# Operative Technique


## ST.A.R.90F4 Elbow Kit

## Elbow articulated external fixator kit

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Essential Moves in Trauma

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# CONTENTS

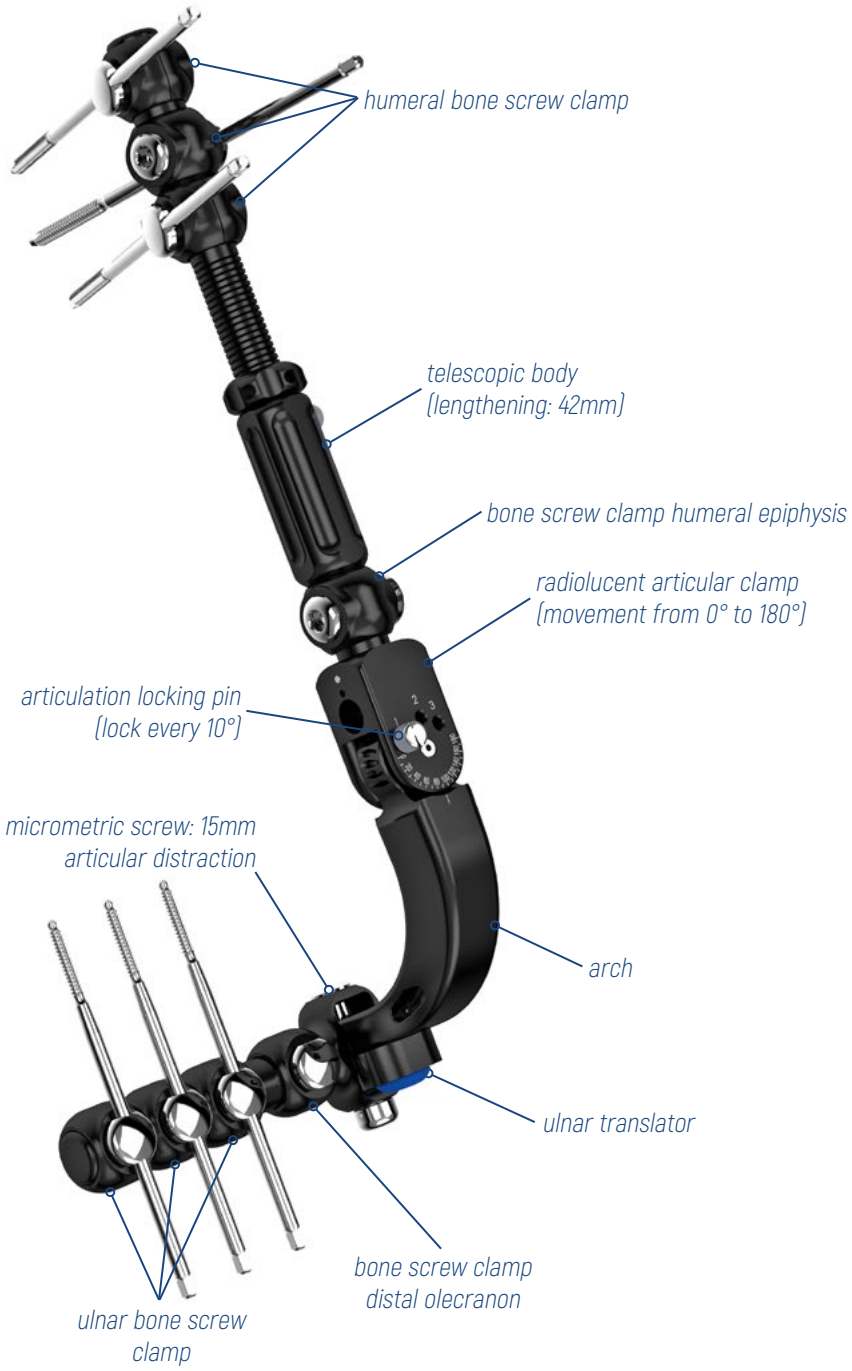
# PRODUCT DESCRIPTION

## Elbow articulated external fixator

The telescopic body ensures that there are at least 10cm between the epicondyle and the first humeral diaphyseal screw to avoid damage to the radial nerve.

The articulating joint has a central hole for the insertion of the guide wire, which is positioned in the centre of rotation of the elbow joint.

The articulation ranges from 0° to 180° and allows complete extension and flexion of the elbow.



