Small External Fixator—Wrist Spanning Frame. For the treatment of wrist fractures.
When to use
The Small External Fixator System is intended to be used in the construction of an external fixation frame for the treatment of hand, wrist and foot fractures, including:
- Unstable intra- and extra-articular fractures of the distal radius
- Open, comminuted, or bilateral fractures of the wrist, hand, or foot
- Fractures in combination with extensive soft tissue injury, bone loss, vascular, or neural involvement
- Fracture dislocations of the wrist, hand, or foot
- Failed closed reduction with casting, resulting in secondary deformity
- Preliminary fixation before, or in conjunction with, open reduction and internal fixation

Basic principles and application technique
Although the exact frame construct chosen is dictated by the soft tissue injury and fracture pattern, basic technique principles apply to all AO small external fixator frames.

Fracture reduction can be accomplished manually with longitudinal traction, percutaneous fixation or open reduction and internal fixation prior to the application of an external fixator.

Fracture reduction is also possible after the frame has been assembled using the modular technique, which allows complete freedom of pin placement.

When using the modular technique, the small external fixator frame can be applied as a wrist spanning frame or a nonspanning frame. The fracture location and complexity determine which frame application is appropriate.
Relevant anatomy for Schanz screw or Kirschner wire placement

Dorsal view

- Target area for proximal pins
- Retinaculum
- Superficial branch of the radial nerve
- Radial artery

Compartment 4
- Extensor digitorum
- Extensor indicis

Compartment 5
- Extensor digiti minimi
- Extensor retinaculum

Compartment 6
- Extensor carpi ulnaris

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References

Nonspanning frames
Do not span the joint.

Indications
– Simple intra-articular distal radius fractures
– Extra-articular distal radius fractures with a relatively large distal fragment
– Corrective distal radius osteotomies due to malunion

Spanning frames
“Bridge” or span the wrist joint, and are the most common application for wrist fixators.

Indications
– Intra-articular distal radius fractures
– Extra-articular distal radius fractures
– Adjunct to percutaneous Kirschner wires
**AO Fracture Classifications**

**23-A Extra-articular fracture**

1. Ulna, radius intact
2. Radius, simple and impacted
3. Radius, multifragmentary

**23-B Partial articular fracture**

1. Radius, sagittal
2. Radius, frontal, dorsal rim
3. Radius, frontal, volar rim

**23-C Complete articular fracture of radius**

1. Articular simple, metaphyseal simple
2. Articular simple, metaphyseal multifragmentary
3. Articular multifragmentary

### Recommended Components

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>292.75</td>
<td>2.5 mm Kirschner Wire with Thread</td>
</tr>
<tr>
<td>294.769</td>
<td>4.0 mm/2.5 mm Self-Drilling Schanz Screw</td>
</tr>
<tr>
<td>294.771</td>
<td>4.0 mm/3.0 mm Self-Drilling Schanz Screw</td>
</tr>
<tr>
<td>294.776</td>
<td>4.0 mm Self-Drilling Schanz Screw</td>
</tr>
<tr>
<td>390.041</td>
<td>Small Combination Clamp, MR safe</td>
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<tr>
<td></td>
<td>Connects rods to rods, rods to Schanz screws or</td>
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<tr>
<td></td>
<td>rods to 2.5 mm Kirschner wires</td>
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<tr>
<td>395.6X</td>
<td>4.0 mm Carbon Fiber Rod</td>
</tr>
<tr>
<td>392.24</td>
<td>Protective Cap, for 2.5 mm Kirschner Wires</td>
</tr>
<tr>
<td>394.991</td>
<td>Protective Cap, for 4.0 mm Fixation Pins</td>
</tr>
</tbody>
</table>

**Note:** MR safe means that the device when used in the MR environment has been demonstrated to present no additional risk to the patient, but may affect the quality of the diagnostic information.

An MR environment is described as the general environment present in the vicinity of an MR scanner and/or anywhere in the procedure room, including the center of the bore of the MR scanner.

