Compendium of MAVERICK External Fixation Applications

Smith+Nephew

MAVERICK◊
Unilateral External Fixation

MAVERICK◊ External Fixation in Damage Control Orthopedics

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The following technique guide was prepared under the guidance of Edward Perez, MD, Matthew Rudloff, MD, and Michael Beebe, MD, under close collaboration with each physician. It contains a summary of medical techniques and opinions based upon their training and expertise in the field, along with their knowledge of Smith+Nephew products. It is provided for educational and informational purposes only. Smith+Nephew does not provide medical advice and it is not intended to serve as such. It is the responsibility of the treating physician to determine and utilize the appropriate products and techniques according to their own clinical judgment for each of their patients. For more information on the products in this surgical technique, including indications for use, contraindications, effects, precautions and warnings, please consult the product's Instructions for Use (IFU).

Mid-Shaft Tibial Fractures

Traveling Traction Construct

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This uniplanar external fixation technique can be applied for temporary stabilization of musculoskeletal trauma of the leg.

This technique involves placement of two centrally threaded transfixion pins. The first is positioned in similar fashion to a proximal tibial skeletal traction pin, in a lateral to medial direction. The second is instrumented medial to lateral through the calcaneal tuberosity, identical to placement of a calcaneal traction pin.

Once the transfixion pins are placed, four Swivel or Combi clamps are engaged to the medial and lateral aspects of the proximal and distal pins. Two 11mm bars of sufficient length are engaged and provisional reduction performed prior to the connections being tightened.

Of note, while this technique can effectively provide length restoration, it does not provide significant sagittal plane stability and adjuvant splint application maybe necessary.

Fixation in Tibial Diaphysis

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External fixation of diaphyseal fractures of the tibia is most commonly-used in temporary settings. Long bone stabilization in the poly-traumatized patient undergoing damage control orthopedics allows for bony stability providing reduced bleeding, pain, and extravasation of the marrow contents. Other indications include significant soft tissue injury that warrant multiple irrigation and debridements and/or delayed soft tissue coverage.

Often the fractures extend either proximally or distally and joint spanning constructs are indicated. Limitations include the uniplanar axis of the pins when using a Multi-Pin Clamp. The ideal placement for pins is perpendicular to the medial surface of the tibia. This allows for bi-cortical fixation and maximal distance. Occasionally the soft tissue injury will dictate placement of the pins on the lateral aspect of the tibia. In such a clinical situation, it is recommended that the trocar and drill sleeve guide is used to prevent inadvertent neurovascular injury.

After application of the clamps and bars, appropriate reduction should be obtained prior to any tightening.

In a damage-controlled setting longitudinal traction is applied and the clamps tightened provided there is no bony impingement on the soft tissues that could lead to further soft tissue complications.

Fluoroscopy can help guide the reduction to a satisfactory position and then final tightening can be carried out. Keeping the pins out of the fracture hematoma may help decrease the risk of infection when the location of the fracture allows.

Fractures of the Distal Tibia

Tibia-Calcaneal Fixation

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This construct, colloquially known as a “delta frame” is suitable for most fractures of the distal tibia (i.e., pilon/plafond), ankle, and talus. The advantage of this construct is the ease of application and cost efficiency due to minimal implant requirements compared to frames incorporating the midfoot/forefoot. The disadvantage of this construct versus that described in the next section, is decreased control of ankle equinus and increased motion at the fracture site due to the ability to pivot on the calcaneal pin.

During application of the Multi-Pin Clamp, it is imperative to avoid placing pins unicortical on the lateral face of the tibia. It is recommended that the surgeon place the pins medial to the tibial crest to avoid this complication. Tibial pins placed far distal in the tibial metaphysis should be medial to the tibialis anterior tendon to avoid injury to the anterior neurovascular bundle.

During application of the calcaneal pin, placement should be performed from medial to lateral and in the posterior half of the calcaneal tuberosity to avoid injury to the medial calcaneal and lateral plantar nerves.

Fluoroscopic imaging of pins should be obtained prior to application of clamps to confirm appropriate placement.

After application of the clamps and bars, appropriate reduction should be obtained prior to any tightening as the mechanical axis of the bars in this construct are not in line with the mechanical axis of the tibia and may result in translational deformity if one side is tightened prior to reduction.

If there is significant soft tissue compromise, a construct with midfoot/forefoot control may optimize recurrent wound care.

After the application of this construct, it is recommended that patients be placed into a posterior splint to avoid equinus.

Tibia Fixation Incorporating foot

This alternative construct is suitable for most fractures of the distal tibia (i.e., pilon/plafond), ankle, and talus. The advantage of this construct is the ease of application and increased stability of the ankle, as well as incorporated equinus control.

Application of the cuneiform pin or first metatarsal base pin should be performed utilizing an anterior to posterior fluoroscopic image of the foot to ensure that the pin does not cross the naviculucuneiform or tarsometatarsal joints. If a cuneiform pin is chosen, the pin may be placed across intercuneiform joints into both the medial and intermediate cuneiform, as needed, to increase stability. If a metatarsal base pin is chosen, the pin may be advanced across the first and second metatarsals, as needed, to increase stability.

After this is appropriately reduced with the ankle held in neutral dorsiflexion, the midfoot pin is connected to the medial bar and used to hold the ankle in neutral dorsiflexion.

Utilization of this construct does not require postoperative splinting to maintain neutral ankle dorsiflexion and is preferred if there is significant soft tissue compromise requiring recurrent wound care.

Tibia-Foot Fixation with Kickstand

The addition of a Bent Bar as a “kickstand” provides both elevation of the extremity as well as prevention of pressure sores on the posterior aspect of the heal. This is beneficial in obtunded or intubated patients who may not be able to monitor their own leg position. The “kickstand” also provides an anterior-directed force on the construct and may help in patients with large posterior malleolar fragments or posterior dislocation patterns. Care should be taken when applying this construct in patients with anterior shear-type injuries. Note that the “kickstand” may be applied with or without the addition of a midfoot/forefoot pin.

Tibial Construct without Multi-Pin Clamps

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This is a common application for external fixation for skeletal injuries around the ankle providing multiplanar fracture stability.

Once the half pin size, and the corresponding instrumentation is selected, the location of pin placement is selected under fluoroscopy in consideration of definitive fixation strategies.

