Operative technique

ST.A.R.90 F4 Knee

Articulated
External Fixator

EXTERNAL fixation

monolateral fixator

articulations

citieffe®
Essential moves in Trauma

Citieffe thanks

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Dr. M. Manca (U.O. Orthopaedic and Traumatology, Versilia Hospital, Lido di Camaiore - Italy)
for their collaboration in the development of this operative technique

This operative technique is intended for orthopaedic surgeons and describes the standard procedure suggested by the manufacturer. Surgeons should however decide on the best approach to be followed depending on their clinical judgment and the patient's needs.

Before use please read the instruction booklet enclosed in the packaging.

Contents

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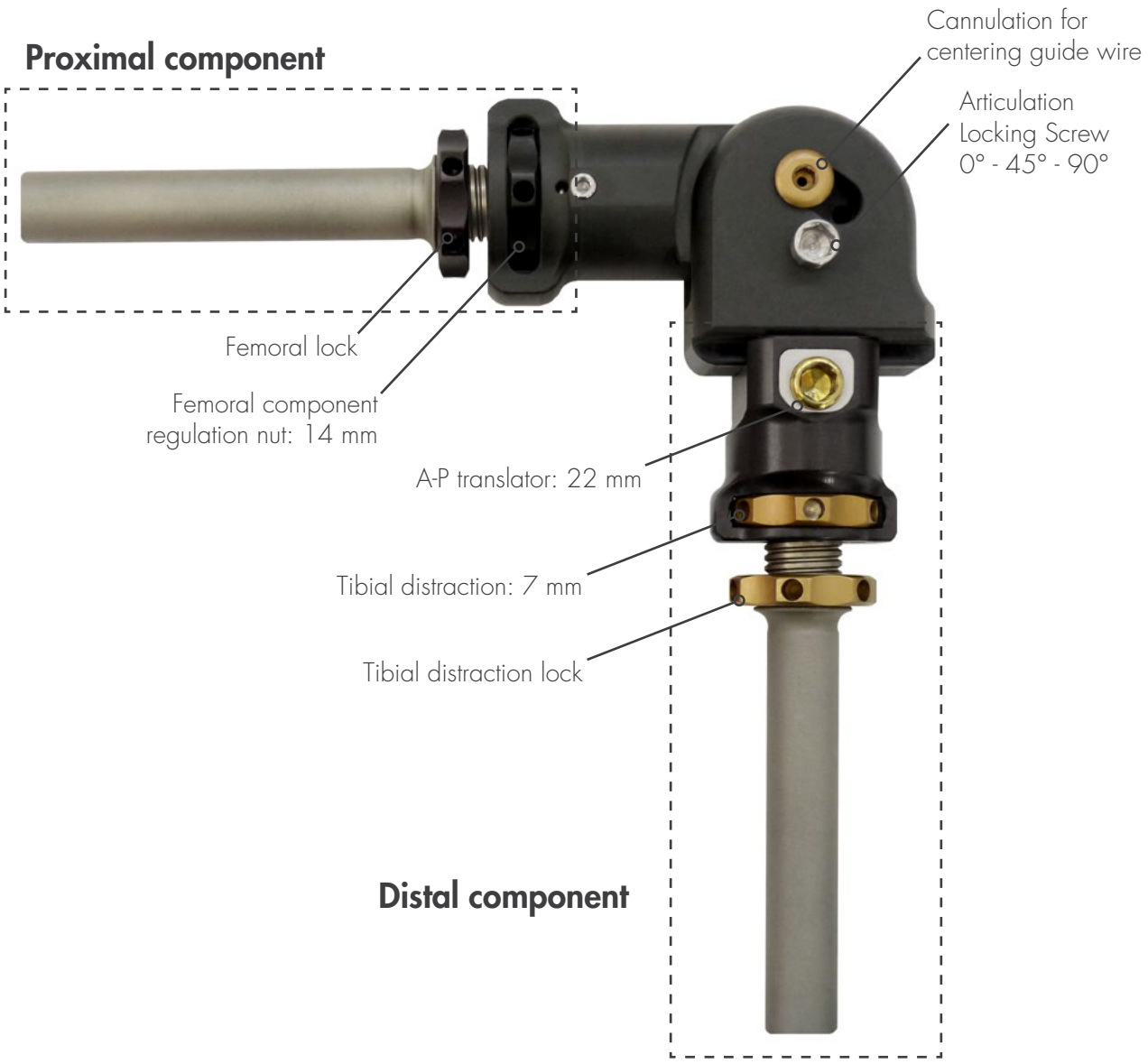
Product description

The Citieffe articulated external fixator is aligned with the transcondylar axis of the knee joint and allows stable articulation without stressing adjacent articular structures. The fixator reproduces physiologic movement between 0° and 90° and avoids overloading articular structures without permitting the physiological rotational movements of normal flexion-extension of the knee. It is very important that the articulating body of the external fixator is correctly aligned in both frontal and sagittal planes: the centre of rotation must be aligned with the transcondylar axis.

The main feature of the articulating fixator is to allow active and passive motion of the knee, protecting the joint from the mechanical stresses of movement and facilitating articular distraction when necessary.

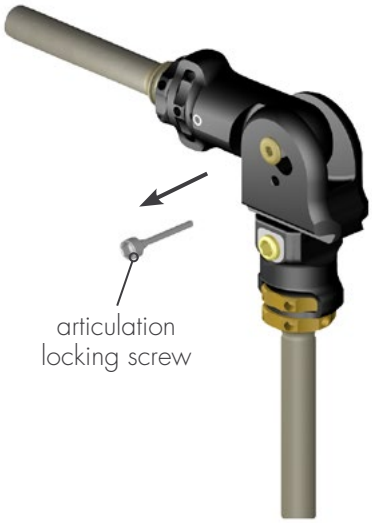
Articulated external fixation is indicated in all those pathological conditions in which it might be necessary to combine bone stabilization and/or ligamentous reconstruction with early mobilization of the articular joint, to avoid the effects of prolonged immobilization.



