Align the pedicle awl (1) (388.550 or 388.551) perpendicular to the contralateral side, and prepare the screw hole. Enlarge the screw hole using the pedicle probe (2) (388.538, 388.539 or 388.540) until it penetrates the contralateral cortex.

Determine the length of the pedicle screw using the depth gauge for pedicle screw (357.789) (3).

2
a Insert flat washer and screw

Place a flat washer with the convex side facing down onto the concavity of the vertebral body.

Pick up a dual-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 release the stick from the handle, press the release button on the handle.
b Insert angled washer and screw

While pressing the release button, load an angled washer in the inserter (385.807) (1). Anchor the washer in the bone by gently tapping the inserter (2).

Once the washer is firmly seated, remove the inserter by pressing the release button (3). Pick up a dual-opening pedicle screw as described on page 12. Insert the pedicle screw into the prepared vertebral body until the screw head is well seated (4). To disconnect the stick from the handle, press the release button on the handle.
The unique feature of the USS small stature/pediatric pedicle hook is that it can be securely fixed to the pedicle by a screw Ø 3.2 mm (X98.024–026), ensuring a high pull-out strength.

1  
Prepare seat for pedicle hook

Prepare the pedicle using the pedicle feeler (388.511) (1). Place the pedicle feeler between the inferior and superior facet joints. Ensure that the feeler is placed in the articular space and not in the bone of the inferior facet.

To facilitate the insertion of the pedicle hook, remove a small portion of the inferior facet with an osteotomy (2). The pedicle feeler has a mark. As soon as the mark 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). Do not push medially.

Remove the pedicle feeler.
2

Position pedicle hook

Using the stick, pick up a pedicle hook from the set, as described on page 3.

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

Insert the hook positioner (388.631) into the positioning hole of the hook, and ease the pedicle hook into the previously prepared seat. Ensure that the pedicle hook is snug around the pedicle by pushing the hook positioner axially and laterally. If it does not move, the pedicle hook is correctly seated. Gently tap the hook positioner with a hammer to firmly seat the hook.

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

3

Drill hole for screw Ø 3.2 mm

For secure anchorage of the pedicle hook to the pedicle, a screw Ø 3.2 mm can be inserted through the hole at the back of the hook.

Use a three-fluted drill bit Ø 2.0 mm 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.

**Note:** Do not start the power drill if the bit 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 (319.060).

5
Insert Ø 3.2 mm screw

Pick up an appropriate screw for pedicle hooks using the holding sleeve (388.381) and the hexagonal screwdriver (314.070), and insert the screw into the previously prepared drill hole. The pedicle hook is now firmly attached to the pedicle.
Position Lamina Hook

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 (388.521) (1 and 2). To ensure 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**

Using the stick, pick up an appropriate lamina hook from the set, as described on page 3.

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

Insert the hook positioner (388.631) into the positioning hole of the hook, and ease the lamina hook into the previously prepared seat. The inferior part of the lamina hook must fit snugly with the lamina.

**Note:** Ensure that the lamina hook does not lie too deep or press upon the bone marrow.

Remove the hook positioner and the handle. The stick remains attached to the hook.
1
Prepare seat for angled lamina hook

Remove the soft tissue from the transverse process. Place the lamina feeler (388.521) around the transverse process, elevating the soft tissue attachments from the anterior portion of the transverse process.

Remove the lamina feeler.

2
Angled lamina hook positioning

Using the stick, pick up an appropriate angled lamina hook from the set, as described on page 12.

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

Insert the hook positioner (388.631) into the positioning 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.
Use the bending template Ø 5.0 mm (388.906/907) to determine the proper rod contour and length.

Contour the rod using either the bending pliers with rolls for rods Ø 5.0 mm, with bending radius adjustment (1) (388.961), or the bending iron (2) (388.911, left, 388.922 right). Steel rods can also be contoured in situ using bending irons.

**Note:** Once bent, the titanium rods should not be bent back again. Do not bend titanium rods more than 45°.

**Note:** Hook/screw offset

The anatomical situation may occasionally prevent the perfect alignment of the implants, making it impossible to insert the rod from the same side. The dual opening and the 7.6 mm offset of the pedicle screws and hooks help compensate for this offset and avoid the need to bend the rod.
The rod Ø 5.0 mm is secured with a sleeve and nut.

1
**Pick up and locate sleeve with sleeve positioner**

Fit the sleeve pusher (388.582) to the sleeve positioner (388.583). Pick up a sleeve, ensuring that the shorter leg of the sleeve pusher stands above the narrow-fluted side of the sleeve. Slide the sleeve positioner over the stick and place it on the implant.

