

SmartMIS<sup>®</sup>

# SPINAL FIXATION SYSTEM

Surgical Technique Guide

Conventional Surgery



## Contents



Introduction 2

Indications 2



Contraindications 3

Sterilization 3



Surgical Technique 4

Instrument Set 12

Instruments 15



Implants 18

## Introduction

SmartMIS Spinal Fixation System is a spinal fixation system composed of dual-lead pedicle screws, smooth rods, transverse link assemblies, connectors for spinal surgery. Various sizes and styles of the implants are available for optimal adaptation of the pathology of the individual patient. Specific instruments have been designed for use with these implants.

## Indications

1. Degenerative spondylolisthesis with distinctive evidence of neurological impairment
2. Vertebral fracture
3. Spinal tumor
4. Dislocation
5. Scoliosis
6. Kyphotic deformity
7. Discogenic deformity
8. Failed previous fusion

## Contraindications

1. Bone absorption, osteopenia, and/or osteoporosis
2. Any active or suspected latent infection of the spine
3. Any mental or neuromuscular disorder which might create unacceptable risk of fixation failure or complications post-operatively
4. Bone stock abnormalities, or deficiency which cannot provide adequate support and/or fixation to the implants
5. Pathological obesity
6. Open wounds
7. Metal sensitivity, documented or suspected
8. Pregnancy
9. Excessive local inflammation reaction
10. Other medical or surgical symptoms that may preclude the potential benefit of spinal implant surgery, such as the presence of tumors, congenital abnormalities, elevation of sedimentation rate unexplainable by other diseases, elevation of white blood count (WBC), or marked left shift in the WBC differential count

## Sterilization

All implants and instruments should be sterilized by steam autoclave following the internal hospital guidelines to achieve the degree of sterility of  $10^{-6}$ .

The suggested parameters are as follow:

Steam Wrapped Gravity Cycle at 121 °C/ 250 °F for 30 minutes.

**CAUTION:**

The use of sodium hydroxide (NaOH) is prohibited.

Avoid the use of corrosive products and instruments including abrasive sponges and metal brushes.



## Surgical Technique

### ○ Patient Position

Patient is positioned in prone position with abdomen free from pressure. This position aids in the maintenance of normal lumbar lordosis and the reduction of abdominal compression, minimizing epidural venous bleeding. C-arm Fluoroscopic image intensifier is used to supervise throughout the surgery.

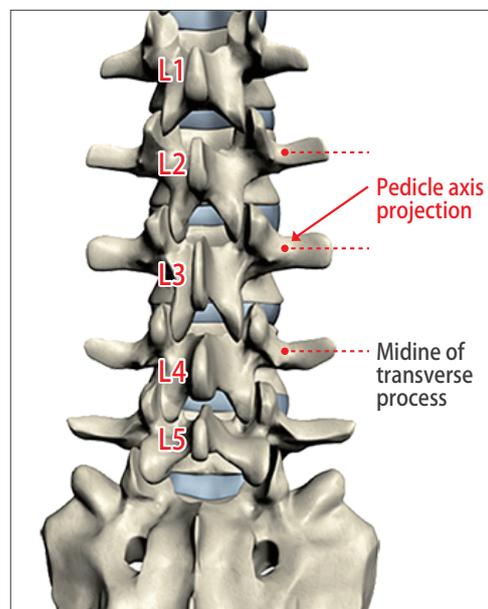


### ○ Locate the Pedicle Entry Points

The use of the SmartMIS Spinal Fixation System in spinal surgery requires a working knowledge of anatomic subtleties in order to identify the pedicles accurately.

In the lumbar spine, the pedicle is located where the line bisects the base of the transverse process. The second line goes through the lateral aspect of the superior articular facet and parallel with the mid-line. The facet osteophytes need to be removed in order to delineate the true position of the pedicle.

Current literature suggests that the screws in the lower lumbar spine should be placed away from the facet joint to avoid interference with the motion of instrumented and unfused segments.



The preferred entrance point locates at the lateral and inferior corner of the superior articular facet.