The half pins are positioned in the tibial diaphysis. These are placed approximately 10-15 degrees out of plane of one another axially. A centrally threaded external fixation pin is then inserted into the calcaneal tuberosity under fluoroscopic control from medial to lateral. If needed for additional stability, an additional pin can be inserted into the midfoot or forefoot. In this example, a cuneiform half pin is illustrated. Typically, this is a 3 or 4mm half pin. A 11mm bar is then placed between the two tibial half pins, with either Swivel or Combi Clamps and secured. Creation of this external fixation segment can facilitate clearance of the soft tissue envelope. Two 11mm bars are then connected provisionally between the proximal tibial bar and the transfixion pin, at which point provisional reduction can be achieved and tightened. Once confirmed, the midfoot half pin is incorporated into the construct for additional stability.

Proximal Tibial Fractures

Fixation of the Tibial Plateau

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This external fixation construct can be utilized for temporary stabilization of extra-articular proximal tibial fractures in select circumstances when fixation into the femur may not be possible, for example existing femoral implants precluding half pin placement.

This is performed by placement of the appropriately sized partially threaded half pins orthogonally into the proximal tibia below the articular surface as localized under fluoroscopy. A Multi-Pin Clamp is then positioned, below the zone of injury, after predrilling with the appropriate-sized Drill in corresponding Tissue Protector. The holes of the Tissue Protector Handle align to the holes of the Multi-Pin Clamp with the corresponding drill sleeve inserted based upon the selected half pin size.

The Angled Posts are inserted into the Multi-Pin Clamp on the tibial shaft half pins and secured. The 11mm Bent Bar is affixed to the proximal tibial half pins and secured. Swivel or Combi clamps are then applied to the proximal and distal segment constructs, with medial and lateral 11mm bars. Reduction is performed and the clamps are provisionally tightened, then confirmed fluoroscopically. Once satisfactory reduction is noted, final tightening is performed.

Fractures of the Femur

Diaphysis Femoral Fractures

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External fixation of femoral shaft fractures is the mainstay of Damage Control Orthopedics. The stability provided decreases bleeding, pain, and extravasation of the marrow contents. Advantages include ease of application that allows for quick stabilization for patients who are often in extremis or hemodynamically unstable, as well as providing excellent stability of the fracture. It is also very useful in mass casualty situations where resources are often limited and can be ultimately used as definitive fixation in those situations.

Allowing motion at the knee and hip is a plus. Limitations include the uniplanar axis of the pins when using a Multi-Pin Clamp, as well as fractures near the joints which require a external fixation technique (knee spanning).

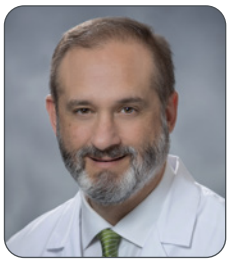
Typically, the pins are placed from lateral to medial but essentially can be placed on any plane from anterior to lateral as dictated by fracture pattern or soft tissue injury. When possible, one should attempt to keep the pin sites away from searing the fracture hematoma while maintaining an adequate pin spread that allows for a stable construct.

The upper outer quadrant of the femur (direct anterior to direct lateral) provides for a neurovascular free approach for safe placement of pins. Use of a Multi-pin Clamp as a guide is helpful in accurate placement of the pins while protecting the soft tissues.

After application of the clamps and bars, appropriate reduction should be obtained prior to any tightening. The need for accuracy of the reduction is dictated by the clinical situation.

In essence, for the damage control patient direct longitudinal traction and tightening of the frame is usually sufficient. Whereas in situations for definitive fixation, the surgeon should assure a satisfactory reduction with fluoroscopy prior to tightening the frame.

Knee-Spanning Constructs



Knee-Spanning Fixation

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The knee-spanning external fixator is often used for femoral shaft fractures that extend distally as well as high energy trauma around the knee, including distal femur fractures, proximal tibia fractures, and knee dislocations. Advantages include fracture stability for hemodynamic control in the setting of damage control orthopedics. In addition to temporary fracture stability, these frames are often employed to allow for improvement in the soft tissue envelope prior to definitive fixation. Limitations include the uniplanar axis of the pins when using a Multi-Pin Clamp. Additionally, a very large fracture span may prove difficult to control.

When possible, an attempt should be made to place the pin sites outside the zone of internal fixation to minimize the risk for infection. The ideal spot for pin placement in the tibia is just medial to the anterior crest. Because of this, the femoral pins are often placed anteriorly to make connection of the Multi-Pin Clamps more facile. Single long bars may be used to connect the Multi-Pin Clamp but often the clinical situation dictates that two bars connected with a bar-to-bar clamp be placed on each side in order to allow for the adequate length and angulation needed for that external fixation construct.

After application of the clamps and bars, appropriate reduction should be obtained prior to any tightening. The need for accuracy of the reduction is dictated by the clinical situation. In essence, for the damage control patient direct longitudinal traction and tightening of the frame is usually sufficient. In situations of soft tissue management, adequate reduction to decompress bony pressure on the soft tissues should be assured prior to tightening the external fixator.

Knee-Spanning Fixation- Pearls

- In proximal tibia fracture-dislocations, the fixator may not be able to control all fracture fragments by ligamentotaxis. Limited internal fixation may be necessary to keep the articular surfaces reduced.
- Occasionally the tibial tubercle is pulled anteriorly by the extensor mechanism. This displacement may not be controlled by the external fixator construct and may lead to serious soft tissue compromise to the anterior tibia. Reduction and limited internal fixation of the tibial tubercle may be necessary to avoid this dreaded complication.
- Posterior knee dislocations in the obese patient may be very difficult to control with standard external fixation. If the thigh girth is sufficiently large enough, the tibia may continue to sublux posteriorly while in the external fixator. Adding an anterior vector to the tibia by placing a “kickstand” bar (as explained on page 5) to the tibial clamps may help alleviate this problem.
- In large fracture spans or unstable pattern even after external fixation, adding additional bars to the longitudinal medial and lateral bars may help add stability to the construct, in addition to incorporating basic known external fixation biomechanical principles.

Knee-Spanning with Swivel or Combi Clamps

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This is a commonly utilized external fixation construct for temporary stabilization of skeletal trauma around the knee.

After selecting the half pin size for anatomy, the appropriate Tissue Protector with Tissue Protector Handle is prepared. The proposed pin placement is marked under fluoroscopy, outside the proposed area of future internal fixation, both in the femur and tibia. The half pins are inserted to the desired depth in both the femur and tibia, and swivel or combi clamps are positioned. An 11mm bar is positioned on the proximal and distal pin cluster and secured.

