Hybrid Fixator—Distal Tibia Frame.
Using rings with clamps.

Technique Guide

Part of the External Fixation System

SYNTHE$ Instruments and implants approved by the AO Foundation
Hybrid Fixator—Distal Tibia Frame

Technique Overview

1. Insert wires

2. Attach wires to ring using adjustable wire/pin clamps

3. Wrench-tighten clamp-locking nuts

4. Tighten wire-locking nuts
   Wrench-tighten the wire-locking nut on the far side of the ring (A). Finger-tighten on the side to be tensioned (B).

5. Tension wires
   Typically, wires are tensioned to 100 kg. Tighten wire-locking nuts (B) and remove tensioner. To obtain maximum wire tension, it is recommended after tensioning the second wire, to retension both wires in the same sequence to obtain the best frame stability. An alternative method would be to use two tensioners simultaneously.

6. Insert Schanz screw into distal fragment
   Insert through wire/pin clamp.

Note: A third wire can be inserted if the fracture pattern does not permit Schanz screw placement.
7
Trim, bend and cap wires
Leave 3 cm–4 cm in case retensioning becomes necessary.

8
Construct anterior half-frame

9
Connect ring to half-frame with ring-to-rod clamp

10
Reduce extra-articular component of fracture
Use ring and anterior rod as handles to manipulate fracture. Tighten ring-to-rod clamp.

11
Add second rod
Connect ring-to-rod clamp and large combination clamp. Add carbon fiber rod.

Note: Operating instructions for the Wire Tensioner (393.742) can be found in Wire Tensioners for Hybrid Fixator (The AO ASIF Hybrid Fixator Technique Guide).
### Recommended Components for Hybrid Fixator

<table>
<thead>
<tr>
<th>Product Number</th>
<th>Item</th>
<th>Quantity Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>294.785</td>
<td>5.0 mm Self-Drilling Schanz Screw, 175 mm</td>
<td>3</td>
</tr>
<tr>
<td>292.38 – 292.41</td>
<td>Spade-Point Reduction Wire (or Spade-Point Wire)</td>
<td>2</td>
</tr>
<tr>
<td>390.005</td>
<td>Large Combination Clamp</td>
<td>3</td>
</tr>
<tr>
<td>393.436</td>
<td>Ring-to-Rod Clamp</td>
<td>2</td>
</tr>
<tr>
<td>393.464</td>
<td>Adjustable Wire/Pin Clamp</td>
<td>5</td>
</tr>
</tbody>
</table>

**Notes:** Additional components are required for optional frame configurations.

Additionally available lengths of stainless steel self-drilling Schanz screws, stainless steel non-self-drilling Schanz screws and titanium self-drilling Schanz screws may also be used.

Although some components are MR Conditional, the standard hybrid frame is **not** safe to be utilized in an MR environment.
<table>
<thead>
<tr>
<th>Product Number</th>
<th>Item</th>
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</tr>
</thead>
<tbody>
<tr>
<td>393.7xx</td>
<td>3/4 Ring (size chosen should allow two finger breadths of soft tissue clearance)</td>
<td>1</td>
</tr>
<tr>
<td>394.8x</td>
<td>11.0 mm Carbon Fiber Rod</td>
<td>2</td>
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<tr>
<td>392.18</td>
<td>Protective Cap, for 1.8 mm and 2.0 mm wires</td>
<td>4</td>
</tr>
<tr>
<td>394.97</td>
<td>Protective Cap, for 11.0 mm rods</td>
<td>4</td>
</tr>
<tr>
<td>394.99x</td>
<td>Protective Cap, for Fixation Pins</td>
<td>3</td>
</tr>
</tbody>
</table>
Hybrid Fixator—Distal Tibia Frame

When to use
The hybrid frame is used for the stabilization of complex distal tibial fractures, particularly those involving the joint.