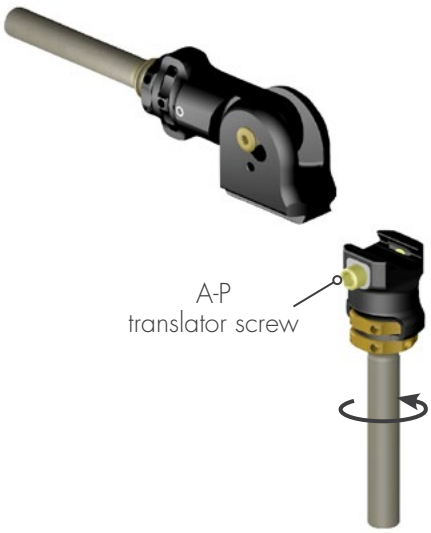
Product description

Figure 1

The external fixator is supplied in STERILE packaging for the RIGHT knee.
If required for the left knee, the assembly should be changed as follows.



Remove the articulation locking screw and reinsert it from the opposite side.

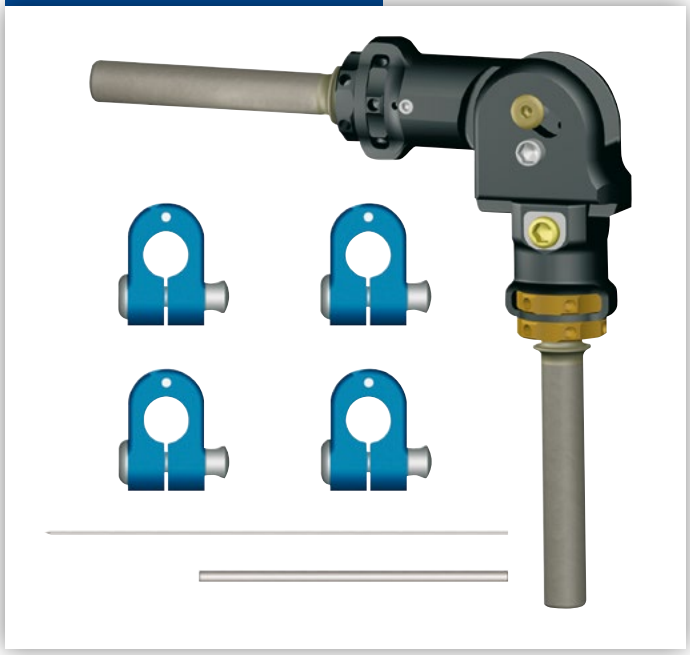


Loosen the A-P translator screw, remove the distal component and turn it 180 °.

Reinsert the distal component and lock it by tightening the translator screw.

Product description

Figure 2



Knee fixator kit

The kit includes:
- 1 knee articulated external fixator;
- 4 bone screw clamps;
- 1 guide wire;
- 1 pin for distraction locking nuts.

The external fixator is supplied in the configuration for right knee application and 90° locking.
The screw clamps accept 6 mm diameter bone screws.

Figure 3

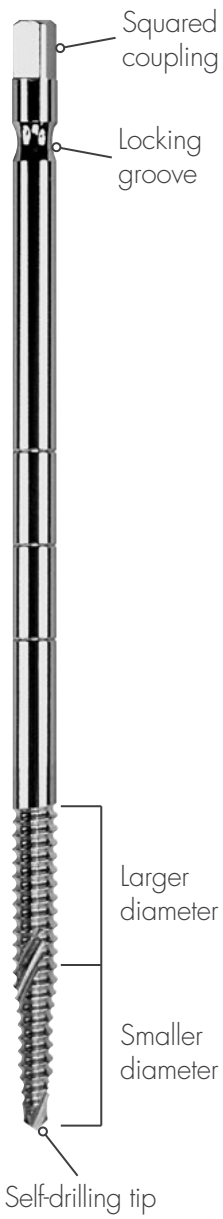
Curved arm kit

The kit includes:
- 1 curved arm for tibial bone screws;
- 2 bone screw clamps.

The curved arm allows insertion of the bone screws into the antero-medial aspect of the tibia, preserving the function of the anterior compartment.
The screw clamps accept 6 mm diameter bone screws.

Bone screws

Figure 4



Bone screw

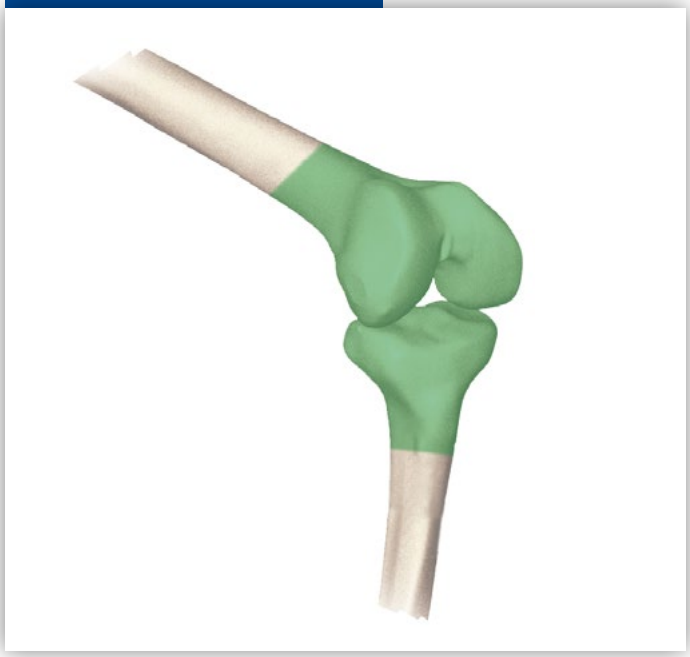
A double diameter stainless steel bone screw, self-drilling and self-tapping, with no pre-drilling required. In case of hard cortical bone it may be necessary to pre-drill.
Also available with hydroxyapatite coating for patients with severe osteoporosis or when a long period of fixation is anticipated.