## Right to left fixator configuration


Fixator configuration for right elbow.

For application on left elbow:

- remove the ulnar portion of the fixator by loosening the blue screw of the ulnar translator with the T-handle hexagon 6mm;
- rotate the ulnar portion 180 ° and tighten the screw again.

**INSTRUMENT REQUIRED**

SF1356 T-handle hexagon 6mm

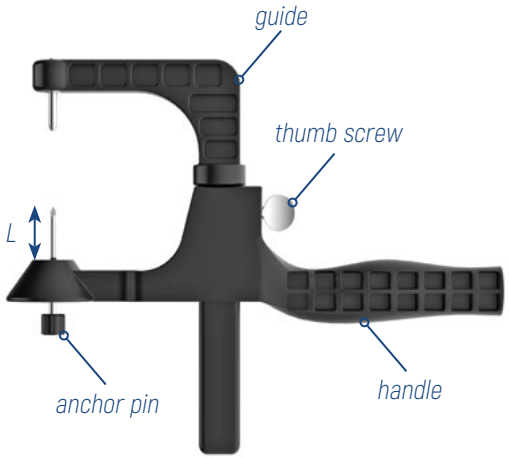
## Bone screws


Ensures easier insertion, strength over time and the possibility of retraction, in case of excessive penetration, without loss of strength.

- Stainless steel
- Self-tapping
- Blunt tip (predrilling is required)
- Single thread

*ø4x120mm for ulna*
*ø5x160mm for humerus*

## Targeting guide for K. wire ø2mm




Targeting guide for K. wire insertion.

- For K. wire ø2mm
- Adjustable anchor pin length (25-35mm)
- Thumb screw locking
- Radiolucent
- Delivered assembled with L=25mm

# INDICATIONS AND PATIENT POSITIONING

## Indications

Acute bone and/or ligament joint lesions:

- dislocations unstable after reduction
- unstable fracture dislocations
- unstable osteosynthesis (comminuted fractures, osteoporotic fractures)

Chronic joint lesions:

- instability
- stiffness

## Patient positioning

The patient is positioned supine with the arm on a radiolucent arm board or hand table.

# OPERATIVE TECHNIQUE

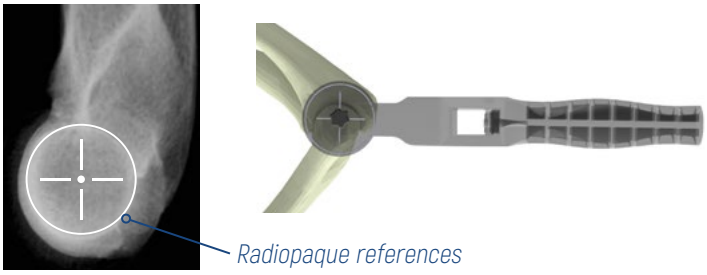
*All the power tools mentioned in the surgical technique must be used with a low speed drill.*

## Targeting guide: handle positioning


Positioning the targeting guide handle.

Reach the contact with the bone, and push it in to the bone, manually. Make sure the black marking on the anchor pin is always visible.

The anchor pin should be centered with the trochlea.




## Targeting guide: guide insertion

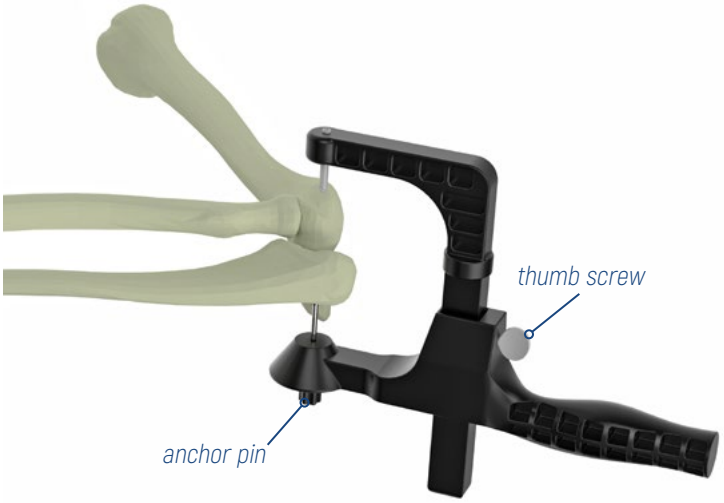

Unscrew slightly the thumb screw, if needed.

