





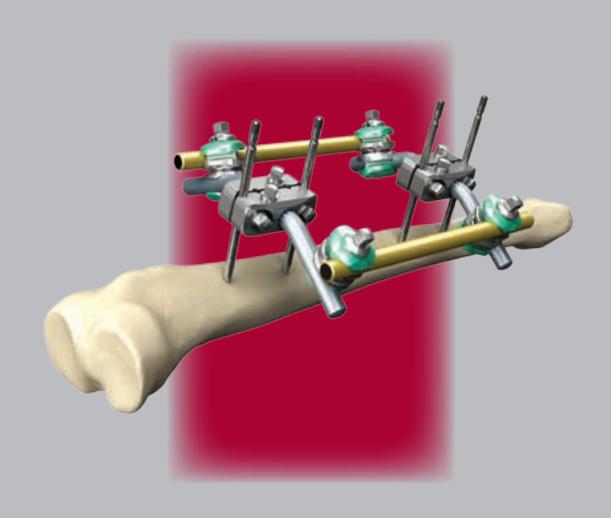




stryker°

Hoffmann 3 Modular External Fixation

Operative Technique



Hoffmann 3 External Fixation

Acknowledgments

Stryker acknowledges the following surgeons for their support in the development of this technique guide: Prof. David Seligson M.D. Prof. Andrew R. Burgess M.D. Dr. Greg M. Osgood M.D. Mr. Christopher T. Andrews, FRCS.

This publication sets forth detailed recommended procedures for using Stryker Osteosynthesis devices and instruments.

It offers guidance that you should heed, but, as with any such technical guide, each surgeon must consider the particular needs of each patient and make appropriate adjustments when and as required.

A workshop training is recommended prior to first surgery.

All non-sterile devices must be cleaned and sterilized before use. Follow the instructions provided in our Instructions for Cleaning, Sterilization, Inspection and Maintenance (L24002000). Multi-component instruments must be disassembled for cleaning. Please refer to the corresponding assembly/disassembly instructions.

See package insert (V15011, V15013, V15034) for a complete list of potential adverse effects, contraindications, warnings and precautions.

The surgeon must discuss all relevant risks, including the finite lifetime of the device, with the patient, when necessary.

Warning:

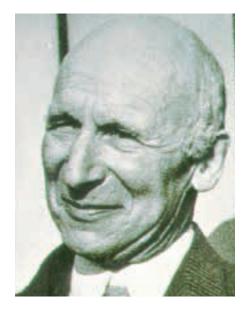
Fixation Screws:

Stryker Osteosynthesis bone screws are not approved or intended for screw attachment or fixation to the posterior elements (pedicles) of the cervical, thoracic or lumbar spine.

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Introduction



In 1938, Raoul Hoffmann, a Germanborn surgeon living and working in Geneva, Switzerland, set himself the goal of designing a new way to reduce and fix broken bones. His objective was to devise a system that would utilise an alternative form of fracture treatment, without reliance on open surgery. The result was history's first fully-functional, mainstream External Fixation System¹.

The main features of the newly born Hoffmann apparatus were its modular design, its ability to realign, reduce and fix fractures and the pioneering aptitude for making intra and postoperative corrections in all three planes with the frame in situ1. Hoffmann's closed reduction technique helped establish the very doctrine for minimally invasive orthopaedic surgery while laying the foundation for the Osteotaxis Method, a term that Hoffmann coined himself¹.

Over the years, the Hoffmann System has evolved considerably. Today's completely modular Hoffmann 3 remains faithful to the ingenuity of its inventor.

The Hoffmann 3 is a modular, multiplanar External Fixation System with independent pin placement capabilities, patented6, rapid assembly Snap-Fit Couplings and MR Conditional frame options that are designed to adapt freely to the anatomy to form constructs of high stability for the management of trauma and correction of deformities. It is comprised of a handful of key elements that work in precise agreement to enable surgeons to create a wide variety of frames that allow unhindered access to damaged tissues, permitting rapid and effective treatment of numerous traumatic injuries^{2,3}.

The Hoffmann 3 is not just an update to the earlier renditions of this System; it is the result of comprehensive engineering that has successfully built upon and significantly added to the power, utility and rich legacy of the previous generations.

In the Hoffmann 3 you will find not just a new look, but a demonstrably innovative feel to the entire platform of 11mm based components.

The new generation of fully articulating Delta Couplings promote enhanced stability, greater versatility and unrivalled convenience. The Delta Couplings feature full compatibility with Hoffmann II MRI and even Hoffmann II Compact MRI. That means you can use any combination of 5, 8 and 11mm Connecting Rods in any construct you build. You can rotate all of the Couplings independently to allow numerous provisional options and the freedom to refine your construct throughout the entire surgical procedure.

These same Couplings can be locked securely once definitive reduction and fixation have been achieved. A variety of Pin Clamps allow you to accurately position each pin while an expanded selection of straight and angled posts extends the reach and utility of your frames. This versatile resource of components enables you to build entire constructs that meet the requirements set forth in ASTM (American Society for Testing and Materials) Standards that govern safe usage of medical devices in MRI environments. Compliance with these Standards include all patented⁶ Vectran coated Connecting Rods, making Stryker both a pioneer and industry leader in MR Conditional External Fixation technology^{4,6}.

- 1. Raoul Hoffmann and His External Fixator, Schwechter, E. M., Swan, K. G.; Published in J Bone Joint Surg Am, Vol. 89, Issue 3, Pages 672 - 678.
- The Damage control Orthopedic (DCO)
 Footplate: A New Use of the Hoffmann II
 External Fixation System. Beck, D.J. Seligson,
 D. Mereau, T., Published in OsteoTrauma Care
 2004, Volume 12, Pages 16 19.
- 3. A Comparison of Two Military Temporary Femoral External Fixators. LTC Paul J. Dougherty, MD; CPT Brian Vickaryous, MD; Edgar Conley, PhD; and Kyle Hickerson, BS; Published in Clinical Orthopaedics and Related Research Number 412, Pages 176-183
- 4. Stryker White Paper; Magnetic Resonance Imaging Testing of External Fixation Frames: Stryker Hoffmann II; J. Nyenhuis, PhD.; School of Electrical and Computer Engineering, Purdue University
- Thermal Response and Torque Resistance of Five Cortical Half Pins Under Simulated Insertion Technique; Wikenheiser, M. A., Market, M. D., Lewallen, D. G., et al., Published in J. Orthop Res 1995; 13; 615 - 619
- 6. U.S. Patent Nos.: US752,7626, US5,752,954, US6,080,153

Introduction





The Hoffmann 3 was developed for use in acute trauma, damage control orthopaedics and definitive fixation settings and is endowed with a variety of features that make it simple, fast, precise and adaptable for many types of patients, regardless of their size or build

You can place pins wherever they are needed and then build the frame around them. You can assemble constructs to suit a variety of fractures, including those close to a joint, while easily accommodating the associated soft tissue envelopes. The patented, single point of tightening Snap-Fit technology and simple instrumentation are designed to enable you to build stable frames quickly and easily^{2,3}. With the frame in place, minimal effort is needed to fine-tune the construct after initial reduction1. Rods and Couplings can be clicked on and off at any time. These important features help contain and rapidly stabilise orthopaedic injuries to allow the patient's overall physiology to improve while providing either temporary or definitive treatment4.

The Third Generation of the Hoffmann System has undergone a rigorous testing protocol to ensure that it continues the venerable tradition of its predecessors. In the following pages, you will find a thorough description of the Hoffmann 3 and a detailed overview of several commonly utilised frames using this ground-breaking System.

Stryker is committed to the highest level of quality, safety and patient care. The entire Hoffmann 3 External Fixation System (Hoffmann 3) was designed from the ground up for MR Conditional placement in MRI environments up to 3.0 Tesla. Hoffmann 3 complies with the American Society for Testing and Materials (ASTM) testing requirements for passive medical devices in the MRI environments.

For more detailed information please refer to the specific section in this operative technique.

- 1. Raoul Hoffmann and His External Fixator, Schwechter, E. M., Swan, K. G.; Published in J Bone Joint Surg Am, Vol. 89, Issue 3, Pages 672 678.
- 2. The Damage control Orthopedic (DCO) Footplate: A New Use of the Hoffmann II External Fixation System. Beck, D.J. Seligson, D. Mereau, T., Published in OsteoTrauma Care 2004, Volume 12, Pages 16 19.
- 3. A Comparison of Two Military Temporary Femoral External Fixators. LTC Paul J. Dougherty, MD; CPT Brian Vickaryous, MD; Edgar Conley, PhD; and Kyle Hickerson, BS; Published in Clinical Orthopaedics and Related Research Number 412, Pages 176 -183
- 4. Stryker White Paper; Magnetic Resonance Imaging Testing of External Fixation Frames: Stryker Hoffmann II; J. Nyenhuis, PhD.; School of Electrical and Computer Engineering, Purdue University



Indications & Contraindications

Intended Use

The Hoffmann 3 Modular External Fixation System is used to provide stabilization of open and/or unstable fractures and where soft tissue injury may preclude the use of other fracture treatments such as IM rods, casts, or other means of internal fixation.

Indications

The Hoffmann 3 Modular External Fixation System components are external fixation frame components for use with the components of the Hoffmann II MRI and Hoffmann II Compact MRI External Fixation Systems, in conjunction with Apex Pins. It is intended to provide stabilization of open and/or unstable fractures and where soft tissue precludes the use of other fracture treatments such as IM nailing or casting or other means of internal fixation.

The indications for use of external fixation devices include:

- Bone Fracture Fixation
- Osteotomy
- Arthrodesis
- · Correction of deformity
- Revision procedure where other treatments or devices have been unsuccessful
- Bone reconstruction procedures

Contraindications

See package insert for warnings and precautions.

Radiologist Guidelines

MR Conditional 🗥



Stryker is committed to the highest level of quality, safety and patient care. The entire Hoffmann 3 External Fixation System (Hoffmann 3) was designed from the ground up for MR Conditional placement in MRI environments.

Hoffmann 3 complies with the American Society for Testing and Materials (ASTM1) testing requirements for passive medical devices in the MRI environments.

Stryker utilizes a systems approach to address two key areas of concern in MRI use:

- (1) frame displacement and
- (2) frame heating.

To address these concerns, Hoffmann 3 is designed with non-ferromagnetic materials and insulated carbon rods:

- Clamps & couplings are made from aluminum, austenitic steel and
- Apex® Half Pins and Posts are made from austenitic steel and aluminum
- Carbon-Fiber Rods are coated with an electrically insulating coating, Vectran®

Since Hoffmann 3 components are non-magnetic, magnetic fields in the MRI environment will not displace the frame nor pose a risk of magnetic injury to patients or damage to the scanner if used under proper conditions.