Reduction is performed and either the previously placed two 11mm bars connected with a Swivel or Combi clamp if positioning permits, or an intercalary short 11mm Bar can be utilized to connect the proximal and distal constructs with an additional clamp.

Provisional tightening is performed, reduction is then confirmed with fluoroscopy before final tightening. The optional addition of another long 11mm Bar can increase the rigidity of the construct.

Fractures of the Pelvis

Pelvis Fixation with Iliac Crest Fixation

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The iliac crest, or gluteal pillar, external fixation construct is suitable for unstable injuries to the pelvic ring. The advantage of this construct is that it may be applied in a setting where fluoroscopic imaging is limited through the use of small incisions over the iliac crest. The disadvantage of this construct is that the vector of reduction is less ideal for stabilization of most pelvic ring injuries and the bony purchase of the pins is less than that of a supra-acetabular construct. Because of this, two, or even three, pins should be placed into each hemipelvis to improve fixation.

During application of the iliac crest pins, palpation of the iliac crest, or use of a k-wire parallel to the medial face of the ilium, may be employed to plan pin trajectory. The anterior one-third of the crest, beginning approximately 2cm behind the anterior-superior iliac spine (ASIS) is best suited for pin placement as the width is increased along the gluteal pillar. After predrilling the cortex, pin placement by hand can reduce the risk of penetration out of either the inner or outer table. If advanced too far, it is possible to penetrate into the superior aspect of the acetabulum, so care must be taken to avoid this.

Fluoroscopic imaging should be obtained of all pins prior to application of clamps to confirm appropriate placement. Two bars are generally required to connect over the anterior aspect of the torso and care should be taken to avoid soft tissue impingement, taking into account fluid resuscitation in the polytraumatized patient. The surgeon should also take into account if other abdominal procedures are required, to ensure the bars do not inhibit access.

Once reduction is obtained and the final construct is tightened, the posterior pelvis should be evaluated fluoroscopically as pelvic external fixation controls anterior instability in a much greater fashion than posterior instability and may actually induce gaping posteriorly.

The iliac crest frame can provide temporary stabilization, but should not generally be utilized in the setting of planned definitive treatment of the pelvis with an external fixator. In the setting of planned definitive fixation, a supra-acetabular construct is preferred.

Pelvis Fixation with Supra-Acetabular Fixation

The supra-acetabular external fixation construct is suitable for unstable injuries to the pelvic ring. The advantage of this construct is that the pin vector is more suitable for internal or external rotation control of the affected hemipelvis when compared to the iliac crest construct. The disadvantage of this construct is that it is highly fluoroscopic dependent and requires optimal positioning and table choice to obtain safe imaging.

During application of the supra-acetabular pins, an obturator-outlet ("teardrop") view is utilized to localize the appropriate starting point and incision. This is generally 3-4cm distal to and 1-2cm medial to the anterior-superior iliac spine (ASIS). However, due to notable deformity of the unstable pelvis, fluoroscopic imaging should be utilized to confirm the starting point. Placement too lateral can cause injury to the lateral femoral cutaneous nerve (LFCN), while placement too medial can cause injury to the femoral vessels.

Once the incision is made, blunt dissection to the supra-acetabular bone should be performed. Utilization of a transverse incision may improve any required extension once the correction is performed if soft tissue tension around the pins occurs.

An iliac oblique view will allow the surgeon to confirm the appropriate starting point in the superior-inferior plane as well as the appropriate trajectory to avoid penetration into the greater sciatic notch. Surgeons should note that the hip capsule extends 1-2cm above the superior edge of the acetabulum and so pins should be placed at least 2cm proximal to the acetabulum in order to avoid penetration in the femoroacetabular joint and decrease the risk of post-surgical septic arthritis.

An obturator-inlet ("down the wing") view will allow confirmation of the appropriate starting point in the medial-lateral plane as well as the appropriate trajectory between the inner and outer tables. After predrilling the cortex, pin placement by hand can reduce the risk of penetration out of either the inner or outer table. Based on surgeon preference, the pin may be advanced above the greater sciatic notch or advanced to the greater sciatic notch without bicortical penetration. The benefit of placement with a more

superior to inferior trajectory is that it may improve patient tolerance in the seated position if the construct is intended to remain for definitive treatment.

Fluoroscopic imaging should be obtained of all pins prior to application of clamps to confirm appropriate placement. A Curved Bar may generally be utilized to decrease the number of junction points required for straight bars and increase construct stability. Care should be taken to avoid soft tissue impingement, taking into account fluid resuscitation in the polytraumatized patient. Placement of the clamps and bars above the pins will increase the ability of the patient to flex their knees and improve tolerance in the seated position.

Once reduction is obtained and the final construct is tightened, the posterior pelvis should be evaluated fluoroscopically as pelvic external fixation controls anterior instability in a much greater fashion than posterior instability and may actually induce gaping posteriorly.

The supra-acetabular construct is more suited than the iliac crest construct in the setting of planned definitive treatment of the pelvic with an external fixator.

Elbow Stabilization

Elbow-Spanning Fixation

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High-energy trauma to the elbow area often necessitates temporary external fixation for soft tissue management, as well as stability at the injury site.