When the bone screw is inserted:

- the self-drilling tip creates a hole the size of the smaller diameter;
- the first self-tapping portion cuts the thread in the bone;
- the smaller diameter inserts easily into the bone;
- the second self-tapping portion cuts the thread for the larger diameter;
- the larger diameter is inserted creating a completely circular hole.

Indications and patient positioning

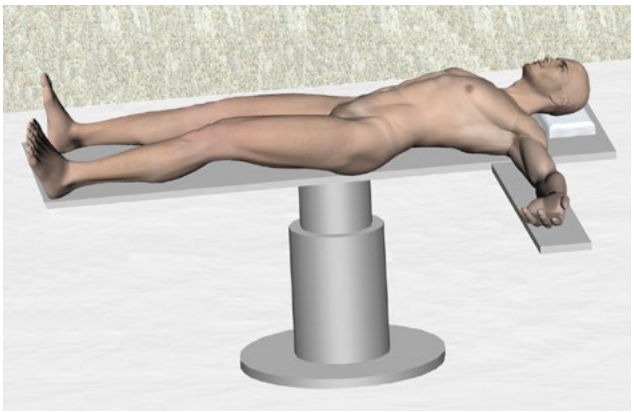
Figure 5



Indications

Citieffe External Fixator ST.A.R.90 F4 Knee is intended for use in the treatment of bone conditions lengthening osteotomies, arthrodesis, fracture fixation and other bone conditions amenable to treatment by use of the external fixation modality.

Figure 6

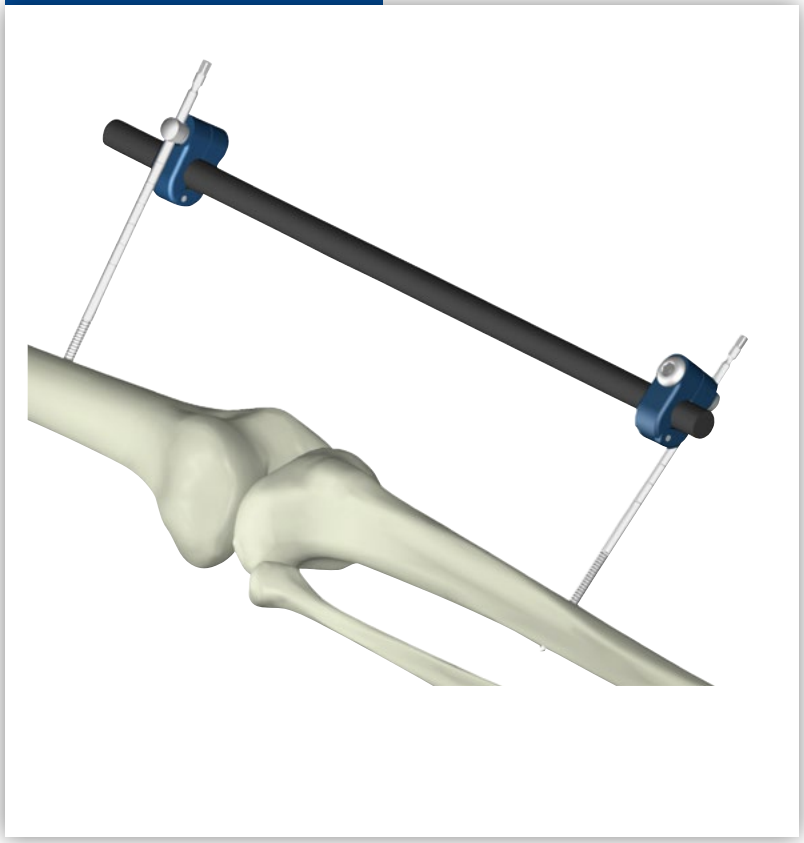


Patient positioning

The patient is supine on a radiolucent operating table with the knee prepared for surgery.
The fixator is positioned according to anatomical landmarks.
In a complex fracture it may be difficult to identify landmarks without prior reconstruction of the articular surface. This can be performed more easily after applying a temporary external fixation.

Operative technique

Figure 7



Temporary fixation

The use of temporary transarticular external fixation is recommended, to provide stable joint reduction to permit accurate reconstruction of the articular surface. Insert anterior femoral and antero-medial tibial bone screws 13 - 14 cm from the articular surface.
The screws are connected with a radiolucent rod and clamps which are locked to maintain the correct femoro-tibial alignment.
This type of application can utilise the ligamentotaxis technique to restore the articular anatomy.

Operative technique

Identify the centre of rotation

Articular fractures must be reduced and stabilized with minimal internal fixation before applying the articulated knee fixator.
The centre of rotation is identified with a Kirschner wire under image intensifier control.