Press down on the sleeve pusher to place the sleeve on the implant/rod (1). Retract the sleeve pusher (2). The sleeve remains on the implant/rod.

2
**Place nut on implant**

Pick up the nut from the loading station using the socket wrench for 12-point nut, with L-handle (388.584).

Introduce the socket wrench 5.0 mm with T-handle (388.143) into the socket wrench for 12-point nut and slide together over the stick. The socket wrench 5.0 mm must engage in the hexagon of the stick, which is used to apply counter torque.

If the stick has already been removed, insert the screwdriver 4.0 mm with T-Handle (388.338) into the socket wrench for 12-point nut and apply counter torque.

3
**Tighten nut**

Tighten the nut with the socket wrench for 12-point nut with L-handle. The instruments used for applying counter torque are spring-loaded and can be kept under constant pressure by means of the T-handle. To tighten the nut further, lift off the L-handle and place it on again.
Introducing Rods into Dual-Opening Implants

Using the USS small stature/pediatric rod introduction pliers (the “persuader”)

Occasionally, a rod cannot easily be introduced into a dual-opening implant because of the distance between the rod and the implant. When using the rod introduction pliers (388.503) (the persuader), the dual-opening implant can be lifted and pulled towards the rod.

1 Mount sleeve pusher onto persuader

Place the sleeve pusher (388.582) onto the cylinder of the persuader (1). Pick up a sleeve from the loading station using the sleeve pusher (2). The handle of the sleeve pusher must be located on the side of the persuader with the arrow.

2 Place persuader on implants

Slide the cylinder of the persuader on the stick and the leg of the pliers on the rod.
3
Attach support for rod introduction pliers

Slide the support for rod introduction pliers (388.615) over the protruding end of the stick, and simultaneously pull the lever (1). The forked opening of the support must face upwards (TOP). Release the lever so that the support engages in the hexagon of the stick (2). The support for rod introduction pliers serves as a locking device when lifting the implants and allows the implants to be rotated.

4
Bring rod towards dual-opening implant

Place the spreader forceps (388.413) on the stick between the support and the persuader. Slowly open the spreader to bring the implant up towards the rod. When the opening of the implant is at the height of the rod, close the persuader to engage the rod.

Note: Carefully close the persuader since this instrument can exert considerable force. If necessary, the catch can be flipped up so that the persuader does not remain in the closed position.

Remove the support for rod introduction pliers.

Note: Do not apply too much force on the anchorage of the implant or it will tear out of the bone.
5
Place sleeve over implant and rod

Push the sleeve pusher down the cylinder to place the sleeve over the rod and implant (1). Retract the sleeve pusher (2). The sleeve remains on the implant/rod.

If the sleeve cannot be readily placed in position, tap the sleeve pusher gently to position the sleeve on the implant.

6
Attach implant to rod

Remove the persuader. Pick up a nut using the socket wrench for 12-point nut (as described on page 23), drop it over the stick and screw it loosely onto the implant.
Distraction or Compression of Two Neighboring Implants

**Distraction or compression with corresponding forceps**

Once the rod has been introduced and loosely attached to the implant, distraction or compression can be performed.

Before tightening the nut of the implant, use the spreader forceps (388.413) for distraction, or the compression forceps (388.424) for compression.

**a. Option**

**Additional use of fixation ring**

If the two implants are placed too far from each other, use the fixation ring for rods Ø 5.0 mm (X98.909). Place the small hexagonal screwdriver (314.070) with the holding sleeve (388.360) onto the fixation ring, and place it next to the implant. Carry out distraction or compression. The implant-rod connection must be loose during this procedure.

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

**b. Option**

**Additional use of holding forceps for rods**

Instead of using the fixation ring, secure the holding forceps for rods (388.441) next to an implant and carry out the distraction or compression.
Connecting a Rod to an Implant with Rod Connectors

Rod connectors can be used to bridge distances between rod and implant in cases where this cannot be achieved with the persuader (as described on page 24). All USS small stature/pediatric rod connectors are open and can be applied at any point during the operation. When using rod connectors, front-opening hooks must be used, or the pedicle screws must be rotated 90°.

1 Fasten rod connector to rod

Position the rod connector on the rod, and insert the ribbed part of the rod connector in the hook or the front-opening screw. Tighten the set screw of the rod connector using the small hexagonal screwdriver (314.070).

2 Connect rod connector to implant

Place the toothed sleeve (X98.021) and the 12-point nut (X98.022) onto the implant, and tighten the nut using the socket wrench for 12-point nut with L-handle (388.584), applying counter torque using the socket wrench 5.0 mm with T-handle (388.143) mounted on the stick.