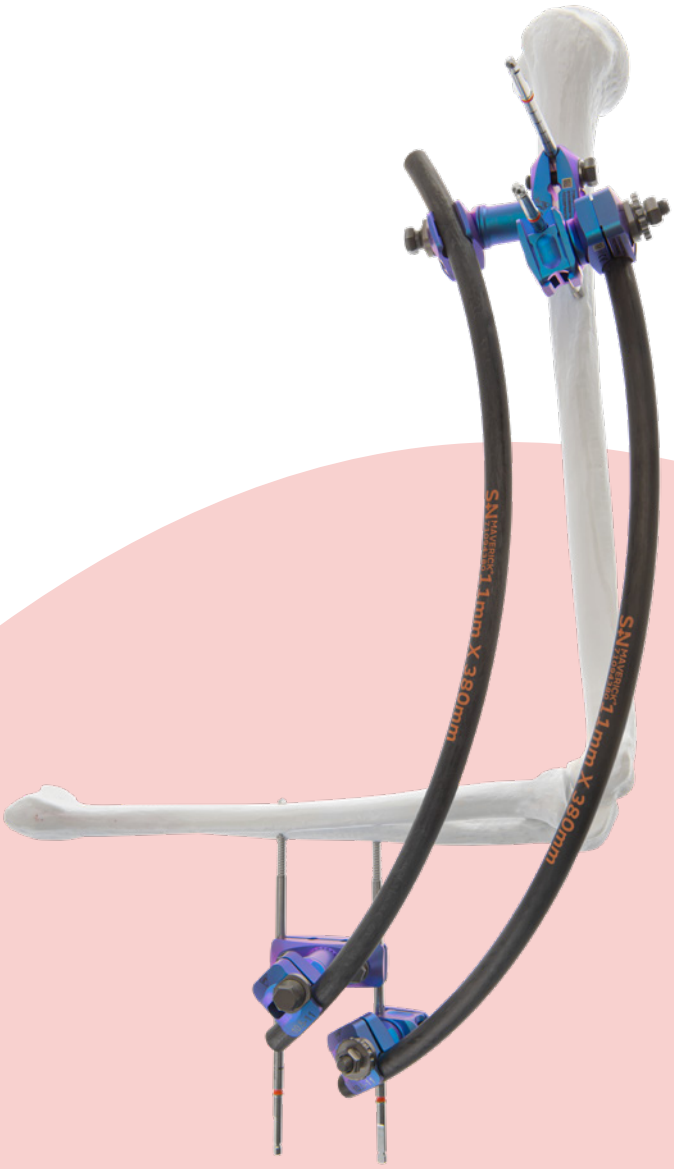
These include military or civilian in ballistic injuries. Occasionally the bony and/or soft tissue injuries are so severe that definitive management is carried out in the external fixator.

Fixation into the humerus poses a risk to the radial nerve. Because of this risk it is recommended that the pins be placed proximally and laterally to avoid the course of the radial nerve. Use of the Tissue Protectors and Trocars will also protect the axillary nerve in situations of proximal pin placement.

The subcutaneous border of the ulna is a known safe zone for pin placement. After connection of the Multi-Pin Clamps, One Curved Bar or two Curved Bars connected by a bar-to-bar clamp, are attached and longitudinal traction is applied.

Tightening of the clamps is then carried out, if possible under flouroscopic guidance, to evaluate for a satisfactory reduction.

In certain situations such as a very large arm or globally unstable situation, stability may be enhanced by placing the pins widely along the ulna and using a pin-to-bar and bar-to-bar clamp technique versus the Multi-Pin Clamp



Catalog information

MAVERICK® Clamps

Reference	Description	
71094020	MAVERICK Swivel Clamp 11mm to 5-6mm	
71094015	MAVERICK Combi Clamp 11mm to 5-6mm	
71094111	MAVERICK Swivel Attachment	
71094045	MAVERICK Multi-Pin Clamp 45mm	
71094075	MAVERICK Multi-Pin Clamp 75mm	

MAVERICK Posts

Reference	Description	
71094060	MAVERICK Post Straight	
71094030	MAVERICK Post 30°	
71094090	MAVERICK Post 90°	

MAVERICK® Bars

Reference	Description
71094100	MAVERICK Bar 11mm x 100mm
71094150	MAVERICK Bar 11mm x 150mm
71094200	MAVERICK Bar 11mm x 200mm
71094250	MAVERICK Bar 11mm x 250mm
71094300	MAVERICK Bar 11mm x 300mm
71094350	MAVERICK Bar 11mm x 350mm
71094400	MAVERICK Bar 11mm x 400mm
71094500	MAVERICK Bar 11mm x 500mm
71094600S	MAVERICK Bar 11mm x 600mm Sterile

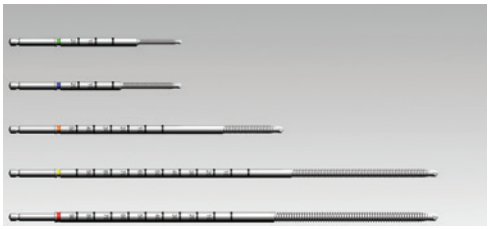
71094190	MAVERICK Bent Bar 11mm x 190mm

71094210	MAVERICK Curved Bar 11mm x 210mm

71094380	MAVERICK Curved Bar 11mm x 380mm

MAVERICK Pins

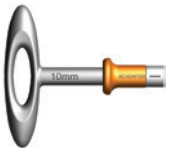
Reference	Description
71094315	MAVERICK Half Pin SS 3 x 100 x 15mm
71094325	MAVERICK Half Pin SS 3 x 100 x 25mm
71094420	MAVERICK Half Pin SS 4 x 100 x 20mm
71094435	MAVERICK Half Pin SS 4 x 100 x 35mm
71094535	MAVERICK Half Pin SS 5 x 160 x 35mm
71094555	MAVERICK Half Pin SS 5 x 160 x 55mm
71094545	MAVERICK Half Pin SS 5 x 200 x 45mm
71094565	MAVERICK Half Pin SS 5 x 200 x 65mm
71094585	MAVERICK Half Pin SS 5 x 250 x 85mm
71094655	MAVERICK Half Pin SS 6 x 200 x 55mm
71094695	MAVERICK Half Pin SS 6 x 250 x 95mm
71094575	MAVERICK Transfixing Pin SS 5mm x 275mm



MAVERICK Drills

Reference	Description
71094024	MAVERICK Short Drill 2.4mm for 3mm Pin
71094032	MAVERICK Short Drill 3.2mm for 4mm Pin
71094040	MAVERICK Medium Drill 4.0mm for 5mm x 160mm Pin
71094140	MAVERICK Long Drill 4.0mm for 5mm x 200mm & 250mm Pin
71094145	MAVERICK Long Drill 4.5mm for 6mm Pin

MAVERICK® Instruments

Reference	Description	
71094101	MAVERICK AO T-Handle 10mm	
71094102	MAVERICK Ratchet Wrench 10mm	
71094103	MAVERICK Tissue Protector Handle	
71094104	MAVERICK Afterburner	
71094105	MAVERICK T-Handle 10mm Long	
71094151	MAVERICK Tissue Protector Short	
71094152	MAVERICK Tissue Protector Medium	
71094153	MAVERICK Tissue Protector Long	
71094155	MAVERICK Tissue Protector Transfixing Pin	
71094156	MAVERICK Tissue Protector 6mm	