Figure 8

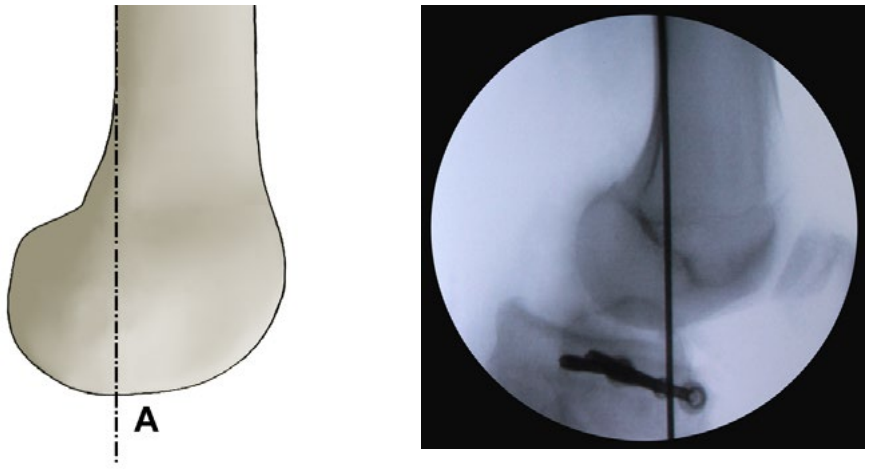


Fig. 8.1
Obtain a true lateral view and continue the line of the posterior diaphyseal surface distally as line **A**

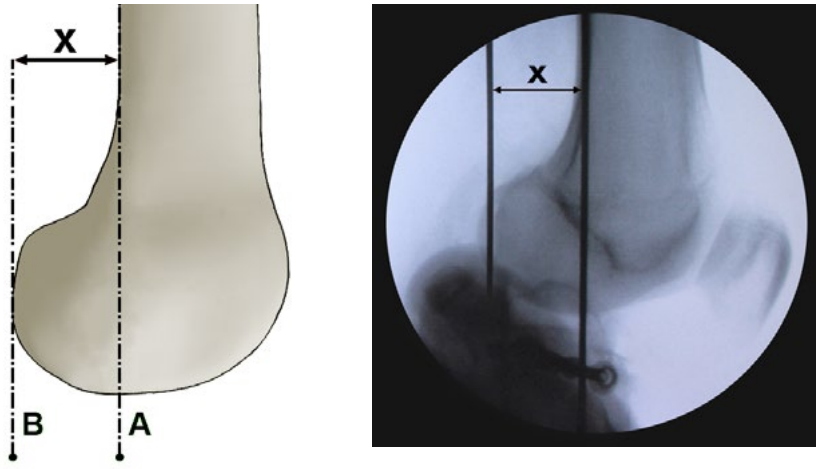


Fig. 8.2
Draw a tangent to the femoral condyle **B** that is parallel to line **A** and measure distance **X** between lines **A** and **B**

Operative technique

Figure 8

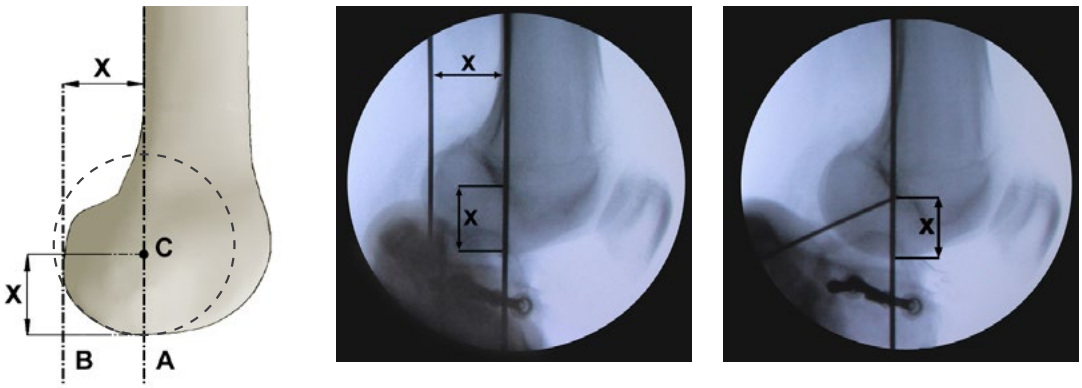


Fig. 8.3
Mark distance **X** on line **A** proximally from the margin of the femoral condyle and identify the theoretical centre of rotation **C**

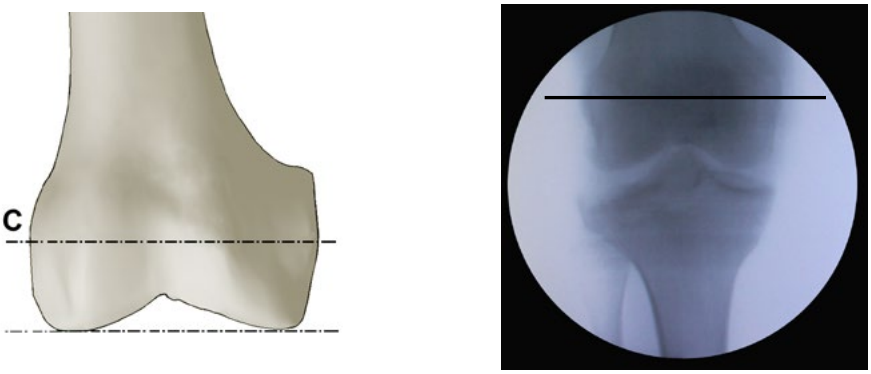


Fig. 8.4
Insert a Kirschner wire at point C parallel to the bicondylar line, which in the anteroposterior view should be virtually parallel with the articular surface