MRI Components 🕰



The MRI components have been tested according to ASTM Standards F2052, F2119, F2182, and F2213. The Hoffmann 3 MRI System can only be guaranteed for MRI use when using Stryker's Apex Pins to build a frame.



Note:

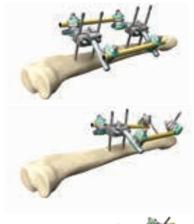
Frame tests have been performed² in areas where the greatest temperature increase is expected with commonly used frames. Due to the versatility of the system, an unlimited number of frames can be built which makes it impossible to test each and every construct. Based on the test results, the Hoffmann 3 may be used in MRI procedures under the specified conditions. There are factors that can influence these results like the number of pins used in the clamps and the number of open and closed loops in the frame. Therefore, it is recommended that each frame be evaluated by a radiologist or MR scientist before the MRI procedure to ensure patient safety. Since different frame configurations and frame sizes might lead to higher temperature increases, Stryker recommends for patient's safety to minimize SAR settings as much as possible. Non-clinical testing has been performed to rule out the possibility of component movement or migration at static magnetic field strengths higher than 3.0 Tesla or maximum spatial gradients higher than 90.0 mT/cm. MR image quality may be compromised if the area of interest is in the exact same area as or approx. 10cm under worst case conditions to the position of the frame or its individual components.

ASTM F2503-08: http://www.astm.org/Standards/F2503.htm

² Based upon Biomechanical Lab Reports: BML 11-066, BML 11-270, BML 12-061, BML 12-062, Stryker in Selzach, Switzerland

Radiologist Guidelines

It has been shown by specific MRI tests² that the Hoffmann 3 External Fixation System may be used for patients undergoing MRI procedures using up to 3.0 Tesla MR systems if certain specific conditions are met. The following frames have been tested in 1.5 Tesla and with 2 exceptions also in 3.0 Tesla MRI environments. All components are safe with respect to displacement in an MRI magnetic field with a maximum spatial gradient of 90 mT/cm.



Standard Bilateral Tibia Frame

1.5 Tesla MR System

 Δ T_{max}: 4.45°C at 1.0W/kg at a whole body average SAR for MR imaging time of 15 minutes

3.0 Tesla MR System

Δ Tmax: 2.80°C at 0.5W/kg at a whole body average SAR for MR imaging time of 15 minutes



1.5 Tesla MR System

Δ Tmax: 2.55°C at 1.0W/kg at a whole body average SAR for MR imaging time of 15 minutes

3.0 Tesla MR System - *USE OF OUT OF BODY COIL RECOMMENDED

Δ Tmax: 6.70°C at 0.5W/kg at a whole body average SAR for MR imaging time of 15 minutes

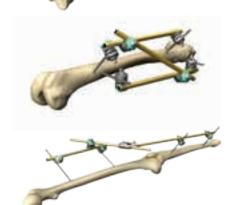


Tibia single rod frame with Multiplanar Delta Coupling

1.5 Tesla MR System

Δ Tmax: 2.8°C at 1.0W/kg at a whole body average SAR for MR imaging time of 15 minutes

3.0 Tesla MR System - Not yet tested at 3.0 Tesla



Femur Emergency Frame with independent pin placement

1.5 Tesla MR System

Δ Tmax: 2.65°C at 1.0W/kg at a whole body average SAR for MR imaging time of 15 minutes

3.0 Tesla MR System - *USE OF OUT OF BODY COIL RECOMMENDED

Δ Tmax: 6.10°C at 0.5W/kg at a whole body average SAR for MR imaging time of 15 minutes

Knee bridging Z-Frame, Independent Pin Placement, with Rod Coupler

1.5 Tesla MR System

 Δ Tmax: 1.0°C at 1.0W/kg at a whole body average SAR for MR imaging time of 15 minutes

3.0 Tesla MR System - Not yet tested at 3.0 Tesla



Pelvis Osteotaxis Frame with Multi-Iliac Crest pin placement

1.5 Tesla MR System

 Δ Tmax: 2.65°C at 1.0W/kg at a whole body average SAR for MR imaging time of 15 minutes

3.0 Tesla MR System

 Δ Tmax: 4.70°C at 0.5W/kg at a whole body average SAR for MR imaging time of 15 minutes



Pelvis Osteotaxis Frame with independent Iliac Crest pin placement

1.5 Tesla MR System

 Δ Tmax: 1.20°C at 1.0W/kg at a whole body average SAR for MR imaging time of 15 minutes

3.0 Tesla MR System - *USE OF OUT OF BODY COIL RECOMMENDED

 Δ Tmax: 7.60°C at 0.5W/kg at a whole body average SAR for MR imaging time of 15 minutes

Tests have been performed using a MR system for a max. image time of 15 minutes. Please note that the Specific Absorption Rate (SAR) may be reported differently, e.g. as whole body averaged SAR or as partial SAR by the software depending on the MR system used.

^{*} ΔTmax<2.0°C at 0.5W/kg if frame is more than 25cm away from body coil centre

 $^{^2} Based \ upon \ Biomechanical \ Lab \ Reports: BML \ 11-066, BML \ 11-270, BML \ 12-061, BML \ 12-062, Stryker \ in Selzach, Switzerland.$

Delta Couplings

Design features for easy frame assembly:

- Pre-assembled Thumbwheel for provisional tightening
- Three dimensional rotation
- Patented Snap-fit technology*

Delta Coupling, Rod-to-Rod or **Pin-to-Rod**

The Rod-to-Rod Delta Couplings can snap onto Ø5, Ø8 or Ø11mm Connecting Rods and Ø5mm Apex Pins**. Rod-to-Rod Delta Couplings are color coded green/green.



Delta Coupling, Pin-to-Rod

The Pin-to-Rod Delta Couplings are designed to fit onto a choice of Ø5, Ø8 or Ø11mm Connecting Rods and Ø4, Ø5 or Ø6mm Apex Pins. Pin-to-Rod Delta Couplings are color coded grey/ green.



Delta Coupling, Pin-to-Rod, inverted

'Inverted' Pin-to-Rod Delta Coupling are available with the bolt on opposite side to facilitate easy tightening when required by special frame construct accessibility. 'Inverted' Pin-to-Rod Delta Couplings are color coded green/grey.



- * Patent No's US5,752,954 and US6,080,153
- ** Note: Standardization with one coupling may be achieved by utilizing a Rod-to-Rod Delta Coupling with Ø8mm or Ø11mm Connecting Rod and 5mm Apex Pins or 3/5mm, 4/5mm Hybrid Apex Pins.

Delta Couplings

Delta Coupling, Rod-to-Rod, multiplanar

The multiplanar Rod-to-Rod Delta Coupling is designed to snap onto a choice of Ø5, Ø8 or Ø11mm Connecting Rods and/or Ø5mm Apex Pins on each side of the joint.

The planar joint allows for 180 degrees of motion and 360 degrees of rotation and with that offers additional flexibility in frame construction. Multiplanar Delta Couplings are color coded green/green and include two pre-assembled Thumbwheels for provisional tightening.



Delta Coupling, Pin-to-Rod, multiplanar

The multiplanar Pin-to-Rod Delta Coupling is designed to snap onto a choice of Ø5, Ø8 or Ø11mm Connecting Rods and Ø4, Ø5 or Ø6mm Apex Pins on each side of the joint.

The planar joint allows for 180 degrees of motion and 360 degrees of rotation and with that offers additional flexibility in frame construction. Multiplanar Delta Couplings, Pinto-Rod are color coded grey/green and include two pre-assembled Thumbwheels for provisional tightening.

For easier reduction of the fracture and flexible adjustment of the frame the multiplanar Delta Couplings can be tightened on one side while keeping full rotational flexibility and adjustability on the other side.

The distance between the bars or pins can be varied from 0 to 37mm allowing very flexible frame construction and adjustment.



Provisional Tightening



Step 1 Snap two Rods (or a Pin and a Rod) into a Delta Coupling.



Step 2Provisionally tighten the Coupling to the Rods using the Thumbwheel.



Step 3 Remove the single-use Thumbwheel from the Delta Coupling before the final tightening.



Should provisional tightening still be required after single-use Thumbwheel removal, use the 4920-9-020 Thumbwheel for additional provisional tightening.

Final Tightening



For final tightening use either the T-handle (4920-9-030) or Spanner Wrench (4920-9-036).

5-Hole Pin Clamp

5 Hole Pin Clamps can be used if parallel Pin placement is desired. The clamp can hold up to five Apex Half Pins, accommodating Ø4, Ø5 or Ø6mm pins.

• Pin Clamps are secured to the Apex Pins by tightening the 7mm Square Head Screws on the side of the Clamp

Posts

Straight, 30° or 90° angled Ø11mm Posts are used along with the Pin Clamps to provide a compact, fracture-specific frame.

 Posts are locked into place by tightening the two 7mm Square Head Screws on the top of the Clamp

Fixed Post Clamps

5 Hole Pin Clamps with either one or two straight or 30° angled fixed Posts are included in the Hoffmann 3 platform for efficient frame construction.

Rod Coupler, 30°

The Rod Couplers are designed to connect two Ø11mm Connecting Rods in a fixed angle. They are ideal for long spanning frames such as knee bridging frames or pelvic bow creation.

The couplers allow also asymmetric fixation of the rods, thus allowing for exact adaptation to the anatomy of the patient. The window in the coupler allows for visual control of the depth of the rods in the clamping area. With that one can ensure stable connection and tight fit.







5, 8 and 11mm Connecting Rod options

Carbon Fiber Vectran coated Connecting Rods, 5, 8 and 11mm options

Stryker provides electrically insulated Carbon Rods for MR Conditional use. The Ø11mm Vectran coated Carbon Connecting Rods are available in lengths from 100mm to 650mm.

The Vectran coated Semi Circular Rods may be used for the fixation of distal femur or proximal and distal tibia (see page 21) fragments.

All Vectran coated Carbon Connecting Rods are intended for Single Patient Use only. Once used on a patient they have to be disposed of. Unused rods can be reprocessed in the tray according to the cleaning and sterilization instructions mentioned in the package insert. Tests have shown intended performance for 50 reprocessing cycles.*

In addition to the MR Conditional standard system features, the Hoffmann 3 also offers a number of Rod options which are MR Unsafe.

Carbon Fiber Connecting Rods, 5 and 8mm options

Uncoated Carbon Rods offer radiolucency and relative elasticity for light weight constructs.

Stainless Steel Connecting Rods, 5 and 8mm options

For fractures requiring more rigidity, stainless steel 5 & 8mm Rods are available.

Aluminium Connecting Rods, 8mm option

Aluminium Rods are lightweight and more elastic than the carbon fiber rods.

Note

- Carbon fibre material is known to be effected by steam sterilisation.
 Hoffmann 3 MR Conditional rods have been tested for multiple sterilisation cycles.
- Frames using one or more MR unsafe components should not be used in the MR Environment.