MAVERICK® Instruments

Reference	Description	
71094161	MAVERICK Trocar Short	
71094162	MAVERICK Trocar Medium	
71094163	MAVERICK Trocar Long	
71094165	MAVERICK Trocar Transfixing Pin	
71094166	MAVERICK Trocar 6mm	

The following JET-X◊ Components are compatible with MAVERICK◊ Unilateral External Fixation

JET-X General Instruments

Reference	Description
71067326	AO T-Handle with 10mm Socket
71063004	AO to Hall Adapter
71063005	AO to Trinkle Adapter
71063015	10mm Open End Wrench
71067322	10mm Ratchet Wrench

JET-X Pin Instruments

Reference	Description
71067310	Tissue Protector Handle
71067306	5mm/6mm Trocar Long
71067307	5mm/6mm Trocar Short
71067308	5mm/6mm Trocar X-Short
71067312	5mm/6mm Tissue Protector Long
71067313	5mm/6mm Tissue Protector Short
71067314	5mm/6mm Tissue Protector X-Short
71063017	5mm Cannulated Pin Tissue Protector
71063018	3.5mm Cannulated Pin Drill Sleeve

JET-X Drills

Reference	Description
71067317S	Drill for X-Short 5mm Half Pin sterile
71067318S	Drill for Short 5mm Half Pin sterile
71067319S	Drill for Long 5mm Half Pin sterile
71067320S	Drill for Short 6mm Half Pin sterile
71067321S	Drill for Long 6mm Half Pin sterile
71063013	3.5mm/1.6mm Cannulated Drill
71063026	JET-X 4.8mm Short Graduated Step Drill
71063028	JET-X 3.5mm Short Graduated Step Drill

JET-X 10.5mm Bars

Reference	Description
71062100	100mm Bar
71062150	150mm Bar
71062200	200mm Bar
71062250	250mm Bar
71062300	300mm Bar
71062350	350mm Bar
71062400	400mm Bar
71062500	500mm Bar
71062600	600mm Bar Sterile
71062160	JET-X L Bar
71062180	JET-X V Bar

JET-X® Sterile Pins

Reference	Description
71063108S	3mm x 10mm TiN Half Pin sterile
71063158S	3mm x 15mm TiN Half Pin sterile
71063208S	3mm x 20mm TiN Half Pin sterile
71063258S	3mm x 25mm TiN Half Pin sterile
71064158S	4mm x 15mm TiN Half Pin sterile
71064208S	4mm x 20mm TiN Half Pin sterile
71064258S	4mm x 25mm TiN Half Pin sterile
71064308S	4mm x 30mm TiN Half Pin sterile
71064358S	4mm x 35mm TiN Half Pin sterile
71065304S	5mm x 30mm TiN X-Short Half Pin sterile
71065308S	5mm x 30mm TiN Short Half Pin sterile
71065309S	5mm x 30mm TiN Long Half Pin sterile
71065354S	5mm x 35mm TiN X-Short Half Pin sterile
71065358S	5mm x 35mm TiN Short Half Pin sterile
71065359S	5mm x 35mm TiN Long Half Pin sterile
71065404S	5mm x 40mm TiN X-Short Half Pin sterile
71065407S	5mm x 40mm TiN Half Pin 1.6 Can sterile
71065408S	5mm x 40mm TiN Short Half Pin sterile
71065409S	5mm x 40mm TiN Long Half Pin sterile
71065454S	5mm x 45mm TiN X-Short Half Pin sterile
71065458S	5mm x 45mm TiN Short Half Pin sterile
71065459S	5mm x 45mm TiN Long Half Pin sterile
71065504S	5mm x 50mm TiN Short Traction Pin sterile
71065507S	5mm x 50mm TiN Traction Pin sterile
71065508S	5mm x 50mm TiN Short Half Pin sterile
71065509S	5mm x 50mm TiN Long Half Pin sterile
71065558S	5mm x 55mm TiN Short Half Pin sterile
71065559S	5mm x 55mm TiN Long Half Pin sterile
71065608S	5mm x 60mm TiN Short Half Pin sterile
71065609S	5mm x 60mm TiN Long Half Pin sterile
71065658S	5mm x 65mm TiN Short Half Pin sterile
71065659S	5mm x 65mm TiN Long Half Pin sterile
71065708S	5mm x 70mm TiN Short Half Pin sterile
71065709S	5mm x 70mm TiN Long Half Pin sterile
71066409S	6mm x 40mm TiN Half Pin sterile
71066459S	6mm x 45mm TiN Half Pin sterile
71066509S	6mm x 50mm TiN Half Pin sterile
71066559S	6mm x 55mm TiN Half Pin sterile
71066609S	6mm x 60mm TiN Half Pin sterile

JET-X Titanium Pins

Reference	Description
71055201	JET-X Ti 5mm x 20mm Short Half Pin
71055202	JET-X Ti 5mm x 20mm Long Half Pin
71055251	JET-X Ti 5mm x 25mm Short Half Pin
71055301	JET-X Ti 5mm x 30mm Short Half Pin
71055351	JET-X Ti 5mm x 35mm Short Half Pin
71055401	JET-X Ti 5mm x 40mm Short Half Pin
71055451	JET-X Ti 5mm x 45mm Short Half Pin
71055501	JET-X Ti 5mm x 50mm Short Half Pin
71055503	JET-X Ti 5mm x 50mm TracTion Pin
71055551	JET-X Ti 5mm x 55mm Short Half Pin
71055601	JET-X Ti 5mm x 60mm Short Half Pin
71055701	JET-X Ti 5mm x 70mm Short Half Pin
71056208	JET-X Ti 6mm x 20mm Short Half Pin
71056258	JET-X Ti 6mm x 25mm Short Half Pin
71056308	JET-X Ti 6mm x 30mm Short Half Pin
71056358	JET-X Ti 6mm x 35mm Short Half Pin
71056408	JET-X Ti 6mm x 40mm Short Half Pin
71056409	JET-X Ti 6mm x 40mm Short Half Pin
71056458	JET-X Ti 6mm x 45mm Short Half Pin
71056459	JET-X Ti 6mm x 45mm Long Half Pin
71056508	JET-X Ti 6mm x 50mm Short Half Pin
71056558	JET-X Ti 6mm x 55mm Short Half Pin
71056608	JET-X Ti 6mm x 60mm Short Half Pin
71056658	JET-X Ti 6mm x 65mm Short Half Pin
71056708	JET-X Ti 6mm x 70mm Short Half Pin