Wire positioning
Proper wire positioning follows these basic guidelines:

- Use a minimum of two wires with a separating angle of at least 60° and approaching 90° when possible. Ideally, the wires should intersect in the center of the bone.
- Wires may be positioned at different levels using the adjustable wire/pin clamp.
- An adequate incision should be made at wire and Schanz screw insertion points to avoid skin tenting and soft tissue irritation. Wires should be straight for the same reason.
- Place an additional Schanz screw or third wire in the distal fragment for stability. If a Schanz screw is used, it should be placed above the ring and angled distally to maximize thread purchase in the bone.
- The anatomy surrounding the distal portion of the tibia should be taken into consideration for wire placement (Figure 1).
- Place wires within the distal fragment and proximal to interfragmentary screws (Figure 2).

Basic principles

- Many of these fractures are due to high energy injuries and may require provisional stabilization by reduction and fixation of an associated fibula fracture and use of a large external fixator across the ankle joint. When the soft tissues are stable, definitive fixation with a hybrid fixator will follow.

- Apply distraction, if required. The Large Distractor (394.35) may be placed across the ankle joint to provide ligamentotaxis and to aid in fracture reduction.

- Restore the articular surface. Screw fixation must be used to provide interfragmentary compression after anatomic reduction of the articular surface. Bone graft may be necessary for any metaphyseal defect.²

- Opposing spade-point reduction wires may be used.³,⁴ They prevent frame movement and are helpful in the reduction of small fragments. When using spade-point reduction wires, insert the wire until the “olive” contacts the bone surface. Washers can be used in osteopenic bone (see Figure 3).

- To increase frame stability, the distal pin on the anterior rod should be 2 cm proximal to the fracture, and the second pin should be as far proximal as possible. To accommodate pins placed in differing planes, modular frame technique, using more than one carbon fiber rod, can be used in place of the anterior frame. (See the Basic Modular Frame Technique Guide.)

- A second carbon fiber rod must be placed either laterally or medially for optimal stability. When ORIF is performed on the fibula, the rod must be placed medially in order to prevent varus deformity. A third rod can be added on the opposite side.

- Preoperative planning of clamp and ring placement should take future x-ray visibility of both the joint line and the fracture site into consideration.

- To achieve fine distraction, Open Compressors (393.76) can be used (Figure 4). For more information, consult the Open Compressor Technique Guide.

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4. Kummer. op cit..
Using the Adjustable Wire/Pin Clamp (393.464)

1. Hold clamp in hand as with a syringe.

2. Pull vise plates apart with thumb and fingers.

3. Hook top vise plate over ring and release.

The wire/pin connection provides up to 15 mm of excursion for versatile wire or pin placement.
Optional Frame Configurations

- Frame with anterior, medial and lateral carbon fiber rods
- Large multi-pin clamp frame with anterior and medial carbon fiber rods
- Large multi-pin clamp frame with an additional Schanz screw in the first metatarsal to prevent equinus contracture

Additional reading


Hybrid Fixator Universal Set (115.940)

**Graphic Case**

304.340 Hybrid Fixator Set Graphic Case

**Implants.**

219.98 Washer, 7.0 mm, 6 ea.
292.38 1.8 mm Spade-Point Wire, 350 mm, 6 ea.
292.39 1.8 mm Spade-Point Reduction Wire, 400 mm, 4 ea.
292.40 2.0 mm Spade-Point Wire, 350 mm, 6 ea.
292.41 2.0 mm Spade-Point Reduction Wire, 400 mm, 4 ea.
294.785 5.0 mm Self-Drilling Schanz Screw, 175 mm, 6 ea.

**Instruments**

310.37 3.5 mm Drill Bit, quick coupling, 195 mm, 2 ea.
321.20 Ratchet Wrench, 11 mm width across flats
391.962 Bending/Cutting Pliers
393.10 Universal Chuck with T-Handle
393.103 Drive Adaptor with quick coupling, for 5.0 mm Schanz Screws
393.742 Wire Tensioner
393.743 Backup Wire Tensioner
393.745 Split Tissue Protection Sleeve, for wires up to 2.5 mm
393.746 Split Tissue Protection Sleeve, for wires and pins up to 5.0 mm
394.182 3.5 mm Trocar, 118 mm (long)
395.913 5.0 mm/3.5 mm Drill Sleeve, 107 mm (long)