^{*} Biomechanical Rest Reports: BML 11-059, BML 12-054

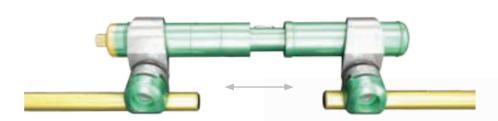
Compatible Components

Compression / Distraction Tube

The Compression/Distraction (C/D) Tube may be incorporated into the frame to allow fine adjustments for fracture reduction. The C/D Tube may be distracted to a maximum of 45mm. One complete revolution of the 7mm Square Head Screw equals 1mm displacement. Turn counter-clockwise for Distraction and clockwise for Compression.

 \emptyset 20mm Rod-to-Tube Clamps are used to connect the Compression/Distraction Tube to 8mm Connecting Rods or Multi-pin Clamp Posts.

The Rod-to-Tube Clamps employ the same non-slip, snap-fit mechanism as the Pin-to-Rod and Rod-to-Rod Delta Couplings.



Note:

MR conditional information: Compression/Distraction Tube should be used OUT OF BODY COIL.

Pelvic Clamp

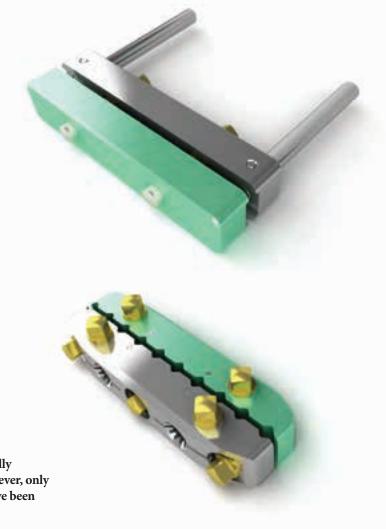
The Pelvic Clamp is specially designed to be used with pins placed in the iliac crest. Since the clamp does not have dedicated pin grooves, it can clamp onto pins that are not fully parallel.

10-Hole Pin Clamp

10-Hole Pin Clamps can hold up to ten 4, 5 or 6mm Apex Half Pins to build frames tailored to bridging long distances in the femur or tibia by increasing stability due to its wide pin spread.

Note:

All Hoffmann II MRI components are mechanically compatible with the Hoffmann 3 Couplings. However, only the frames shown in this Operative Technique have been tested for MR environment.



Apex Pin

Four types of half pins are offered in the system: Blunt/Self-Tapping Half Pins, Blunt/Cancellous Half Pins, Self-Drilling/Self-Tapping Half Pins, and Self-Drilling Transfixing Pins. Pre-drilling is necessary when using blunt pins. It is optional to pre-drill when using selfdrilling pins.

General Guidelines For Pre-Drilling

- Always pre-drill with a NEW, sharp drill
- Drill slowly to help prevent thermal injury
- When placed through an exposed bone surface irrigating the interface can reduce heating
- Always use a drill that's smaller in diameter than the Apex Half Pin

Pin Thread Diameter	Drill Bit	Location
3mm	2.2mm	Ulna, Radius, Wrist, Metacarpal
4mm	3.2 – 3.5mm	Radius, Ulna, Humerus, Tibia, Metatarsal
5mm	4.0 – 4.5mm	Tibia, Femur, Calcaneus, Pelvis
6mm	4.5 – 5.0mm	Adult Tibia, Femur, Pelvis

Additional Options

- Stainless steel and titanium
- · HA Coating
- Sterile and non sterile packaging
- Hybrid Apex Pins with 3mm thread diameter and 5mm Shaft, as well as 4mm thread diameter and 5mm Shaft

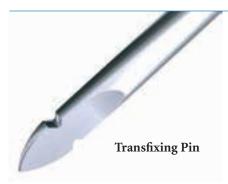
Note:

For additional information please refer to the specific Apex Pin Brochure. Literature Number LAPFB.



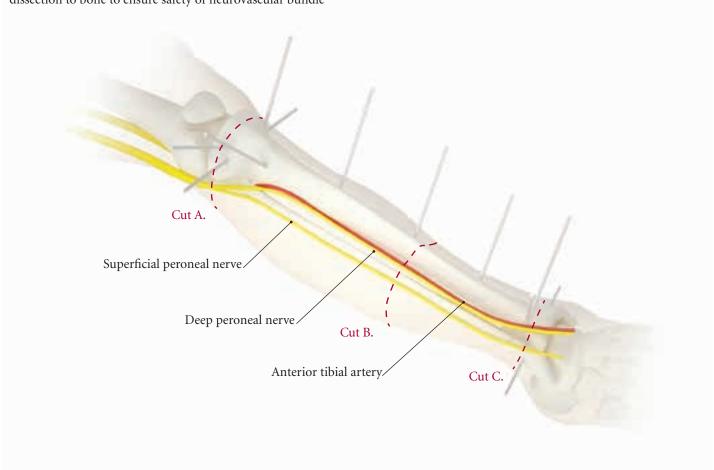


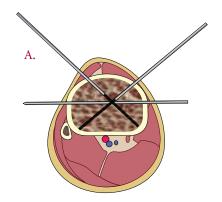


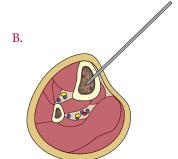


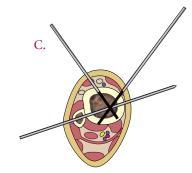
Pin Technique / Safe Zones

- Knowledge of the cross-sectional anatomy of the tibia helps to ensure safe pin placement
- Apex Half Pins can be placed in the medial face of the tibia from plateau to pilon
- Transfixing Pins can be safely placed except in the distal third of the tibia proximal to the metaphysis and distal to the fibula head near the peroneal nerve
- Before insertion of anterior Apex Half Pins near the ankle joint, perform blunt dissection to bone to ensure safety of neurovascular bundle



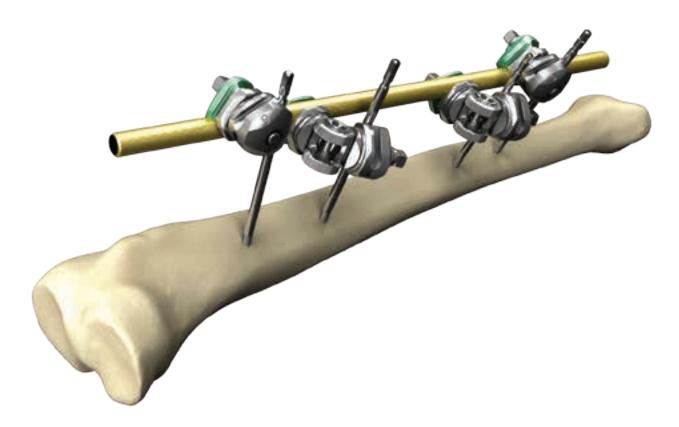






Tibial Single Rod Frame

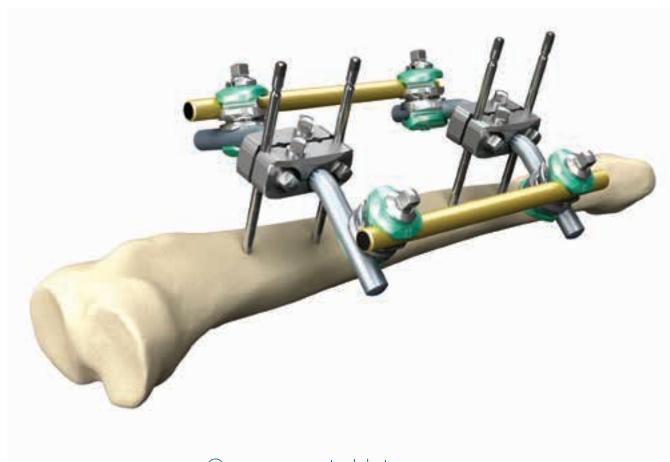
Independent Pin Placement, with multiplanar Delta Couplings



REF	Description	Quantity
4922-1-025	Pin-to-Rod Delta Coupling, multiplanar	2
4922-1-020	Pin-to-Rod Delta Coupling	2
5018-5-150	Apex Pin Ø5 x 150mm	4
4922-8-300	Connecting Rods Ø11 x 300mm	1

Tibial Standard Bi-lateral Frame

Parallel Pin Placement



Components List

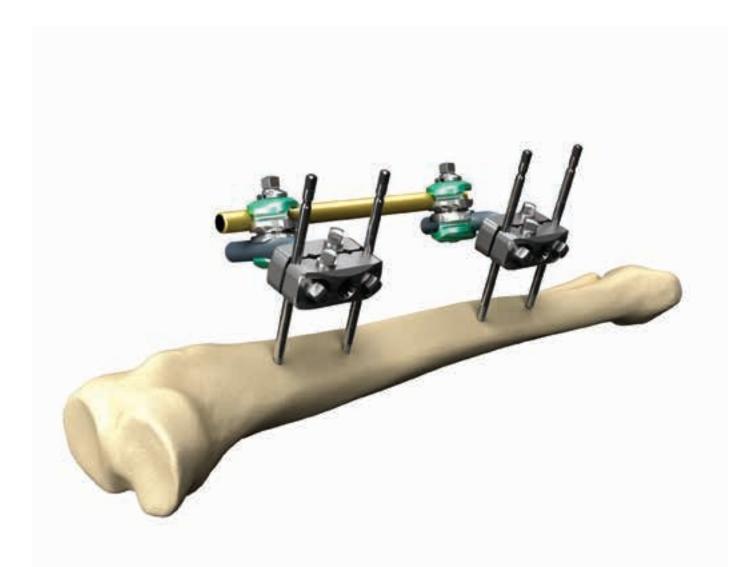
REF	Description	Quantity
4922-2-020	5-Hole Pin Clamp	2
4922-2-140	30° Angled Post Ø11mm	4
4922-1-010	Rod-to-Rod Delta Coupling	4
5018-5-150	Apex Pin Ø5 x 150mm	4
4922-8-300	Connecting Rods Ø11 x 300mm	2

Note:

Alternatively the Pin-to-Rod Delta Couplings can be replaced by mulitplanar Pin-to-Rod Delta Couplings, thus offering more flexibility and freedom when placing the Apex Pins and when reducing the fracture before final tightening.

