mini FLO

Treating hands like flowers

EXTERNAL **fixation** **monolateral fixators** **hand**

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Essential moves in Trauma

Citieffe thanks

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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.

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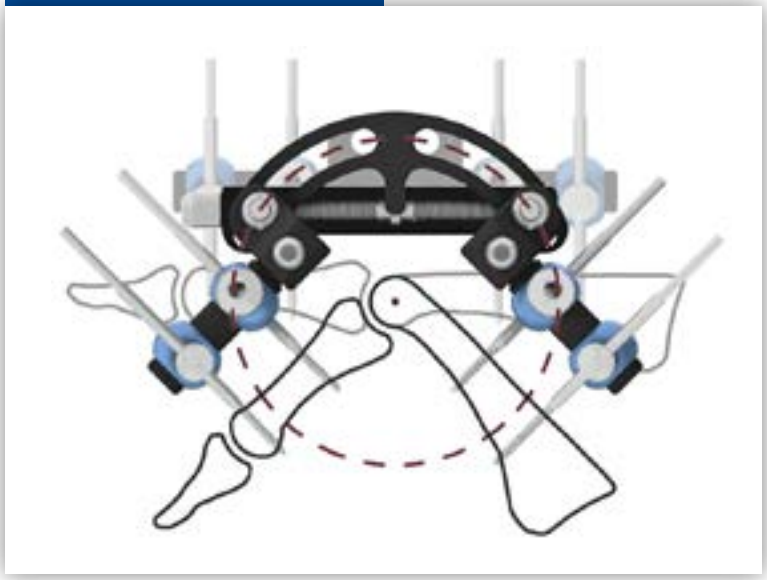
Essential Moves in Trauma

Introduction

To decrease historical complication rates, different devices have been used to lengthen contracted tissue over finger joints. In most cases, these devices were used to treat the contracture with continuous traction. However, the loading on the involved joints can be greatly increased with resultant damage.
These methods demonstrate that it is possible to lengthen the pathological contracture adequately by applying traction.
The MiniFlo fixator has been developed to avoid the above problems and allow gradual extension of the scar contraction, without stressing the involved joints.

Figure 1



Basic principles

The fundamental principle of the MiniFlo fixator operation is based on an arc of a circle, the center of which is aligned with that of the affected joint.

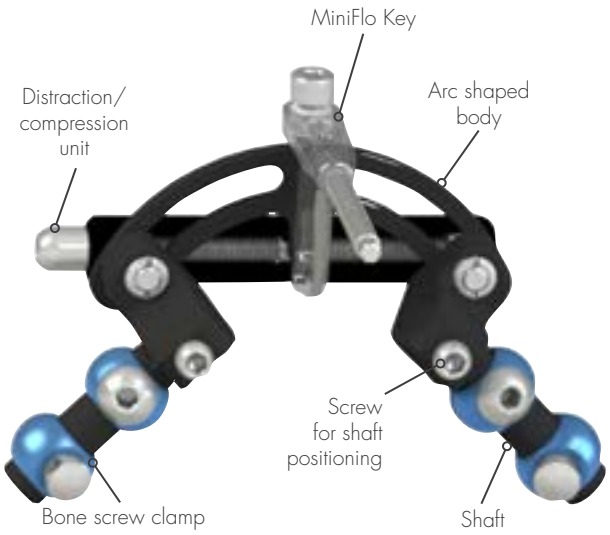
The arc shaped MiniFlo fixator body is positioned dorsally over the involved joint.

Note • Anesthestic method

Fixator application does not require incisions or haemostasis. Surgery can therefore be performed with local anesthesia (eg. metacarpal block).

Product description

Figure 2



Fixator components

The MiniFlo fixator main features are:
- an arc shaped central body;
- two shafts on which the Bone Screw Clamps are mounted;
- two screws for shaft positioning;
- distraction/compression unit.

Distraction or compression of the fixator is performed gradually by the patient with the MiniFlo Key.

Available sizes MiniFlo fixator: R25 - R30

Figure 3

MiniFlo R25

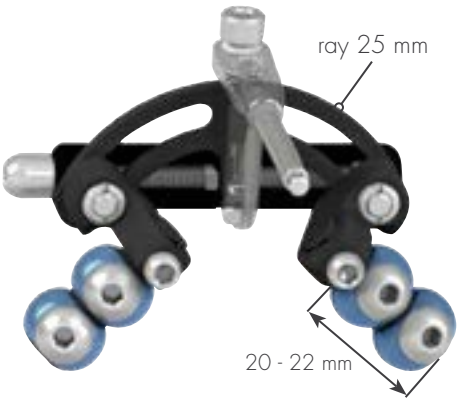
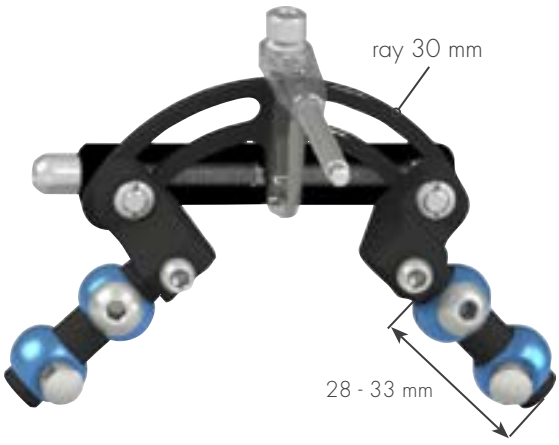


