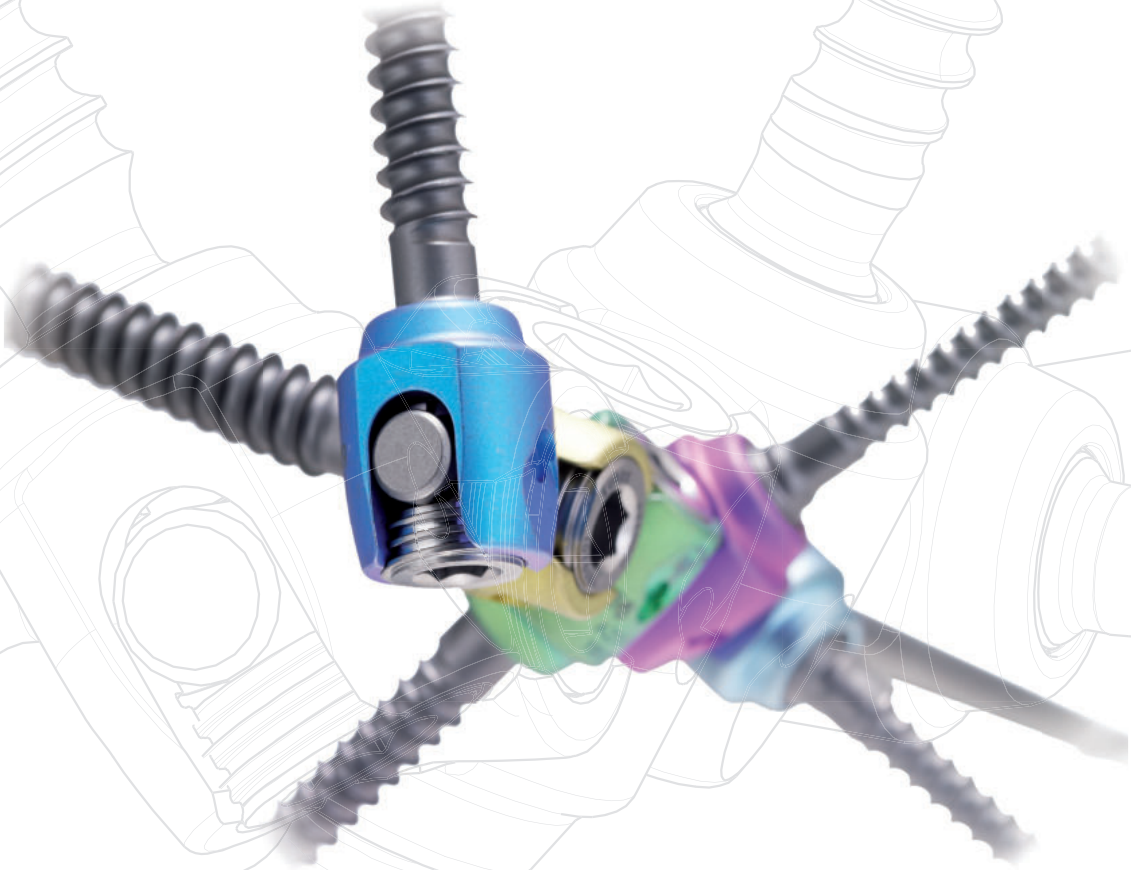
Surgical Technique

Proven French innovation in orthopaedics

E.SPINE®

Thoraco-lumbo-sacral osteosynthesis



SPINE - RACHIS

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E.SPINE®

A. INTRODUCTION

E.SPINE® system is a set of implants to correct and temporarily stabilize the thoraco-lumbo-sacral spine posteriorly, in order to achieve osteosynthesis. The system is intended to be removed after fusion of the instrumented part.

This set of implants constitutes a modular system, which allows the surgeon to adapt the construct to patient's anatomy and pathology.

E.SPINE system is used to perform surgeries for the treatment of degenerative spine pathologies as well as deformity pathologies.

1. Implants combination

	E.SPINE – Titane Rod Ø 5,5 mm	E.SPINE - CoCr Rod Ø 5,5 mm	E.SPINE - PEEK Rod Ø 5,5 mm	E.SPINE - Titane Rod Ø 6 mm	E.SPINE - CoCr Rod Ø 6 mm	E.SPINE – Rod-connector Ø 5,5-6 mm – rod side
E.SPINE – Rod-connector Ø5,5-6mm – connector side	X	X	X	X	X	
E.SPINE – Pedicular screw	X	X	X			X
E.SPINE – Reduction pedicular screw	X	X	X			X
E.SPINE – Hook	X	X	X			X
E.SPINE – LTT Cross-link	X	X	X			X
E.SPINE – Transversale link	X	X	X			X
E.SPINE – Closed domino connector Ø5,5mm	X	X	X			X
E.SPINE – Closed domino connector Ø5,5-6mm	X	X	X	X	X	X
E.SPINE – Reduced closed domino connector Ø5,5-6mm	X	X	X	X	X	X
E.SPINE – Open domino connector Ø5,5mm	X	X	X			X
E.SPINE – Open domino connector Ø5,5-6mm	X	X	X	X	X	X
E.SPINE – Reduced open domino connector Ø5,5-6mm	X	X	X	X	X	X
E.SPINE – Straight connector Ø5,5mm	X	X	X			
E.SPINE – Straight connector Ø5,5-6mm	X	X	X	X	X	
E.SPINE TANIT – Iliosacral connectors	X	X	X			
NEMOST – Growing domino	X	X				

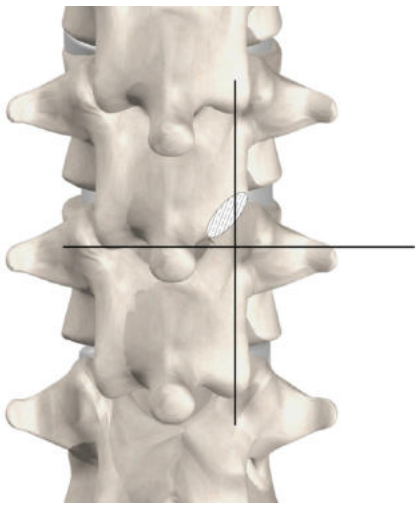
B. DEGENERATIVE TREATMENT

1. OSTEOSYNTHESIS BY PEDICLE SCREWS

1.1. Pedicle preparation

- **Insertion point**

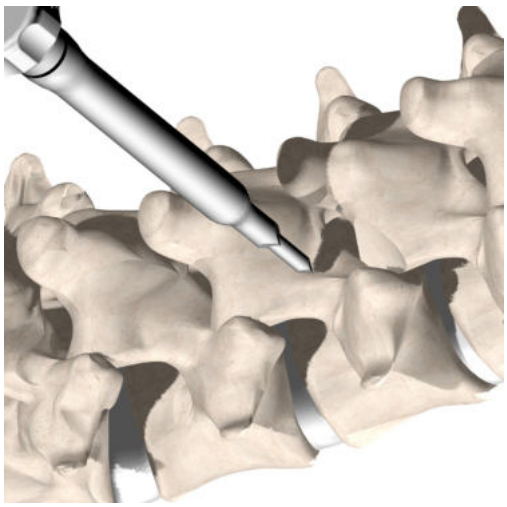
To visualize the pedicle screw entry point, first clean the facet joints and perform a small osteotomy of the lower portion of the upper facet joint at the edge of the upper rim of the transverse process. Adjust the entry point as a function of the vertebral levels to be instrumented.



- **Awl**

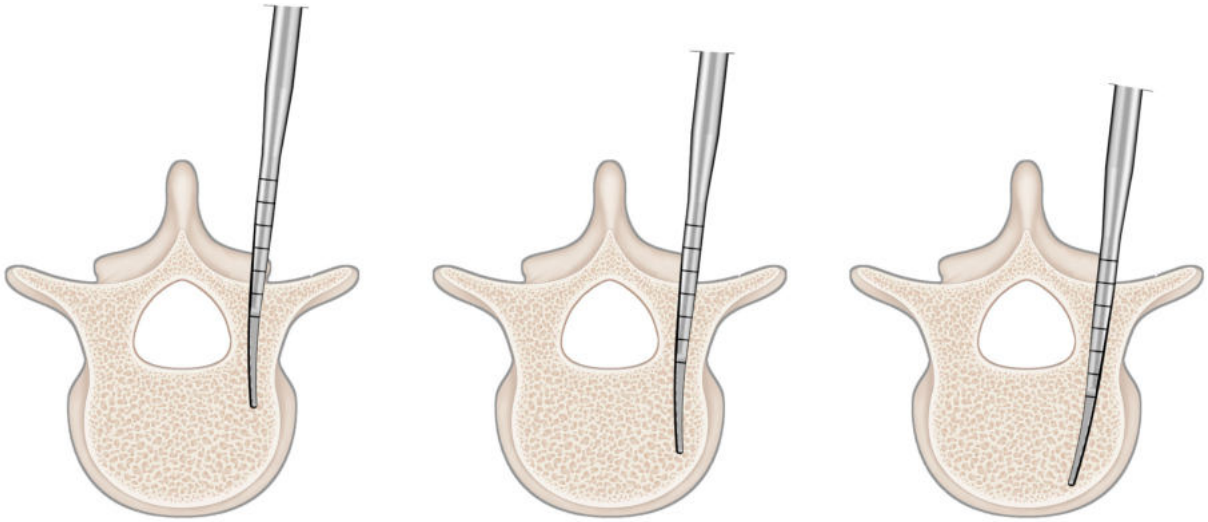
Use the awl to make a 3 to 5 mm hole on the cortical wall at the insertion point determined anatomically. The standard awl is adjustable to permit selecting the insertion depth sought in the bone.

A awl with a fixed stop is proposed as an option.



- **Pedicular probe**

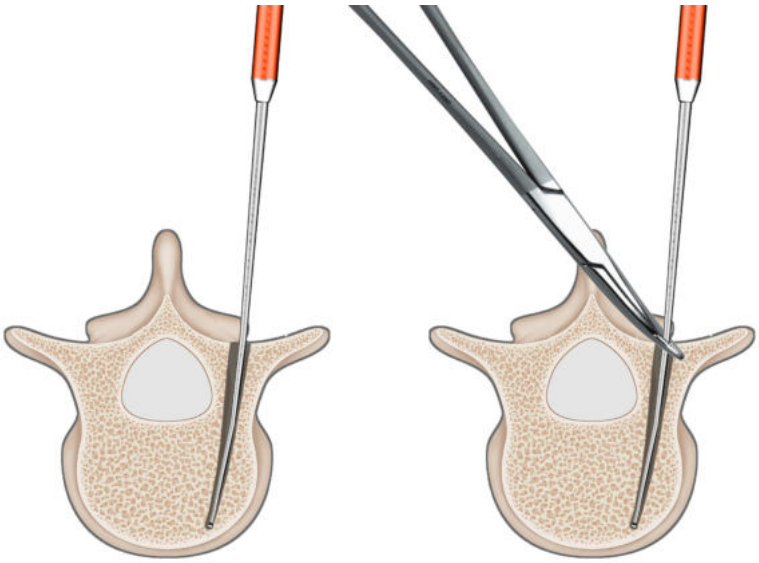
The pedicle probe makes it possible to identify a path in the pedicle cancellous sheath. Orientate the tip of the probe towards the lateral side of the vertebra to prevent any penetration into the medial cortex. Proceeding with caution, drive the probe inside the vertebra over a depth of about 20mm. X-ray control may be used to ascertain the proper trajectory of the instrument. Once the tip of the probe has passed the vertebral canal, rotate it by 180° then continue the penetration into the vertebral body.



- **Pedicular feeler**

The pedicle feeler makes it possible to check the integrity of the sheath created by probing the internal and lateral walls. The end of the feeler, fitted with a ball, is pushed to the end of its sheath to check the presence of bone at the end of the perforation.

A homeostasis clamp may be clamped to the probe at the limit of the pedicle to confirm the length of the pedicle screw necessary.



- **Taps**

In certain cases, tapping may be necessary (sclerotic bone for example).

Taps are undersized between 0.5 and 1mm below the diameter of the future pedicle screws.

Pink and **light blue** rings for screws diameter 4.35 mm and 5 mm

Green ring for screws diameter 6 mm

Yellow and **dark blue** rings for screws diameters 6.5 mm and 7 mm

REMARK

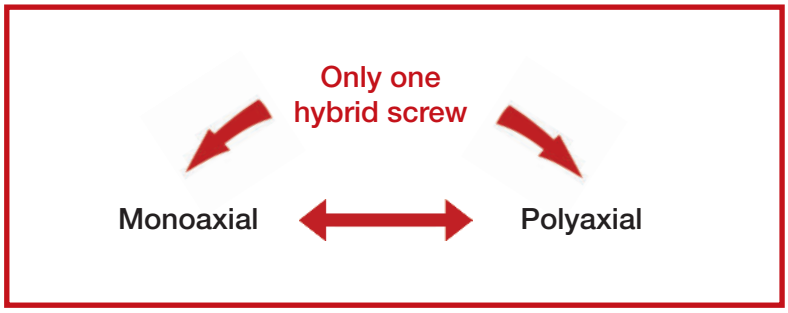
Tapping must always end at the limit of the threads.
Colour rings indicate only the screws to be used.

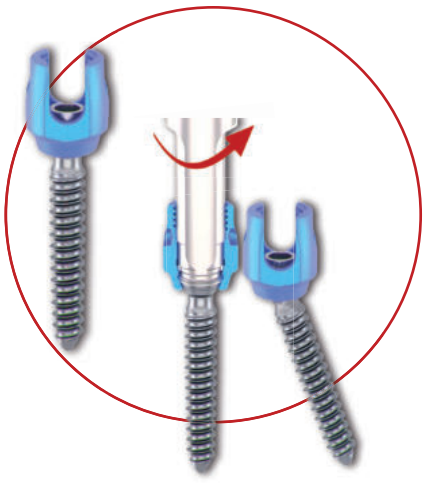
1.2. Principle of hybrid screw

The E.SPINE® pedicle screws can be used either in monoaxial or in polyaxial modes.

Both modes are reversible and the change may be made as many times as necessary. The choice may be made outside the patient or in situ.

Screws are delivered originally set to the monoaxial mode.

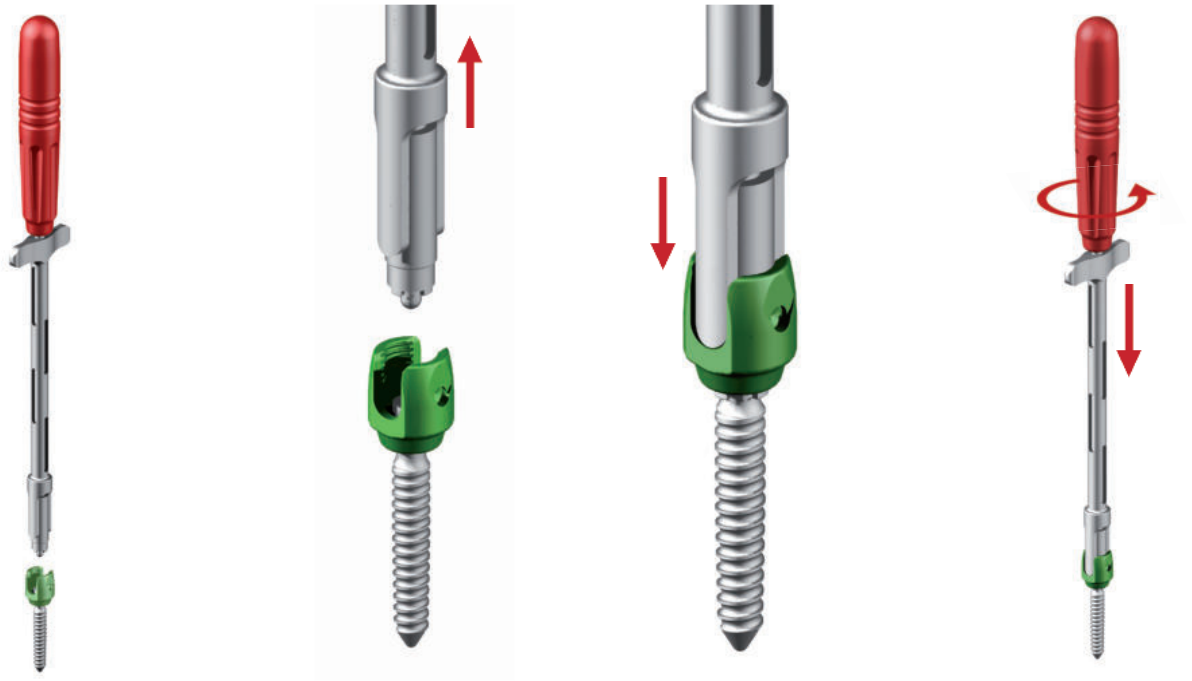




Use the polyaxial lock screwdriver to change the screw utilization mode.