Insert the guide.

### INSTRUMENTS REQUIRED

SF1381
Targeting guide for K. wire ø2mm

## Targeting guide: locking

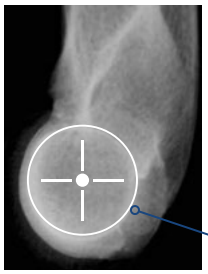



Check X-rays for the best allignment.

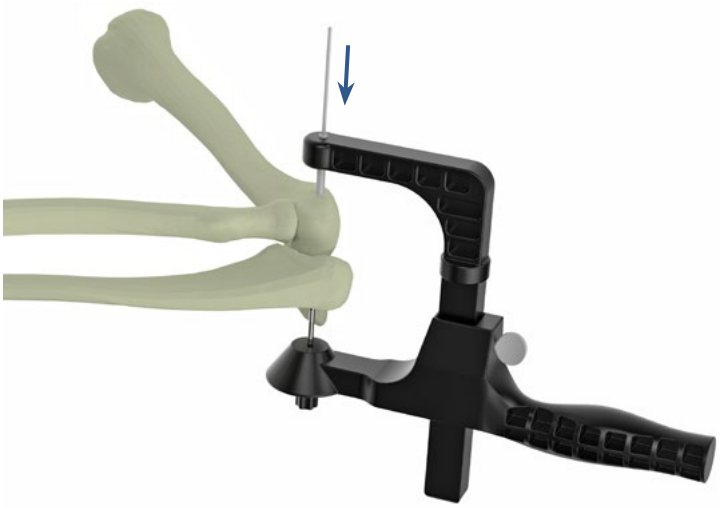
Make sure the tip of the guide touches the bone.

Lock the thumb screw by turning it clockwise.

If needed, screw in the anchor pin to increase the stability.




## K. wire insertion



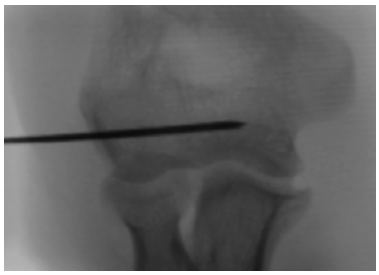
Insert the K. wire ø2x200mm through the targeting guide.

The tip of the K. wire must be positioned in the center of the circumference.

Position the wire horizontally and insert it in the center of the epicondyle in a direction parallel to the joint line.

Check under image intensifier in the antero-posterior view.

*NOTE: the K. wire ø2x200mm is inside the box of the Elbow Articulated External Fixator (F4-2260)*



## INSTRUMENTS REQUIRED



K. wire ø2x200mm

## Targeting guide: removal


Unscrew the thumb screw.

Remove the guide.

Remove the handle.

## Fixator application


Slide the articulated external fixator over the K. wire, with the telescopic body proximally and the curved arm extending posterior to the joint.

Extend the telescopic body so that the most proximal bone screw is at the level of the deltoid muscle insertion.

Gently tighten the body locking screw to lock the position of the telescopic body to prevent accidental unscrewing using T-handle hexagon 6mm.

Check the tightness of the ulnar translator screw.

### INSTRUMENTS REQUIRED

SF1356
T-handle hexagon 6mm

## Humerus side: insertion of 1st cannula

Starting from the proximal hole.

Insert the long Trocar into the long Cannula.

Introduce them into the proximal hole of the humerus side.

Lock the cannula tightening the pin holder using T-handle hexagon 6mm.

*NOTE: the proximal bone screw must be perpendicular to the anatomical and mechanical axis of the humerus and the distal bone screw should be inserted parallel to the first.*
*Both screws should be inserted in the center of the bone.*

## Humerus side: predrilling

Remove the trocar.

Drill using Drill bit ø4mm.

### INSTRUMENTS REQUIRED

SF1396
Trocar, long

SF1391
Cannula, long (110mm)

SF1356
T-handle hexagon 6mm



SF1335
Drill bit ø4mm (AO joint)

## Humerus side: insertion of 2nd cannula

Insert the 2nd long Trocar into the 2nd long Cannula.

Introduce them into the parallel hole of the humerus side.

Lock the cannula tightening the pin holder using T-handle hexagon 6mm.