Figure 4

MiniFlo R30



Components and features

Figure 5

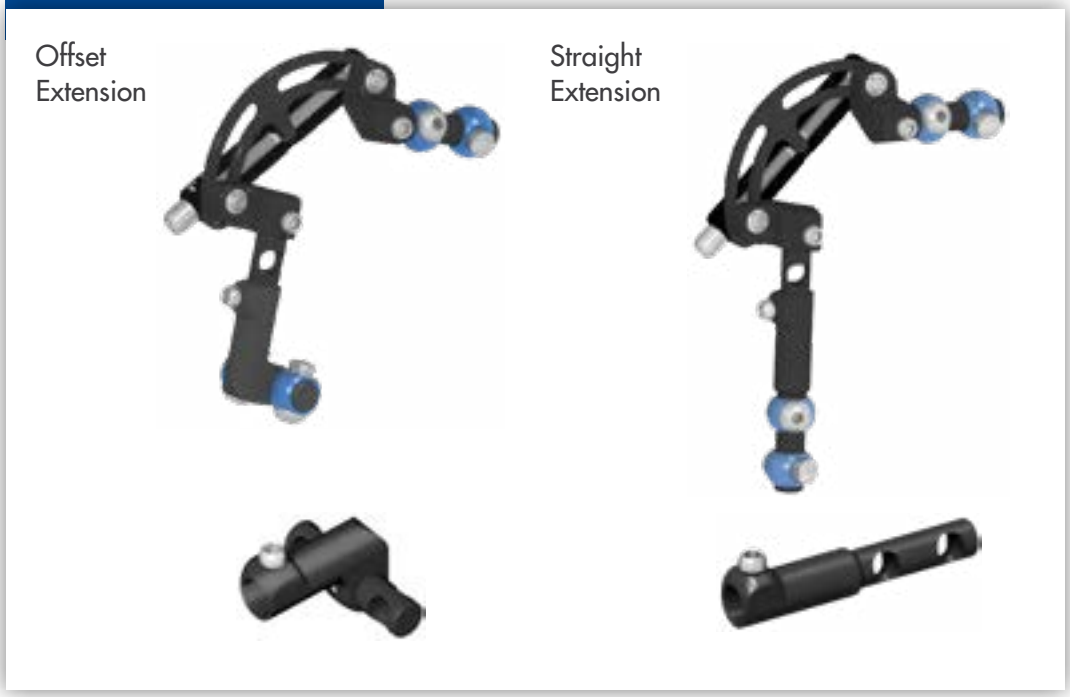
MiniFlo R30

If the fixator is used bridging two joints (metacarpo-phlangeal and proximal inter-phalangeal joints) the MiniFlo R30 is combined with the MiniFlo Offset or Straight Extension.
As this type of mounting bridges two joints it is not possible to define a single center of articulation.
It is necessary to adapt the centre of rotation of the fixator to the center of articulation that may vary from the flexed to straightened positions.

Telescopic components (only for MiniFlo R30)

To compensate for over distraction

Figure 6



Components and Bone Screws

Figure 7

MiniFlo key (removable)

This component has two functions: intraoperatively as a targeting device and postoperatively as a distraction wrench.

NOTE *It should not be used to lock Bone Screw Clamps.*

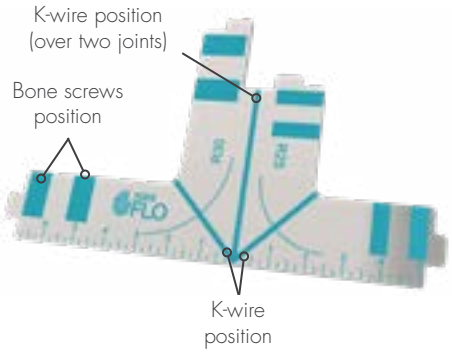
Figure 8

K-wire and 3 mm Allen wrench

(included in the fixator package)

K-wire: diameter 1.5 mm, L. 150 mm, trocar tip.
The mark on the K-wire allow precise positioning of the fixator over the center of the joint.
The 3 mm Allen wrench is used to lock all fixator locking screws.