Introduce the end-fitting of the instrument inside the head of the pedicle screw. A slight rotation of this end-fitting allows snapping the end-fitting into the open head of the pedicle screw.

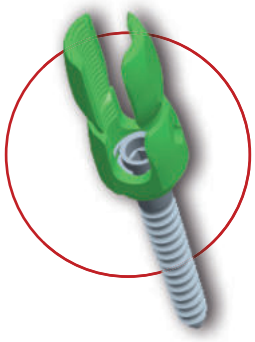
Maintain the slider and rotate the red handle clockwise or anti-clockwise to select the future mode of operation of the pedicle screw.



1.3. Pedicle screws ans reduction screws

There are two models of screws.

A standard pedicle screw with a short threaded extension that makes it possible to tighten the connection using the tightening plug.



A reduction pedicle screw with a long threaded extension that makes it possible to install the tightening plug on the head of the implant when the rod is not bearing on the bottom of the implant groove. Thanks to their extended body, the screws allow to impart an anteroposterior pullback effect onto the vertebrae or reciprocally allow the rod to be pushed down to the canal of the screw head, since the movements are relative and associated with the stiffness of the various elements involved (rod, bone, fibrous tissues, etc.…).

Just as for the standard pedicle screws, these reduction pedicle screws exhibit the same hybrid monoaxial/polyaxial characteristics (see above).

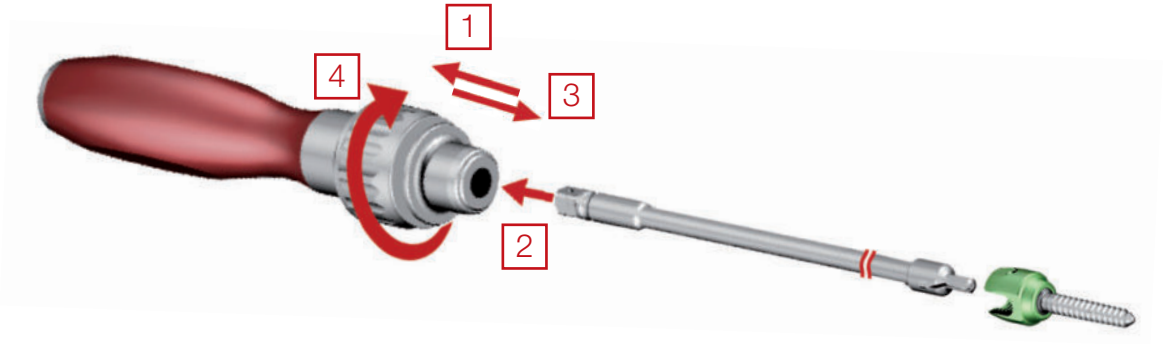
The standard and reduction pedicle screws are available in different diameters and lengths. The head colour serves as a rapid identification scheme for the screw diameter.

1.4. Insertionof pedicle screws using the pedicle screwdriver

The universal standard screwdriver can be used with both the standard and reduction screws.

- **Assembly of the snap-on handle**

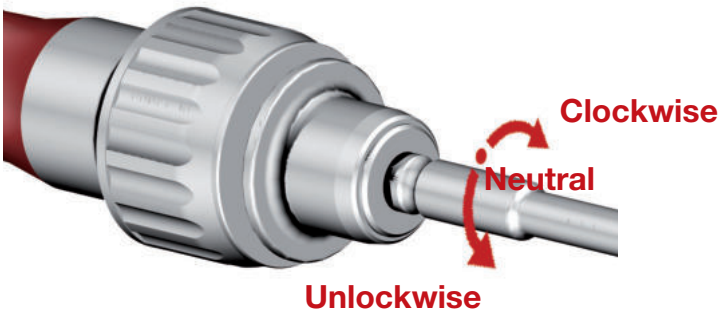
1 Pull the handle spring ring towards the body of the handle and hold it in position.



2 Snap the screwdriver shaft into the handle.

3 Release the spring ring. The connection has been effected.

4 Using the selector on the handle, select any of the three different positions: one to screw, one to unscrew, and one neutral position that enables you to drive the screws in both directions of rotation.



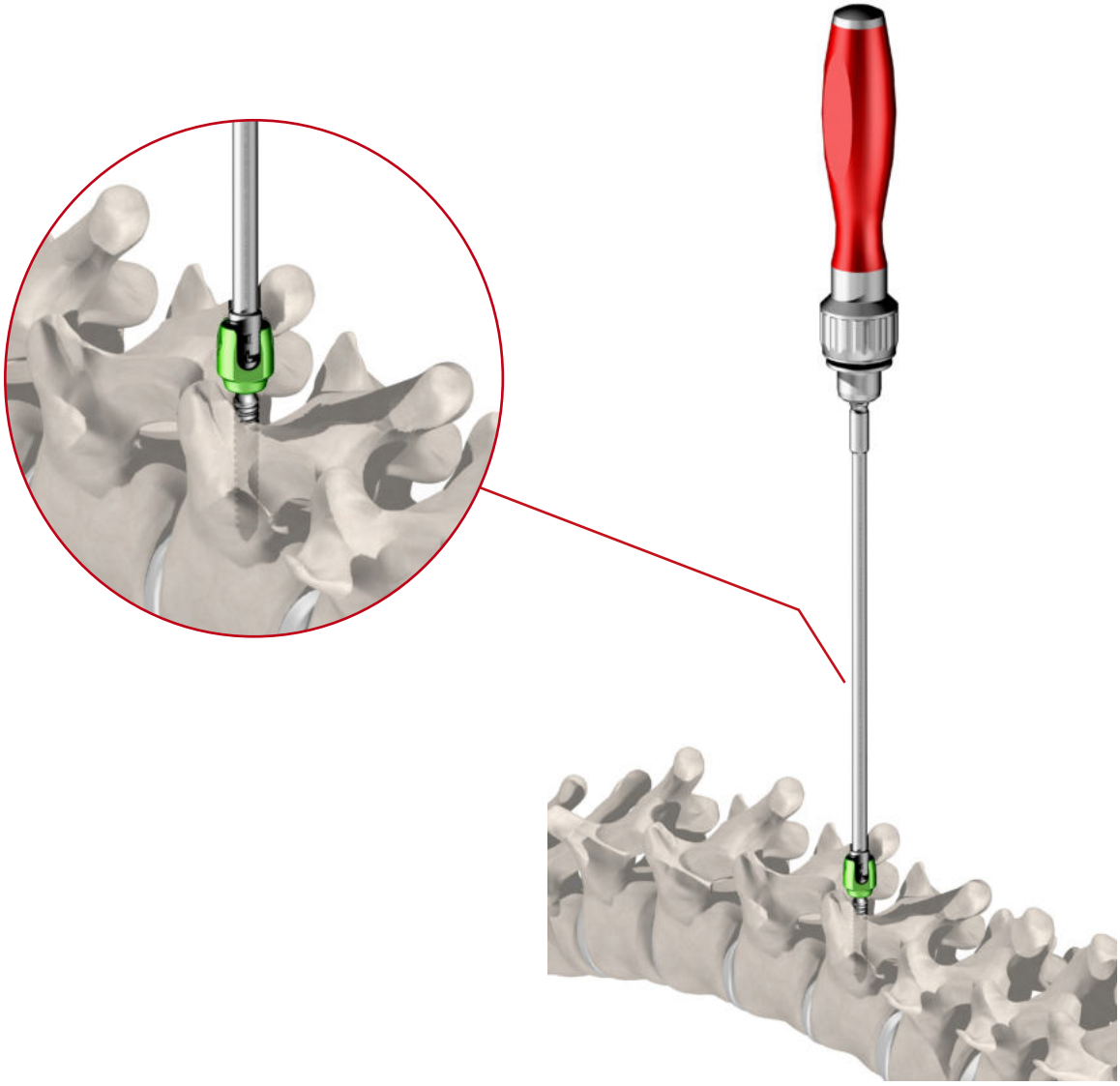
- **Insertion of the pedicle screw**

First, snap-fit the screwdriver shaft into the handle (see previous paragraph).

- **Fitting the screw into the pedicle**

Place the tip of the pedicle screw into the hole made previously at the entry of the pedicle.

Slowly drive in the pedicle screw by means of the screwdriver.



2. ROD SELECTION

E.SPINE® rods for degenerative spine are available only in 5,5 mm diameter. Different grades of materials are available:

- Titanium alloy Ta6V4 ELI, either straight or pre-bent
- PEEK, pre-bent shapes only

These different materials offer a choice of per-operative options with different stiffness and strength of constructs.

A template trail rod may be used to measure the length of rod necessary as well as its optimal bending.

CAUTION

The template rod is not to be implanted. Following the utilization of the template rod, make sure that you strengthen it back before storing it back in the container. The template rod made in shape-memory material will return to its rectilinear shape under the effect of heat during the sterilization process.

2.1. Handling the rod

The length of rod necessary is determined beforehand. It is then possible to select rods pre-cut, pre-bent or not, or to select a rod to be cut using a rod cutter.

The end of the rod has a hexagonal shape which makes it possible, using the hexagonal wrench, to define the orientation of the rod (sagittal plane, for example), to facilitate the bending operation.

Hexagonale wrench

CAUTION

Never tighten the tightening plugs on the hexagonal-shaped part of the rod.

Different rod-holders may be used. The choice is made mainly as a function of the type of handling that will be performed using the rod.

The rod holder makes it possible to hold the rod in a stable manner with minimal overall dimension requirements.

Rod holder

The rod forceps makes it possible to hold the rod more firmly and to impart more efforts to the rod.

Rod forceps

The locking pliers must be used only for actions that call for high forces (example: rod rotation, creation of fixed bearing points during the compression, distraction manoeuvers, etc.)

Locking pliers

2.2. Shaping the rod

Straight rods may be bent as per the curvature required, using the 3-point bender.

3-point benders

REMARK

Avoid repeated curvature modifications as this could affect the rod strength. Bending must be regular over the whole length of the rod.

The PEEK rods are supplied with a predetermined curvature radius. Do not bend them again, unlike the titanium or CrCo pre-bent rods the curvature of which may be adjusted using the bending pliers.

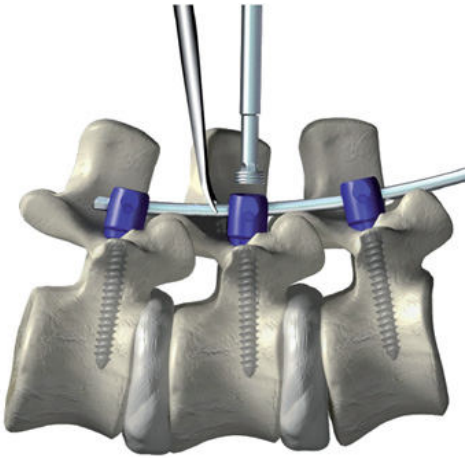
2.3. Fitting the rod inside the implants

The rod bent to shape can then be positioned inside the implants using different methods.

- **Simple insertion using a rod pucher**

Held by the rod holder, the rod is placed above the U openings of the implants, then introduced to reach its position at the bottom of the canals of these implants. Should there be a minor resistance, a rod pusher is used to facilitate the lowering of the rod into the implant canals.

Maintain the pressure applied to the rod using the rod pusher then install the tightening plugs.
Installation of the tightening plugs is realized with the pre-locking screwdriver.



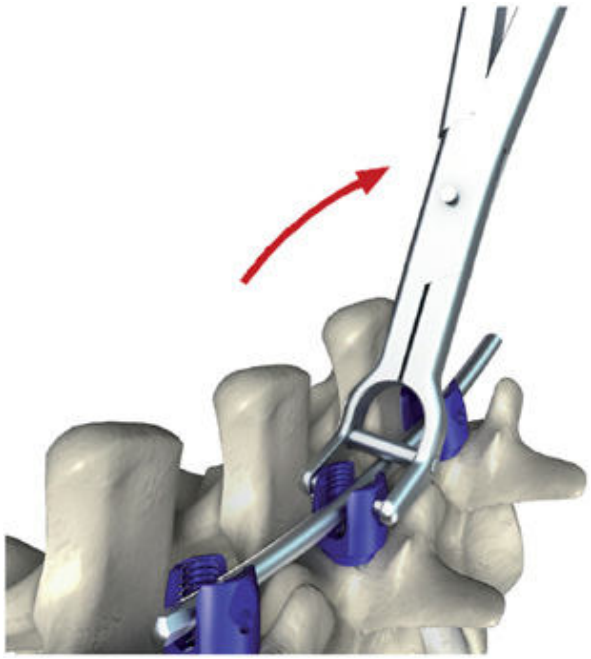
REMARK

Ascertain that the rod is perfectly positioned at the bottom of the implants before installing the tightening plugs.

- **Inserting the rod using the rocker (option)**

When the rod is roughly aligned with the implant axis but that it is slightly distant from the head of the same implant, the rocker may be used to impart a vertical pressure on the rod; the rocker is attached to the implant head through two lateral holes.

Holding the pressure on the rod using the rocker makes it possible to install the tightening plugs.



CAUTION

Ascertain that the rod is perfectly positioned at the bottom of the implants before installing the plugs. If necessary, readjust the bending of the rod.

- **Inserting the rod using the persuader**

When the rod is distant from the implant head but not exactly aligned with the implant axis, the persuader may be used to achieve a longer recall run.

Utilization :

1 The slider of the persuader must be set to its maximum high position. This position is achieved by expanding to the maximum the lateral grip of the handle.

2 Then place the persuader on either side of the rod to hold it between the two end arms.

3 Lower the persuader down to lever approximate the head of the implant so that the arms of the instrument clip into the side holes of the implants.

REMARK
Make sure that the soft or bony tissues do not prevent the clipping of the instrument onto the implant.

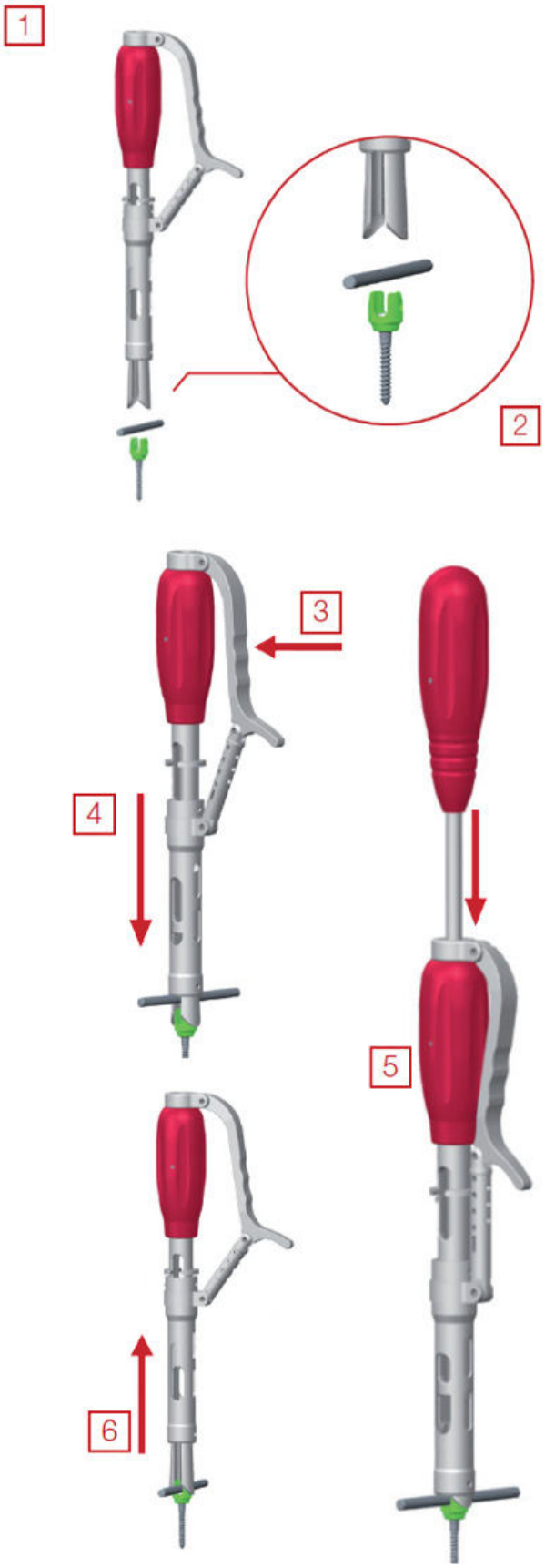
4 While maintaining the instrument aligned with the implant, progressively tighten the handle, so causing the vertical movement of the slider and maintaining pressure on the rod.