**Note:** Schanz screws (stainless steel or titanium) and carbon fiber rods are made from nonmagnetic materials and do not create heat or deflection in the MR environment.

Additional components are required for optional frame configurations.

Titanium self-drilling Schanz screws or stainless steel non-self-drilling Schanz screws may also be used.
Technique Overview

When constructing a small external fixator frame, choices for pins include:
- 2.5 mm Kirschner wires with thread
- 4.0 mm/2.5 mm self-drilling Schanz screws
- 4.0 mm/3.0 mm self-drilling Schanz screws
- 4.0 mm self-drilling Schanz screws

Schanz screws provide more frame stiffness than 2.5 mm Kirschner wires.

If using 2.5 mm Kirschner wires in either the metacarpal or the radius, K-wires should converge at 40°–60° in the sagittal plane. This improves fixation by lengthening the bone-pin interface.

If using Schanz screws, they should be perpendicular to the long axis of the metacarpal and the radius.

Both K-wires and Schanz screws should also be placed at 40°–60° in the frontal plane, not lateral. Pin placement at 40°–60° in the frontal plane prevents thumb impingement allowing full mobilization of the thumb, avoids soft tissue interference, and makes visualization of the fracture and the wrist joint possible during x-ray.
1

**Insert metacarpal pins**

To avoid entrapping the extensor mechanism in extension, flex the second metacarpophalangeal joint to 90°.

Make a small incision at the site of planned pin insertion. Bluntly dissect the soft tissues and push the drill sleeve to the bone. Insert the pins through the drill sleeve.

The K-wires and Schanz screws should be placed proximally and distally in the diaphyseal bone of the second metacarpal.
2

Build first module

Connect one MR safe small combination clamp to each pin in the metacarpal. Connect the clamps with a short 4.0 mm carbon fiber rod.

3

Insert pins in the radius

Make a small incision at the site of planned pin insertion. Bluntly dissect the soft tissues and push the drill sleeve to the bone. Insert the pins through the drill sleeve.

Take care to avoid the superficial branch of the radial nerve.

Notes: For accuracy and ease of insertion in hard bone, consider predrilling for the Schanz screws with a 2.0 mm drill bit.

For best stability, pin spacing should be maximized, and the distal pin should be as close to the fracture as possible.
4

**Build second module**

Connect one MR safe small combination clamp to each pin in the radius. Connect the clamps with a 4.0 mm carbon fiber rod.

Reduce the fracture using partial frames as handles to aid in reduction.

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5

**Connect modules**

Connect the modules with a third rod and two MR safe small combination clamps.

Perform final fracture reduction, if required, and tighten the nuts securely.

Flexion and/or ulnar deviation may be required to obtain anatomic reduction.
Increase stiffness

Use Schanz screws in place of 2.5 mm K-wires and/or add a fourth bar to increase stiffness and to prevent rotation. The fourth bar should span the length of the frame, connecting the first and second modules.
Optional Frame Configurations

- Single stack frame configuration
- Double stack frame configuration
- Double stack frame configuration with fifth Schanz screw or 2.5 mm K-wire
- Double stack frame configuration
Modular “Z” frame configuration

Modular “Z” frame configuration with fourth bar
Small External Fixator Set with Self-Drilling Schanz Screws
Stainless Steel (115.755) or Titanium (115.750)

**Graphic Case**

690.378  Small External Fixator Graphic Case

**Implants in Set 115.755**

292.16  1.6 mm Kirschner Wire, 150 mm, trocar point, 1 pkg. of 10
292.20  2.0 mm Kirschner Wire, 150 mm, trocar point, 1 pkg. of 10
292.75  2.5 mm Kirschner Wire with Thread, 150 mm, trocar point, 15 mm thread length, 1 pkg. of 10

Self-Drilling Schanz Screws

294.769  4.0 mm/2.5 mm, 20 mm thread length, 80 mm, 2 ea.
294.771  4.0 mm/3.0 mm, 20 mm thread length, 80 mm, 4 ea.
294.773  4.0 mm/3.0 mm, 18 mm thread length, 65 mm, 4 ea.
294.775  4.0 mm, 20 mm thread length, 80 mm, 2 ea.
294.776  4.0 mm, 30 mm thread length, 100 mm, 2 ea.