The entry point of sacral fixation located at inferior lateral aspect of the L5-S1 facet joint, converging toward the center of the promontory with sagittal inclination parallel to the S1 superior endplate



Figure 1

## 01 Pedicle Preparation

The point of entrance to the pedicle is identified and lateral imaging with C-arm fluoroscopy is used to confirm position and provide reference for subsequent placement of pedicle.

Determine the angle of entry and penetrate the probing cortex with the **Awl (With Stop) (406-0201)** to mark that position.  
(Figure 1)



Figure 2

Using the **Probe (406-0301 or 406-0302)** gently deepen the hole through the pedicle cancellous bone to the desired depth.  
(Figure 2)

The probe is placed through the pedicle into the body of the vertebrae with C-Arm Fluoroscopy assistor approximately.

In some cases such as with osteoporotic bone, the probe may not be used but the **4mm Guide Pin (406-3104, 406-3114)** can be placed directly into the pedicle to vertebral body for checking the enter point of screw trajectory.

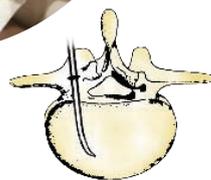




Figure 3

Select the handle to attach the instruments is a normal grip design. For operation smoothly, the **T-handle (406-0101)** has no ratchet.

But the **Ball Handle (407-0104)** is a ratchet function and with cannula hole design. (Figure 3)

Use the **Tap (433-0504~433-0507)** to prepare the screw thread if need be.

Two types of tap are used for different types of screws, please refer to the tap index in the table.

The **Sensor (406-0401)** depth sounding is used to confirm the continuity of the cortical wall of the pedicle should medial or inferior perforation occurs, establishing another orientation and position of the pedicle passage is indicated. (Figure 4)



Figure 4

 Cortex Screw	 Tap	<table border="1"> <thead> <tr> <th>Tap Cat.No.</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>433-0504</td> <td>ø4mm Tap</td> </tr> <tr> <td>433-0505</td> <td>ø5mm Tap</td> </tr> <tr> <td>433-0506</td> <td>ø6mm Tap</td> </tr> <tr> <td>433-0507</td> <td>ø7mm Tap</td> </tr> </tbody> </table>	Tap Cat.No.	Description	433-0504	ø4mm Tap	433-0505	ø5mm Tap	433-0506	ø6mm Tap	433-0507	ø7mm Tap	 Screw	<table border="1"> <thead> <tr> <th>Cat.No.</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>433-0514</td> <td>ø4mm Tap</td> </tr> <tr> <td>433-0515</td> <td>ø5mm Tap</td> </tr> <tr> <td>433-0516</td> <td>ø6mm Tap</td> </tr> <tr> <td>433-0517</td> <td>ø7mm Tap</td> </tr> </tbody> </table>	Cat.No.	Description	433-0514	ø4mm Tap	433-0515	ø5mm Tap	433-0516	ø6mm Tap	433-0517	ø7mm Tap
		Tap Cat.No.	Description																					
		433-0504	ø4mm Tap																					
		433-0505	ø5mm Tap																					
		433-0506	ø6mm Tap																					
433-0507	ø7mm Tap																							
Cat.No.	Description																							
433-0514	ø4mm Tap																							
433-0515	ø5mm Tap																							
433-0516	ø6mm Tap																							
433-0517	ø7mm Tap																							



406-0101  
T-Handle



407-0104  
Ball Handle, Ratchet



433-0504~433-0507  
4~7mm Cortex Tap



433-0514~433-0517  
4~7mm Tap



406-0401  
Sensor

## 02 Screw Insertion

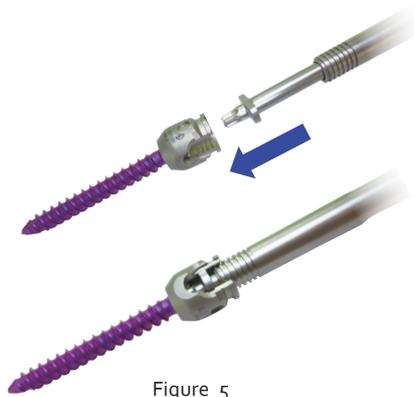


Figure 5

Select the appropriate screw driver by screw shape; please refer to the index in the table.