*NOTE: the parallelism of the humeral screws allows to adjust the body fixator position in order to insert the ulnar screws in the center of the bone.*

## Humerus side: predrilling

Remove the 2nd trocar.

Drill using Drill bit ø4 mm.

## INSTRUMENTS REQUIRED

SF1396
Trocar, long

SF1391
Cannula, long (110mm)

SF1356
T-handle hexagon 6mm



SF1335
Drill bit ø4mm (AO joint)

## Humeral bone screws insertion

Remove the proximal Drill bit ø4mm.

Insert the 1st humeral bone screw through the cannula using the Quick-connect adapter for bone screw.

*NOTE: use the bone screw ø5x160mm.*

## Humeral bone screws insertion

Remove the 2nd drill bit.

Insert the 2nd humeral bone screw through the cannula using the Quick-connect adapter for bone screw.

*NOTE: use the bone screw ø5x160mm.*

Use the T-handle ø5mm for any adjustment of the screws insertion depth.

### INSTRUMENTS REQUIRED

SF1305
Quick-connect adapter for bone screw (stem ø5mm)

DF900005
T-handle ø5mm

## Fixator positioning



The K. wire and the humeral bone screws should be parallel, which will allow adjustment of the external fixator in the frontal plane to find the best position for the ulnar screws.

Keep the distal part of the fixator body parallel to the ulna.

## Humeral bone screws locking

Unlock the two cannulas loosening the pin holder using T-handle hexagon 6mm.

Remove the two cannulas.

Lock the bone screws tightening the pin holder using T-handle hexagon 6mm.

### INSTRUMENTS REQUIRED

SF1356
T-handle hexagon 6mm

## Ulna side: insertion of 1st cannula

Starting from the distal hole.

Insert the short Trocar into the short Cannula.

Introduce them into the distal hole of the ulna side.

Lock the cannula tightening the pin holder using T-handle hexagon 6mm.

*NOTE: the distal ulnar bone screw must be perpendicular to the ulnar crest.*

## Ulna side: predrilling

Remove the trocar.

Drill using Drill bit ø3mm.

## INSTRUMENTS REQUIRED

SF1397
Trocar, short

SF1392
Cannula, short (80mm)

SF1356
T-handle hexagon 6mm



SF1334
Drill bit ø3mm (AO joint)

## Ulna side: insertion of 2nd cannula

Insert the short Trocar into the short Cannula.

Introduce them into the proximal hole of the ulna side.

Lock the cannula tightening the pin holder using T-handle hexagon 6mm.

*NOTE: the proximal bone screw parallel to the first and perpendicular to the anatomical axis of the ulna.*

## Ulna side: predrilling

Remove the 2nd trocar.

Drill using Drill bit ø3mm.

## INSTRUMENTS REQUIRED

SF1397
Trocar, short

SF1392
Cannula, short (80mm)

SF1356
T-handle hexagon 6mm



SF1334
Drill bit ø3mm (AO joint)

## Ulnar bone screws insertion

Remove the distal Drill bit ø3mm.

Insert the 1st ulnar bone screw through the cannula using the Quick-connect adapter for bone screw.

*NOTE: use bone screw ø4x120mm.*

## Ulnar bone screws insertion

Remove the 2nd drill bit.

Insert the 2nd ulnar bone screw through the cannula using the Quick-connect adapter for bone screw.

*NOTE: use bone screw ø4x120mm.*

Use the T-handle ø5mm for any adjustment of the screws insertion depth.

## INSTRUMENTS REQUIRED

SF1305
Quick-connect adapter for bone screw (stem ø5mm)