Tibial Standard Osteotaxis Half Frame

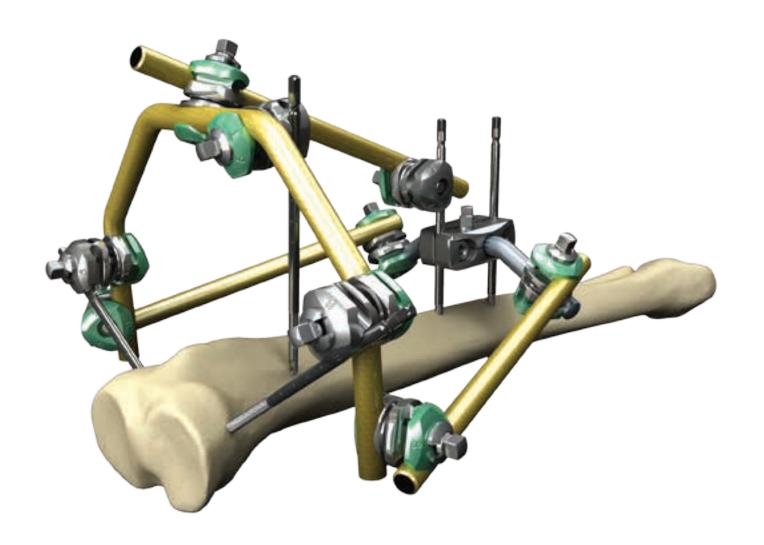
Parallel Pin Placement



REF	Description	Quantity
4922-2-020	5-Hole Pin Clamp	2
4922-2-140	30° Angled Post Ø11mm	2
4922-1-010	Rod-to-Rod Delta Coupling	2
5018-5-150	Apex Pin Ø5 x 150mm	4
4922-8-300	Connecting Rods Ø11 x 300mm	1

Tibial Plateau Semi-Circular Frame

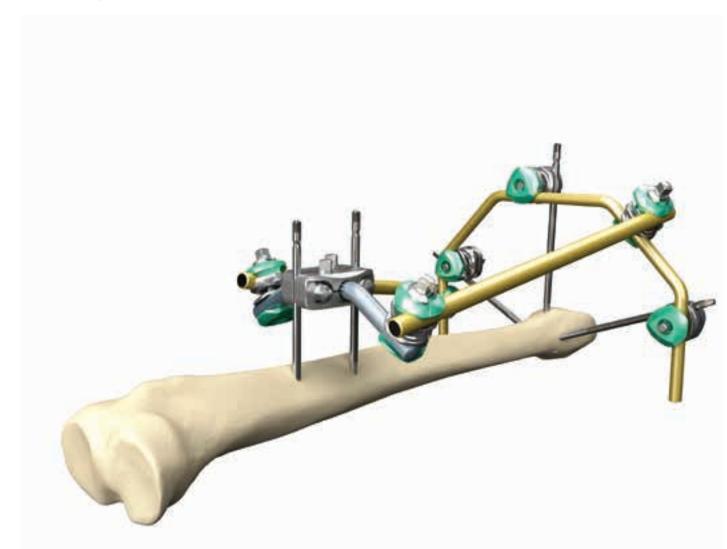
Parallel/Independent Pin Placement



Description	Quantity
5-Hole Pin Clamp	1
30° Angled Post Ø11mm	2
Rod-to-Rod Delta Coupling	5
Pin-to-Rod Delta Coupling	2
Pin-to-Rod Delta Coupling, inverted	2
Apex Pin Ø5 x 150mm	5
Semi Circular Rod Ø11 x 220mm	1
Connecting Rods Ø11 x 300mm	3
	5-Hole Pin Clamp 30° Angled Post Ø11mm Rod-to-Rod Delta Coupling Pin-to-Rod Delta Coupling Pin-to-Rod Delta Coupling, inverted Apex Pin Ø5 x 150mm Semi Circular Rod Ø11 x 220mm

Distal Tibia Semi-Circular Frame

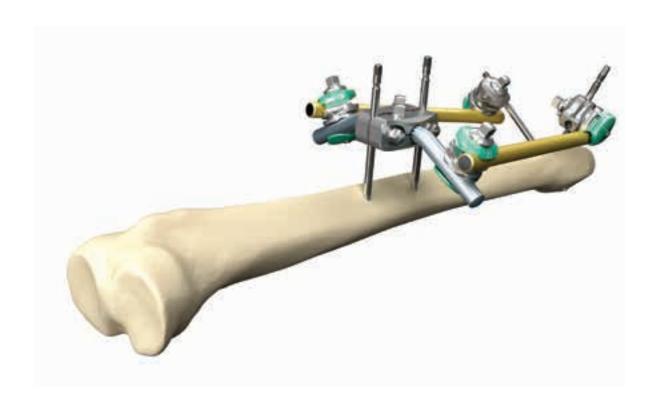
Parallel/Independent Pin Placement



REF	Description	Quantity
4922-2-020	5-Hole Pin Clamp	1
4922-2-140	30° Angled Post Ø11mm	2
4922-1-010	Rod-to-Rod Delta Coupling	4
4922-1-020	Pin-to-Rod Delta Coupling	3
4922-1-030	Pin-to-Rod Delta Coupling inverted	
	(alternatively 1)	
5018-5-150	Apex Pin Ø5 x 150mm	5
5028-7-030	Semi-Circular Rod Ø8mm	1
4922-8-300	Connecting Rods Ø11 x 300mm	2

Distal Tibia Shaft Frame

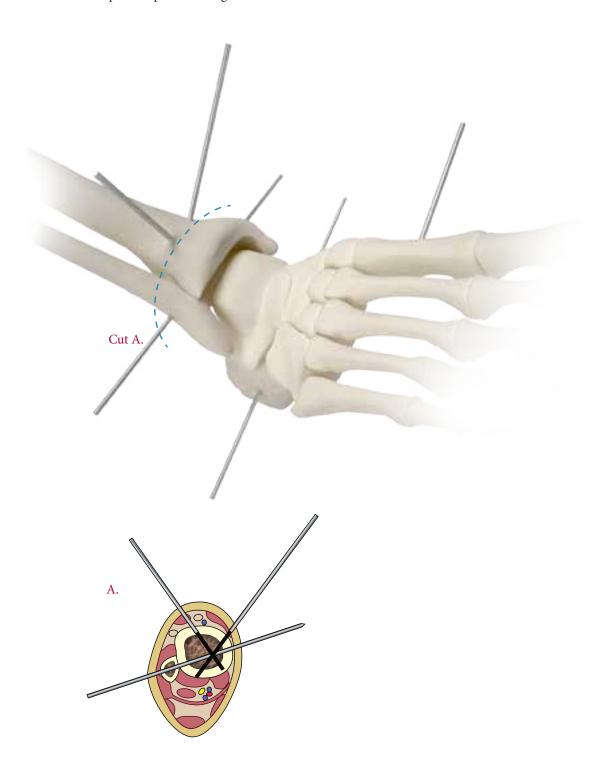
Parallel / Independent Pin Placement



REF	Description	Quantity
4922-2-020	5-Hole Pin Clamp	1
4922-2-140	30° Angled Post Ø11mm	2
4922-1-010	Rod-to-Rod Delta Coupling	2
4922-1-020	Pin-to-Rod Delta Coupling	2
5018-5-150	Apex Pin Ø5 x 150mm	4
4922-8-250	Connecting Rods Ø11 x 250mm	2

Pin Technique/Safe Zones

- Proximal to the ankle Half-pins can be placed from the medial to lateral in the anteromedial face of the tibia
- Distal to the crossing of the anterior tibial vessels just proximal to the ankle transfixing pins are also safe
- Before insertion of anterior Apex Half Pins near ankle joint, perform blunt dissection to bone to ensure safety of neurovascular bundle
- Transfixation pins are placed through the calcaneus from medial to lateral



Ankle Cross Brace Frame

Independent Pin Placement



REF	Description	Quantity
5018-5-150	Apex Pin Ø5 x 150mm	1
5018-3-180	Apex Pin Ø5 x 180mm	1
5023-3-090	Apex Pin Ø4 x 90mm	1
5030-5-200	Transfixing Pin Ø5/4 x 200mm	1
4922-1-010	Rod-to-Rod Delta Coupling	5
4922-1-020	Pin-to-Rod Delta Coupling	3
4922-1-030	Pin-to-Rod Delta Coupling inverted	2
4922-8-350	Connecting Rods Ø11 x 350mm	2
4922-8-200	Connecting Rods Ø11 x 200mm	3

Ankle Bridging Frame

Parallel Pin Placement



REF	Description	Quantity
4922-2-020	5-Hole Pin Clamp	3
4922-2-140	30° Angled Post Ø11mm	2
4922-2-120	Straight Post Ø11mm	2
4922-1-010	Rod-to-Rod Delta Coupling	4
5018-5-150	Apex Pin Ø5 x 150mm	2
5030-5-200	Transfixing Pin Ø5/4 x 200mm	2
4922-8-250	Connecting Rods Ø11 x 250mm	2



Components List

REF	Description	Quantity
5018-5-150	Apex Pin Ø5 x 150mm	3
5023-3-090	Apex Pin Ø4 x 90mm	1
4922-1-010	Rod-to-Rod Delta Coupling	3
4922-1-020	Pin-to-Rod Delta Coupling	4
4922-8-300	Connecting Rods Ø11 x 300mm	1
4922-8-150	Connecting Rods Ø11 x 150mm	2

Note:

Alternatively, a second pin can be placed in the calcaneus.

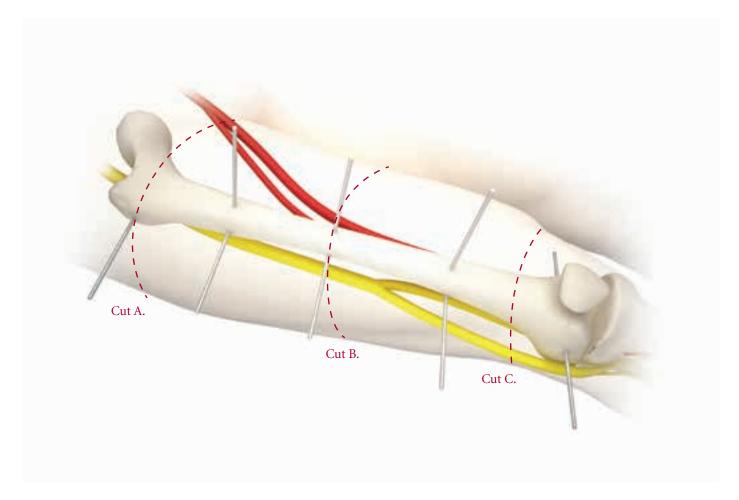


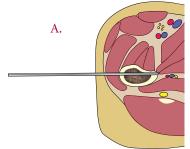
REF	Description	Quantity
5018-5-150	Apex Pin Ø5 x 150mm	2
5023-3-090	Apex Pin Ø4 x 90mm	1
4922-1-010	Rod-to-Rod Delta Coupling	3
4922-1-020	Pin-to-Rod Delta Coupling	3
4922-8-250	Connecting Rods Ø11 x 250mm	2
4922-8-100	Connecting Rods Ø11 x 100mm	1