Fully insert the end of the Screw Driver into the appropriate length screw head, thread the sleeve into the screw head to provide a stable insertion, and then push the cover directly on the sleeve to prevent loosening during rotation. If want to release sleeve, pull the cover back and anticlockwise the sleeve. (Figure 5 and 6)



Figure 6

**CAUTION:**

If the tip of Multi-axial Screw Driver/Multi-axial Long-Arm Screw Driver is not fully inserted into the Multiaxial Screw, the screw will not remain stable and effect screw insertion.

Insert the pedicle screw along pre-prepared screw hole. Once the screw is inserted, the sleeve is unscrewed and the Screw Driver disengaged from the screw.





Figure 7

### 03 Rod Preparation and Insertion

The spinal curve should be a gentle lordotic curve; use the **Rod Template (407-2901)** to be the line drawn on top of the screw heads for checking lordotic curve. The rod curve is adjusted according to the Rod Template by the **Rod Bender (406-1201)**.

(Figure 7)

Use the **Rod Holder (406-1301)** to place rod into the bottom of screw heads from either the cephalad or caudad direction.



Figure 8

### 04 Star Set Screw Insertion

The Star Set Screws are inserted into the implants using the **Star Set Screw Holder (433-1301)**, and tighten the Star Set Screws using the T25 Set Screw Driver.

(Figure 8)

**CAUTION:**

The T25 Set Screw Holder should not be used to tighten the Star Set Screws, otherwise instrument will be damaged.



407-2901

Rod Template  
150mm



406-1201

Rod Bender



406-1301

Rod Holder



433-1301

Star Set Screw Holder



Figure 9



Figure 10

## 05 Rod Reduction

If the rod is not fully fixed to the bottom of the screw head, the **Rod Pusher (406-2601)** can help to press the rod or use the **Rod Reducer (433-1401)** to fully press the rod to the bottom of the screw head, and insert a T25 Set Screw Driver with Star Set Screw which through the hole of Rod Reducer to tighten it. (Figure 9)

### CAUTION:

The Rod Reducer may be used on standard screws, but not long-arm screws.

## 06 Rod Adjustment

If the rod needs to be rotated, use the **Poly Adjustment Driver (433-3306)** to release a set screw at the end of the rod and use a **5mm Rotator Bar (406-3005)** to stick the end of the rod, then rotate the rod until it reaches the proper direction. (Figure 10)

Usually deformity/scoliosis correction use long segment rods, the **Rod Clamp (407-2101)** and the **Insitu Bender (406-1203)** can be used to adjust the curve of long Segment.

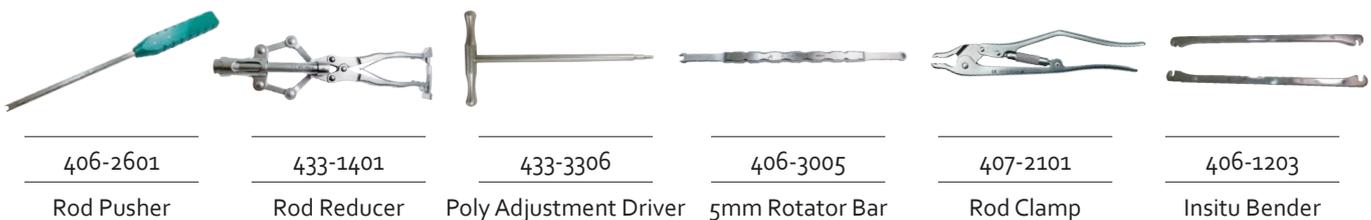




Figure 11



Figure 12



Figure 13

## 07 Distraction and Compression

If either compression or distraction is needed, one side of the motion segment should be tightened and another be provisionally loosened.

The **Angled Compressor (407-0901)** or the **Angled Distractor (407-0902)** is placed on the rod that can be used to adjust the distance between the screws.

Once it has been achieved, tightening screw again. (Figure 11 and 12)

## 08 Final Tightening

After all the implants are firmly seated, the set screws suppress the movement between the rod and the screw cup. But it still need final tightening set screw in order to avoid rod loosening.