REMARK
Excessive effort on the handle could be dangerous and cause either the detachment of the implant or the destruction of the bone.

5 Once the rod has been fully reduced, the persuader is self-locked and becomes stable. It is then possible to introduce the tightening plugs using the persuader tube as a guide for the assembly pre-locking screwdriver.

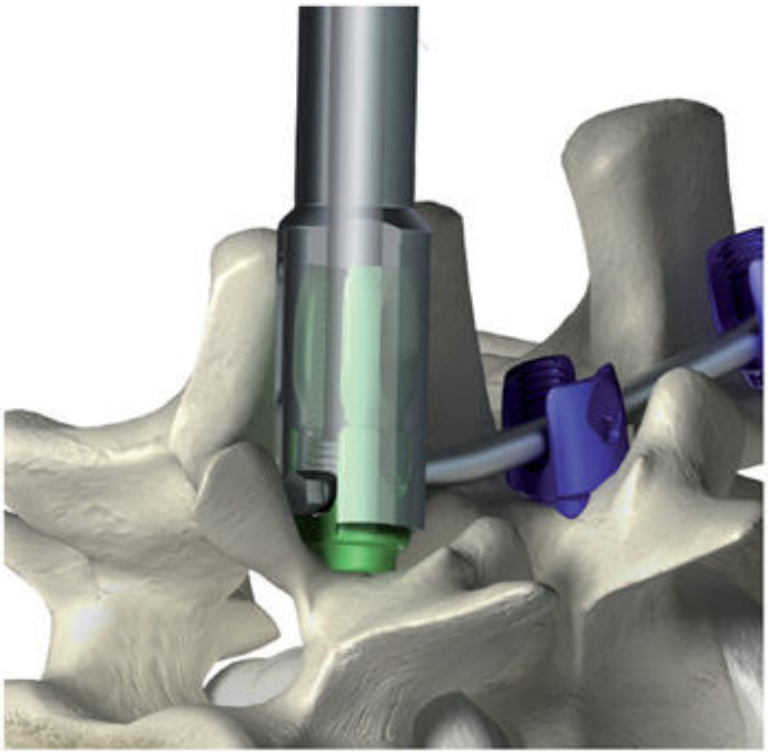
REMARK
Ensure that the rod is perfectly positioned at the bottom of the implants before installing the plugs. Ifnot, adjust the bending of the rod as necessary.

6 Once the tightening plug has been installed, the persuader may be removed by slowly spreading the handle gripper. This will move the slider upward and free the studs from the side holes of the implants.



- **Reduction screws**

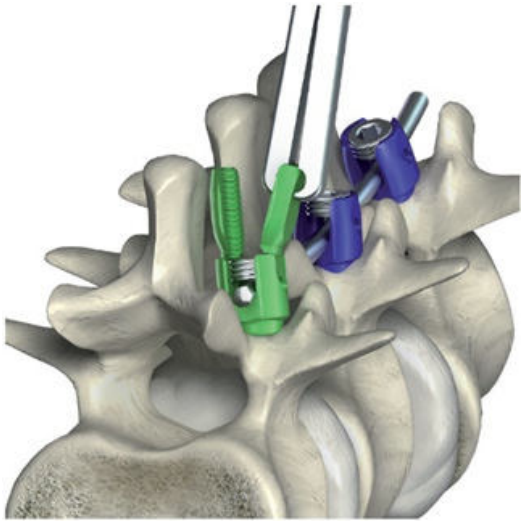
Reduction screws exhibit threaded extension that enable the tightening plug to be tighten over a longer length. This makes it possible to reduce the rod or to pull the vertebra along an anteroposterior relative movement.



REMARK

Locking must be done by coupling the final locking screwdriver with the T-handle torque. It is necessary to use the counter torque when tightening the locking screws.

When the rod has been lowered down to the end of the implant groove, the threaded extensions of the reduction screws may be removed using a flexion movement using the rod holder clamp.



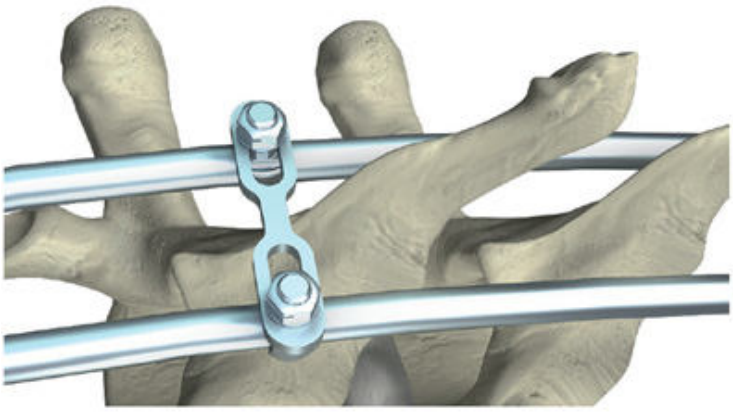
3. INSTALLATION OF THE CROSSLINK

Crosslink enable making frame constructs that connect the two rods transversally. The frame opposes the torsion effects and other windshield wipers-like effects.

The crosslink, the length of which covers the space between the two rods, is held by the rod holder. The nuts must not be tightened.

The crosslink is placed vertically above the rods, the jaws are clipped to the rods by means of a simple vertical pressure imparted using the LTT locker.

Tighten the nuts until the nuts provided with an unlocking system become deformed.

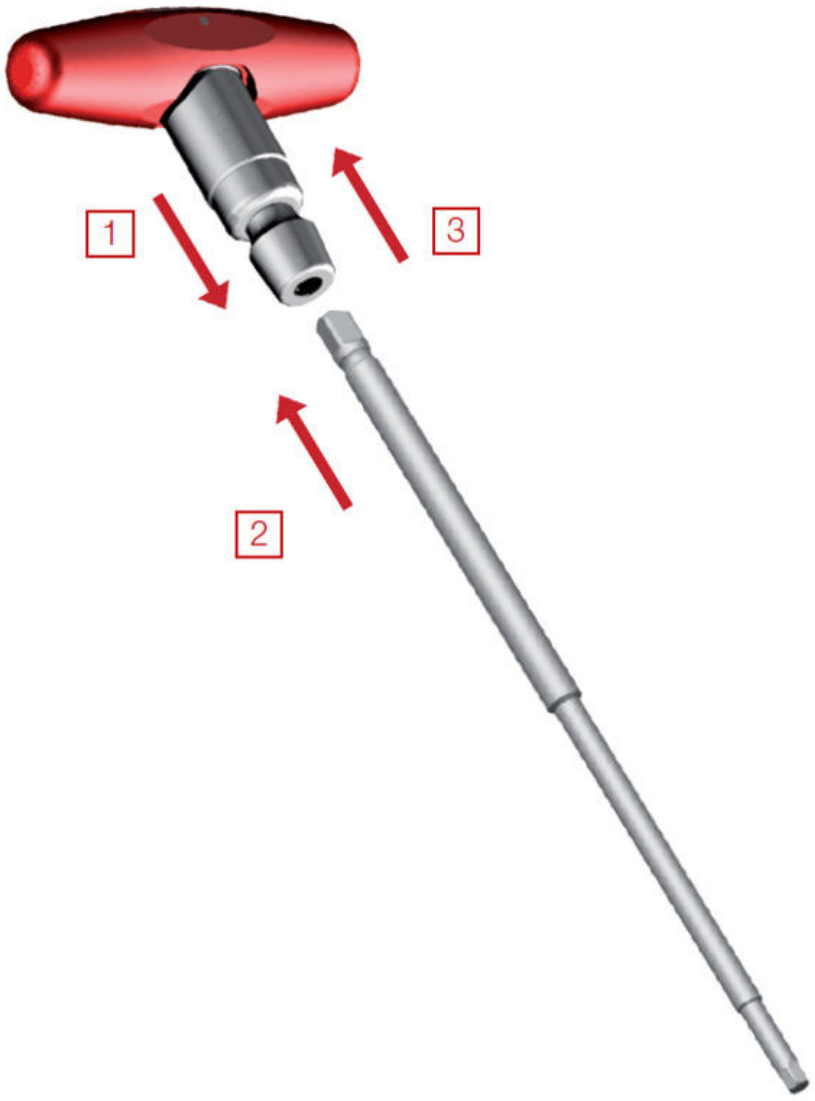


4. FINAL TIGHTENING

- **Assembly of the torque handle**

You must snap-fit the handle onto the shaft of the tightening screwdriver.

1. Push the spring ring of the handle opposite the handle and hold it in position.
2. Snap fit the screwdriver shaft inside the handle.
3. Release the spring ring to effect the fixation.



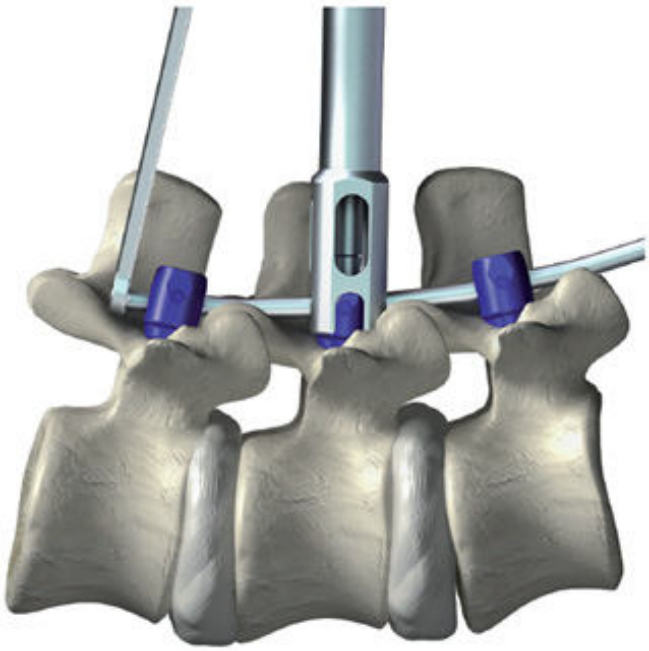
- **Locking screw tightening**

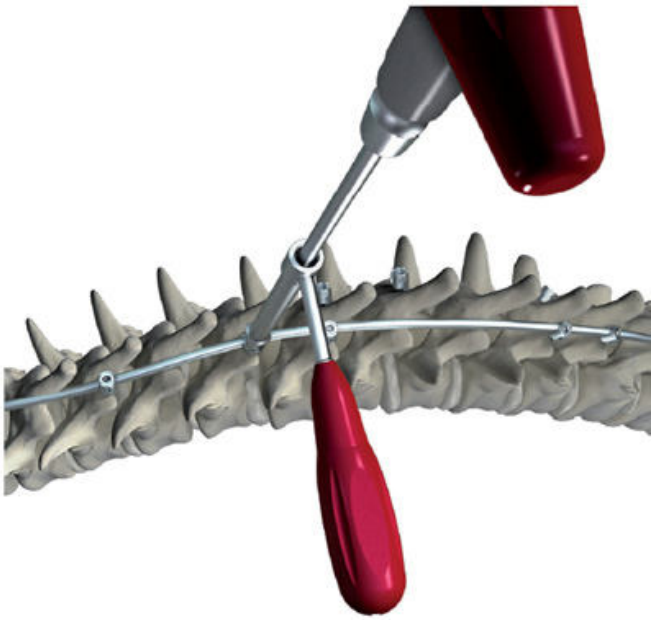
During the final tightening step, it is recommended to use a counter-torque to prevent deteriorating the implant/ bone interfaces.

REMARK

When using PEEK rods, use self-breaking tightening screws (blue) with final locking screwdriver assembled with the ratchet handle. Those screws are designed to break when the tightening torque nears 6.5Nm.

For all the other rods, the torque handle must be used to ensure optimum tightening of the interconnections. The tripping torque is approximately 10Nm.





C. DEFORMATIONS TREATMENT

1. OSTEOSYNTHESIS BY PEDICLE SCREWS

1.1. Pedicle preparation

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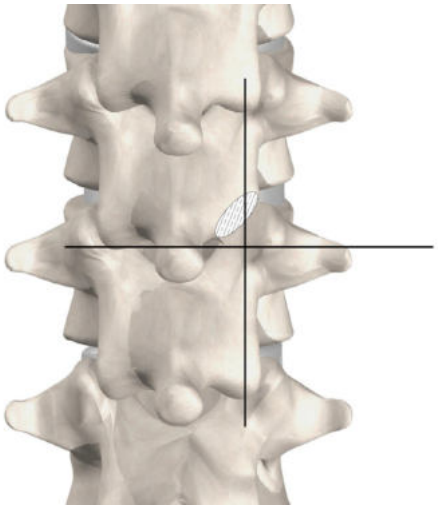

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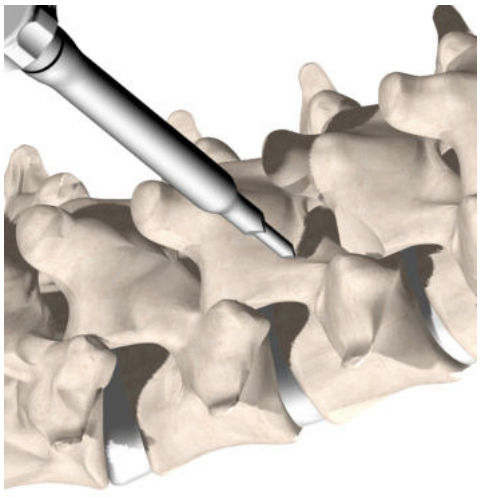

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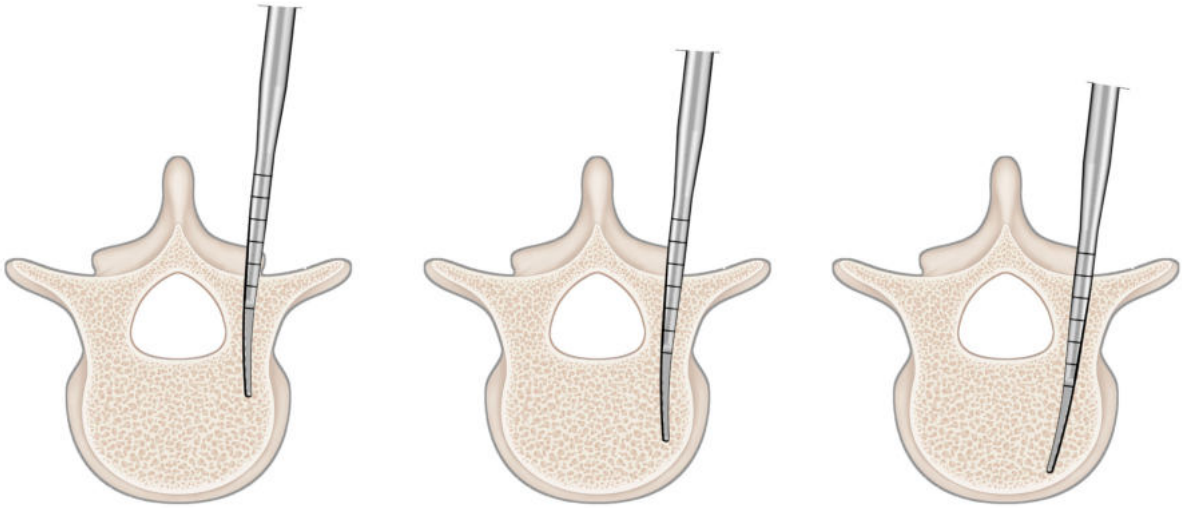