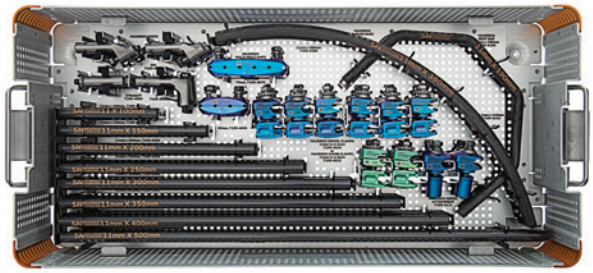
JET-X Pin Caps

Reference	Description
71062007	5mm Pin Caps
71062017	4mm Pin Caps

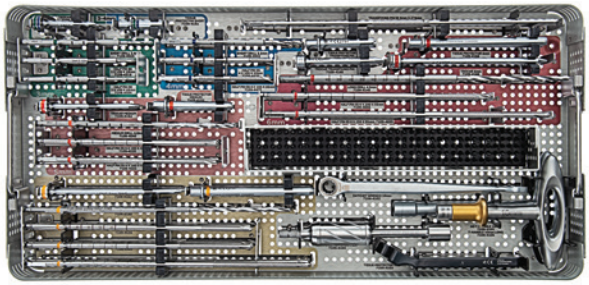
MAVERICK® Instrument and implant trays

MAVERICK Base Tray instruments and implants

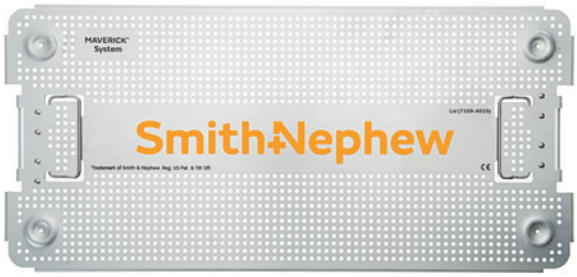
71094000A ✚ 71094000 or 71094001



Deep Tray
MAVERICK Bars and Clamps
Tray can accept Swivel or Combi
71094011



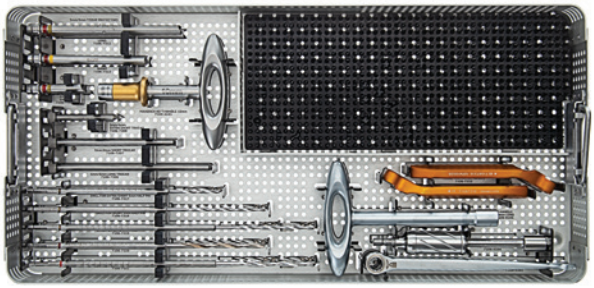
Tray Insert
Pins, Instruments, Drills
71094012



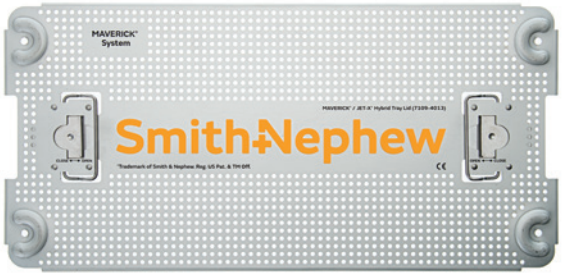
Lid for Tray 71094011
71094010

MAVERICK / JET-X® Hybrid Tray

71094003A ✚ 71094003



Tray Insert
JET-X Pin Instruments
MAVERICK General Instruments
Fits in Tray 71094011
71094014



Optional – Lid for Tray 71094014
71094013

Tray layout

MAVERICK® Unilateral External Fixation instruments and implants with Swivel Clamp option

71094000A	MAVERICK full set instruments	Set Qty
71094101	MAVERICK AO T-Handle 10mm	1
71094102	MAVERICK Ratchet Wrench 10mm	1
71094103	MAVERICK Tissue Protector Handle	1
71094104	MAVERICK Afterburner	1
71094105	MAVERICK T-Handle 10mm Long	1
71094151	MAVERICK Tissue Protector Short	2
71094152	MAVERICK Tissue Protector Medium	2
71094153	MAVERICK Tissue Protector Long	2
71094155	MAVERICK Tissue Protector Transfixing Pin	2
71094156	MAVERICK Tissue Protector 6mm	2
71094161	MAVERICK Trocar Short	2
71094162	MAVERICK Trocar Medium	2
71094163	MAVERICK Trocar Long	2
71094165	MAVERICK Transfixing Pin Trocar	2
71094166	MAVERICK Trocar 6mm	2
71094010	MAVERICK Tray Lid	1
71094011	MAVERICK Bars and Clamps Tray	1
71094012	MAVERICK Pins and Instruments Tray	1

71094000	MAVERICK full set implants Swivel Clamp	Set Qty
71094020	MAVERICK Swivel Clamp 11mm to 5-6mm	16
71094111	MAVERICK Swivel Attachment	4
71094045	MAVERICK Multi-Pin Clamp 45mm	2
71094075	MAVERICK Multi-Pin Clamp 75mm	2
71094060	MAVERICK Post Straight	2
71094030	MAVERICK Post 30°	4
71094090	MAVERICK Post 90°	2
71094100	MAVERICK Bar 11mm x 100mm	2
71094150	MAVERICK Bar 11mm x 150mm	2
71094200	MAVERICK Bar 11mm x 200mm	3
71094250	MAVERICK Bar 11mm x 250mm	3
71094300	MAVERICK Bar 11mm x 300mm	3
71094350	MAVERICK Bar 11mm x 350mm	3
71094400	MAVERICK Bar 11mm x 400mm	3
71094500	MAVERICK Bar 11mm x 500mm	3
71094190	MAVERICK BENT Bar 11mm x 190mm	1
71094210	MAVERICK CURVED Bar 11mm x 210mm	1
71094380	MAVERICK CURVED Bar 11mm x 380mm	1
71094315	MAVERICK Half Pin SS 3 x 100 x 15mm	2
71094325	MAVERICK Half Pin SS 3 x 100 x 25mm	2
71094420	MAVERICK Half Pin SS 4 x 100 x 20mm	2
71094435	MAVERICK Half Pin SS 4 x 100 x 35mm	2
71094535	MAVERICK Half Pin SS 5 x 160 x 35mm	4
71094555	MAVERICK Half Pin SS 5 x 160 x 55mm	4
71094545	MAVERICK Half Pin SS 5 x 200 x 45mm	4
71094565	MAVERICK Half Pin SS 5 x 200 x 65mm	4
71094585	MAVERICK Half Pin SS 5 x 250 x 85mm	4
71094655	MAVERICK Half Pin SS 6 x 200 x 55mm	2
71094695	MAVERICK Half Pin SS 6 x 250 x 95mm	2
71094575	MAVERICK Transfixing Pin SS 5mm x 275mm	2
71094024	MAVERICK Short Drill 2.4mm	2
71094032	MAVERICK Short Drill 3.2mm	2
71094040	MAVERICK Medium Drill 4.0mm	2
71094140	MAVERICK Long Drill 4.0mm	2
71094145	MAVERICK Long Drill 4.5mm	2