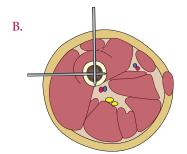
Femur Frames

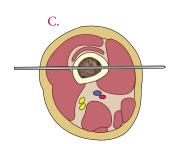
Pin Technique / Safe Zones

- In the femur half-pins placed from lateral to medial are safe the entire length of the bone
- Transfixing pins can be placed in the distal quarter of the femur distal to the passage of the femoral artery posteriorly





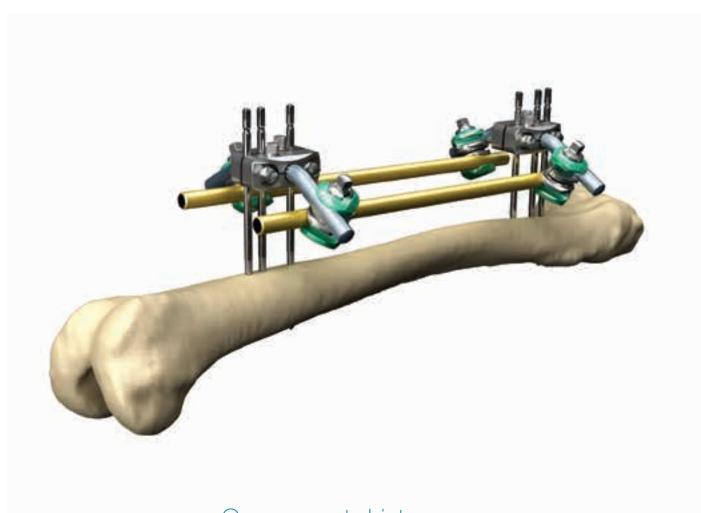




Femur Frames

Femur Bi-Lateral Frame (Double Half Frame)

Parallel Pin Placement

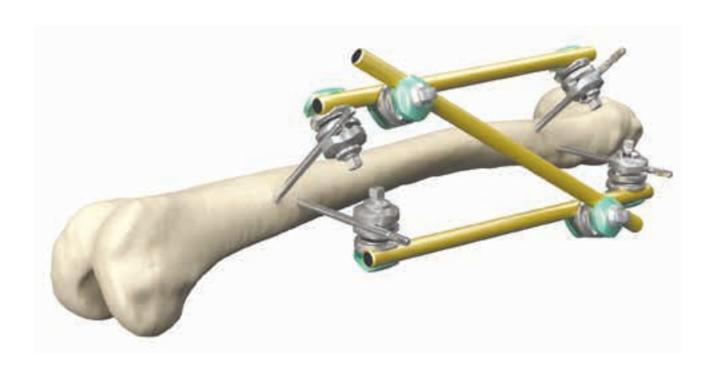


Description	Quantity
5-Hole Pin Clamp	2
30° Angled Post Ø11mm	4
Rod-to-Rod Delta Coupling	4
Apex Pin Ø6 x 180mm	6
Connecting Rods Ø11 x 350mm	2
	5-Hole Pin Clamp 30° Angled Post Ø11mm Rod-to-Rod Delta Coupling Apex Pin Ø6 x 180mm

Femur Frames

Femur Emergency Frame

Independent Pin Placement



Components List

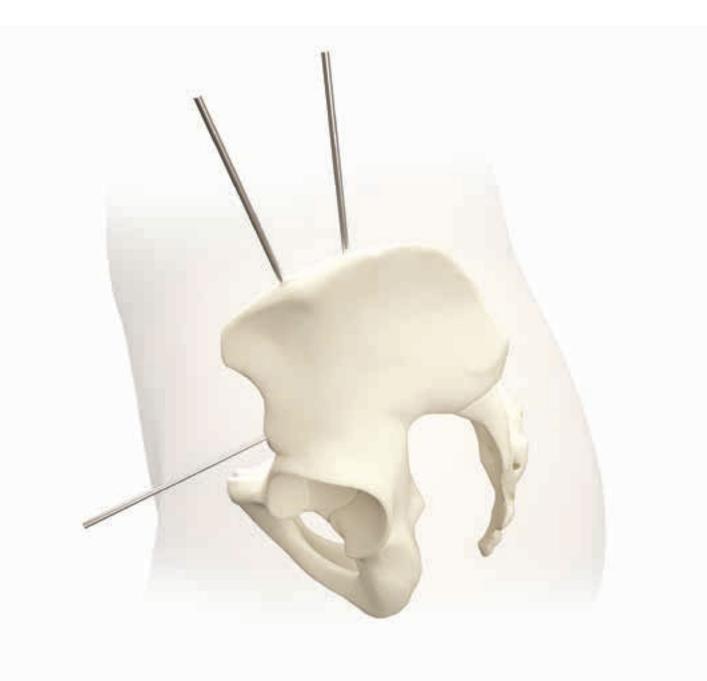
REF	Description	Quantity
4922-1-020	Pin-to-Rod Delta Coupling	4
4922-1-010	Rod-to-Rod Delta Coupling	2
5021-6-180	Apex Pin Ø6 x 180mm	4
4922-8-350	Connecting Rods Ø11 x 350mm	3

Note:

Apply additional pins and rods before patient transportation.

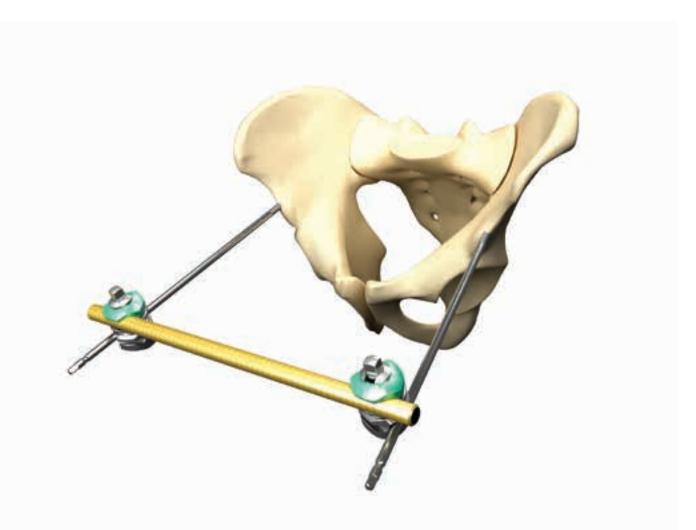
Pin Technique / Safe Zones

- Pins can be placed percutaneously in the iliac wings
- Pins can be placed in the pelvis in the crest between the anterior-superior and anterior inferior iliac spines



Pelvic Emergency Frame

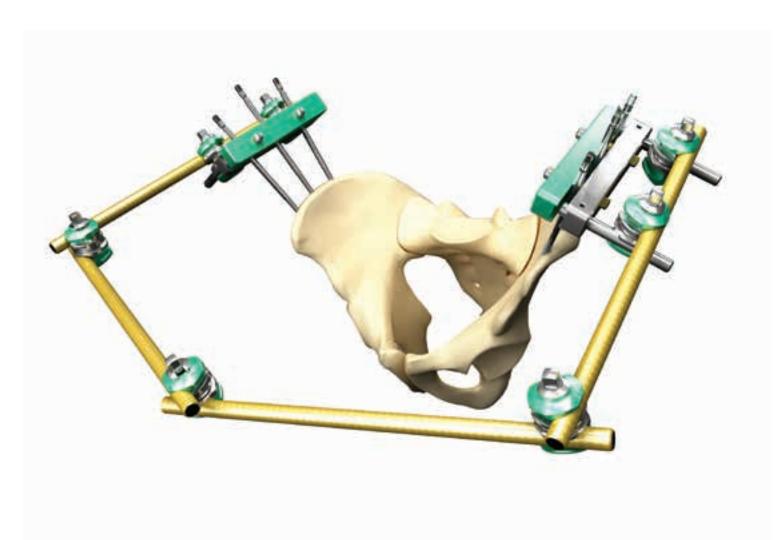
Single Supra-acetabular Pin Placement



REF	Description	Quantity
4922-1-020	Pin-to-Rod Delta Coupling	2
5021-8-200	Apex Pin Ø6 x 200mm	2
4922-8-400	Connecting Rods Ø11 x 400mm	1

Pelvic Osteotaxis Frame

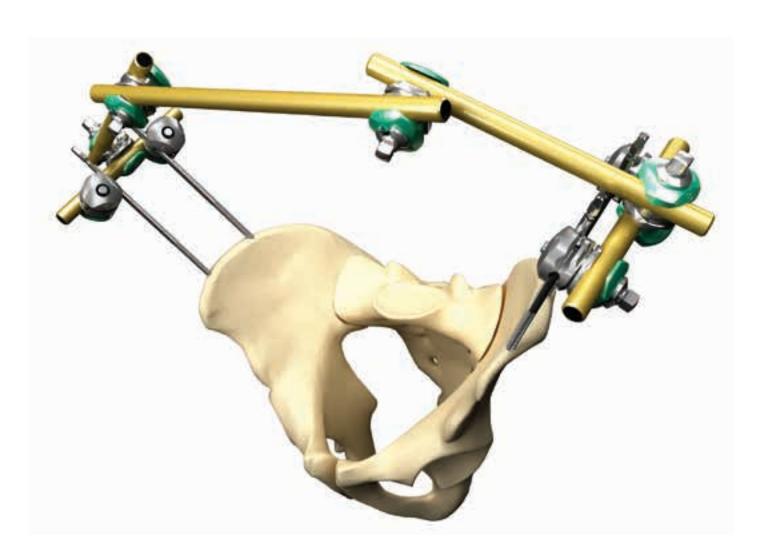
Multi-Iliac Crest Pin Placement



REF	Description	Quantity
4921-2-080	Pelvic Pin Clamp	2
4922-1-010	Rod-to-Rod Delta Coupling	7
5018-6-200	Apex Pin Ø5 x 200mm	6
4922-8-350	Connecting Rods Ø11 x 350mm	2
4922-8-400	Connecting Rods Ø11 x 400mm	2

Pelvic Osteotaxis Frame

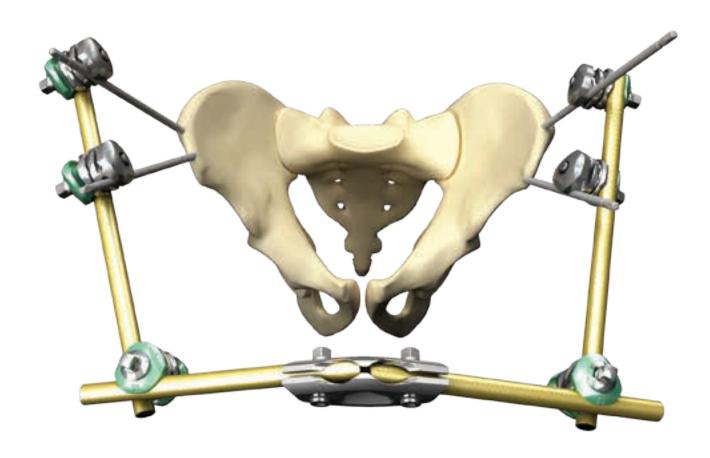
Independent Iliac Crest Pin Placement



REF	Description	Quantity
4922-1-030	Pin-to-Rod Delta Coupling, Inverted	4
4922-1-010	Rod-to-Rod Delta Coupling	4
5018-6-200	Apex Pin Ø5 x 200mm	4
4922-8-350	Connecting Rods Ø11 x 350mm	3
4922-8-150	Connecting Rods Ø11 x 150mm	2