Operative technique

Figure 9

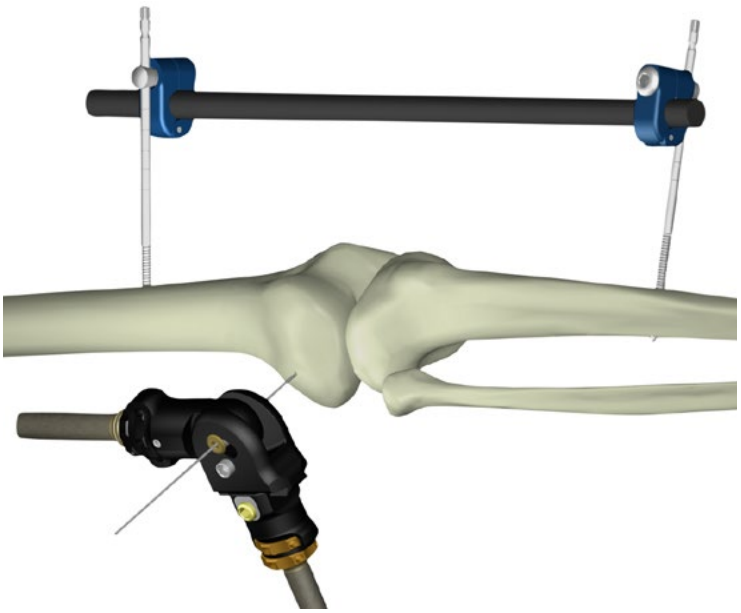


Fig. 9.1

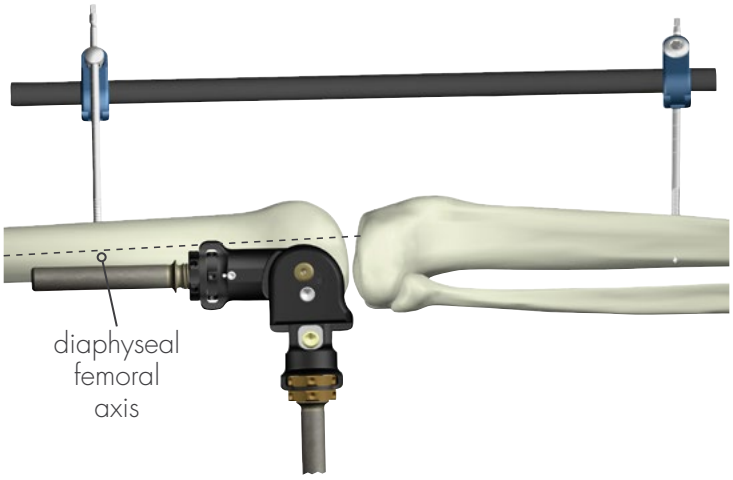


Fig. 9.2

Application of articulated fixator

Insert the K. wire in the centering cannulation and slide the fixator over the wire, keeping it locked at 90° (Fig. 9.1).
Position the femoral rod of the fixator parallel to the femoral diaphyseal axis (in the lateral projection) (Fig. 9.2).

Operative technique

Figure 10

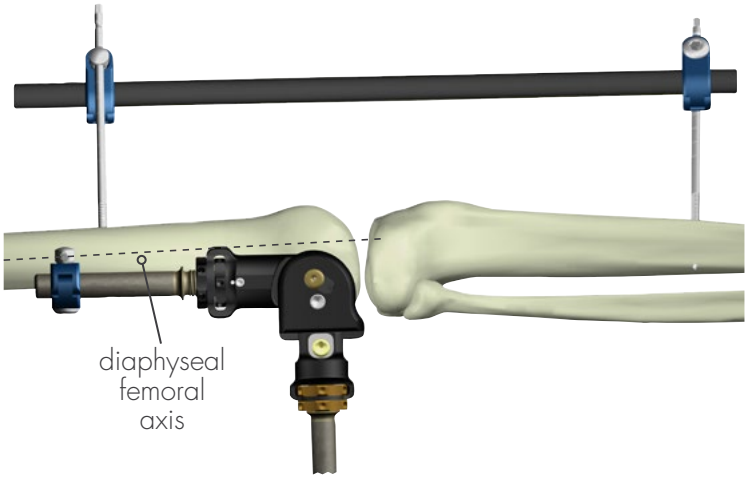


Fig. 10.1

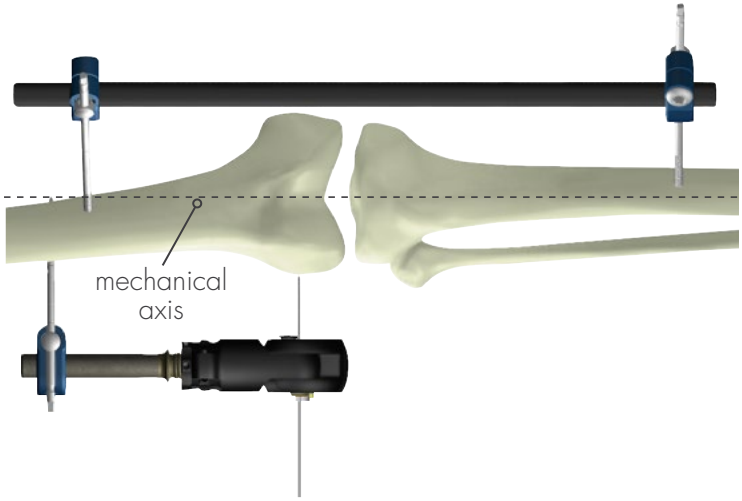


Fig. 10.2

Application of articulated fixator

Support the fixator so that its weight does not bend the K wire, and insert the first bone screw in the centre of the diaphysis using a screw guide.
Partially lock the bone screw clamp with the hexagonal wrench.
With the image intensifier check that the femoral rod of the fixator is parallel to:

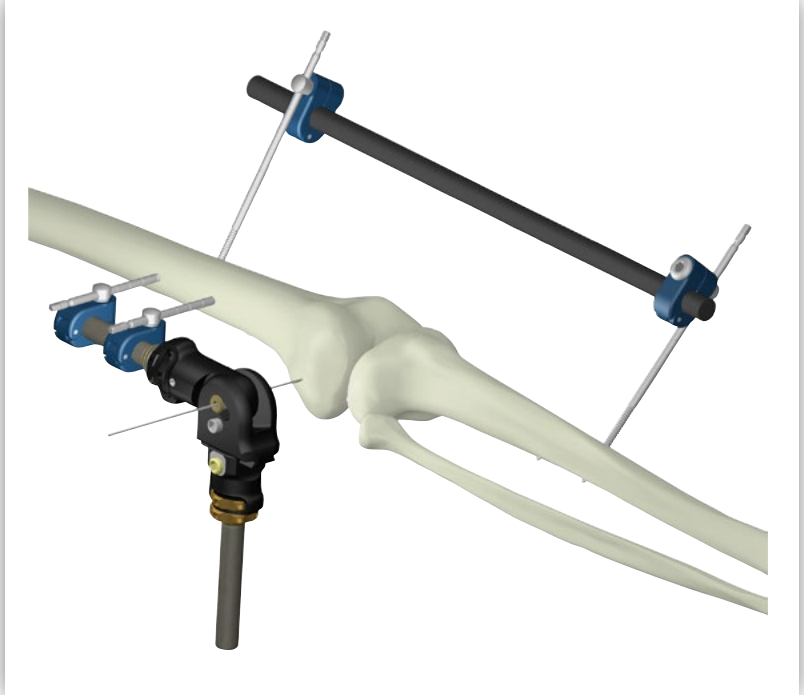
— the femoral axis, in lateral projection (Fig. 10.1)
— the mechanical axis of the limb, in antero-posterior projection (Fig. 10.2).

Complete tightening of the bone screw clamp.

NOTE *The mechanical axis is a line drawn from the centre of the femoral head to the centre of the tibio-tarsal joint.*

Operative technique

Figure 11

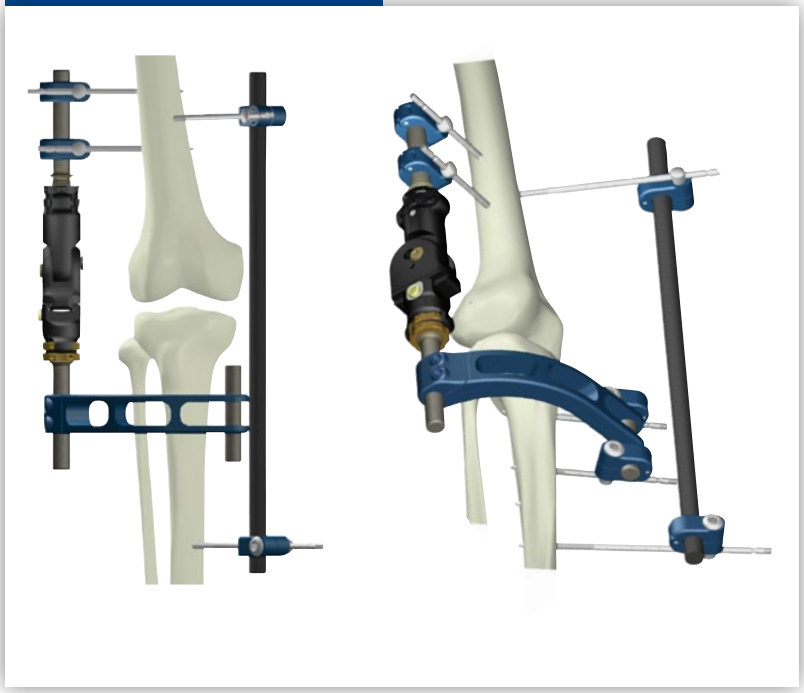


Second femoral bone screw insertion

Insert a second distal femoral bone screw parallel to the first and tighten the clamp with the hexagonal wrench.