DF900005
T-handle ø5mm

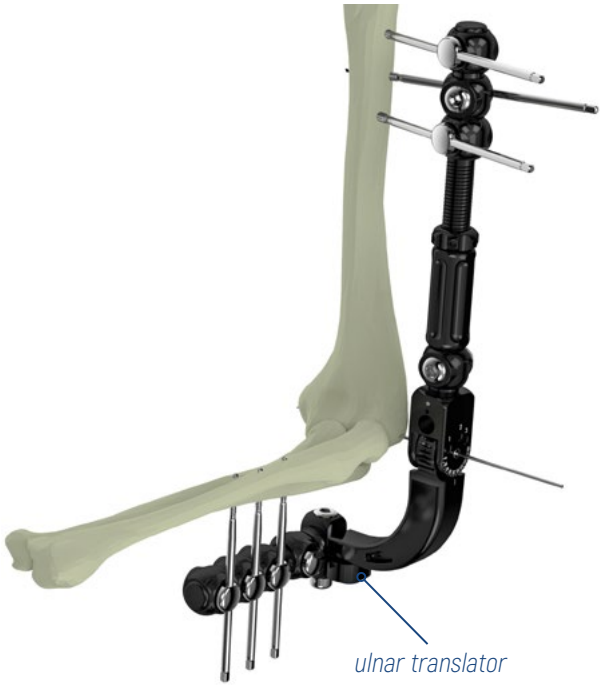
## Ulnar bone screws locking

Unlock the two cannulas loosening the pin holder using T-handle hexagon 6mm.

Remove the two cannulas.

Lock the bone screws tightening the pin holder using T-handle hexagon 6mm.

## Bone screws insertion




Complete the insertion of all the screws needed with the same steps.
Confirm that adequate soft tissue release has been performed around the humeral screws to allow free movement during flexion and extension.
Tighten the bone screw clamps and the ulnar translator.

Check that the K. wire does not bend while flexing and extending the elbow.
Check in the lateral projection the congruence between the external fixator and the elbow during this movement.

If the K. wire bends during the flexion-extension movement, loosen the ulnar translator screw and repeat flexion-extension movements to evaluate if this eliminates the K. wire bending.
If the K. wire remains straight, tighten the ulnar translator.
If K. wire bending persists, loosen the ulnar translator, make some elbow flexion-extension movements and tighten the ulnar translator until the K. wire no longer bends.

### INSTRUMENTS REQUIRED

SF1356
T-handle hexagon 6mm

## Ulnar translator


The fixator has an integral ulnar translator which can compensate for possible errors in the positioning of the K. wire in the centre of rotation of the elbow.

By unlocking the ulnar translator screw, the correct position of the K. wire can be found with flexion-extension manoeuvres to avoid impingement or subluxation.

Once the correct position is obtained the screw is locked.

## Additional bone screw insertion

In patients with bulky muscles, with osteopenic bone or in case of stiff elbow, insert two additional screws:

- one in the distal humerus just above the olecranon fossa (**Fig. A**);
- one immediately distal to the olecranon, making sure they are outside the joint capsule (**Fig. B**).