Note: Only use the toothed sleeve with rod connectors.
Cross-link connectors are horizontal stabilizers linking the two longitudinal rods, which increases the stiffness of the construction. They are recommended for unstable fractures and multi-segmental constructions.

1

Assemble cross-link connectors

Outside the operating field, push the appropriate length of cross-link rod Ø 3.5 mm (X96.920–999) through the two cross-link clamps (1). One right (X99.310) and one left (X99.311) clamp (1a) or two identical clamps (1b) can be used depending on the space available in each case.

**Alternative**

If the distance between the two rods to be connected is less than 30 mm, one of the two cross-link clamps must be replaced by a cross-link clamp with rod (X99.306) (1c). Push the rod of the cross-link clamp with rod through the second cross-link clamp.

Do not tighten the set screws.

2

Mount cross-link connector

Click the assembled cross-link connector onto the rods Ø 5.0 mm (2a), ensuring that the set screws are completely unscrewed.

The cross-link rod Ø 3.5 mm can be angled by up to ±15° (2b).
3

**Secure cross-link connector**

First, tighten the set screws for the rods ø 5.0 mm on both cross-link clamps using the screwdriver ø 4.0 mm with T-handle (388.338) (1). Next, tighten both set screws for the cross-link rod ø 3.5 mm using the hexagonal screwdriver 2.5 mm (314.070) (2).

4

**Distract cross-link assembly (optional)**

Loosen one of the set screws with the small hexagonal screwdriver, and perform distraction with the spreader forceps (388.413). Retighten the set screws.
Implants are obtainable in stainless steel (SSt) and titanium alloy (TAN). For steel, replace the X in the article number with a 2; for titanium alloy, replace it with a 4. It is not recommended to mix the different implant metals.

**Pedicle screws with dual side-openings**

- Ø 4.2 mm (X98.461–467)*, Ø 5.0 mm (X98.469–473)*, Ø 6.0 mm (X98.475–480)*, Ø 7.0 mm (X98.482–488)*
- Double thread

**Pedicle hooks**

- Large (X98.348/349)*, small (X98.343/347)*
- With dual side opening or front opening (when using rod connectors)

**Screws for pedicle hooks**

- Lengths: 20–30 mm (X98.024–026)*
- Thread diameter: 3.2 mm
- Core diameter: 2.1 mm

**Lamina hooks**

- Small (X98.308/309)*, medium (X98.318/319)*, large (X98.328/329)*
- With dual side opening or front opening

**Angled lamina hooks**

- Right angled (X98.376/378)* or left-angled (X98.377/379)*
- With dual side opening or front opening

**Sleeve**

- (X98.020)*

**Nut**

- 12 point (X98.022)*

*All implants are also available sterile packed. Add suffix “S” to article number.
Rods
- Rods Ø 5.0 mm, lengths 150–500 mm, for fractures and deformities (X98.491–496)*

Rod connectors and toothed sleeve
- Rod connectors, open, lengths 15–25 mm (X98.227–229)*
- Sleeve, toothed (X98.021)*

Connectors
- Extension connector Ø 5.0/5.0 mm (X98.364)*
- Extension connector Ø 5.0/6.0 mm (X98.167)*
- Parallel connector Ø 5.0/5.0 mm (X98.159)*
- Parallel connector Ø 5.0/6.0 mm (X98.162)*
- Parallel connector Ø 3.5/5.0 mm (498.959)*

Cross link connectors
- Cross-link clamp, right, for rods Ø 5.0 mm (499.310)*
- Cross-link clamp, left, for rods Ø 5.0 mm (499.311)*
- Cross-link clamp with rod, for rods Ø 5.0 mm (499.306)*
- Cross-link rod Ø 3.5 mm, lengths 30–100 mm (496.920–496.999)*

Transverse connectors
- Transverse Connector, low profile for Rods Ø 5.0 mm (X97.871–X97.879)*

Washers (only for anterior stabilization)
For dual-opening pedicle screws
- Flat (X98.035–037)* or angled (X98.301–303)*
- Inner diameter 5.0/6.0/7.0 mm

Fixation ring for rods Ø 5.0 mm (X98.909)*
For compression/distraction

*All implants are also available sterile packed. Add suffix “S” to article number.
Pedicle Preparation Instruments for the Insertion of Screws