NOTE *The best stability is obtained with the clamps at each end of the rod.*

Figure 12

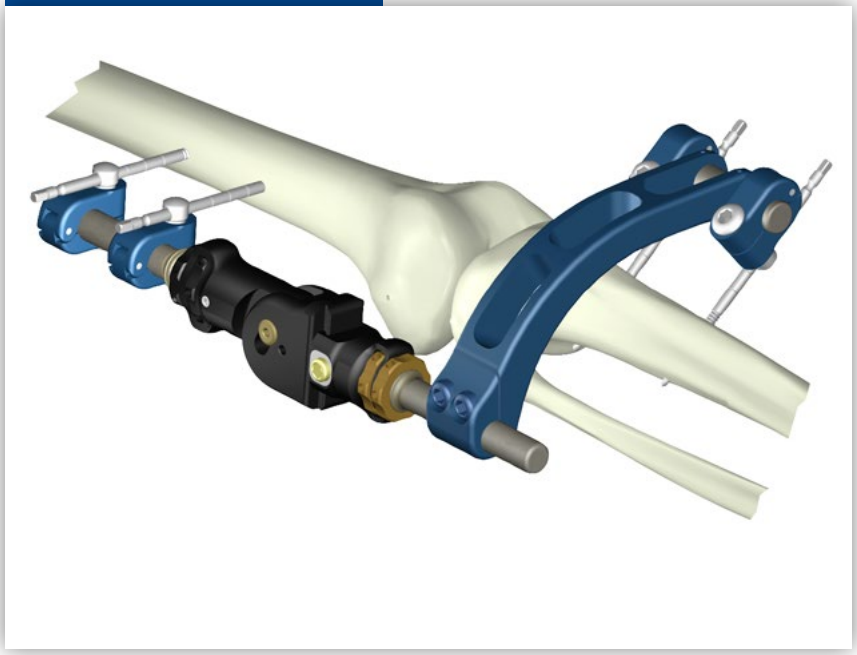


Curved arm assembly

Remove the Kirschner wire and articulation locking screw so that the fixator can be extended. Insert the curved arm over the middle of the distal fixator rod and tighten the two locking screws. Position 2 clamps on the bar at the end of the arm and insert the tibial bone screws, starting with the most distal one.

Operative technique

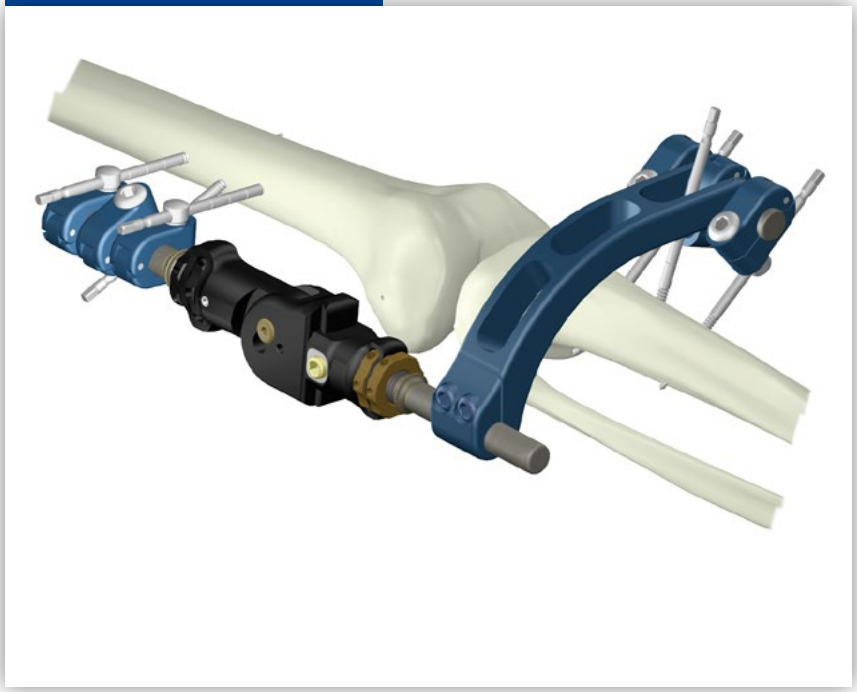
Figure 13



Articulated distraction

Tighten all bone screw clamps firmly and remove the temporary fixator. Distract the articulation by turning the nut for tibial distraction with the dedicated pin. Lock the position by tightening the distraction locking nut.
Check joint movement and symmetrical distraction. Check that there is no joint impingement during flexion and extension. Further adjustment can be performed if necessary with the femoral distraction nut and locking screw translator, and with release of the fascia lata.

Figure 14

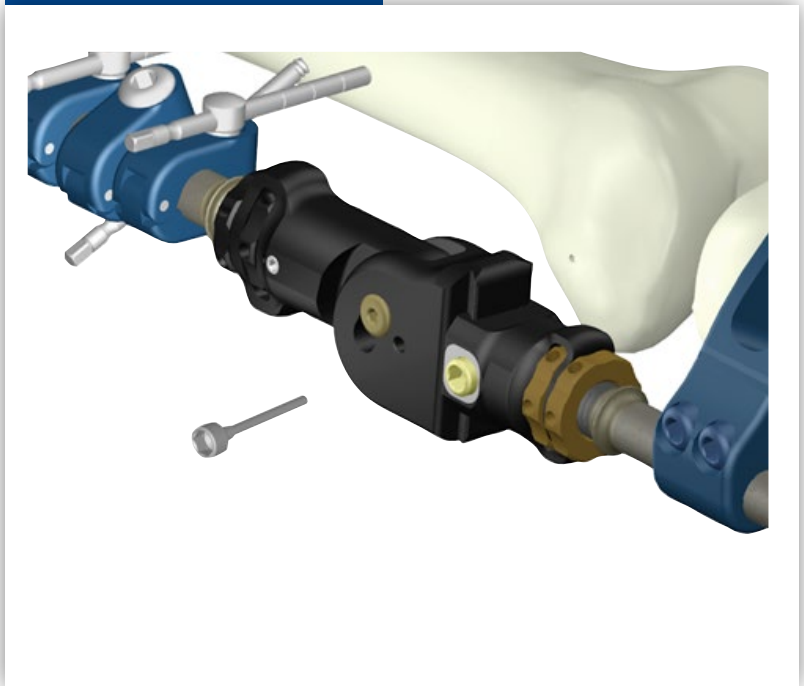


Final assembly

Finally a third femoral and tibial bone screw is inserted. These should be oblique to the previous screws and preferably between them. Final tightening of all bone screw clamps is performed with the torque wrench.