MAVERICK◊ Unilateral External Fixation instruments and implants with Combi Clamp option

71094000A	MAVERICK full set instruments	Set Qty
71094101	MAVERICK AO T-Handle 10mm	1
71094102	MAVERICK Ratchet Wrench 10mm	1
71094103	MAVERICK Tissue Protector Handle	1
71094104	MAVERICK Afterburner	1
71094105	MAVERICK T-Handle 10mm Long	1
71094151	MAVERICK Tissue Protector Short	2
71094152	MAVERICK Tissue Protector Medium	2
71094153	MAVERICK Tissue Protector Long	2
71094155	MAVERICK Tissue Protector Transfixing Pin	2
71094156	MAVERICK Tissue Protector 6mm	2
71094161	MAVERICK Trocar Short	2
71094162	MAVERICK Trocar Medium	2
71094163	MAVERICK Trocar Long	2
71094165	MAVERICK Transfixing Pin Trocar	2
71094166	MAVERICK Trocar 6mm	2
71094010	MAVERICK Tray Lid	1
71094011	MAVERICK Bars and Clamps Tray	1
71094012	MAVERICK Pins and Instruments Tray	1

71094001	MAVERICK◊ full set implants Combi Clamp	Set Qty
71094015	MAVERICK Combi Clamp 11mm to 5-6mm	16
71094111	MAVERICK Swivel Attachment	4
71094045	MAVERICK Multi-Pin Clamp 45mm	2
71094075	MAVERICK Multi-Pin Clamp 75mm	2
71094060	MAVERICK Post Straight	2
71094030	MAVERICK Post 30°	4
71094090	MAVERICK Post 90°	2
71094100	MAVERICK Bar 11mm x 100mm	2
71094150	MAVERICK Bar 11mm x 150mm	2
71094200	MAVERICK Bar 11mm x 200mm	3
71094250	MAVERICK Bar 11mm x 250mm	3
71094300	MAVERICK Bar 11mm x 300mm	3
71094350	MAVERICK Bar 11mm x 350mm	3
71094400	MAVERICK Bar 11mm x 400mm	3
71094500	MAVERICK Bar 11mm x 500mm	3
71094190	MAVERICK BENT Bar 11mm x 190mm	1
71094210	MAVERICK CURVED Bar 11mm x 210mm	1
71094380	MAVERICK CURVED Bar 11mm x 380mm	1
71094315	MAVERICK Half Pin SS 3 x 100 x 15mm	2
71094325	MAVERICK Half Pin SS 3 x 100 x 25mm	2
71094420	MAVERICK Half Pin SS 4 x 100 x 20mm	2
71094435	MAVERICK Half Pin SS 4 x 100 x 35mm	2
71094535	MAVERICK Half Pin SS 5 x 160 x 35mm	4
71094555	MAVERICK Half Pin SS 5 x 160 x 55mm	4
71094545	MAVERICK Half Pin SS 5 x 200 x 45mm	4
71094565	MAVERICK Half Pin SS 5 x 200 x 65mm	4
71094585	MAVERICK Half Pin SS 5 x 250 x 85mm	4
71094655	MAVERICK Half Pin SS 6 x 200 x 55mm	2
71094695	MAVERICK Half Pin SS 6 x 250 x 95mm	2
71094575	MAVERICK Transfixing Pin SS 5mm x 275mm	2
71094024	MAVERICK Short Drill 2.4mm	2
71094032	MAVERICK Short Drill 3.2mm	2
71094040	MAVERICK Medium Drill 4.0mm	2
71094140	MAVERICK Long Drill 4.0mm	2
71094145	MAVERICK Long Drill 4.5mm	2

MAVERICK◊ Unilateral External Fixation instruments and implants with Swivel and Combi Clamp option

71094000A	MAVERICK full set instruments	Set Qty
71094101	MAVERICK AO T-Handle 10mm	1
71094102	MAVERICK Ratchet Wrench 10mm	1
71094103	MAVERICK Tissue Protector Handle	1
71094104	MAVERICK Afterburner	1
71094105	MAVERICK T-Handle 10mm Long	1
71094151	MAVERICK Tissue Protector Short	2
71094152	MAVERICK Tissue Protector Medium	2
71094153	MAVERICK Tissue Protector Long	2
71094155	MAVERICK Tissue Protector Transfixing Pin	2
71094156	MAVERICK Tissue Protector 6mm	2
71094161	MAVERICK Trocar Short	2
71094162	MAVERICK Trocar Medium	2
71094163	MAVERICK Trocar Long	2
71094165	MAVERICK Transfixing Pin Trocar	2
71094166	MAVERICK Trocar 6mm	2
71094010	MAVERICK Tray Lid	1
71094011	MAVERICK Bars and Clamps Tray	1
71094012	MAVERICK Pins and Instruments Tray	1