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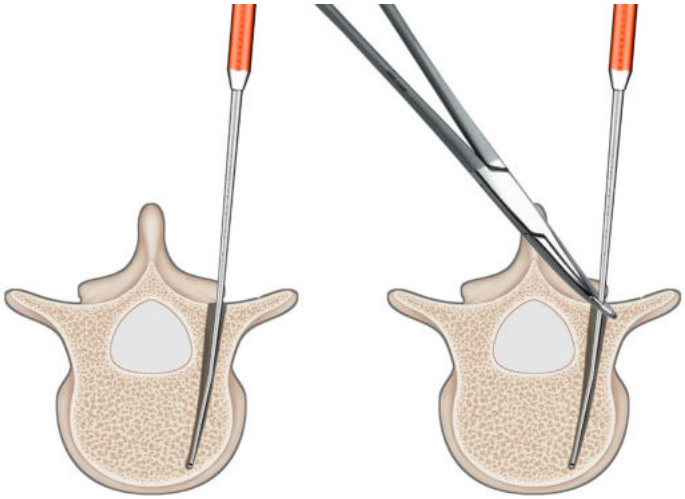

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1.2. Principle of hybrid screw

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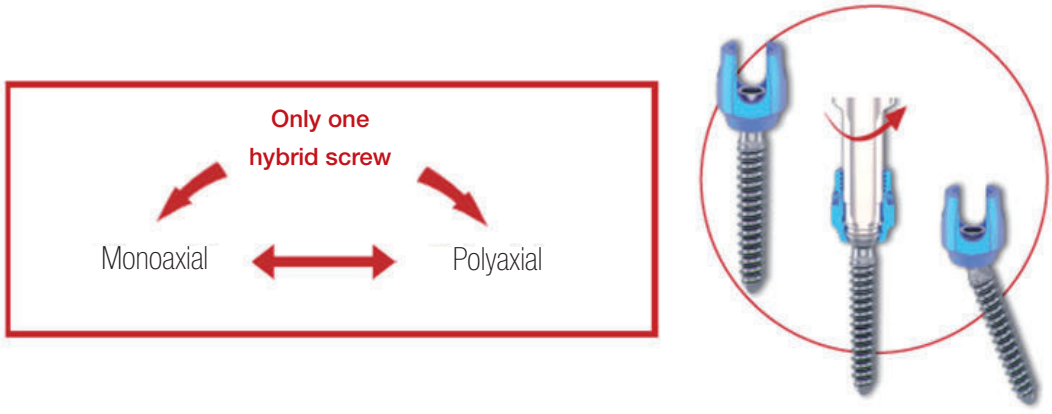

Use the polyaxial lock screwdriver to change the screw utilization mode.

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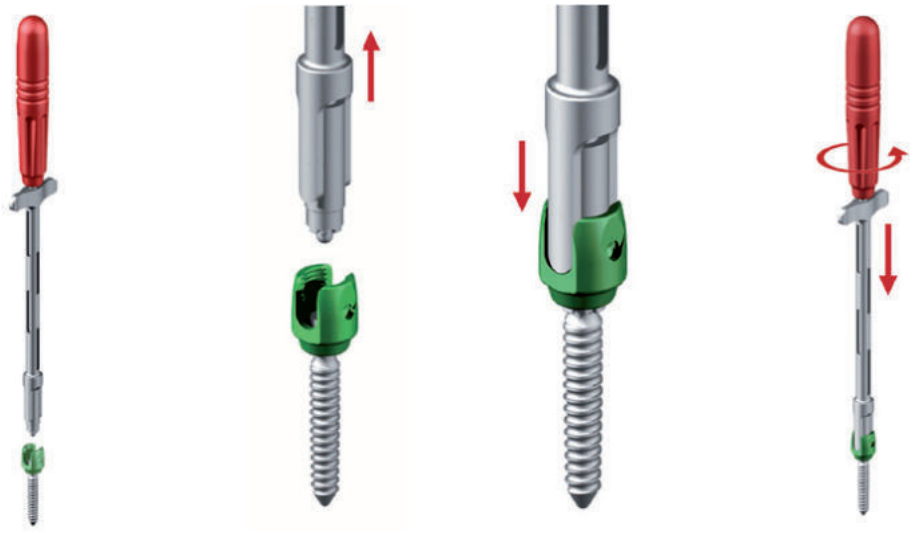

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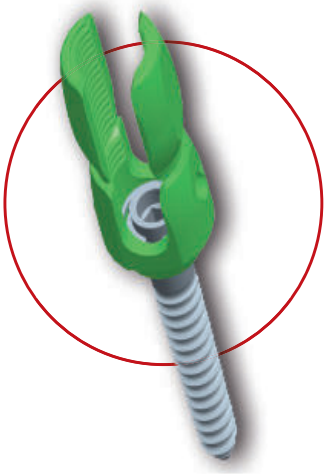

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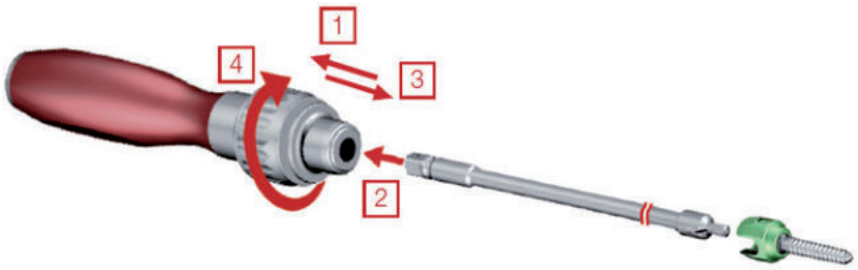
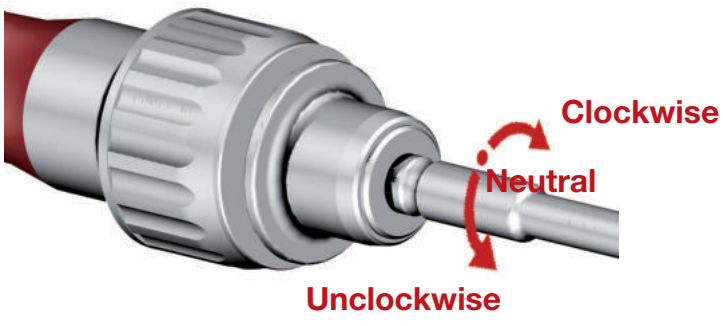


2 Snap the screwdriver shaft into the handle.

3 Release the spring ring. The connection has been effected.

4 Using the selector on the handle, select any of the three different positions: one to screw, one to unscrew, and one neutral position that enables you to drive the screws in both directions of rotation.



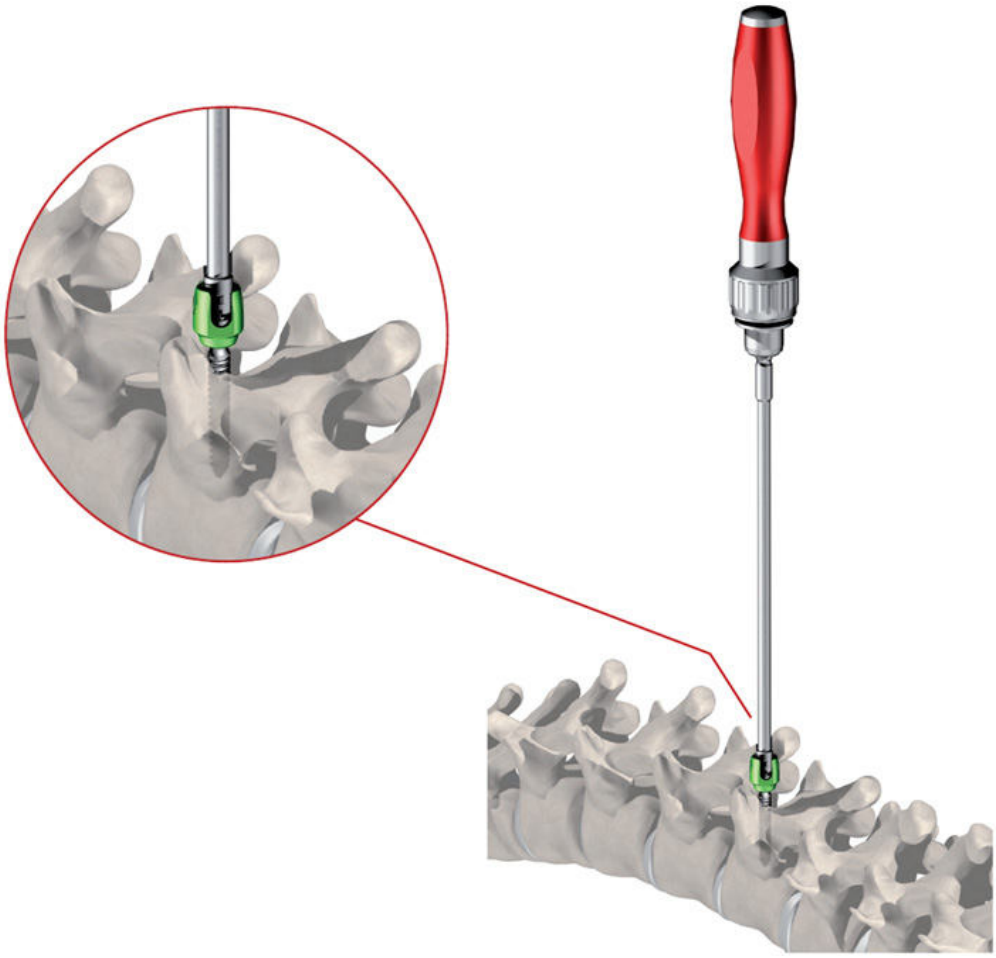
- **Insertion of the pedicle screw**

First, snap-fit the screwdriver shaft into the handle (see previous paragraph).

- **Fitting the screw into the pedicle**

Place the tip of the pedicle screw into the hole made previously at the entry of the pedicle.

Slowly drive in the pedicle screw by means of the screwdriver.



2. OSTEOSYNTHESIS USING HOOKS

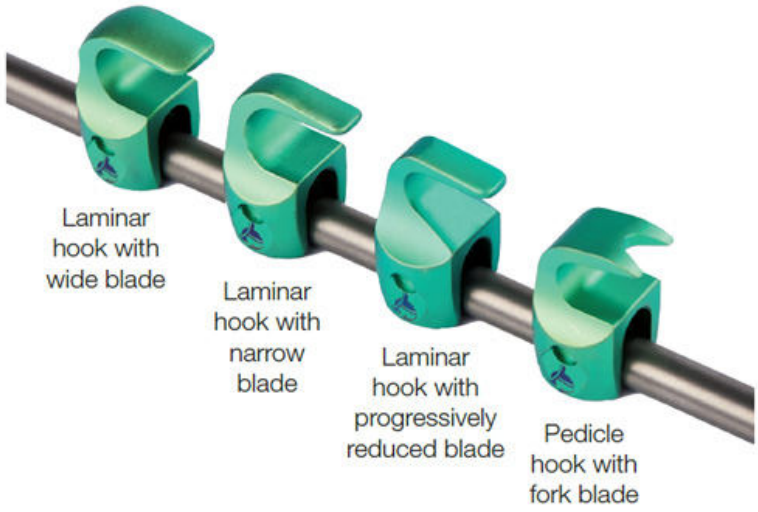
In the thoracic region, hooks may be used to replace pedicle screws.

2.1. Hook selection

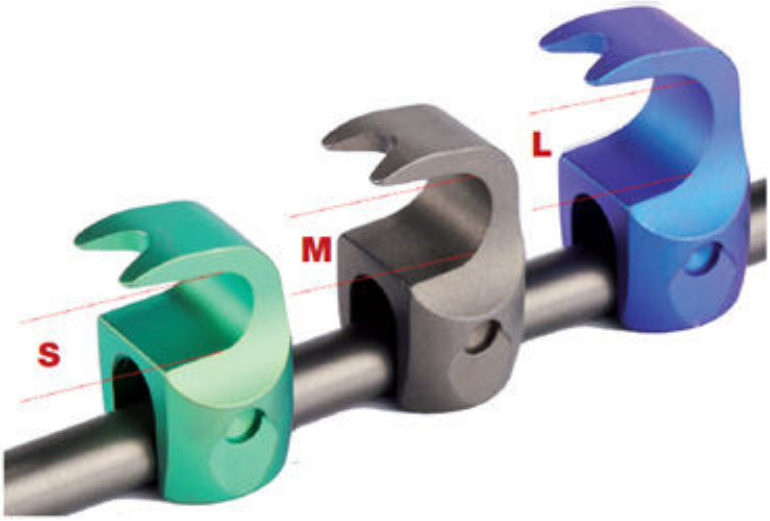
Hooks are available in different types and different sizes as a function of their implantation site and of the geometry of the vertebrae: implantation under the pedicle, on the transverse process, over or under the posterior laminae.

The choice between these various hooks will depend on the patient's anatomy, the degree and type of deformity, the correction method selected so as to achieve stable anchoring of the hooks.

All hooks are available in three sizes except for the offset lumbar laminar hooks.



The size of the hooks vary as a function of the width of the groove.



- **Pedicle hook**

Always use the pedicle hook with its fork blade oriented upward. It is placed in the inter-joint space. It must be impacted using the surgical hammer so that the fork blade will match the lower portion of the vertebral pedicle. A pedicle rugine (optional) may be used to prepare the implantation site. It may be necessary to remove the joint capsule to properly visualize the cartilage of the lower facet joint. Once the hook has been inserted, carefully try to move it laterally to check its proper positioning.

- **Laminar hook**

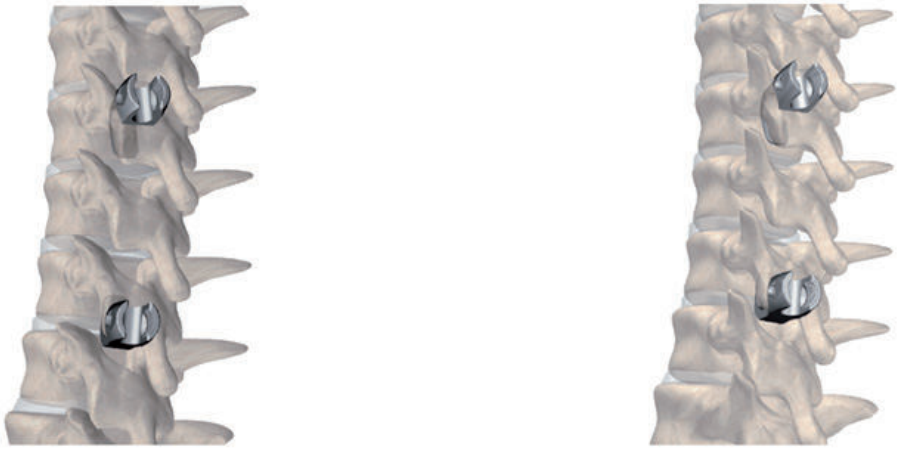
Laminar hooks are available with three laminar shapes:

- Wide
- Progressive
- Reduced

These hooks are generally used to perform different hook-claws:

- Pediculo-laminar
- Lamino-laminar
- Pediculo-transverse

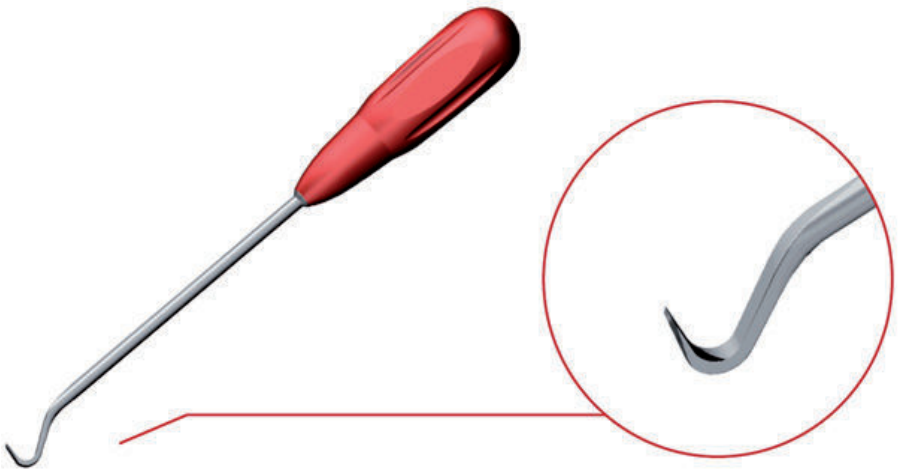
As a function of the type of clamp to be constructed, the hook can be used with its blade upward (sublaminar) or downward (supra-laminar or transverse).