**Fig. A**

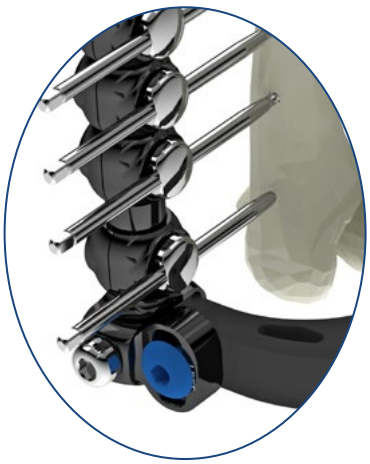


**Fig. B**

### INSTRUMENTS REQUIRED

SF1356
T-handle hexagon 6mm

## Check the fixator position

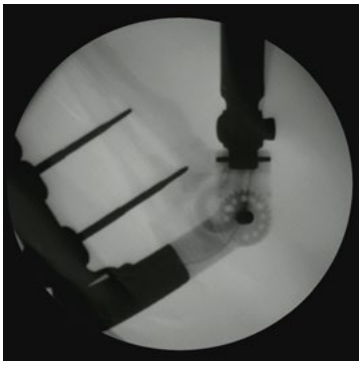


Fig. A

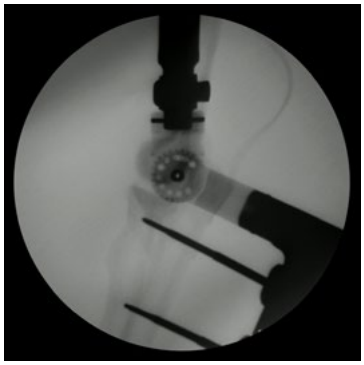
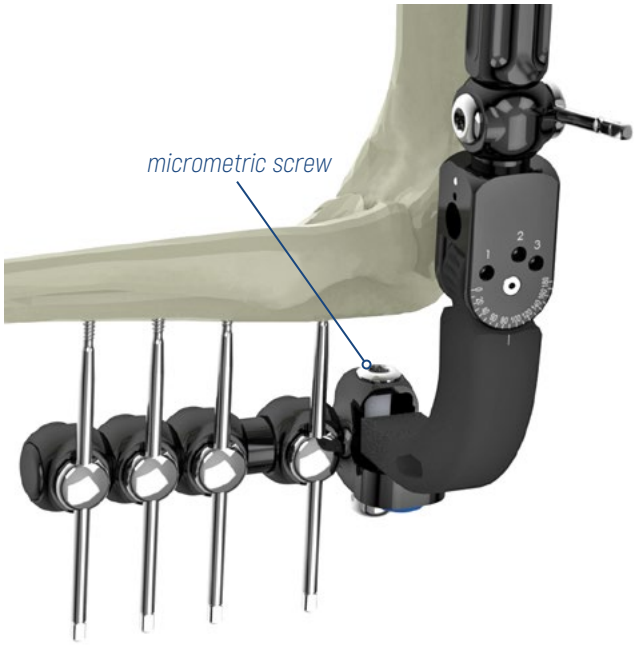


Fig. B

Check that there is no impingement or subluxation between the articular surfaces during the flexion and extension (**Fig. A**, **Fig. B**).

If all is well the guide wire can now be removed.

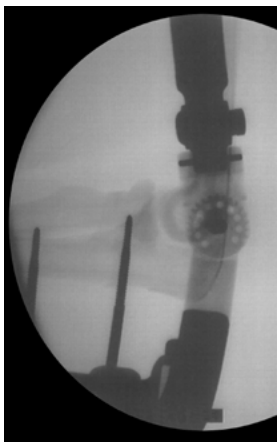
## Articular distraction

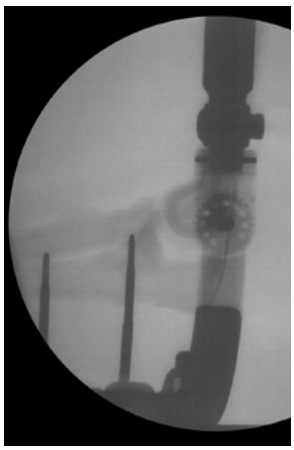



Turning the micrometric screw with T-handle hexagon 6mm produces distraction at the joint.

The amount of articular diastasis can be seen with the image intensifier in the frontal plane.

The distraction force will act on the olecranon and ulna, without changing the center of rotation of the elbow joint.





### INSTRUMENTS REQUIRED

SF1356
T-handle hexagon 6mm

## Elbow flexion-extension

Confirm that adequate soft tissue release has been performed around the humeral screws to allow free movement during flexion and extension.

At the end of the operation, insert the articulation locking pin to lock the joint in the desired position: the device has a range of movement from 0° to 180° with possible locking every 10°.

*NOTE: the locking pin is inside the box of the Elbow articulated external fixator (F4-2260).*