71094005	MAVERICK full set implants with Swivel and Combi Clamps	Set Qty
71094020	MAVERICK Swivel Clamp 11mm to 5-6mm	8
71094015	MAVERICK Combi Clamp 11mm to 5-6mm	8
71094111	MAVERICK Swivel Attachment	4
71094045	MAVERICK Multi-Pin Clamp 45mm	2
71094075	MAVERICK Multi-Pin ClamP 75mm	2
71094060	MAVERICK Post Straight	2
71094030	MAVERICK Post 30°	4
71094090	MAVERICK Post 90°	2
71094315	MAVERICK Half Pin SS 3 X 100 X 15mm	2
71094325	MAVERICK Half Pin SS 3 X 100 X 25mm	2
71094420	MAVERICK Half Pin SS 4 X 100 X 20mm	2
71094435	MAVERICK Half Pin SS 4 X 100 X 35mm	2
71094535	MAVERICK Half Pin SS 5 X 160 X 35mm	4
71094555	MAVERICK Half Pin SS 5 X 160 X 55mm	4
71094545	MAVERICK Half Pin SS 5 X 200 X 45mm	4
71094565	MAVERICK Half Pin SS 5 X 200 X 65mm	4
71094585	MAVERICK Half Pin SS 5 X 250 X 85mm	4
71094655	MAVERICK Half Pin SS 6 X 200 X 55mm	2
71094695	MAVERICK Half Pin SS 6 X 250 X 95mm	2
71094575	MAVERICK Transfixing Pin SS 5mm X 275mm	2
71094024	MAVERICK Short Drill 2.4mm	2
71094032	MAVERICK Short Drill 3.2mm	2
71094040	MAVERICK Medium Drill 4.0mm	2
71094140	MAVERICK Long Drill 4.0mm	2
71094145	MAVERICK Long Drill 4.5mm	2
71094100	MAVERICK Bar 11mm x 100mm	2
71094150	MAVERICK Bar 11mm x 150mm	2
71094200	MAVERICK Bar 11mm x 200mm	3
71094250	MAVERICK Bar 11mm x 250mm	3
71094300	MAVERICK Bar 11mm x 300mm	3
71094350	MAVERICK Bar 11mm x 350mm	3
71094400	MAVERICK Bar 11mm x 400mm	3
71094500	MAVERICK Bar 11mm x 500mm	3
71094190	MAVERICK BENT Bar 11mm x 190mm	1
71094210	MAVERICK Curved Bar 11mm x 210mm	1
71094380	MAVERICK Curved Bar 11mm x 380mm	1

MAVERICK◊ and JET-X◊ instruments

71094003A	MAVERICK – JET-X instruments only	Set Qty
71067306	5mm/6mm Long Trocar	2
71067307	5mm/6mm Short Trocar	2
71067308	5mm/6mm X-Short Trocar	2
71067310	Tissue Protector Handle	2
71067312	5mm/6mm Tissue Protector for Long HP	2
71067313	5mm/6mm Tissue Protector for Short HP	2
71067314	5mm/6mm Tissue Protector for X-Short HP	2
71094101	MAVERICK AO T-Handle 10mm	1
71094102	MAVERICK Ratchet Wrench 10mm	1
71094104	MAVERICK Afterburner	1
71094105	MAVERICK T-Handle 10mm Long	1
71094014	MAVERICK – JET-X Hybrid Tray	1
71094010	MAVERICK Tray Lid	1
71094011	MAVERICK Bars and Clamps Tray	1

71094003	MAVERICK◊ Full set implants - use with 71094003A	Set Qty
71094015	MAVERICK Combi Clamp 11mm to 5-6mm	8
71094020	MAVERICK Swivel Clamp 11mm to 5-6mm	8
71094111	MAVERICK Swivel Attachment	4
71094045	MAVERICK Multi Pin Clamp 45mm	2
71094075	MAVERICK Multi Pin Clamp 75mm	2
71094060	MAVERICK Post Straight	2
71094030	MAVERICK Post 30°	4
71094090	MAVERICK Post 90°	2
71094100	MAVERICK Bar 11mm x 100mm	2
71094150	MAVERICK Bar 11mm x 150mm	2
71094200	MAVERICK Bar 11mm x 200mm	3
71094250	MAVERICK Bar 11mm x 250mm	3
71094300	MAVERICK Bar 11mm x 300mm	3
71094350	MAVERICK Bar 11mm x 350mm	3
71094400	MAVERICK Bar 11mm x 400mm	3
71094500	MAVERICK Bar 11mm x 500mm	3
71094190	MAVERICK BENT Bar 11mm x 190mm	1
71094210	MAVERICK CURVED Bar 11mm x 210mm	1

71094003	MAVERICK Full set implants – use with 71094003A	Set Qty
71094380	MAVERICK CURVED Bar 11mm x 380mm	1
71067317	Drill for X-Short 5mm Half Pin sterile	2
71067318	Drill for Short 5mm Half Pin sterile	2
71067319	Drill for Long 5mm Half Pin sterile	2
71067320	Drill for Short 6mm Half Pin sterile	2
71067321	Drill for Long 6mm Half Pin sterile	2
71065304S	5mm x 30mm TiN X-Short Half Pin sterile	2
71065354S	5mm x 35mm TiN X-Short Half Pin sterile	2
71065404S	5mm x 40mm TiN X-Short Half Pin sterile	2
71065454S	5mm x 45mm TiN X-Short Half Pin sterile	0
71065308S	5mm x 30mm TiN Short Half Pin sterile	4
71065358S	5mm x 35mm TiN Short Half Pin sterile	4
71065408S	5mm x 40mm TiN Short Half Pin sterile	4
71065458S	5mm x 45mm TiN Short Half Pin sterile	2
71065504S	5mm x 50mm TiN Short Traction Pin sterile	0
71065508S	5mm x 50mm TiN Short Half Pin sterile	0
71065558S	5mm x 55mm TiN Short Half Pin sterile	0
71065608S	5mm x 60mm TiN Short Half Pin sterile	0
71065658S	5mm x 65mm TiN Short Half Pin sterile	0
71065708S	5mm x 70mm TiN Short Half Pin sterile	0
71065309S	5mm x 30mm TiN Long Half Pin sterile	2
71065359S	5mm x 35mm TiN Long Half Pin sterile	2
71065409S	5mm x 40mm TiN Long Half Pin sterile	2
71065459S	5mm x 45mm TiN Long Half Pin sterile	0
71065509S	5mm x 50mm TiN Long Half Pin sterile	2
71065559S	5mm x 55mm TiN Long Half Pin sterile	0
71065609S	5mm x 60mm TiN Long Half Pin sterile	2
71065659S	5mm x 65mm TiN Long Half Pin sterile	0
71065709S	5mm x 70mm TiN Long Half Pin sterile	2
71066409S	6mm x 40mm TiN Half Pin sterile	2
71066459S	6mm x 45mm TiN Half Pin sterile	0
71066509S	6mm x 50mm TiN Half Pin sterile	2
71066559S	6mm x 55mm TiN Half Pin sterile	0
71066609S	6mm x 60mm TiN Half Pin sterile	2
71065507S	5mm x 50mm TiN Traction Pin sterile	1
71065407S	5mm x 40mm TiN Half Pin 1.6mm Cannulated sterile	1

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