A laminar rugine (optional) may be used to prepare the implantation site.

If a hook is placed on the transverse process, use the rugine (optional) to dissect the tissues that cover the upper portion of the transverse process.

If a laminar hook is used, use the rugine (optional) to undermine the yellow ligament in the medial zone of the canal. It is sometimes necessary to resect the lower portion of the proximal lamina to enable the hook to be positioned in an intra-canal position.

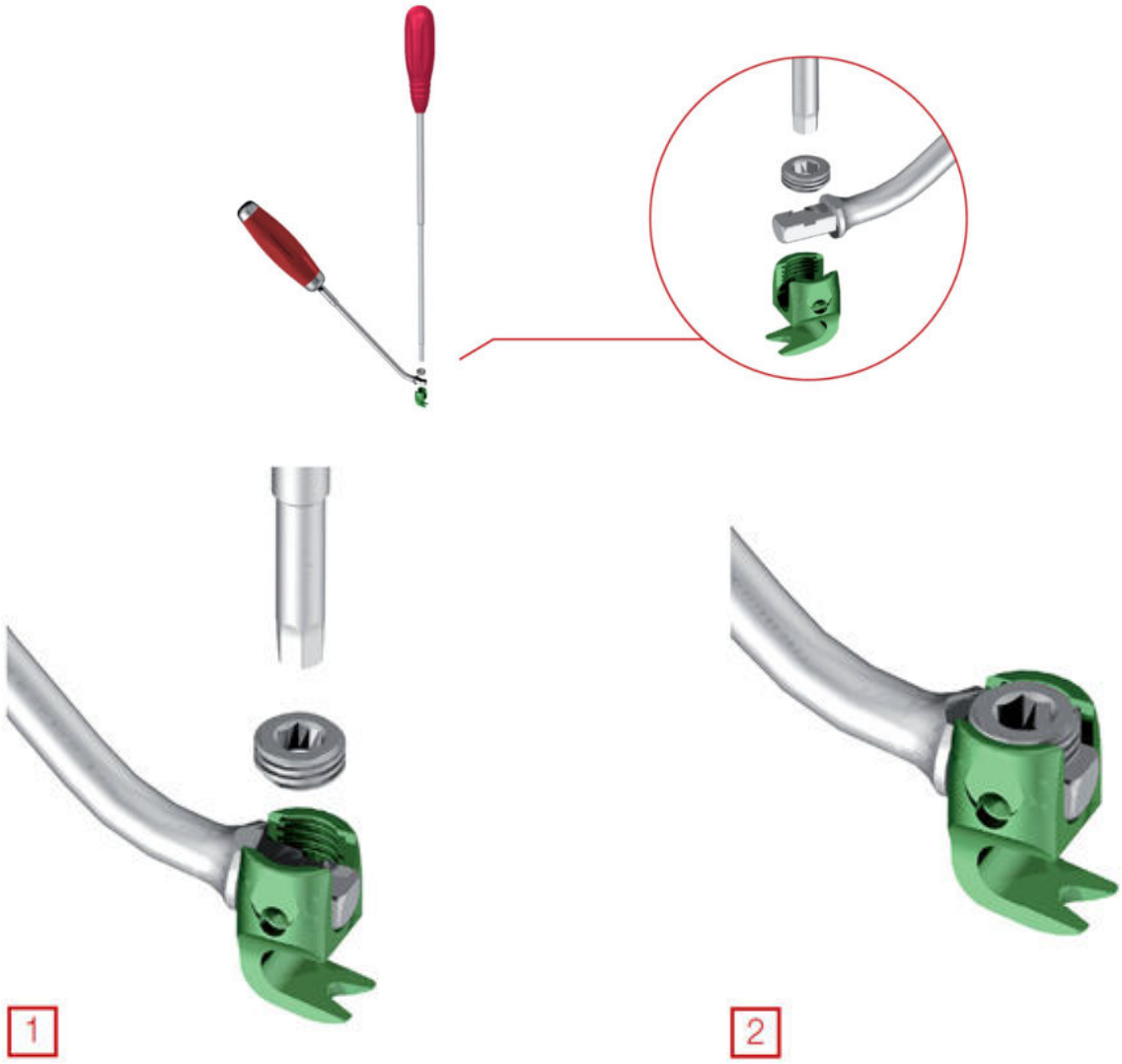


2.2. Installation of the hooks

Several different instruments may be used to install the hooks.

The curved hook holder enables the implant to be held stable with minimal space requirements. The tip of the instrument is introduced into the U-shape of the hook selected. A tightening plug is then screwed onto the hook until the latter is stable on the hook-holder.

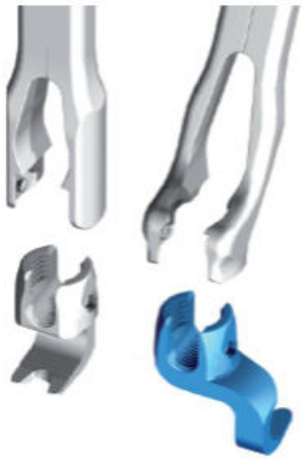
At this stage the implant acts as a rugine.



1 Insert the hook holder inside the U of the hook

2 Screw in the tightening plug into the hook

Alternatively, a straight or offset implant clamp may be used to hold the hook.



3. ROD SELECTION

E.SPINE® rods for deformation treatment are available in 5,5 mm and 6 mm diameter. Different grades of materials are available:

- Titanium alloy Ta6V4 ELI, either straight or pre-bent
- CoCr alloy, either straight or pre-bent

These different materials offer a choice of per-operative options with different stiffness and strength of constructs.

REMARK

Ø 6 mm rods are not compatible with E.SPINE® pedicular screws and hooks

A template trail rod may be used to measure the length of rod necessary as well as its optimal bending.

CAUTION

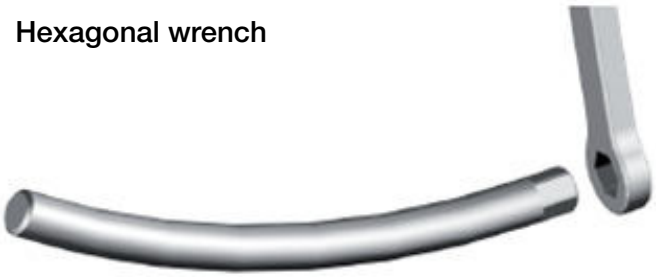
Do not implant the template rod. Following its utilization, make sure that you strengthen it back before storing it back in the container. The template rod made in shape-memory material will return to its rectilinear shape under the effect of heat during the sterilization process.

3.1. Handling of the rod

The length of rod necessary is determined beforehand. It is then possible to select rods pre-cut, pre-bent or not, or to select a rod to be cut using a rod cutter.

The end of the rod has a hexagonal shape which makes it possible, using the hexagonal wrench, to define the orientation of the rod (sagittal plane, for example), to facilitate the bending operation.

Hexagonal wrench



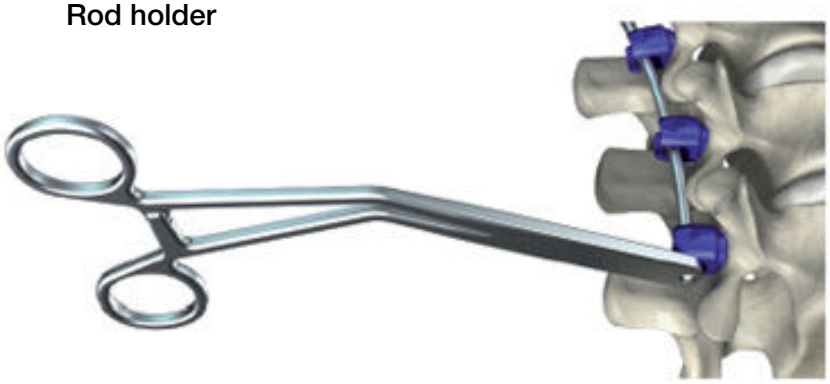
CAUTION

Never tighten the tightening plugs on the hexagonal-shaped part of the rod.

Different rod-holders may be used. The choice is made mainly as a function of the type of handling that will be performed using the rod.

The rod holder makes it possible to hold the rod in a stable manner with minimal overall dimension requirements.

Rod holder



The rod forceps makes it possible to hold the rod more firmly and to impart more efforts to the rod.

Rod forceps

The locking pliers must be used only for actions that call for high forces (example: rod rotation, creation of fixed bearing points during the compression, distraction manoeuvers, etc.)

Locking pliers

3.2. Shaping of the rod

Straight rods may be bent as per the curvature required, using the 3-point bender.

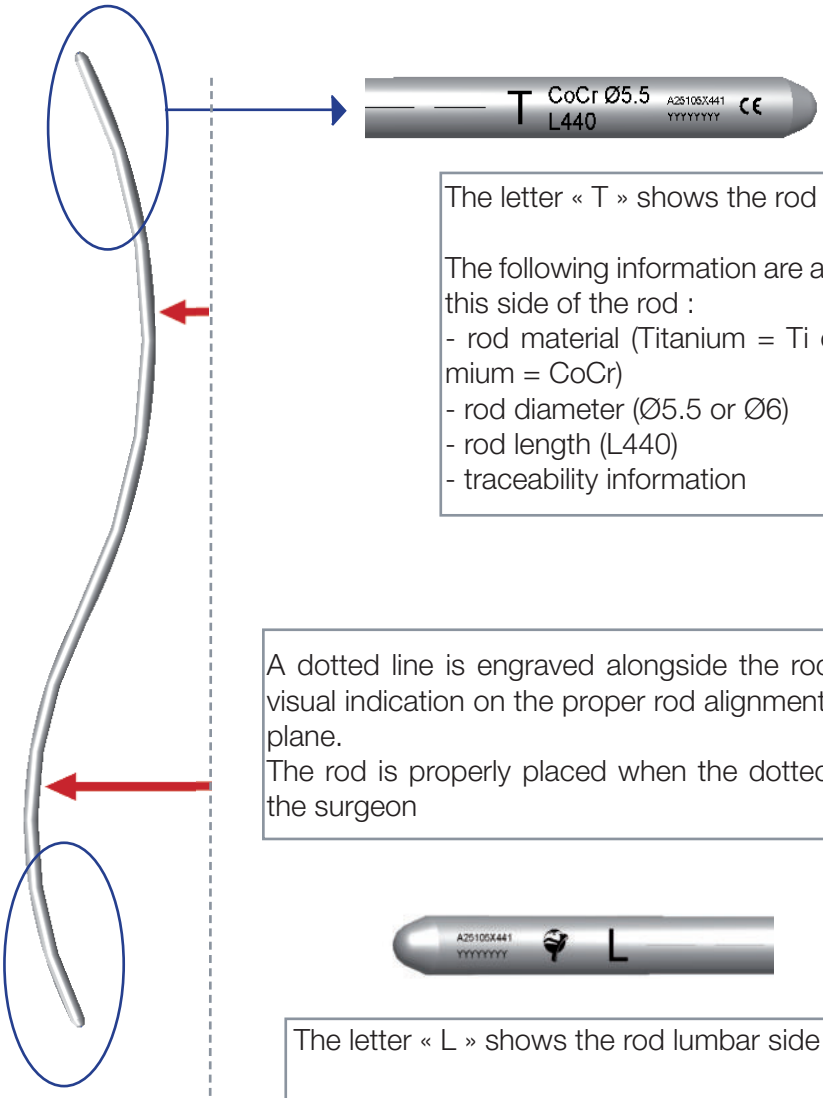
3- point benders

REMARK

Avoid repeated curvature modifications as this could affect the rod strength. Bending must be regular over the whole length of the rod.

It is also possible to bent rods thanks to bending levers puting the rods into the instruments holes.

Long pre-bent rods (L440mm) representing a « normal » sagittal profile are available in Titanium or Cobalt chromium and in Ø5.5mm or Ø6mm.



The letter « T » shows the rod thoracic side

The following information are also engraved on this side of the rod :
- rod material (Titanium = Ti or Cobalt Chromium = CoCr)
- rod diameter (Ø5.5 or Ø6)
- rod length (L440)
- traceability information

A dotted line is engraved alongside the rod to provide a visual indication on the proper rod alignment in the sagittal plane.
The rod is properly placed when the dotted line is facing the surgeon

The letter « L » shows the rod lumbar side

The following information are also engraved on this side of the rod :
- traceability information

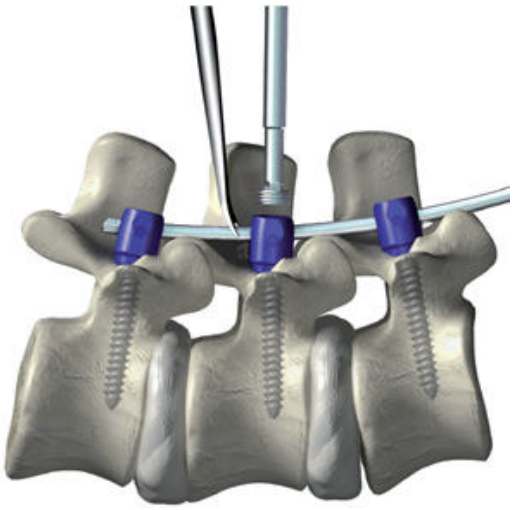
3.3. Fitting the rod inside the implants

The rod bent to shape can then be positioned inside the implants using different methods.

- **Simple insertion using a rod pucher**

Held by the rod holder, the rod is placed above the U openings of the implants, then introduced to reach its position at the bottom of the canals of these implants. Should there be a minor resistance, a rod pusher is used to facilitate the lowering of the rod into the implant canals.

Maintain the pressure applied to the rod using the rod pusher then install the tightening plugs.
Installation of the tightening plugs is realized with the pre-locking screwdriver.



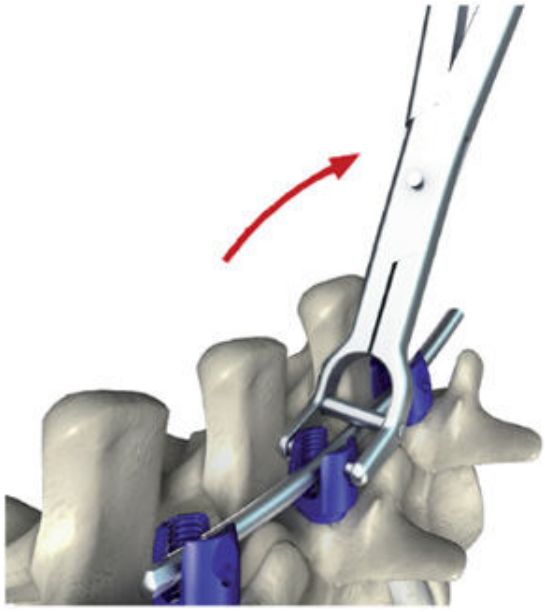
REMARK

Ascertain that the rod is perfectly positioned at the bottom of the implants before installing the tightening plugs.

- **Inserting the rod unsing the persuader (option)**

When the rod is roughly aligned with the implant axis but that it is slightly distant from the head of the same implant, the rocker may be used to impart a vertical pressure on the rod; the rocker is attached to the implant head through two lateral holes.

Holding the pressure on the rod using the rocker makes it possible to install the tightening plugs.



CAUTION

Ascertain that the rod is perfectly positioned at the bottom of the implants before installing the plugs. If necessary, readjust the bending of the rod.