Pelvic Osteotaxis Frame

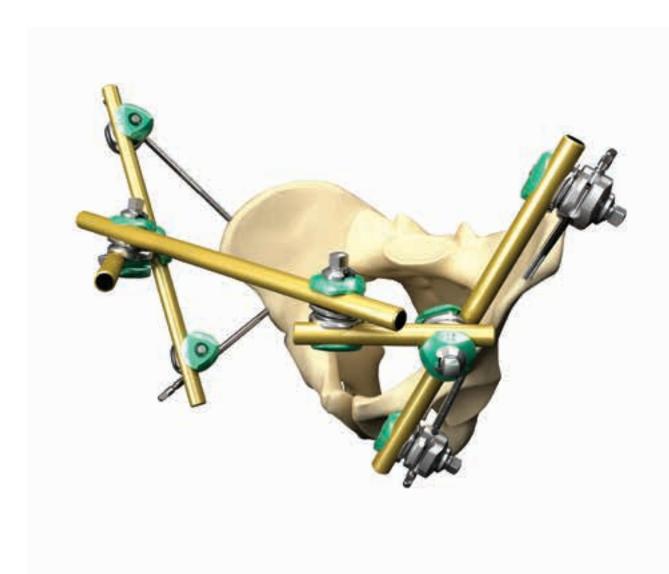
Independent Iliac Crest Pin Placement, with Rod Coupler



REF	Description	Quantity
4922-1-030	Pin-to-Rod Delta Coupling, inverted	4
4922-1-010	Rod-to-Rod Delta Coupling	2
4922-1-220	Rod Coupler, 30°	1
4922-8-150	Connecting Rod 11 x 150mm	2
4922-8-250	Connecting Rod 11 x 250mm	2
5018-6-180	Apex Pin Ø5 x 180mm	4

Pelvic Orthogonal Frame Construct

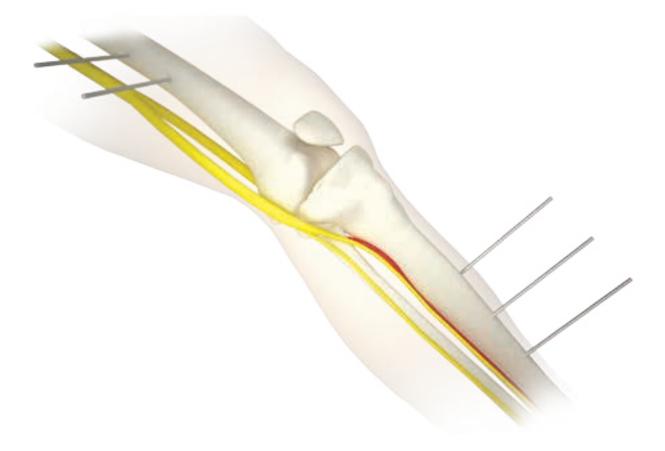
Perpendicular Iliac Crest / Supra-acetabular Pin Placement



REF	Description	Quantity
4922-1-020	Pin-to-Rod Coupling	4
4922-1-010	Rod-to-Rod Coupling	3
5018-6-200	Apex Pin Ø5 x 200mm	4
4922-8-350	Connecting Rods Ø11 x 350mm	2
4922-8-150	Connecting Rods Ø11 x 150mm	2
4922-8-400	Connecting Rods Ø11 x 400mm	1

Pin Technique/Safe Zones

- Half-pins are placed in the femur anterolaterally in the shaft
- These are connected to half-pins placed in the anterior-medial face of the tibia



Knee Bridging Frame

Independent Pin Placement, with Rod Coupler



Components List

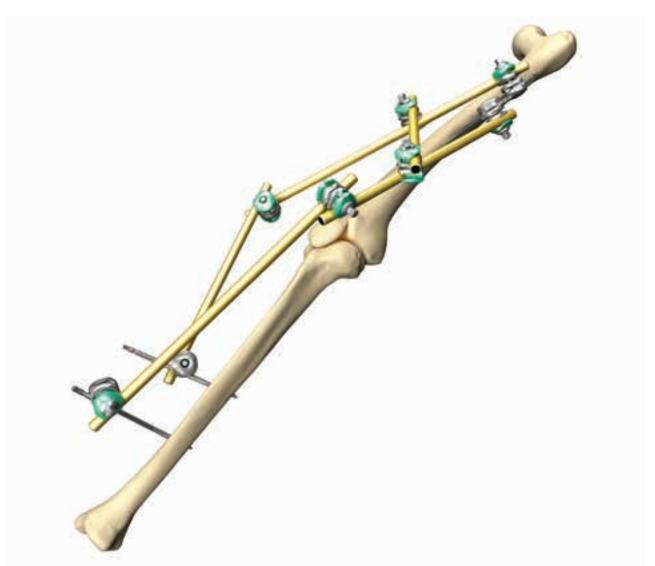
REF	Description	Quantity
4922-1-020	Pin-to-Rod Delta Coupling	4
5018-6-180	Apex Pin Ø5 x 180mm	4
4922-1-220	Rod Coupler, 30°	1
4922-8-450	Connecting Rod 11 x 450mm	1
4922-8-350	Connecting Rod 11 x 350mm	1

Note

Alternatively the Pin-to-Rod Delta Couplings can be replaced by mulitplanar Pin-to-Rod Delta Couplings, thus offering more flexibility and freedom when placing the Apex pins and when reducing the fracture before final tightening or, instead of the Rod Coupler a Rod-to-Rod Delta Coupling could be used.

Knee Bridging Frame

Independent Pin Placement

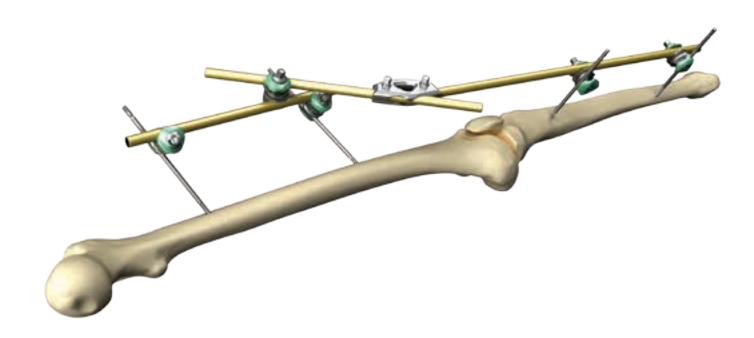


Components List

Description	Quantity
Pin-to-Rod Delta Coupling	4
Rod-to-Rod Delta Coupling	4
Apex Pin Ø6 x 180mm	2
Apex Pin Ø5 x 180mm	2
Connecting Rods Ø11 x 350mm	4
Connecting Rods Ø11 x 200mm	1
	Pin-to-Rod Delta Coupling Rod-to-Rod Delta Coupling Apex Pin Ø6 x 180mm Apex Pin Ø5 x 180mm Connecting Rods Ø11 x 350mm

Knee Bridging Z-Frame

Independent Pin Placement, with Rod Coupler



Components List

REF	Description	Quantity
4922-1-020	Pin-to-Rod Delta Coupling	4
4922-1-010	Rod-to-Rod Delta Coupling	1
5018-6-180	Apex Pin Ø5 x 180mm	4
4922-1-220	Rod Coupler, 30°	1
4922-8-400	Connecting Rod 11 x 400mm	2
4922-8-250	Connecting Rod 11 x 250mm	1

Note:

Alternatively the Pin-to-Rod Delta Couplings can be replaced by mulitplanar Pin-to-Rod Delta Couplings, thus offering more flexibility and freedom when placing the Apex Pins and when reducing the fracture before final tightening. Or, instead of the Rod Coupler a Rod-to-Rod Delta Coupling could be used.

	REF	Description	
	Delta Couplings MR		
3	4922-1-010	Rod-to-Rod Delta Coupling, Ø5/8/11mm Rods and Ø5mm Apex Pins	
	4922-1-020	Pin-to-Rod Coupling, Ø5/8/11mm Rods and Ø4/5/6mm Apex Pins	
	4922-1-030	Pin-to-Rod Coupling Inverted, Ø5/8/11mm Rods and Ø4/5/6mm Apex Pins	
	4922-1-015	Delta Coupling, Rod-to-Rod, multiplanar, Ø5/8/11mm Rods and Ø5mm Apex Pins	
	4922-1-025	Delta Coupling, Pin-to-Rod, multiplanar, Ø5/8/11mm Rods and Ø4/5/6mm Apex Pins	
- 5	Tubes		
9	4921-1-100	Tube-to-Rod Coupling, Ø8mm Rods and Ø20mm Tube	
	4921-0-000	Dynamization Ø20mm Tube	
	4921-0-015	Compression/Distraction Ø20mm Tube	
	Multi-Pin Cla	mps MR	
Col	4922-2-020	5-Hole Pin Clamp	
Co	4922-2-320	5-Hole Pin Clamp with one Ø11mm Straight Post	
6	4922-2-220	5-Hole Pin Clamp with two Ø11mm Straight Posts	
- Con	4922-2-340	5-Hole Pin Clamp with one Ø11mm 30° Angled Post	
Co	4922-2-240	5-Hole Pin Clamp with two Ø11mm 30° Angled Posts	
	4922-1-220	Rod Coupler, 30°	
Contract of the second	4921-2-060	10-Hole Pin Clamp	
600	4921-2-080	Pelvic Clamp	

REF Description

Protective End Caps*



5027-1-040 4mm Apex Pins White

5027-1-050 5mm Apex Pins Blue

*Package Contains 15 units

Posts





4921-2-120 Straight Post Ø8mm

4921-2-140 30° Angled Post Ø8mm

4922-2-120 Straight Post Ø11mm

4922-2-140 30° Angled Post Ø11mm

4922-2-160 90° Angled Post Ø11mm

$\emptyset 11mm\ MRI\ Carbon\ Connecting\ Rods$

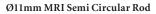






4922-8-100	Ø11 x 100mm
4922-8-150	Ø11 x 150mm
4922-8-200	Ø11 x 200mm
4922-8-250	Ø11 x 250mm
4922-8-300	Ø11 x 300mm
4922-8-350	Ø11 x 350mm
4922-8-400	Ø11 x 400mm
4922-8-450	Ø11 x 450mm
4922-8-500	Ø11 x 500mm
4922-8-550	Ø11 x 550mm
4922-8-600	Ø11 x 600mm
4922-8-650	Ø11 x 650mm

5028-8-065 Ø8 x 65mm 5028-8-100 Ø8 x 100mm Ø8 x 150mm 5028-8-150 5028-8-200 $\emptyset 8 \times 200 mm$ 5028-8-250 Ø8 x 250mm 5028-8-300 $\emptyset 8 \times 300 mm$ 5028-8-350 Ø8 x 350mm 5028-8-400 $\emptyset 8 \times 400 mm$ 5028 - 8 - 450Ø8 x 450mm 5028-8-500 Ø8 x 500mm





4922-7-220 Semi Circular Rod (Ø11 x 220mm)

Ø8mm MRI Semi Circular Rod



5028-7-030 Semi Circular Rod (Ø8 x 174mm)



Number LAPFB (for US) or 5075-4-000 (for outside US).