Figure 9

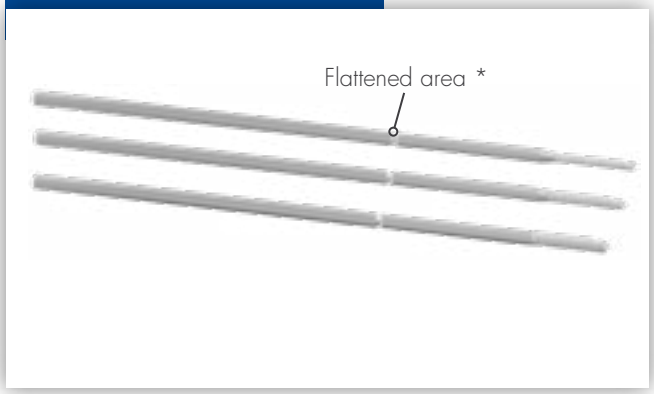


MiniFlo Template

The MiniFlo template helps to determine the dimension of the fixator to be used.
It also indicates the correct insertion point of the K-wire used to determine the articular rotation centre.

Components and Bone Screws

Figure 10

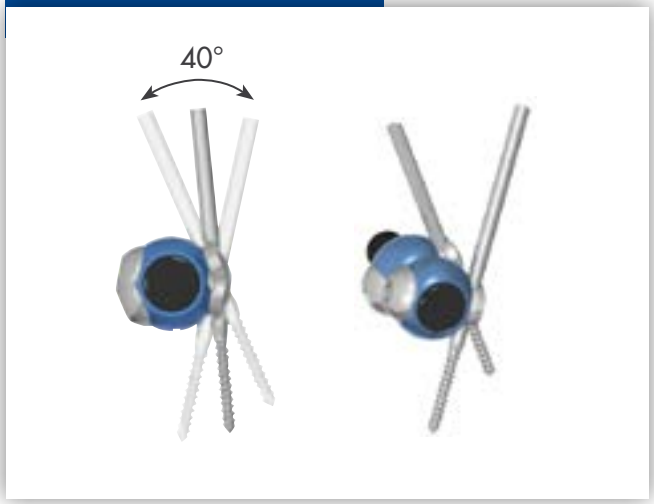


Bone screw

Total length: 100 mm.
Thread length: 13 mm.
Shaft diameter: 2,5 mm.
Thread diameters: 1,6 mm, 2,0 mm, 2,5 mm.
The bone screw thread diameter should not exceed 1/3 of the bone diameter.

* The flattened area on the screw shaft facilitate cutting off of the extra shaft after screw and fixator application.

Figure 11



Bone screw insertion

Possible bone screw insertion angle allowed by Bone Screw Clamp.

Indications

Figure 12

Indications

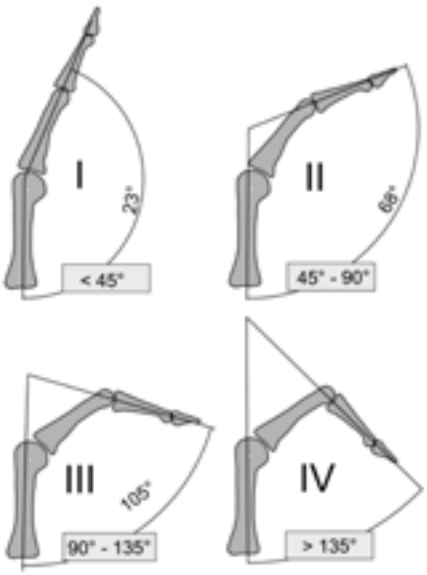
Treatment of:
1) post-traumatic joint stiffness
2) high degree Dupuytren contractures

Figure 13

Clinical example

Typical example of a Dupuytren contracture (IV) affecting the ring finger (the most frequent location of the disease).
Often two joints are involved: the metacarpo-phalangeal joint (MCP) and the proximal inter-phalangeal joint (PIP). The extent of the contracture can however be quite different on the two affected joints. In some cases, contracture is located only (or mainly) over one of the two joints.

Figure 14



* Angles represent the required corrections

Stages of Dupuytren's disease

The classification most frequently used identifies four stages of severity depending on the overall angle of flexion.