The **Anti-Torque Wrench, Notch Ø5.5mm (433-3402)** should be held screw head and rod firmly to prevent torqueing of the construct while final tightening. Assemble the Torque Limiting **T-Handle (407-1002)** to the **Star Set Screwdriver (433-3305)**, and insert to set screw through the Anti-torque Wrench. Rotate the Torque Limiting T-Handle until it clicks, which means it achieve the final tightening torque of 12Nm and avoid over screwing and destroy implants. (Figure 13)



407-0901

Angled Compressor



407-0902

Angled Distractor



433-3402

Anti-Torque Wrench,  
Notch Ø5.5mm



407-1002

Torque Limiting  
T-Handle



433-3305

Star Set Screwdriver

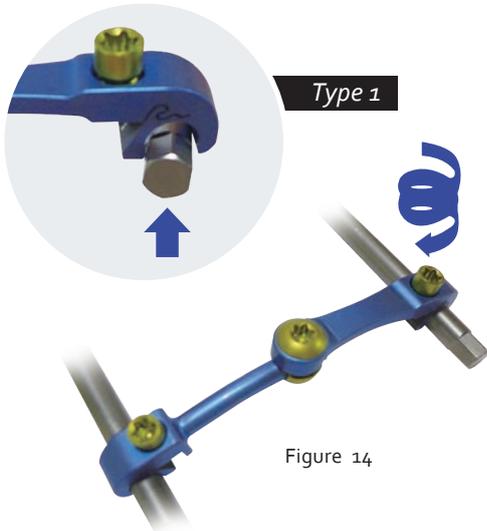


Figure 14

## 09 Transverse Link Placement

If multi-segment fixation, the Transverse Link can be assembled to assist construct stability to withstand rotation and lateral bending of the vertebral column. The Rod Holder holds the Transverse Link to cross on two rods, and the hooks of Transverse Link capture and position the rods. After that, the screws are tightened by the **T20 Screw Wrench (412-3101)**. (Figure 14 and 15)

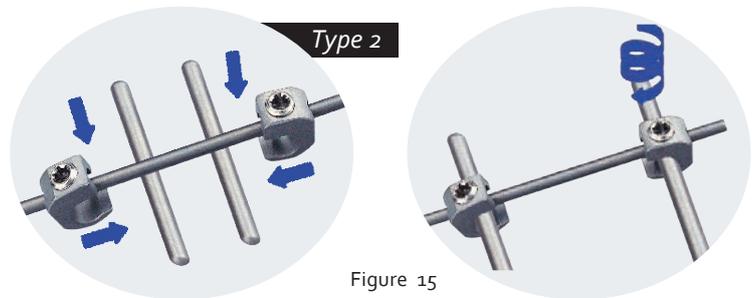


Figure 15



Figure 16

## 10 Cutting off

When insert the long-arm screw done the final tightening, use the **Long Arm Cutting Forceps (407-2102)** to remove the remaining tab of the long arm screw. (Figure 16)