REF

Description

	KEF	Description
	Ø8mm Stain	less Steel Connecting Rods
	5029-8-065	Ø8 x 65mm
	5029-8-100 5029-8-150	Ø8 x 100mm Ø8 x 150mm
	5029-8-200	Ø8 x 200mm
	5029-8-250	Ø8 x 250mm
	5029-8-300	Ø8 x 300mm
	5029-8-350 5029-8-400	Ø8 x 350mm Ø8 x 400mm
4/	5029-8-450	Ø8 x 450mm
	5029-8-500	Ø8 x 500mm
	Ø8mm Alum	inium Connecting Rods
	5029-8-605	Ø8 x 65mm
	5029-8-610	Ø8 x 100mm
	5029-8-615	Ø8 x 150mm
	5029-8-620	Ø8 x 200mm
(/	5029-8-625 5029-8-630	Ø8 x 250mm Ø8 x 300mm
1	5029-8-635	Ø8 x 350mm
N //	5029-8-640	Ø8 x 400mm
0 9	5029-8-645	Ø8 x 450mm
	5029-8-650 5029-7-028	Ø8 x 500mm Semi Circular Rod Small (Ø134mm)
	5029-7-028	Semi Circular Rod Medium (Ø174mm)
	5029-7-032	Semi Circular Rod Large (Ø214mm)
	Ø8mm Carbo	on Rods
	5029-8-805	Ø8 x 65mm
	5029-8-810	Ø8 x 100mm
	5029-8-815	Ø8 x 150mm
	5029-8-820 5029-8-825	Ø8 x 200mm Ø8 x 250mm
	5029-8-830	Ø8 x 300mm
	5029-8-835	Ø8 x 350mm
	5029-8-840	Ø8 x 400mm
	5029-8-845 5029-8-850	Ø8 x 450mm Ø8 x 500mm
	REF	Description
	Apex Pins**	^
	4	MR
	5030-5-250	Transfixing Pin Ø4/5mm, 250 x 50mm
-	5050-4-300	Transfixing Pin Ø5/6mm, 300 x 40mm
	5026 1 150	Salf drilling Hybrid Half Din Anay (A4/5mm, 150 y 40mm
	5026-1-150 5026-8-120	Self-drilling Hybrid Half Pin Apex Ø4/5mm, 150 x 40mm
	3020-8-120	Self-drilling Hybrid Half Pin Apex Ø3/5mm, 120 x 20mm
	5015-7-250	Cancellous Half-Pin Apex Ø5/6mm, 250 x 70mm
	5023-3-120	Self-drilling Half Pin Apex Ø4mm, 120 x 30mm
FC	5023-5-120	Self-drilling Half Pin Apex Ø4mm, 120 x 35mm
	5023-5-150	Self-drilling Half Pin Apex Ø4mm, 150 x 40mm
	5018-5-120	Self-drilling Half Pin Apex Ø5mm, 120 x 35mm
	5018-5-150	Self-drilling Half Pin Apex Ø5mm, 150 x 40mm
	5018-5-200	Self-drilling Half Pin Apex Ø5mm, 200 x 50mm
	5018-5-250	Self-drilling Half Pin Apex Ø5mm, 250 x 50mm
	5018-6-150	Self-drilling Half Pin Apex Ø5mm, 150 x 50mm
	5018-6-180	Self-drilling Half Pin Apex Ø5mm, 180 x 50mm
	5018-6-200	Self-drilling Half Pin Apex Ø5mm, 200 x 60mm
	5018-7-250	Self-drilling Half Pin Apex Ø5mm, 250 x 70mm
Note:	5018-8-180	Self-drilling Half Pin Apex Ø5mm, 180 x 60mm
For detailed Apex Pin	5021 6 100	Self-drilling Half Pin Apex Ø6mm, 180 x 60mm
information refer to Literature	5021-6-180 5021-8-250	Self-drilling Half Pin Apex Ø6mm, 180 x 60mm Self-drilling Half Pin Apex Ø6mm, 250 x 80mm
Number LAPFB (for US) or	3021-0-230	oen arming fran f in Apex gomin, 250 x outilli

Hoffmann 3 Instruments and Trays

	REF	Description
Or C	4920-9-036	7mm Spanner Wrench
-	4920-9-020	Thumbwheel
	4920-9-030	7mm T-Wrench; Ø5/6mm Pin Driver
	4936-9-070	7mm Socket Wrench with universal joint (optional)
	5085-2-032	Drill 3.2mm for Ø4mm Pins
	5085-2-040	Drill 4.0mm for Ø5mm Pins
	5085-2-045	Drill 4.5mm for Ø6mm Pins
	4922-9-050	Universal Chuck for 4, 5 & 6mm dia. Apex Pins, AO Coupling
	4922-9-140	Tissue Protection Sleeve
=	4922-9-240	Trocar
()=1000000000000000000000000000000000000	4922-9-060	Stabilization/ Reduction Wrench
5	5057-0-300	Drill Brace Assembly
	5057-0-310	Handle for Drill Brace
	Trays	
	4922-9-900	Sterilization Metal Tray, empty, including the Lid
Solyton	1806-9-700	Spare Lid for Metal Tray
Elemental.	4922-9-950	Plastic Tray (for Level 3/4/5 Military or Disaster Recovery Use), empty, including the Lid
668	Spare Parts	
	4922-9-952	Plastic Tray Lid
	4922-9-953	Plastic Tray Upper Insert
	4922-9-954	Plastic Tray Lower Insert
(Top)	Sterile Field Ki	ts
	4922-9-940S	Sterile Field Kit A*
	4922-9-941S	Sterile Field Kit B*
	* For detailed content list and description please refer to the specific section in this Operative Technique.	

^{*}Note:

For additional information including Drill Guides, Drill Guide Blocks, Drill Sleeves, Protection Sleeves, Quick Release Apex Chucks, Pin Cutters and more, please refer to the specific Apex Pin Brochure. Literature Number LAPFB.

Operative Technique.

Military or Disaster Recovery Kits

Hoffmann 3 for Military or Disaster Recovery Use

Hoffmann External Fixation Systems have a long tradition providing solutions not only for patient care in the established environment of Trauma Center Infrastructures but also in extreme situations such as military operations or disaster recovery management around the World.

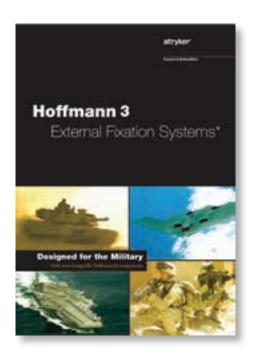
The Hoffmann brand has been the pioneer brand offering sterile packaged external fixation kits and user friendly set configurations that allow fracture treatment or fracture stabilization either with forward deployed Field Kits, Level 3/4/5 Military Trays in military actions or in natural disasters such as earthquakes, volcanic eruptions, avalanches, cyclic storms or tsunamis. In these situations the Hoffmann key features offering a stable, smart and simple way to treat injured patients are crucial.

Universal Vision, Global Engineering, Swiss Manufacturing

The Third Generation of the Hoffmann System has undergone a rigorous design and testing protocol to ensure that it continues the venerable tradition of its predecessors.

In close collaboration with leadership members of armed forces and disaster recovery professionals the Hoffmann 3 Field Kit A & B were designed to allow Stryker to offer tailored solutions for those special situations.

The Hoffmann 3 Sterile Field Kits A & B contain scalpels, mosquito clamps, self-drilling Apex Pins, a manual Drill-Brace for Pin insertion and frame tightening, Hoffmann 3 Delta Couplings and Vectran coated Carbon Fibre Connecting Rods for the temporary stabilization of diverse fracture patterns.





* White paper: Comparison between the Hoffmann II MRI and the Hoffmann 3 systems: the mechanical behavior of the connecting rods and a monoplanar bilateral frame. E. Wobmann, MSc; M. A. Behrens, MSc; S. Brianza, PhD; T. Matsushita, MD, DMSc; D. Seligson, MD; NL11-NA-TR-2465

Based upon Biomechanical Test Reports from Stryker Trauma AG, Selzach, Switzerland; BML 11-072 and BML 11-059.

Components of the Hoffmann 3 Sterile Field Kit A (REF. 4922-9-940S):



*Note:

Not available as a single item. Components are sterile packed in the Hoffmann 3 Sterile Field Kit A.

For Intended Use, Indications and Contraindications as well as for Warnings and Precautions see section on page 4 and the following pages of this Operative Technique and Package Inserts.



Femoral Safe Zone



Between anterolateral & lateral sites

Antero-Lateral

Distal from the greater trochanter to 3-4 fingers proximal to patella

Lateral

Distal from the greater trochanter to 1-2 fingers proximal to knee joint

Tibial Safe Zone



Medial

1-2 fingers distal to knee joint avoiding patella tendon and tibial tubercle

1 finger proximal to ankle

Hoffmann 3 Sterile Field Kit A Application Technique:

Step 1:

Provisionally reduce and align the limb. Apply self drilling, self tapping Apex Pins through 1cm linear incision of the soft tissue made down to the bone with the scalpel. The included hemostat clamp may be used to spread soft tissues before pin insertion.



Step 2:

Pins are placed through both cortices using the black brace, "pin end," as shown.

Step 3:

Insert the first Pin 2-3 finger breadth proximal to the fracture/bone defect (Fig. 1)*.



Fig 1.

* Note:

In emergency situations often there is no X-Ray (fluoroscopy) available. Under such circumstances it is not possible to localize the fracture site accurately. Therefore, it is recommended to place the Apex Pins in an area which is in a safe distance proximally and distally from the fracture site.

Step 4

The insertion point of the Apex Pin in the first cortex should be positioned exactly in the center of the cross-section of the bone to avoid excentric or tangential positioning (Fig. 2). After penetration of the first cortex, a drop in resistance will be detected. Using light pressure, insertion of the pin is continued. Once firm resistance of the second cortex is felt, six complete revolutions of the drill brace will put the pin tip through the second cortex (Fig. 2).