**Pedicle awls**
For opening the posterior cortical bone of the pedicle.
- Pedicle awl, length 230 mm, for screws \( \varnothing \) 4.0 and 4.2 mm (388.551)
- Pedicle awl, length 230 mm, for screws \( \varnothing \) 5.0 mm, 6.0 mm, 7.0 mm (388.550)

**Pedicle probes**
For opening the pedicle channel.
- Pedicle probe \( \varnothing \) 2.8 mm, length 230 mm, for 4.2 mm screws (388.538)
- Pedicle probe \( \varnothing \) 3.8 mm, length 230 mm, for 5.0 and 6.0 mm screws (388.540)
- Pedicle probe \( \varnothing \) 4.8 mm, length 230 mm, for 7.0 mm screws (388.539)

**Feeler for screw channel, straight (388.545) and curved (388.546)**
These serve to probe the inner pedicle walls and determine the correct screw length using length marks at 25 mm, 30 mm, 40 mm, 50 mm, 60 mm and 70 mm.
### Lamina feeler (388.521)
To prepare the lamina for placing a lamina hook.

### Pedicle feeler (388.511)
For penetrating the facet capsule and locating the pedicle for placing a pedicle hook.

### Chisel, width 9 mm (388.530)
To remove bone on the lower condyl for precisely fitting pedicle hooks.

### Hook positioner (388.631)
Eases the placement of hooks.

### Drill Guide 2.0 (388.581) and Handle for Drill Guide 2.0 (387.060), with Drill Bit 2.0 mm, length 100/75 mm, 3-flute, for Quick Coupling (315.190)
For precisely predrilling the hole for the screws used to fix the pedicle hooks.
Depth Gauge for Screws Ø 1.5 to 2.0 mm, measuring range up to 38 mm (319.060)
For determining the length of the fixation screws to be introduced in the pedicle hooks.

Screw driver, hexagonal, small 2.5 mm (314.070) and Holding Sleeve for Fillister Head Screws (388.381)
For inserting the fixation screws in the pedicle hooks.
Instruments for Inserting Screws and Hooks

Hook and Screw Holder, with Hexagonal 4.0 mm (388.612)
Lengthens the hook or screw to ease placement and manipulation of the implants.

Handle for Hook and Screw Holder (388.622)
Lengthens the hook and screw holder and makes the hook and screws easier to handle.

Screwdriver Shaft, hexagonal 4.0 mm (388.337), optional
May be used with the handle (388.622) as an alternative way of introducing the dual-opening screws.

Holding sleeve for Art. No. 314.132, 388.330, 388.370 (388.380), optional
To be used with screwdriver shaft hexagonal 4.0 mm (388.337) and screwdriver hexagonal 4.0 mm (388.335), both optional.
Instruments for Bending Rods

**Bending template Ø 5.0 mm, length 150 mm (388.906) and length 500 mm (388.907)**

For determining the length and bend of the rod.

**Bending pliers with rolls for USS rods Ø 5.0 mm (388.961)**

For bending rods. The knob is used for setting the bending radius.

**Bending iron for rods Ø 5.0 mm, left (388.911) and right (388.922)**

- Alternative to bending pliers.
- Can be used to bend the rod in situ.
**Instruments for Assembling the Construction**

**Holding forceps for rods Ø 5.0 mm (388.441)**

To place the rod in dual-opening implants.
- The tooth lock mechanism ensures a lasting and stable grip of the 5.0 mm rod.
- The thumb release enables single-handed use for easy maneuvering and positioning of the rod.

**Rod pusher for rods Ø 5.0 mm (388.941)**

Assists in the placement of rods in implants with a dual opening.

**Socket wrench for twelve-point nut, with L-handle (388.584)**

For tightening the nuts when assembling the construction.

**Socket wrench for stick, with T-handle (388.143)**

For applying counter torque.

**Sleeve positioner (388.583) and sleeve pusher (388.582)**

For placing a sleeve on the assembly of hooks, screws and rods.
Rod introduction pliers (388.503) and sleeve pusher (388.582)

Enables rods to be inserted in dual-opening implants and mount the sleeve on the assembly.
- The sleeve pusher enables the sleeve to be premounted and held while pressing in the rod into the correct alignment.
- The tooth lock mechanism allows step-wise manipulation and retains the rod position.

Support for rod introduction pliers (388.615)

The rod introduction pliers (388.503) and the spreader forceps (388.413) are used to enable biplanar repositioning and carefully insert the rod into the dual opening of the hooks or screws.

Spreader forceps (388.413)

Can also be used with the rod introduction pliers and the support for biplanar rod repositioning in dual-opening implants.
- The distraction position can be maintained with the “speed lock.”

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