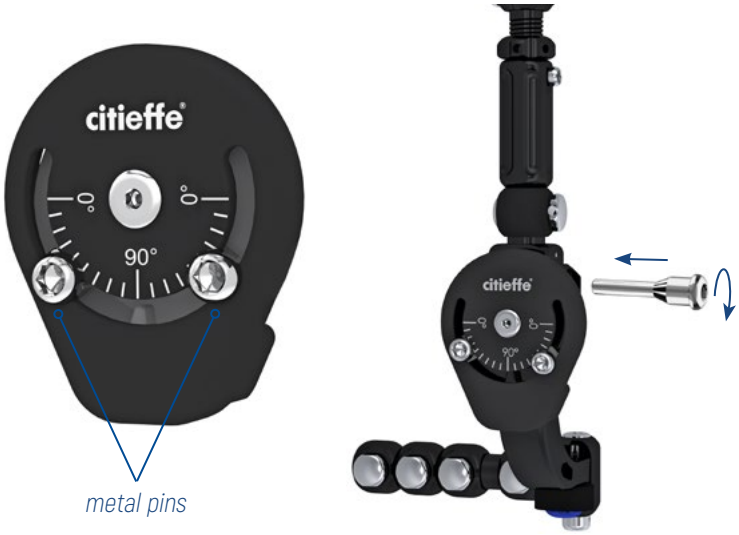

*example of articulation locking pin insertion*

### INSTRUMENTS REQUIRED

Articulation locking pin

# OPTIONAL OPERATIVE TECHNIQUE - Flexion-extension control

## Elbow fixator R.O.M. limiter (F4-2749)



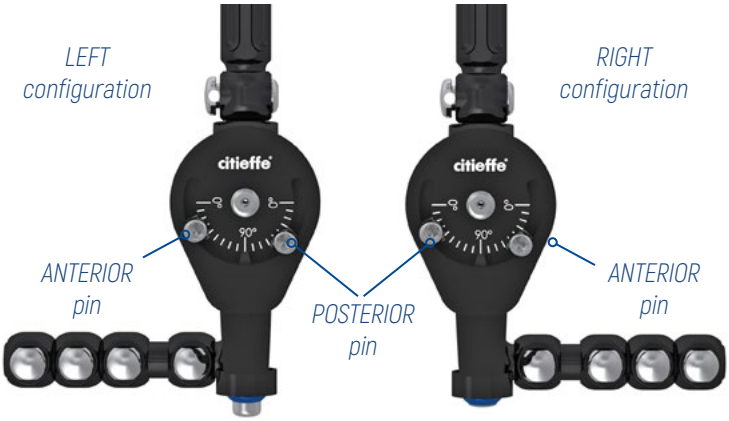

The elbow fixator R.O.M. (Range of Motion) limiter is a radiolucent accessory that allows to control the flexion-extension of the joint.

Connect the R.O.M. limiter to the fixator through the hole in the central body.

Depending on the treatment requirements, the Range of Motion (R.O.M.) is determined by the positioning of the 2 metal pins on the graduated scale.
Tighten the 2 pins in the desired position using the T-handle hexagon 6mm.

*NOTE: the R.O.M. limiter could also be connected to the fixator in the post-operative phase to facilitate functional recovery and physiotherapy treatment.*

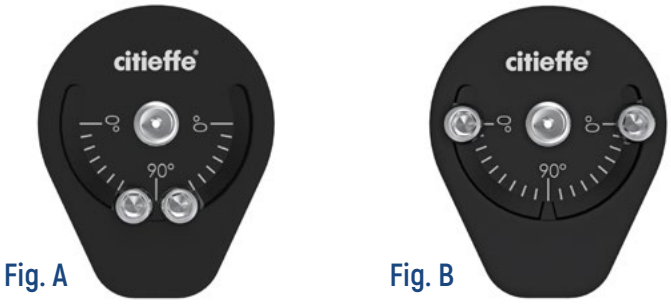
## Adjustment of Range of Motion (R.O.M.)




Adjust the 2 metal pins to define the desired Range of Motion.

**ANTERIOR pin** to define **extension** range of movement.

**POSTERIOR pin** to define **flexion** range of movement.




Example of the 2 metal pins position:

**Fig. A)** **both pins at 90°**
the fixator is **locked** in both extension and flexion;

**Fig. B)** **both pins at 0°**
the fixator is **completely free** in extension and flexion movements.

## INSTRUMENTS REQUIRED

F4-2749
Elbow fixator R.O.M. limiter

SF1356
T-handle hexagon 6mm

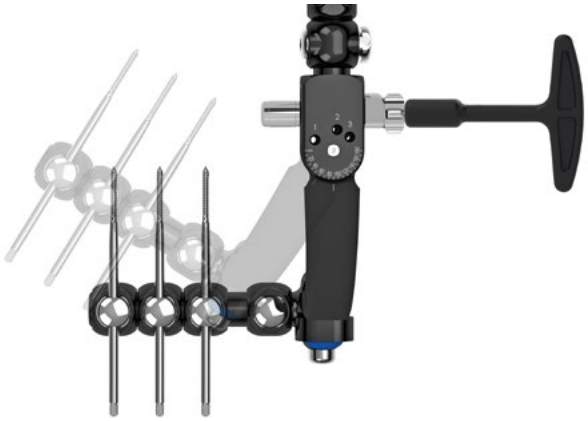
# OPTIONAL OPERATIVE TECHNIQUE - Induced flexion-extension

## Flexo-extension elbow device (F4-0230)

The elbow flexo-extension device is an accessory that allows to force the joint movement of the elbow in cases of stiffness or deficit in extension and is used during physiotherapy exercises.

Connect the flexo-extension device to the fixator through the hole in the central body.