412-3101

T20 Screw Wrench



407-2102

Long Arm  
Cutting Forceps

## Instrument Set



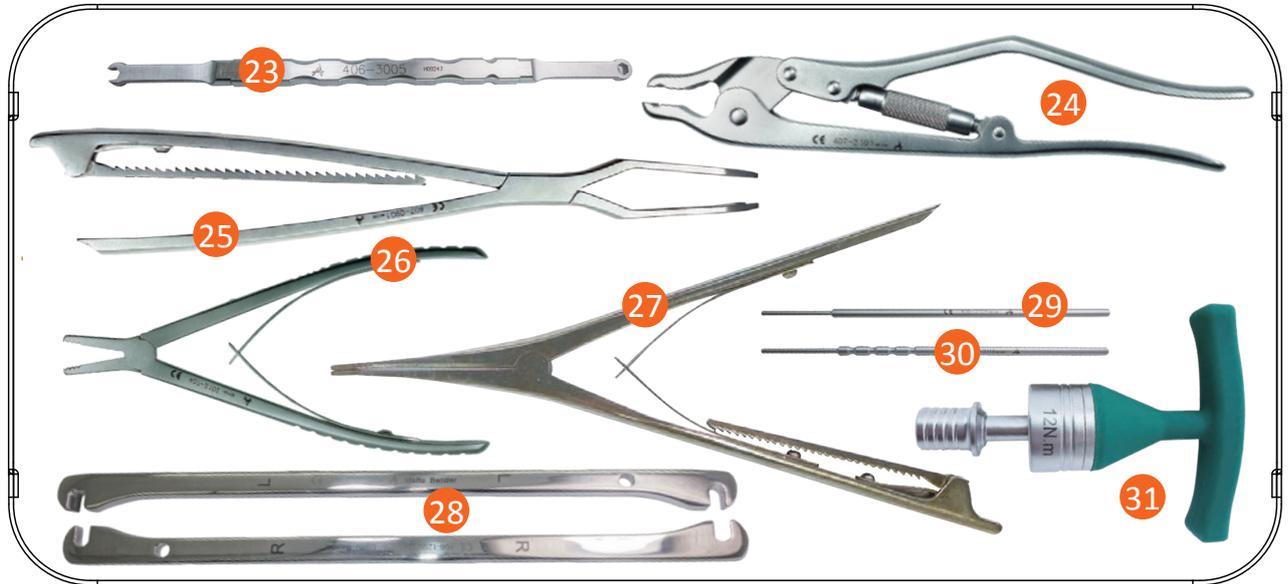
Instrument Tray 1

Cat.No.	Description	Q'nty
① 433-0504~433-0507	4~7mm Cortex Tap ( 4 size each 1 )	4
② 433-0514~433-0517	4~7mm Tap ( 4 size each 1 )	4
③ 433-3303	Mono Screwdriver	2
④ 433-3301	Multiaxial Screwdriver	2
⑤ 433-3304	Mono Long-Arm Screwdriver	2
⑥ 433-3302	Multiaxial Long-Arm Screwdriver	2
⑦ 406-0201	Awl (With Stop)	1
⑧ 406-0301	Probe	1
⑨ 406-0302	Straight Probe	1
⑩ 407-0104	Ball Handle, Ratchet	1



Instrument Tray 2

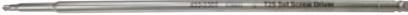
Cat.No.	Description	Q'nty
11 433-3305	Star Set Screwdriver	2
12 433-3306	Poly Adjustment Driver	1
13 433-3402	Anti-Torque Wrench, Notch Ø5.5mm	1
14 433-1301	Star Set Screw Holder	2
15 407-2901	Rod Template 150mm	1
16 406-1201	Rod Bender	1
17 406-0401	Sensor	1
18 412-3101	T20 Screw Wrench	1
19 406-2601	Rod Pusher	1
20 433-1401	Rod Reducer	1
21 406-0101	T-Handle	1
22 406-1301	Rod Holder	1



Instrument Tray 3

Cat.No.	Description	Q'nty
23 406-3005	5mm Rotator Bar	2
24 407-2101	Rod Clamp	1
25 407-0901	Angled Compressor	1
26 407-2102	Long Arm Cutting Forceps	1
27 407-0902	Angled Distractor	1
28 406-1203	Insitu Bender	1
29 406-3104	4mm Guide Pin	4
30 406-3114	4mm Guide Pin	4
31 407-1002	Torque Limiting T-Handle	1

## Instruments

Cat.No.	Description	
433-0504 433-0505 433-0506 433-0507	4mm Cortex Tap 5mm Cortex Tap 6mm Cortex Tap 7mm Cortex Tap	
433-0514 433-0515 433-0516 433-0517	4mm Tap 5mm Tap 6mm Tap 7mm Tap	
433-3303	Mono Screwdriver	
433-3301	Multiaxial Screwdriver	
433-3304	Mono Long-Arm Screwdriver	
433-3302	Multiaxial Long-Arm Screwdriver	
406-0201	Awl (With Stop)	
406-0301	Probe	
406-0302	Straight Probe	
407-0104	Ball Handle, Ratchet	
433-3305	Star Set Screwdriver	
433-3306	Poly Adjustment Driver	