Operative technique

Figure 15

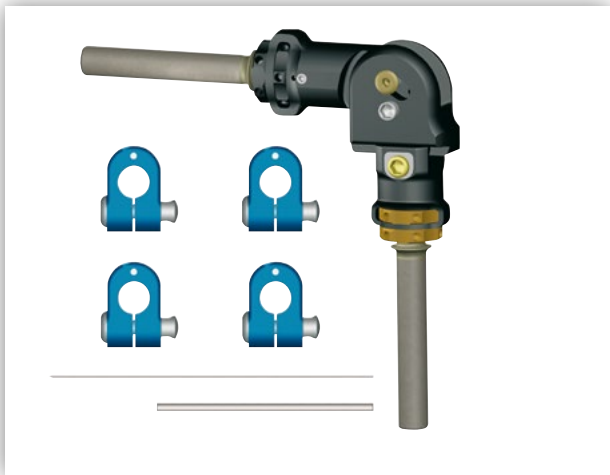


Post-operative management

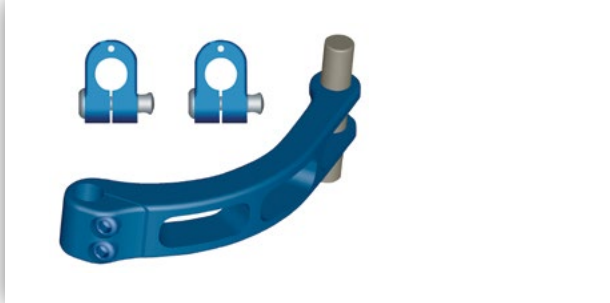
The fixator can be locked in extension by inserting the articulation locking screw. The amount and timing of permitted joint movement are determined by the type of lesion and stability of any fractures
Weightbearing must also be moderated during the first weeks after surgery, according to the type of injury, and increased progressively.

Ordering information

STERILE

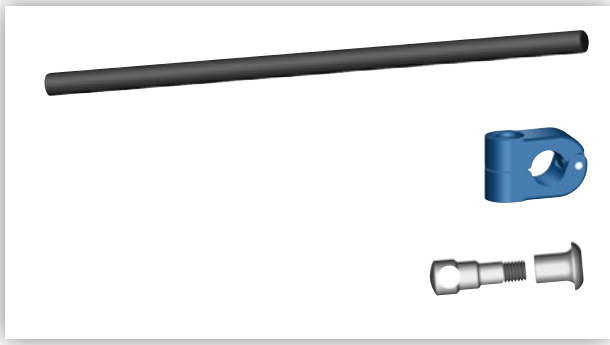


Code	Description
F4-2460	Knee fixator kit Contents: 1 articulated knee external fixator 4 bone screw clamps 1 guide wire 1 pin for distraction locking nuts



F4-2745	Curved arm kit Contents: 1 curved arm 2 bone screw clamps

F4-145120	ø5 mm cortical bone screw - L. 120-34 mm
F4-145150	ø5 mm cortical bone screw - L. 150-40 mm
F4-156150	ø6 mm cortical bone screw - L. 150-40 mm
F4-156180	ø6 mm cortical bone screw - L. 180-50 mm
F4-156200	ø6 mm cortical bone screw - L. 200-60 mm

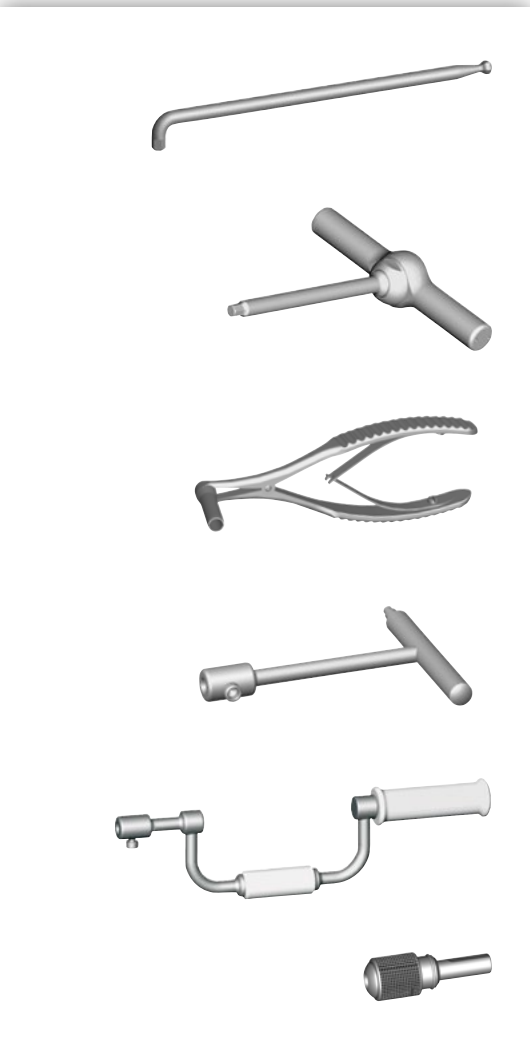


F4-2798	Radiolucent rod ø14x360 mm
F4-2799	Radiolucent rod ø14x400 mm
F4-5100	Clamp
F4-5200	Bone screw holder

Bone screws are also available with hydroxyapatite coating or in Nickel-free stainless steel alloy.
We reccomend to consult the labeling of ST.A.R.90 F4 External Fixation Bone Screws with hydroxyapatite coating.

Ordering information

NOT STERILE



Code	Description
EBA-0050	6 mm hexagonal wrench
F4-0205	Torque wrench
F4-0215	Bone screw guide
F4-0220	T handle for chucks
SF1050	Drill brace
SF1090	Chuck for ø6 mm bone screws

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