**Fixation Material**

390.005 Large Combination Clamp, 6 ea.
392.18 Protective Caps, for 1.8 mm and 2.0 wires, 1 pkg. of 10
393.436 Ring-to-Rod Clamp, 4 ea.
393.464 Adjustable Wire/Pin Clamp, 10 ea.
393.722 3/4 Ring, 205 mm ID
393.732 3/4 Ring, 115 mm ID
393.734 3/4 Ring, 140 mm ID, 2 ea.
393.736 3/4 Ring, 165 mm ID, 2 ea.
394.85 11.0 mm Carbon Fiber Rod, 300 mm, 2 ea.
394.86 11.0 mm Carbon Fiber Rod, 350 mm, 2 ea.
394.97 Protective Caps, for 11.0 mm Rods, 1 pkg. of 10
394.993 Protective Caps, for 5.0 mm Fixation Pins, 1 pkg. of 10

Note: For additional information, please refer to package insert.

For detailed cleaning and sterilization instructions, please refer to http://us.synthes.com/Medical+Community/Cleaning+and+Sterilization.htm or to the below listed inserts, which will be included in the shipping container:

– Processing Synthes Reusable Medical Devices—Instruments, Instrument Trays and Graphic Cases—DJ1305
– Processing Non-sterile Synthes Implants—DJ1304
## Also Available

### Sets

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<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>105.135</td>
<td>4.0 mm Cannulated Screw Instrument and Implant Set</td>
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<tr>
<td>105.185</td>
<td>7.3 mm Cannulated Screw Instrument and Implant Set</td>
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<tr>
<td>105.957</td>
<td>Power Drive Set</td>
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<tr>
<td>115.720</td>
<td>Large External Fixator Set, with Self-Drilling Schanz Screws</td>
</tr>
<tr>
<td>115.740</td>
<td>Large External Fixator Set, with Titanium Self-Drilling Schanz Screws</td>
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<tr>
<td>150.16</td>
<td>ComPact Air Drive II Set</td>
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### Implants

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<tr>
<td>294.43–.48</td>
<td>4.0 mm, spade point, 60 mm–150 mm</td>
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<tr>
<td>294.52–.57</td>
<td>5.0 mm, blunted trocar point, 100 mm–250 mm</td>
</tr>
<tr>
<td>294.71–.76</td>
<td>4.5 mm, blunted trocar point, 100 mm–200 mm</td>
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<tr>
<td>294.774–.779</td>
<td>4.0 mm, 60 mm–175 mm</td>
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<tr>
<td>294.782–.788</td>
<td>5.0 mm, 100 mm–250 mm</td>
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<tr>
<td>294.792–.798</td>
<td>6.0 mm, 100 mm–250 mm</td>
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<tr>
<td>390.002</td>
<td>Large Multi-Pin Clamp, 6 position</td>
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<td>390.003</td>
<td>Rod Attachment, for Large Multi-Pin Clamp</td>
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<tr>
<td>390.008</td>
<td>Large Open Adjustable Clamp</td>
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<td>393.721</td>
<td>Full Ring, 205 mm ID</td>
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<td>393.731</td>
<td>Full Ring, 115 mm ID</td>
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<tr>
<td>393.735</td>
<td>Full Ring, 165 mm ID</td>
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<td>393.737</td>
<td>1/4 Ring, 165 mm ID</td>
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<tr>
<td>394.991</td>
<td>For 4.0 mm Fixation Pins, 10/pkg.</td>
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<tr>
<td>394.992</td>
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<tr>
<td>394.994</td>
<td>For 6.0 mm Fixation Pins, 10/pkg.</td>
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### Instruments

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<tbody>
<tr>
<td>393.101</td>
<td>Drive Adaptors with quick coupling</td>
</tr>
<tr>
<td>393.102</td>
<td>For 4.0 mm Schanz Screws</td>
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<tr>
<td>393.104</td>
<td>For 4.5 mm Schanz Screws</td>
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<tr>
<td>393.105</td>
<td>For 6.0 mm Schanz Screws</td>
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<tr>
<td></td>
<td>Small Universal Chuck with T-Handle</td>
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