Cat.No.	Description	
433-3402	Anti-Torque Wrench, Notch Ø5.5mm	
433-1301	Star Set Screw Holder	
407-2901	Rod Template 150mm	
406-1201	Rod Bender (french bender)	
406-0401	Sensor	
412-3101	T20 Screw Wrench	
406-2601	Rod Pusher	
433-1401	Rod Reducer	
406-0101	T-Handle	
406-1301	Rod Holder	
406-3005	5mm Rotator Bar	
407-2101	Rod Clamp	

Cat.No.	Description	
407-2102	Long Arm Cutting Forceps	
407-0901	Angled Compressor	
407-0902	Angled Distractor	
406-1203	Insitu Bender	
406-3104	4mm Guide Pin	
406-3114	4mm Guide Pin	
407-1002	Torque Limiting T-Handle	
20141-022	SmartLoc Block	
99902-042	SmartMIS Product Case, Metal Lid	
99900-042	SmartMIS Instrument Case, Metal Lid	

**STERILIZATION:**

The implants and instruments are delivered non sterile. Before use needed cleaned and sterilized recommended to be steam sterilized refer to "A-SPINE Reprocessing Manual" following process parameters:

Steam Wrapped Gravity Cycle at 121 °C/250 °F for 30 minutes.

If need more information, the "Intended for Use" and "A-SPINE Reprocessing Manual" can be downloaded from A-SPINE official website: <http://www.aspine.com.tw/>

## Implants

### Monoaxial Screw

Cat.No.	Description
1097-550358	Monoaxial Screw Ø 5.5 x L 35mm
1097-550408	Monoaxial Screw Ø 5.5 x L 40mm
1097-550458	Monoaxial Screw Ø 5.5 x L 45mm
1097-550508	Monoaxial Screw Ø 5.5 x L 50mm
1097-650408	Monoaxial Screw Ø 6.5 x L 40mm
1097-650458	Monoaxial Screw Ø 6.5 x L 45mm
1097-650508	Monoaxial Screw Ø 6.5 x L 50mm
1097-650558	Monoaxial Screw Ø 6.5 x L 55mm
1097-750358	Monoaxial Screw Ø 7.5 x L 35mm
1097-750408	Monoaxial Screw Ø 7.5 x L 40mm
1097-750458	Monoaxial Screw Ø 7.5 x L 45mm
1097-750508	Monoaxial Screw Ø 7.5 x L 50mm



### Monoaxial Screw (Longarm)

Cat.No.	Description
1098-550358	Monoaxial Screw (Longarm) Ø 5.5x L 35mm
1098-550408	Monoaxial Screw (Longarm) Ø 5.5x L 40mm
1098-550458	Monoaxial Screw (Longarm) Ø 5.5x L 45mm
1098-550508	Monoaxial Screw (Longarm) Ø 5.5x L 50mm
1098-650408	Monoaxial Screw (Longarm) Ø 6.5x L 40mm
1098-650458	Monoaxial Screw (Longarm) Ø 6.5x L 45mm
1098-650508	Monoaxial Screw (Longarm) Ø 6.5x L 50mm
1098-650558	Monoaxial Screw (Longarm) Ø 6.5x L 55mm
1098-750358	Monoaxial Screw (Longarm) Ø 7.5x L 35mm
1098-750408	Monoaxial Screw (Longarm) Ø 7.5x L 40mm
1098-750458	Monoaxial Screw (Longarm) Ø 7.5x L 45mm
1098-750508	Monoaxial Screw (Longarm) Ø 7.5x L 50mm



Multiaxial Screw

Cat.No.	Description
1130-55035R	Multiaxial Screw Ø 5.5 x L 35mm
1130-55040R	Multiaxial Screw Ø 5.5 x L 40mm
1130-55045R	Multiaxial Screw Ø 5.5 x L 45mm
1130-55050R	Multiaxial Screw Ø 5.5 x L 50mm
1130-65035R	Multiaxial Screw Ø 6.5 x L 35mm
1130-65040R	Multiaxial Screw Ø 6.5 x L 40mm
1130-65045R	Multiaxial Screw Ø 6.5 x L 45mm
1130-65050R	Multiaxial Screw Ø 6.5 x L 50mm
1130-65055R	Multiaxial Screw Ø 6.5 x L 55mm
1130-75035R	Multiaxial Screw Ø 7.5 x L 35mm
1130-75040R	Multiaxial Screw Ø 7.5 x L 40mm
1130-75045R	Multiaxial Screw Ø 7.5 x L 45mm
1130-75050R	Multiaxial Screw Ø 7.5 x L 50mm
1130-75055R	Multiaxial Screw Ø 7.5 x L 55mm