Place 5-Hole Pin Clamp over first Apex Pin, using the widest placement possible. Keep the Clamp Screws facing up and out (medial), as shown (Fig. 3). As mentioned above: Keep safe distance from the fracture site.

Step 6:

Insert second proximal Pin maintaining parallel alignment with the first Pin, using the Clamp as a guide (Fig. 4).

Step 7:

Repeat the process for the two distal Pins, keeping the Pins parallel and at least two finger breadth away from the fracture/bone defect (Fig. 5).

Step 8:

In the next step attach the Rod-to-Rod Delta Couplings with the Connecting Rod. With frame in place and fracture reduced, fully tighten all nuts, using the drill brace end marked "clamp".

In case the frame is not used in the pre-assembled manner, use the following instructions to assemble the frame.

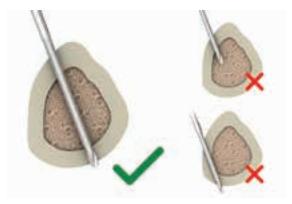


Fig 2.





Fig 4.



Step 9:

Attach the Delta Rod-to-Rod Couplings as shown. Use care to avoid the 30° bend area when tightening the Couplings onto the Posts (Fig. 6).



Fig 6.

Step 10:

Snap a Connecting Rod to the Coupling. Provisionally tighten using the thumbwheel (Fig. 7).





Fig 7.

Step 11:

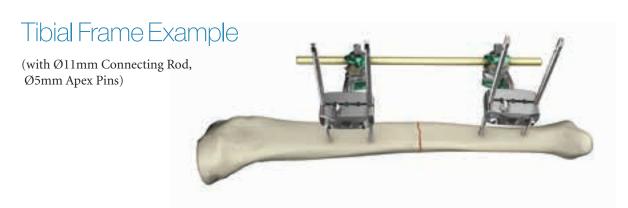
Remove the thumbwheel from the Rod-to-Rod Coupling to prepare for final tightening (Fig. 8).



Step 12:

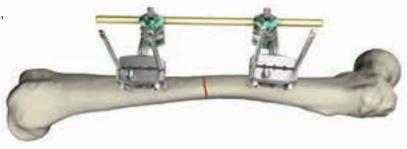
Use the "Clamp" end of the Brace for final tightening while maintaining reduction and alignment of the limb. Repeat for all Clamps and Couplings (Fig. 9).



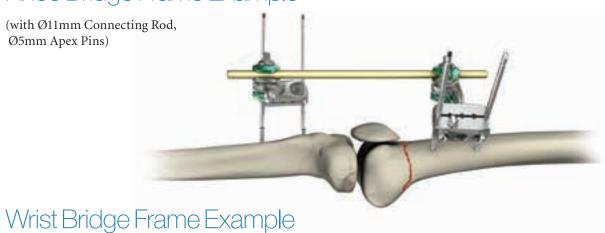


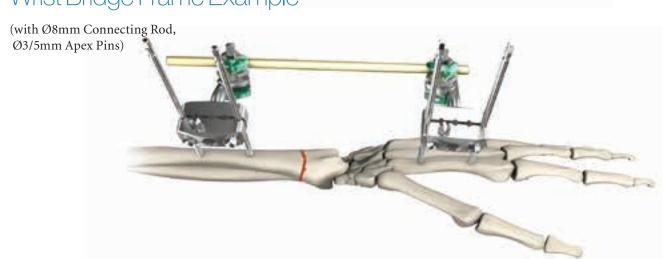
Femoral Frame Example

(with Ø11mm Connecting Rod, Ø5mm Apex Pins)



Knee Bridge Frame Example





Components of the Hoffmann 3 Sterile Field Kit B (REF. 4922-9-941S):



6 x Delta Coupling, Rod-to-Rod, REF. 4922-1-010

3 x Vectran coated Connecting Rod Ø11 x 400mm, REF. 4922-8-400

4x Apex Pin Ø5mm, 180 x 50mm, self-drilling, REF. 5018-6-180

1 x Drill Brace for Apex Pins and Couplings / Clamps, REF. VIM-0*

The Brace accepts Pins on one end and fits over the Clamp / Delta Coupling screws, on the other end, to function as a wrench.

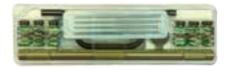
1 x No.10 Scalpel, REF. SW A-S10*

1 x Mosquito Hemostat Clamp, REF. 32-01241*

*Note:

Not available as a single item. Components are sterile packed in the Hoffmann 3 Sterile Field Kit B.

For Intended Use, Indications and Contraindications as well as for Warnings and Precautions see section on page 4 and the following pages of this Operative Technique and Package Inserts.



Femoral Safe Zone



Between anterolateral & lateral sites

Antero-Lateral

Distal from the greater trochanter to 3-4 fingers proximal to patella

Latera

Distal from the greater trochanter to 1-2 fingers proximal to knee joint

Tibial Safe Zone



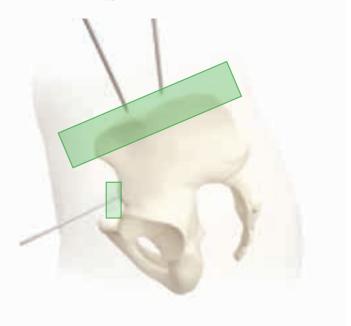
Medial

1-2 fingers distal to knee joint avoiding patella tendon and tibial tubercle

1 finger proximal to ankle

Pin Placement for Pelvic Emergency Frame; Pin Technique / Safe Zones

Pins can be placed percutaneously in the iliac wings or in the crest between the anterior-superior and anteriorinferior iliac spines.



Hoffmann 3 Sterile Field Kit B Application Technique:

Step 1:

Provisionally reduce and align the limbs. Apply self drilling, self tapping Apex Pins by inserting through 1cm linear incision of the soft tissue made down to the bone with the scalpel. The included hemostat clamp may be used to spread soft tissue before pin insertion.





Step 2:

Pins are placed through both cortices using the black brace, "Pin end," as shown.

Step 3:

Insert the first Pin 2-3 finger breadth away from the fracture / bone defect (Fig 1)*.

*Note:

In emergency situations often there is no X-Ray (fluoroscopy) available. Under such circumstances it is not possible to localize the fracture site accurately. Therefore, it is recommended to place the Apex Pins in an area which is in a safe distance from the fracture site.



The insertion point of the Apex Pin in the first cortex should be positioned exactly in the center of the cross-section of the bone to avoid excentric or tangential positioning (Fig. 2). After penetration of the first cortex, a drop in resistance will be detected. Using light pressure, insertion of the pin is continued. Once firm resistance of the second cortex is felt, six complete revolutions of the drill brace will put the pin tip through the second cortex (Fig 2).

Step 5:

Place second Pin in the same limb/fragment. (Fig 3).

Note:

The larger the distance between these two pins the more stable the construct will be**

Step 6

Attach one Delta Coupling to each Pin***.



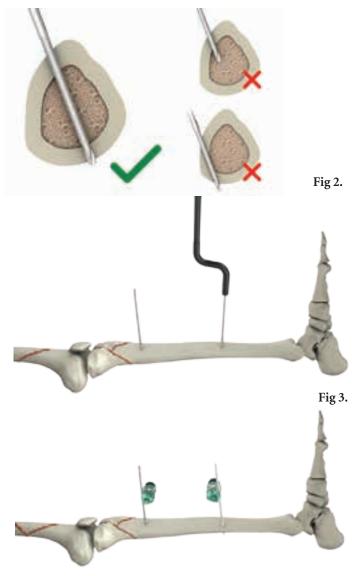


Fig 4.

^{**} Gernot Asche, Wolfgang Roth, Ludwig Schroeder (eds.): The External Fixator - Standard indications, operating instructions and examples of frame configurations; Markus Behrens: The mechanics and stability of fixator components. Page 32 ff.

^{***} For increased stability follow the «rule of thumb»: «In» – «Up», meaning the Delta Couplings shall be «in» between the pins, the black Thumbwheels looking «up» so that one has access to them for easy tightening.

Step 7:

Attach a Connecting Bar to the Delta Couplings (Fig 5). Provisionally tighten the Delta Couplings using the built-in black Thumbwheels by hand (Fig. 6).

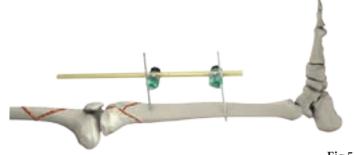


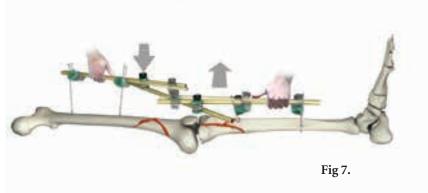
Fig 5.



Fig 6.

Step 8:

Repeat this in the other limb and connect the two frames with 2 more couplings and a third bar to achieve a Z-frame - here shown as a kneebridging frame (Fig. 7). Before final tightening reduce and align the limbs as shown (Fig. 7).



Step 9:

For final tightening remove the black Thumbwheel from the Coupling (Fig. 8).



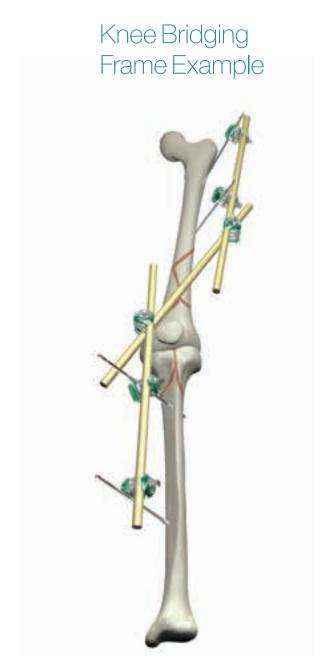
Fig 8.

Step 10:

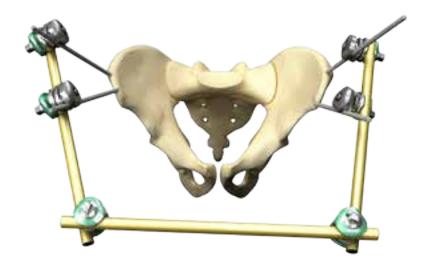
Use the "Clamp" end of the Brace for final tightening while maintaining reduction and alignment of the limbs. Repeat for all Delta Couplings (Fig. 9).



Fig 9.



Pelvic Emergency Frame Example



Notes

Notes



Reconstructive

Hips

Knees

Trauma & Extremities

Joint Preservation

Orthobiologics

Medical & Surgical

Power Tools & Surgical Accessories Image Guided Navigation Endoscopy & Arthroscopy Integrated Communications Beds, Stretchers & EMS Sustainability Solutions

Neurotechnology & Spine

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Interventional Spine
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