## Induced flexion

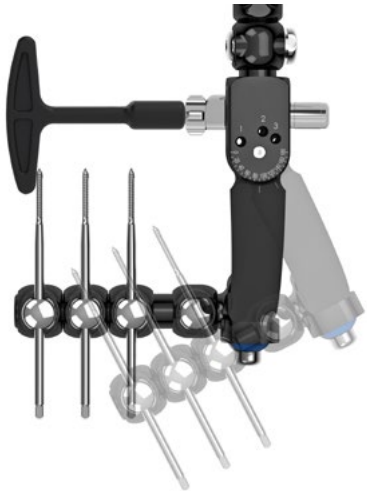


In cases of rigid flexion, the device must be **inserted posteriorly** into the joint clamp, closing it with the nut on the front.

Then use the T-handle hexagon 6mm by turning it clockwise to gradually recover the joint flexion.

Once the desired degree of flexion has been reached, the fixator can be locked in the position reached by the locking pin.

## Induced extension



In cases of rigid extension, the device must be **inserted anteriorly** into the joint clamp, closing it with the nut on the back.

Then use the T-handle hexagon 6mm by turning it clockwise to gradually recover the joint extension.

Once the desired degree of extension has been reached, the fixator can be locked in the position reached by the locking pin.

## INSTRUMENTS REQUIRED

F4-0230
Flexo-extension elbow device

SF1356
T-handle hexagon 6mm

# OPTIONAL OPERATIVE TECHNIQUE - Distal extension of the ulnar screws

## Elbow external fixator extension (F4-2748)

The external fixator has an extension that allows distal positioning of the ulnar bone screw clamps up to 7cm.

It is indicated where internal fixation, or soft tissue injuries, prevent ulnar screw insertion in the standard positions.

The extension is single use, in sterile packaging.

## Extension

Fig. A

**Fig. A)** Remove the most distal ulnar bone screw clamp, it will not be used.

Fig. B

**Fig. B)** Using the T-handle hexagon 6mm, unscrew the pin of the first clamp of the device Extension.

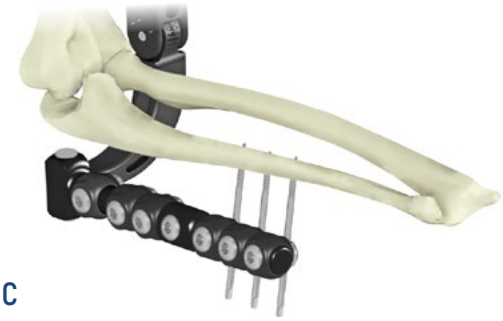


Fig. C

**Fig. C)** Insert the Extension device on the end distal of the fixator and lock by screwing the pin.

### INSTRUMENTS REQUIRED

F4-2748
Elbow external fixator extension

SF1356
T-handle hexagon 6mm

# ORDERING INFORMATION

## PK-130 Elbow Fixator Procedure Kit

STERILE

CONTENTS

1 x F4-2260 Elbow Articulated External Fixator

Contents:
1x articulated external fixator (pin holders ø6mm)
1x K. wire ø2x200mm
1x articulation locking pin

*NOTE: unique fixator for right and left side*


1 x F4-2749 Elbow Fixator R.O.M. limiter

4 x F4-140120 Cortical bone screw ø4mm L120-25mm
4 x F4-150160 Cortical bone screw ø5mm L160-35mm

| Code | Thread ø mm | Stem ø mm | Thread L. mm | Total L. mm |
|---|---|---|---|---|
| F4-140120 | 4 | 5 | 25 | 120 |
| F4-150160 | 5 | 5 | 35 | 160 |

1 x SF1381 Targeting guide for K. wire ø2mm

STERILE

2 x SF1397 Trocar, short

2 x SF1396 Trocar, long

2 x SF1392 Cannula, short (80mm)

2 x SF1391 Cannula, long (110mm)

2 x SF1334 Drill bit ø3mm (AO joint)
2 x SF1335 Drill bit ø4mm (AO joint)

1 x SF1305 Quick-connect adapter for bone screw (stem ø5mm)

1 x SF1356 T-handle hexagon 6mm

1 x DF900005 T-handle ø5mm

## Additional components

660201 K. wire trocar tip ø2x200mm

F4-2748 Elbow external fixator extension

F4-0230 Flexo-extension elbow device

NOT STERILE

## NOTES

# ST.A.R.90F4 Elbow Kit

## Elbow articulated external fixator kit



citieffe®
Essential Moves in Trauma

INSPIRED BY PEOPLE
MOVED BY INNOVATION

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