- **Inserting the rod using the persuader**

When the rod is distant from the implant head but not exactly aligned with the implant axis, the persuader may be used to achieve a longer recall run.

Utilization :

1 The slider of the persuader must be set to its maximum high position. This position is achieved by expanding to the maximum the lateral grip of the handle.

2 Then place the persuader on either side of the rod to hold it between the two end arms.

3 Le persuader est descendu jusqu'au contact avec la tête de l'implant de façon que les bras de l'instrument viennent se clipper dans les perforations latérales des implants.

REMARK
Make sure that the soft or bony tissues do not prevent the clipping of the instrument onto the implant.

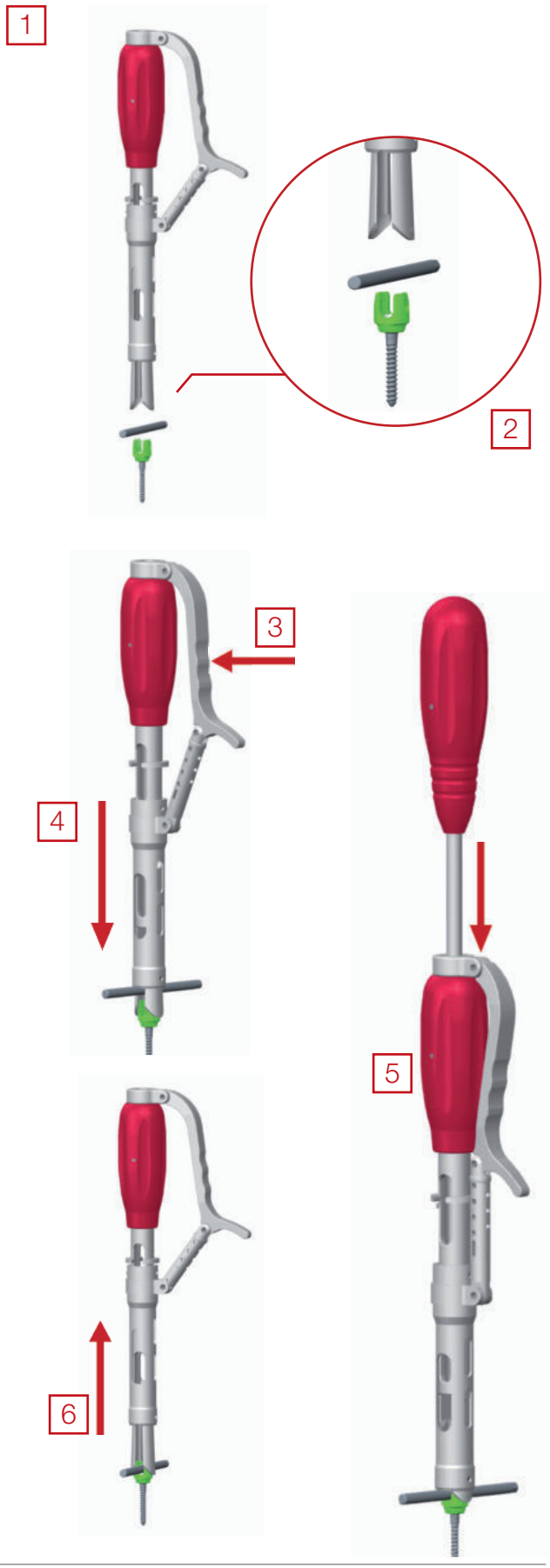
4 While maintaining the instrument aligned with the implant, progressively tighten the handle, so causing the vertical movement of the slider and maintaining pressure on the rod.

REMARK
Excessive effort on the handle could be dangerous and cause either the detachment of the implant or the destruction of the bone.

5 Once the rod has been fully reduced, the persuader is self-locked and becomes stable. It is then possible to introduce the tightening plugs using the persuader tube as a guide for the assembly pre-locking screwdriver.

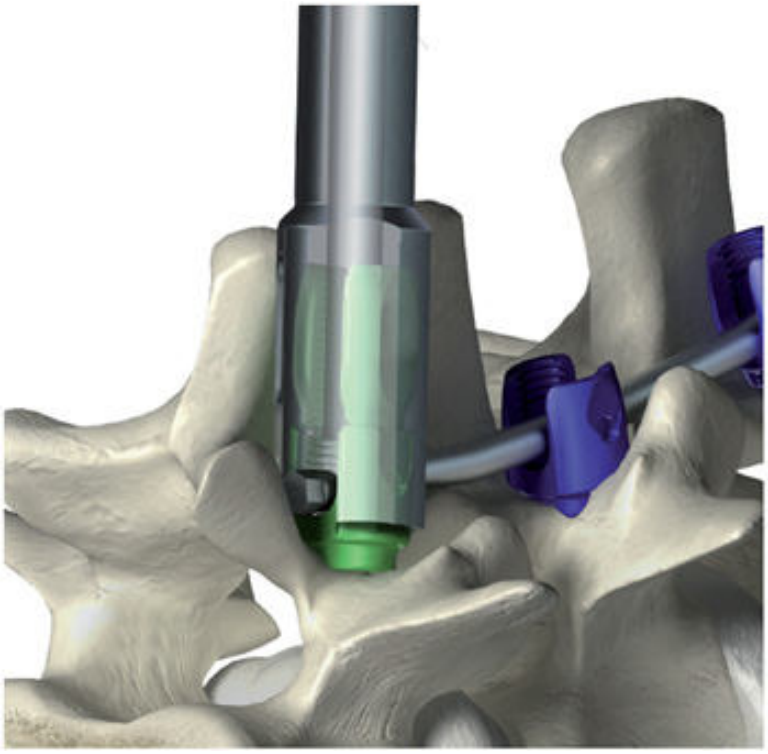
REMARK
Ensure that the rod is perfectly positioned at the bottom of the implants before installing the plugs. Ifnot, adjust the bending of the rod as necessary.

6 Once the tightening plug has been installed, the persuader may be removed by slowly spreading the handle gripper. This will move the slider upward and free the studs from the side holes of the implants.



- **Reduction screws**

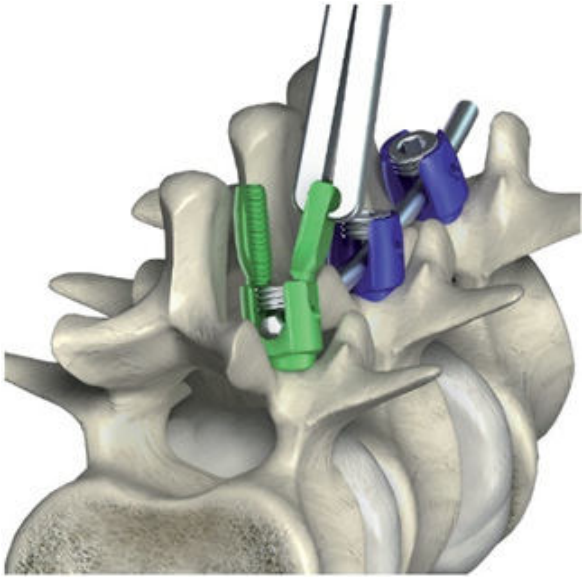
Reduction screws exhibit threaded extension that enable the tightening plug to be tighten over a longer length. This makes it possible to reduce the rod or to pull the vertebra along an anteroposterior relative movement.



REMARK

Locking must be done by coupling the final locking screwdriver with the T-handle torque. It is necessary to use the counter torque when tightening the locking screws.

When the rod has been lowered down to the end of the implant groove, the threaded extensions of the reduction screws may be removed using a flexion movement using the rod holder clamp.

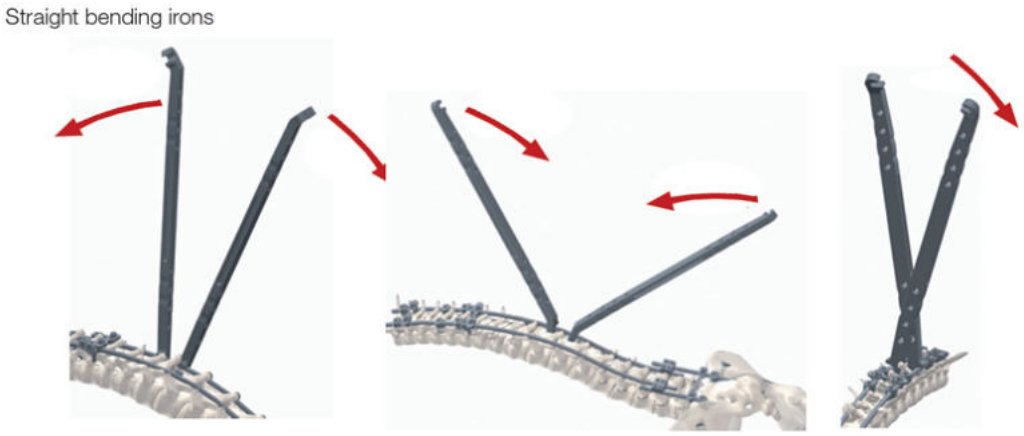


3.4. In situ adjustement of the rod bending

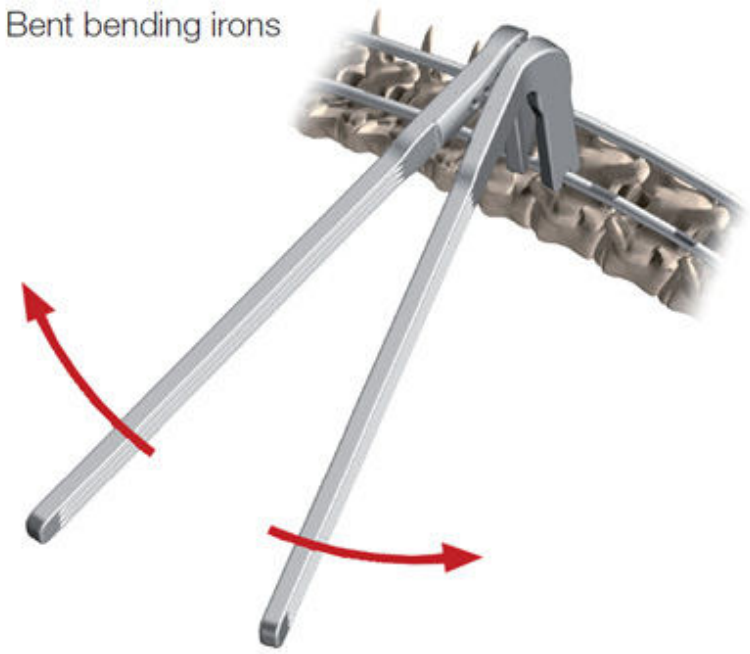
In order to adjust the bending of the rod or to perform spine correction manoeuvers, it is possible to use two types of bending irons:

- **Straight bending irons**: used vertically, they make it possible to modify the bending of the rod along the sagittal plane.
- **Bent bending irons** : used horizontally, they make it possible to modify the rod bending along the coronal plane.

These manoeuvers may be used to increase or decrease lordosies or kyphosies, optimize the implant alignment, correct deformities along the frontal plane, etc.



The straight bending irons can also be coupled together to derotate in the horizontal plane.

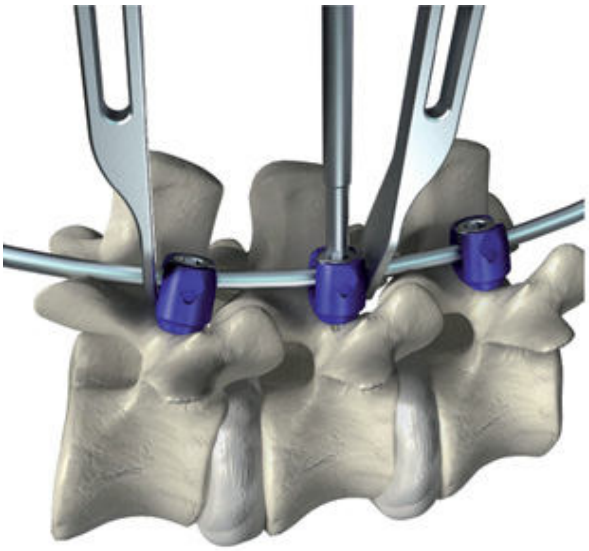


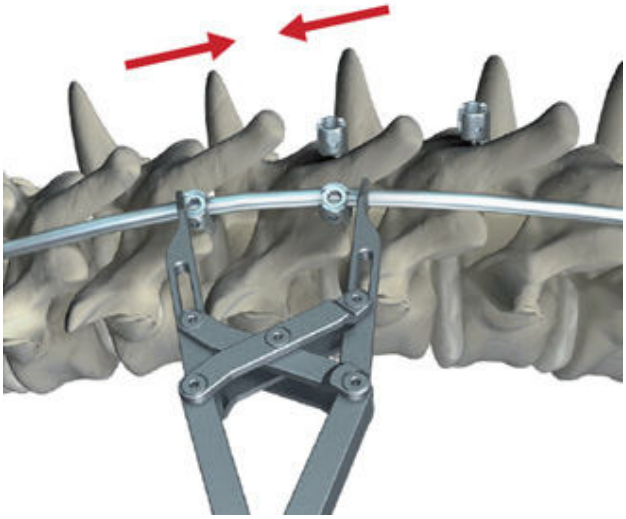
4. COMPRESSION - DISTRACTION - ROTATION

The tightening plugs are held assembled on implants not locked on the rod in order to allow the movement of the implants along the rod.

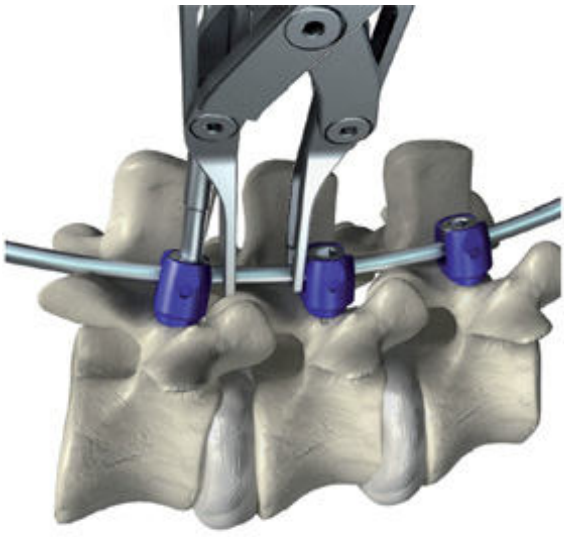
The distraction and compression parallel clamps may be used to spread the implants or move them closer.

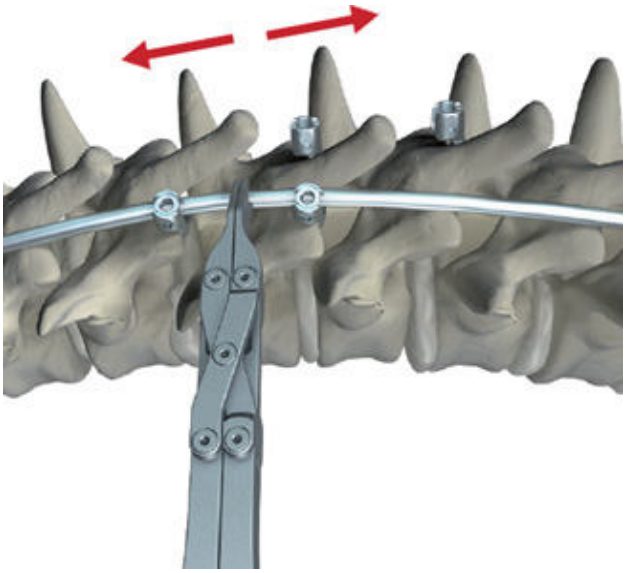
- **Compression**





- **Distraction**





The tips of the instrument arms must straddle the rod on either side of the implants to be mobilized. One of the two implants may become a fixed point by tightening the tightening plug before performing the correction manoeuvers. Once the displacement or the strength required achieved, the tightening plug of the second implant is tightened to the rod.

When implants are too distant, it is possible to create an additional fixed point using a locking pliers or another rod holder onto the rod.

- **Compression**

The rotation of the rod is made using either the hexagonal wrench inserted at the end of the rod, or using a pair of locking pliers that will be rotated until the required rod orientation. Then, at least one of the tightening plug is locked to maintain the rod position.