**Implants in Set 115.750**

292.16  1.6 mm Kirschner Wire, 150 mm, trocar point, 1 pkg. of 10
292.20  2.0 mm Kirschner Wire, 150 mm, trocar point, 1 pkg. of 10
292.75  2.5 mm Kirschner Wire with Thread, 150 mm, trocar point, 15 mm thread length, 1 pkg. of 10

Titanium Self-Drilling Schanz Screws

494.769  4.0 mm/2.5 mm, 20 mm thread length, 80 mm, 2 ea.
494.771  4.0 mm/3.0 mm, 20 mm thread length, 80 mm, 4 ea.
494.775  4.0 mm, 20 mm thread length, 80 mm, 2 ea.
494.776  4.0 mm, 30 mm thread length, 100 mm, 2 ea.

Note: For additional information, please refer to package insert.
### Instruments (for both sets)
- 391.944 Wire Cutters
- 392.819 4.0 mm Parallel Drill Guide
- 392.955 4.0 mm/2.5 mm Drill Sleeve
- 393.101 Drive Adaptor with quick coupling, for 4.0 mm Schanz Screws, 2 ea.
- 394.183 2.5 mm Trocar
- 395.35 Combination Wrench, 7 mm width across flats
- 395.36 Socket Wrench, 7 mm width across flats
- 395.38 Simple T-Handle
- 395.911 Drill Sleeve Handle
- 395.922 4.0 mm Threaded Drill Sleeve

### Fixation Material (for both sets)
- 390.041 Small Combination Clamp, MR safe, 12 ea.
- 392.24 Protective Caps, for 2.5 mm Kirschner Wires (light blue), 1 pkg. of 10
- 394.991 Protective Caps, for 4.0 mm Fixation Pins (yellow), 1 pkg. of 10
- 395.60 60 mm, 2 ea.
- 395.61 80 mm, 4 ea.
- 395.62 100 mm, 4 ea.
- 395.63 120 mm, 4 ea.
- 395.64 140 mm, 4 ea.
- 395.65 160 mm, 2 ea.
- 395.66 180 mm, 2 ea.
- 395.67 200 mm, 2 ea.
- 395.68 220 mm, 2 ea.
- 395.69 240 mm, 2 ea.
- 395.70 260 mm, 2 ea.
- 395.71 280 mm, 2 ea.
- 395.72 300 mm, 2 ea.
- 395.73 320 mm, 2 ea.
- 395.74 340 mm, 2 ea.
- 395.75 360 mm, 2 ea.
- 395.76 380 mm, 2 ea.
- 395.77 400 mm, 2 ea.

### Also Available Sets
- 105.105 Kirschner Wire Implant Module Set
- 115.985 Mini External Fixator Instrument and Implant Set

### Also Available Implants
- 294.30 4.0 mm/3.0 mm Schanz Screw, 20 mm thread, 80 mm length
- 294.767 4.0 mm/2.5 mm Schanz Screw, trocar point, 18 mm thread, 65 mm length
- 294.768 4.0 mm/2.5 mm Schanz Screw, trocar point, 20 mm thread, 80 mm length
- 294.777 4.0 mm Self-Drilling Schanz Screw, 40 mm thread length, 125 mm
- 494.777 4.0 mm Titanium Self-Drilling Schanz Screw, 40 mm thread length, 125 mm

### Also Available Fixation Material
- 390.042 Small Adjustable Clamp, MR safe, nonspanning
- 394.99 Protective Caps, for 4.0 mm Connecting Bars and Carbon Fiber Rods (black), (10/pkg.)