\* Other size order by demand



Multiaxial Screw (Longarm)

Cat.No.	Description
1131-55035R	Multiaxial Screw (Longarm) Ø 5.5x L 35mm
1131-55040R	Multiaxial Screw (Longarm) Ø 5.5x L 40mm
1131-55045R	Multiaxial Screw (Longarm) Ø 5.5x L 45mm
1131-55050R	Multiaxial Screw (Longarm) Ø 5.5x L 50mm
1131-65035R	Multiaxial Screw (Longarm) Ø 6.5x L 35mm
1131-65040R	Multiaxial Screw (Longarm) Ø 6.5x L 40mm
1131-65045R	Multiaxial Screw (Longarm) Ø 6.5x L 45mm
1131-65050R	Multiaxial Screw (Longarm) Ø 6.5x L 50mm
1131-65055R	Multiaxial Screw (Longarm) Ø 6.5x L 55mm
1131-75035R	Multiaxial Screw (Longarm) Ø 7.5x L 35mm
1131-75040R	Multiaxial Screw (Longarm) Ø 7.5x L 40mm
1131-75045R	Multiaxial Screw (Longarm) Ø 7.5x L 45mm
1131-75050R	Multiaxial Screw (Longarm) Ø 7.5x L 50mm



## Multiaxial Cortex Screw

Cat.No.	Description
1088-45030R	Multiaxial Cortex Screw Ø 4.5 x L 30mm
1088-45035R	Multiaxial Cortex Screw Ø 4.5 x L 35mm
1088-55035R	Multiaxial Cortex Screw Ø 5.5 x L 35mm
1088-55040R	Multiaxial Cortex Screw Ø 5.5 x L 40mm
1088-55045R	Multiaxial Cortex Screw Ø 5.5 x L 45mm
1088-55050R	Multiaxial Cortex Screw Ø 5.5 x L 50mm
1088-65040R	Multiaxial Cortex Screw Ø 6.5 x L 40mm
1088-65045R	Multiaxial Cortex Screw Ø 6.5 x L 45mm
1088-65050R	Multiaxial Cortex Screw Ø 6.5 x L 50mm
1088-65055R	Multiaxial Cortex Screw Ø 6.5 x L 55mm
1088-75040R	Multiaxial Cortex Screw Ø 7.5 x L 40mm
1088-75045R	Multiaxial Cortex Screw Ø 7.5 x L 45mm
1088-75050R	Multiaxial Cortex Screw Ø 7.5 x L 50mm
1088-75055R	Multiaxial Cortex Screw Ø 7.5 x L 55mm

\* Other size order by demand



## Smooth Rod

Cat.No.	Description
1084-56408	Smooth Rod Ø 5.5 x L 40mm
1084-56508	Smooth Rod Ø 5.5 x L 50mm
1084-56608	Smooth Rod Ø 5.5 x L 60mm
1084-56708	Smooth Rod Ø 5.5 x L 70mm
1084-50808	Smooth Rod Ø 5.5 x L 80mm
1084-50908	Smooth Rod Ø 5.5 x L 90mm
1084-51008	Smooth Rod Ø 5.5 x L 100mm
1084-51208	Smooth Rod Ø 5.5 x L 120mm
1084-53008	Smooth Rod Ø 5.5 x L 300mm

\* Other size order by demand



### Star Set Screw

Cat.No.	Description
1075-08028	Star Set Screw Ø 8.5 x H 5mm



### Transverse Link

Cat.No.	Description
1063-26078	Transverse Link L 13.5mm



### Adjustable Crosslink

Cat.No.	Description
1063-05448	Adjustable Crosslink L 36-44mm
1063-05608	Adjustable Crosslink L 44-60mm



### Side Rod

Cat.No.	Description
1030-06408	Side Rod Ø 5.5 x L 40mm



\* Order by demand





Double lead thread  
Multi-axial Screw