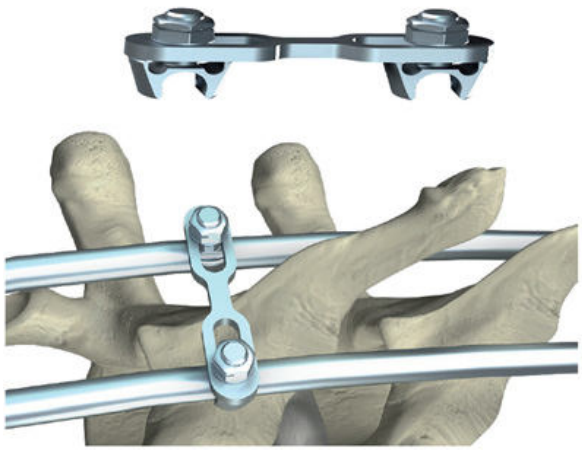
5. INSTALLATION OF THE CROSSLINK

5.1. Standard crosslink

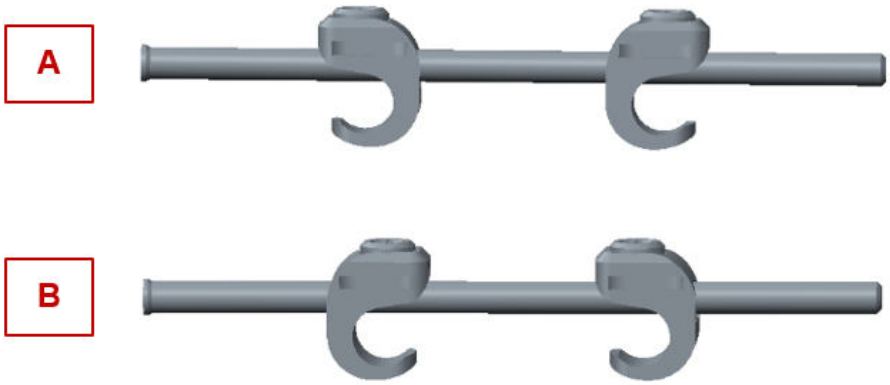
Crosslink enable making frame constructs that connect the two rods transversally. The frame opposes the torsion effects and other windshield wipers-like effects.

The crosslink, the length of which covers the space between the two rods, is held by the rod holder. The nuts must not be tightened.
The crosslink is placed vertically above the rods, the jaws are clipped to the rods by means of a simple vertical pressure imparted using the LTT locker.

Tighten the nuts until the nuts provided with an unlocking system become deformed.



5.2. Alternative optionnelle de liaison tranverse «Low-profile»



« Low-profile » crosslink is composed of 3 elements.

1. A 3.5 mm diameter transverse rod, available in several length from 40 to 120 mm, used to adjust the distance between the two lngitudinal rods of the construct.

2. Two identical hooks which could slide along the transversal rod and be used in two different configurations.
   - In opposition (option A) : Possibility of distraction of the longitudinal rods.
   - Facing each other (option B) : Possibility of compression of the longitudinal rods.

REMARK

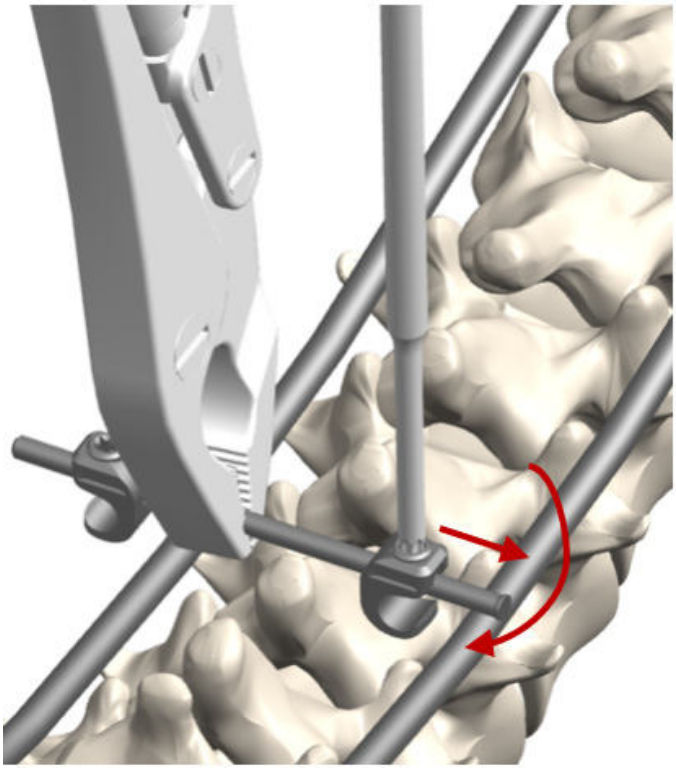
Hooks configuration must be chosen before implantation.

3. Locking screws inserted into the hooks to tighten the crosslink into the longitudinal rods.

- **Transversal rod implantation**

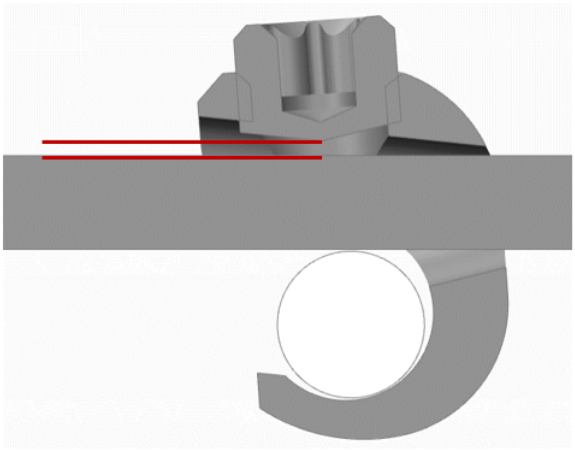
The transversal rod possess a stop at one end to avoid dislocation of the components during manipulations of the implants.

Before implantation, one hook can be removed from the transversal rod or not, according to surgeons' preferences.



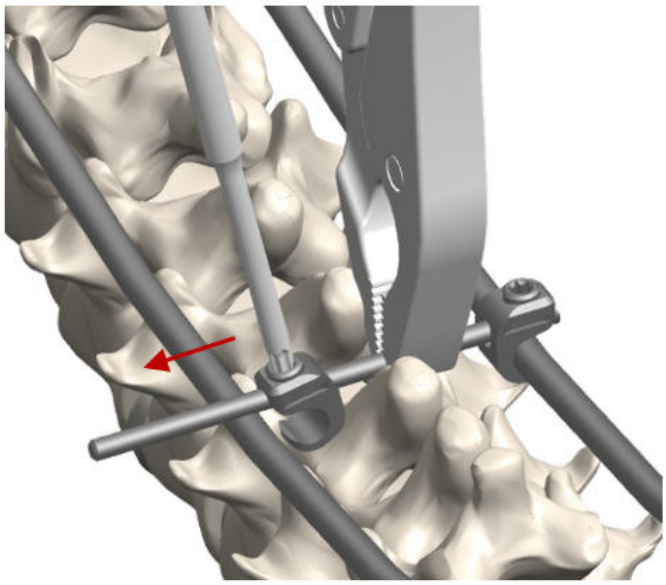
REMARK

Locking screws must be adjusted before implantation. Make sure that the hooks could easily slide along the transversal rod when a longitudinal rod is inserted inside the hook blade..



- **Technique with interepineous ligament ablation**

The longitudinal rod is firmly maintain thanks to any plier which could hold small rods. T20 screwdriver is inserted in the locking screw to hold and place the hook along the transversal rod. When the hook's blade has hold the longitudinal rod, the locking screw can be slightly tighten, the hook become stable on the rods. The same technique can be used for the second hook which was free during the first hook insertion).



Once the crosslink position is judged satisfactory, the locking screws can be completely tightened.

REMARK

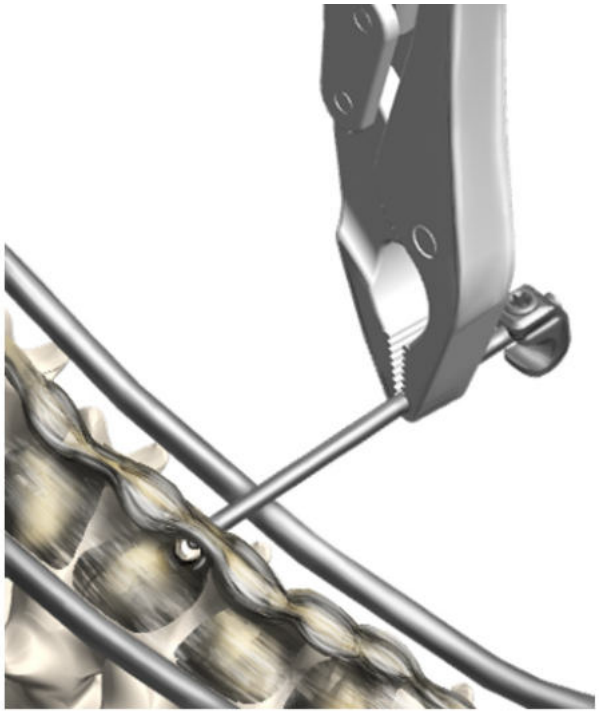
If the longitudinal rods are not parallel, the crosslink transversal rod can be slightly bent. Be careful not to overbent this rod, it could prevent the hooks from sliding along it.

- Technique without interepineous ligament ablation

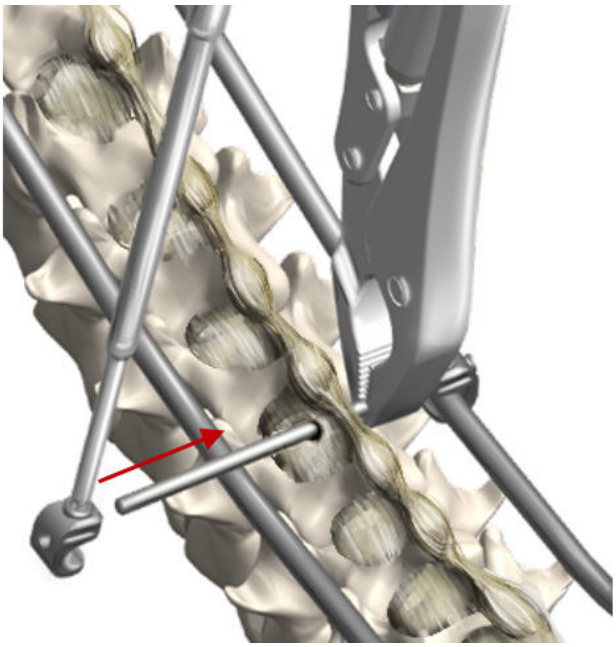
A small opening is done in the interepineous ligament to create a path for the Ø3.5mm crosslink transversal rod.

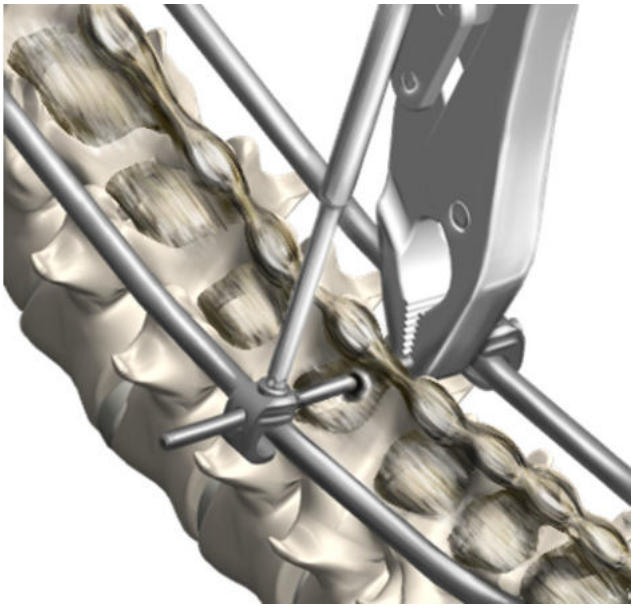
One of the hooks is removed from the crosslink to free one of the transversal rod ends.

Held by a clamp, the transversal rod is then inserted into the previously created opening.



Using the same technique as that described above, the first hook is mobilized to capture the first longitudinal rod. The set screw is tightened slightly to temporarily stabilize the assembly (the assembly should remain loose and movable to facilitate connection on the opposite side).



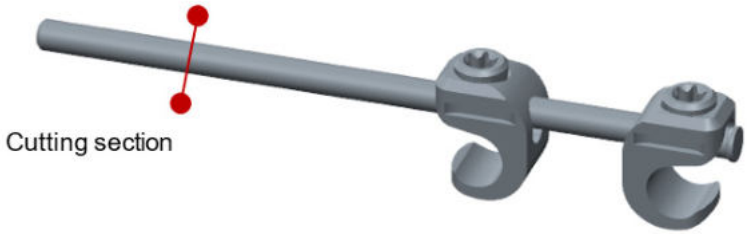


The free hook (2) is then connected to the free end of the crossbar and slides to capture the second longitudinal rod. The setscrews are then firmly tightened on the two hooks.

REMARK

In exceptional cases, surgeons may want to cut the crossbar to adjust its length to the distance between the two longitudinal rods.

It is possible to do this, but the cut should be made in such a way that the two hooks remain assembled on the bar and held together on one side of the bar before the cut, as this operation can create a deformation of the section of the bar. rod which could make it impossible to reassemble the components.



6. LONGITUDINAL CONNECTIONS

It is possible to connect two rods longitudinally with three types of connectors:

- **Closed domino connector**

It makes it possible to connect two rods side by side. Before final locking, ensure that the two rods protrude from either side of the connector.

Three versions are available:

Standard version for Ø5.5mm rods

Standard version for Ø5.5 to 6mm rods

Reduced version for Ø5.5 to 6mm rods

- **Open domino connector**

It makes it possible to connect two rods side by side. The open side of the connector enables you to connect one of the two rods laterally. Before final locking, ensure that the rod is perfectly at the bottom of the groove on the open side, and that the two rods protrude on either sides of the connector.

Three versions are available:

Standard version for Ø5.5mm rods

Standard version for Ø5.5 to 6mm rods

Reduced version for Ø5.5 to 6mm rods

REMARK

Ensure that the rods protrude from either sides of the connectors.

- **Closed cylinder connector**

It makes it possible to connect the two rods end to end. Before final locking, ensure that the two rods abutt their end into the connector, thanks to the visualisation hole of the version for Ø5.5 to 6mm rods.

Two versions are available:

Version for Ø5.5mm rods

Version for Ø5.5 to 6mm rods

- **Rod connector**

It makes it possible to connect anchoring implants from the thoracic pole with the connecting longitudinal lumbar rod. Before final locking, make sure that the longitudinal rod abutt its end into the rod-connector head thanks to the two visualisation holes.

Rod-connector are available in several length and in straight and pre-bent versions.

7. FINAL TIGHTENING

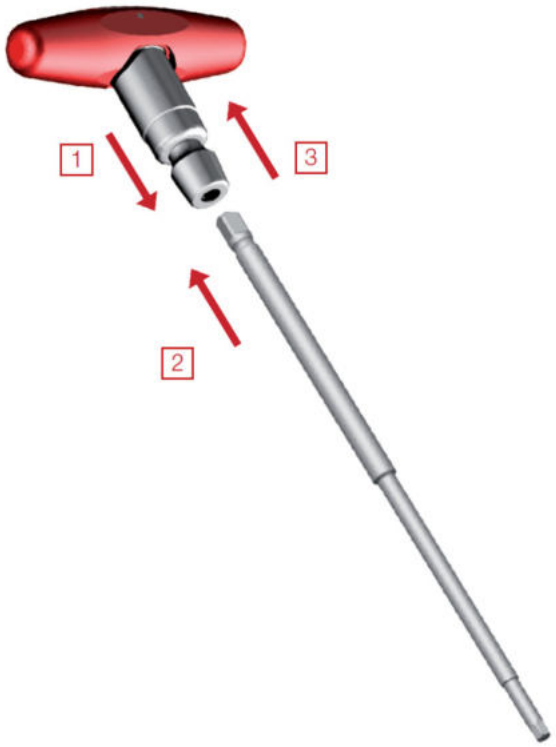
- **Assembly of the torque handle**

You must snap-fit the handle onto the shaft of the tightening screwdriver.

1 Push the spring ring of the handle opposite the handle and hold it in position.

2 Snap fit the screwdriver shaft inside the handle.

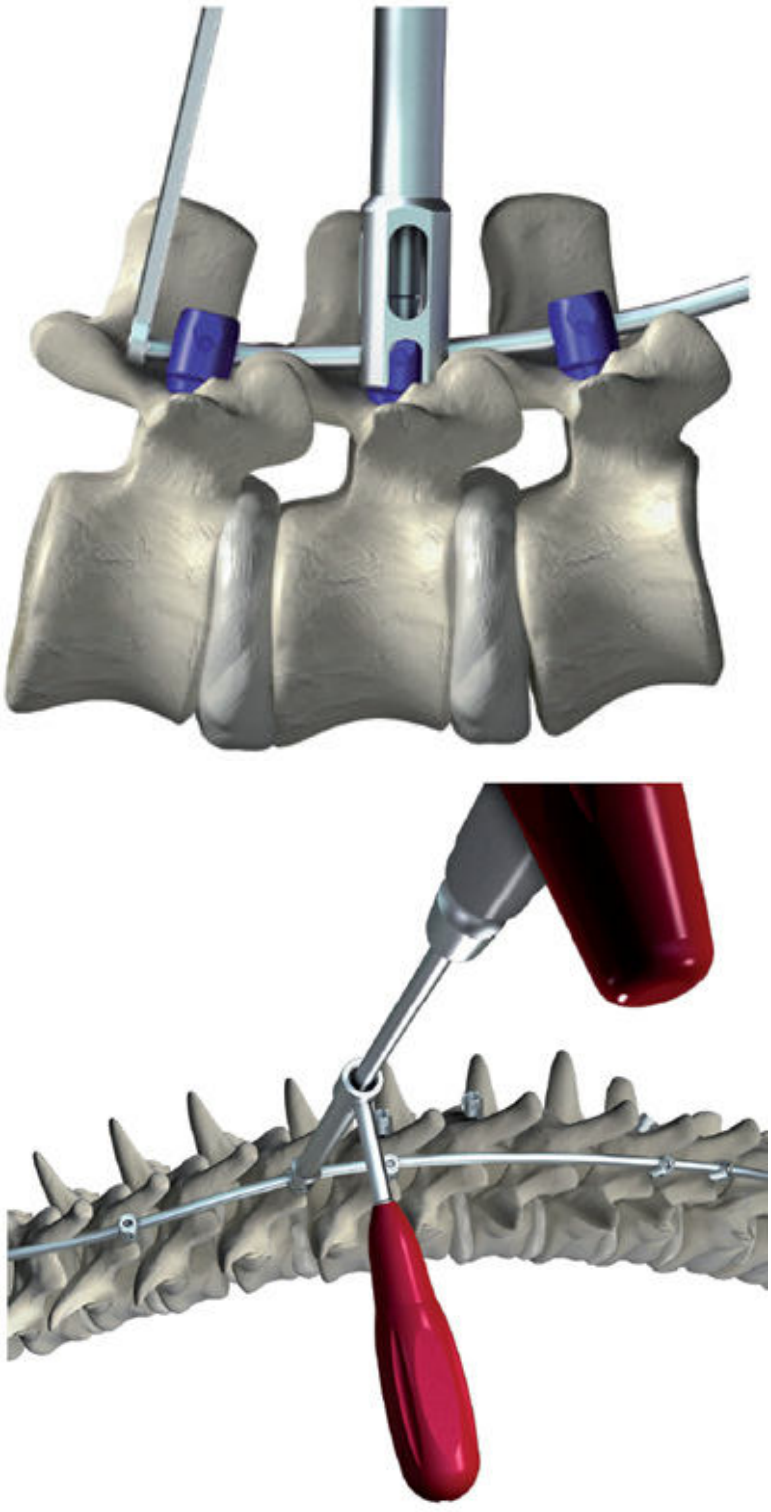
3 Release the spring ring to effect the fixation.



- **Locking screw tightening**

During the final tightening step, it is recommended to use a counter-torque to prevent deteriorating the implant/bone interfaces.

The torque handle must be used to ensure optimum tightening of the interconnections. The tripping torque is approximately 10Nm.



D. IMPLANTS

PEDICULAR SCREW - NON-STERILE

	Reference	Length	Diameter
	**A25111251**	25 mm	4,35 mm
	A25111301	30 mm	
	A25111351	35 mm	
	A25111401	40 mm	
	A25111451	45 mm	
	A25111501	50 mm	
	A25111551	55 mm	
	**A25112251**	25 mm	5 mm
	A25112301	30 mm	
	A25112351	35 mm	
	A25112401	40 mm	
	A25112451	45 mm	
	A25112501	50 mm	
	A25112551	55 mm	
	A25112601	60 mm	
	**A25113251**	25 mm	6 mm
	A25113301	30 mm	
	A25113351	35 mm	
	A25113401	40 mm	
	A25113451	45 mm	
	A25113501	50 mm	
	A25113551	55 mm	
	A25113601	60 mm	
	**A25114251**	25 mm	6,5 mm
	A25114301	30 mm	
	A25114351	35 mm	
	A25114401	40 mm	
	A25114451	45 mm	
	A25114501	50 mm	
	A25114551	55 mm	
	A25114601	60 mm	
	A25114651	65 mm	
	**A25115301**	30 mm	7 mm
	A25115351	35 mm	
	A25115401	40 mm	
	A25115451	45 mm	
	A25115501	50 mm	
	A25115551	55 mm	
	A25115601	60 mm	
	A25115651	65 mm	
	A25115701	70 mm	
	A25115751	75 mm	

REDUCTION PEDICULAR SCREW - NON-STERILE

	Reference	Length	Diameter
	**A25121251**	25 mm	4,35 mm
	A25121301	30 mm	
	A25121351	35 mm	
	A25121401	40 mm	
	A25121451	45 mm	
	A25121501	50 mm	
	A25121551	55 mm	
	**A25122251**	25 mm	5 mm
	A25122301	30 mm	
	A25122351	35 mm	
	A25122401	40 mm	
	A25122451	45 mm	
	A25122501	50 mm	
	A25122551	55 mm	
	A25122601	60 mm	
	**A25123251**	25 mm	6 mm
	A25123301	30 mm	
	A25123351	35 mm	
	A25123401	40 mm	
	A25123451	45 mm	
	A25123501	50 mm	
	A25123551	55 mm	
	A25123601	60 mm	
	A25123651	65 mm	
	**A25124251**	25 mm	6,5 mm
	A25124301	30 mm	
	A25124351	35 mm	
	A25124401	40 mm	
	A25124451	45 mm	
	A25124501	50 mm	
	A25124551	55 mm	
	A25124601	60 mm	
	A25124651	65 mm	
	A25124701	70 mm	
	**A25125301**	30 mm	7 mm
	A25125351	35 mm	
	A25125401	40 mm	
	A25125451	45 mm	
	A25125501	50 mm	
	A25125551	55 mm	
	A25125601	60 mm	
	A25125651	65 mm	
	A25125701	70 mm	
	A25125751	75 mm	
	A25125801	80 mm	

HOOKS - NON-STERILE

	Reference	Size	Designation
	**A2513511** **A2513521** **A2513531**	Small Medium Large	Progressive Blade Hook
	**A2513611** **A2513621** **A2513631**	Small Medium Large	Pedicle Hook
	**A2513711** **A2513721** **A2513731**	Small Medium Large	Reduced Blade Hook
	**A2513811** **A2513821** **A2513831**	Small Medium Large	Large Blade Hook
	**A2513911** **A2513921**	Reduced	Laminar Hook - Left Offset Laminar Hook - Right

LOCKING SCREW - NON-STERILE

	Reference	Designation
	**A2511001** **A251101101**	Locking Screw Self-Breaking Locking Screw - 6,5 Nm

TITANIUM RODS - NON-STERILE

	Reference	Length	Diameter	Designation
	**A25101042**	40 mm	5,5 mm	Titanium straight rod
	A25101052	50 mm		
	A25101062	60 mm		
	A25101072	70 mm		
	A25101082	80 mm		
	A25101092	90 mm		
	A25101112	110 mm		
	A25101132	130 mm		
	A25101162	160 mm		
	A25101222	220 mm		
	A25101442	440 mm		
	A25101502	500 mm		

	**A25102041** **A25102051** **A25102061** **A25102071** **A25102081** **A25102091**	40 mm 50 mm 60 mm 70 mm 80 mm 90 mm	5,5 mm	Tige Pré-Cintrée Titane

TITANIUM RODS - STERILE

	Reference	Length	Diameter	Designation
	**A251051441**	440 mm	5,5 mm	Titanium pre-bent rod
	**A251052441**	440 mm	6 mm	Titanium pre-bent rod
	**A251060091** **A251060111** **A251060131** **A251060221**	90 mm 110 mm 130 mm 220 mm	5,5 mm	Lumbosacral Titanium pre-bent rod

COCRS RODS - NON-STERILE

	Reference	Length	Diameter	Designation
	**A251040401** **A251040501** **A251040601** **A251040701** **A251040801** **A251040901** **A251041101** **A251041301** **A251041601** **A251042201** **A251044401** **A251045001**	40 mm 50 mm 60 mm 70 mm 80 mm 90 mm 110 mm 130 mm 160 mm 220 mm 440 mm 500 mm	5,5 mm	CoCr Straight Rod

COCRS RODS- STERILE

	Reference	Diameter	Length	Designation
	**A251053441** **A251054441**	5,5 mm 6 mm	440 mm	CoCr Pre-bent Rod

PEEK RODS - NON-STERILE

Reference	Length	Diameter	Designation
A251030351	35 mm	5,5 mm	PEEK Pre-bent Rod
A251030401	40 mm		
A251030501	50 mm		
A251030601	60 mm		
A251030701	70 mm		
A251030801	80 mm		
A251030901	90 mm		
A251031001	100 mm		
A251031101	110 mm		
A251031201	120 mm		
A251031351	135 mm		

RODS - CONNECTORS - NON-STERILE

Reference	Length	Diameter	Designation
A251070131	130 mm	5,5 mm	Pre-Bent Thoracic
A251070161	160 mm		
A251071161	160 mm	5,5 mm	Straight Thoracic

TRANSVERSAL CONNECTION - NON-STERILE

Reference	Length	Designation
A2514031	35 mm	Transverse link LTT
A2514041	46 mm	
A2514061	60 mm	
A2514071	70 mm	
A2514081	80 mm	

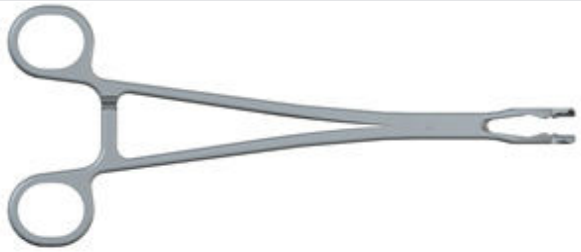
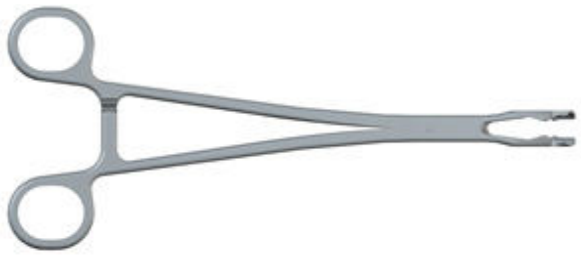
A251410401	40 mm	Cross Link
A251410601	60 mm	
A251410801	80 mm	
A251411001	100 mm	
A251411201	120 mm	

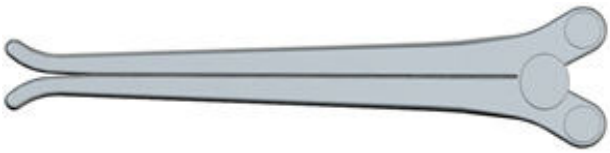
CONNECTORS - NON-STERILE

	Reference	Diameter	Designation
	**A2515001** **A251500012**	5,5 mm 5,5 / 6 mm	Closed Domino Connector
	**A251510011**	5,5 / 6 mm	Closed Reduced Domino Connector
	**A2515001** **A251500012**	5,5 mm 5,5 / 6 mm	Open Domino Connector
	**A251511011**	5,5 / 6 mm	Open Reduced Domino Connector
	**A2515021** **A251502012**	5,5 mm 5,5 / 6 mm	Straight Connector

E. INSTRUMENTATION

E.SPINE INSTRUMENTATION

	Reference	Designation
	**B2521012**	Adjustable pointed awl
	**B2521024**	Pedicle probe
	**B2521031**	Pedicle sensor
	**B25220711**	Tap for Ø4.35 & 5mm screws
	**B25220721**	Tap for Ø6mm screws
	**B25220731**	Tap for Ø6.5 & 7mm screws
	**B2522041**	Mono-polyaxial screwdriver
	**B2522012**	Monoblock pedicle screwdriver
	**B2524062**	Ratchet handle
	**B2523032**	Angled hook holder
	**B2523031**	Straight hook holder
	**B2525021**	Curved hook impactor

	Reference	Designation
	B2523171	Trial rod L440mm
	B2523181	Hexagonal wrench
	14260301	Curved rod clamp
	B2523202	Tight rod pliers
	B2523192	Clamp
	B2523052	Rod bender
	B2523072	Rod pusher / Head orientator
	B2523042	Persuader
	B2523122	Right bending lever
	B2523132	Left bending lever
	B2522021	T20 screwdriver
	B2522032	Final locking screwdriver

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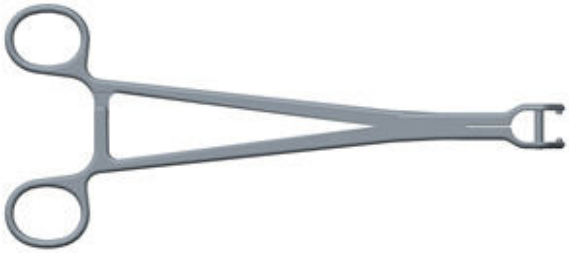
	Reference	Designation
	**B2522091**	Temporary locking screwdriver
	**B2522051**	Counter torque
	**B2522082**	Locking screw double holder
	**B2523082**	Parallel compression pliers
	**B2523092**	Parallel distraction pliers
	**B2522061**	LTT locking device
	**B2523072**	Dynamometric T handle

HOOKS SPECIFIC INSTRUMENTATION

	Reference	Designation
	**B2525031**	Pedicular gouge
	**B2525041**	Transverse gouge
	**B2525051**	Laminar gouge
	**B2525061**	Sub-articular gouge

INSTRUMENTS EN OPTION

	Reference	Designation
No visual available	**1413-199** **PI32008** **RC701003-E**	Cutting pliers
	**B2521011**	Square awl with stop
	**B2523042**	Persuader
	**B2523021**	Rocker
	**B2523081**	Compression pliers

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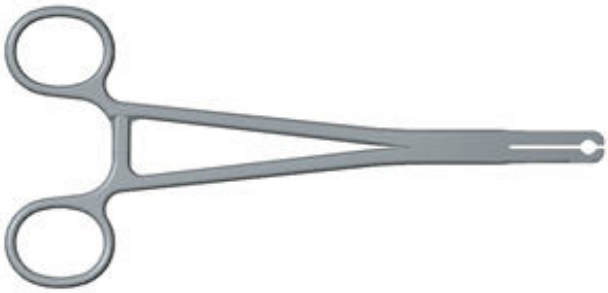
	Reference	Designation
	**B2523091**	Distraction pliers
	**B2523061**	Straight rod holder
	**B2522011**	Pedicle screwdriver with long or short hex end fittings
	**B2522011-02-01**	Short hex end fitting for pedicle screwdriver
	**B2522011-02-02**	Long hex end fitting for pedicle screwdriver
	**B2523141**	Right coronal bending lever
	**B2523151**	Left coronal bending lever

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