General considerations

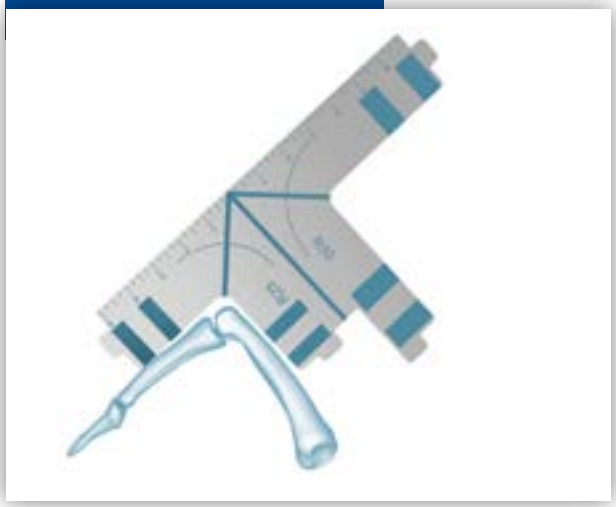
One-step surgical removal of the Dupuytren scar tissue involves high risks especially in more advanced stages (III and IV). In addition to potential injury to the nerve/vessel bundle involved in the Dupuytren, surgical treatment may be complicated by skin necrosis and skin defects.
In severe cases pre-distraction of the contracted finger ray may help to avoid this complication.

Literature

• Distraction Correction of Chronic Flexion Contractures of PIP Joint: Comparison Between Two Distraction Rates
Shirzad Houshian, MD, Chandrasekar Chikkamuniyappa, MS
From the Department of Orthopaedics, Upper Limb Unit, University Hospital Lewisham, London, UK.
The Journal of Hand Surgery, Vol. 32A, No.5, May-June 2007; 651-6.
• The use of skeletal traction in the treatment of severe primary Dupuytren's disease
Neil Citron, Jane C. Messina, From Nelson Hospital, London, UK.
Journal of Bone & Joint Surgery [Br] 1998;80-B:126-9.

Operative Technique. Inter-Phalangeal application
Treatment of a Single Joint

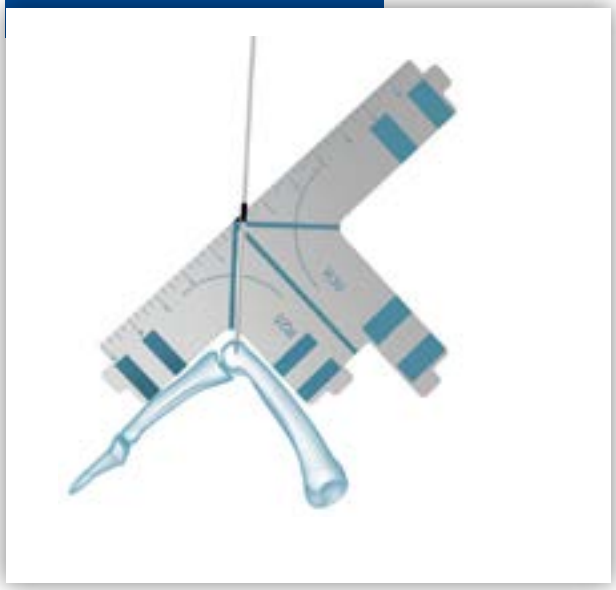
Figure 15



Template positioning

To choose the size of the fixator to be used the Template is positioned over the segment to be treated.
Should it be difficult to take the measurement of the finger to be treated, an adjacent finger can be used as reference.

Figure 16



Definition of the center of articulation

With the image intensifier a lateral projection of the joint is obtained.
The 1.5 mm K-wire (supplied with the MiniFlo fixator) is inserted percutaneously on the dorsal aspect of the bone with a power drill.
The K-wire should be directed towards the center of the joint to determine correct fixator positioning (as bisector of the the angle of contracture) until the tip of the K-wire engages the far cortex.
If the center of the fixator arc does not match the rotation center of the joint, displacement may develop during distraction.
Minor discrepancies can be ignored.

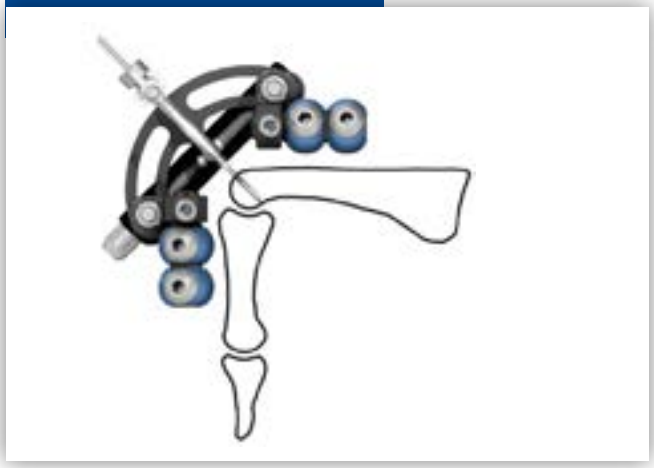
Figure 17

Mark on the K-wire

The mark on the K-wire can be used as a reference for fixator positioning.

Operative Technique. Inter-Phalangeal application Treatment of a Single Joint

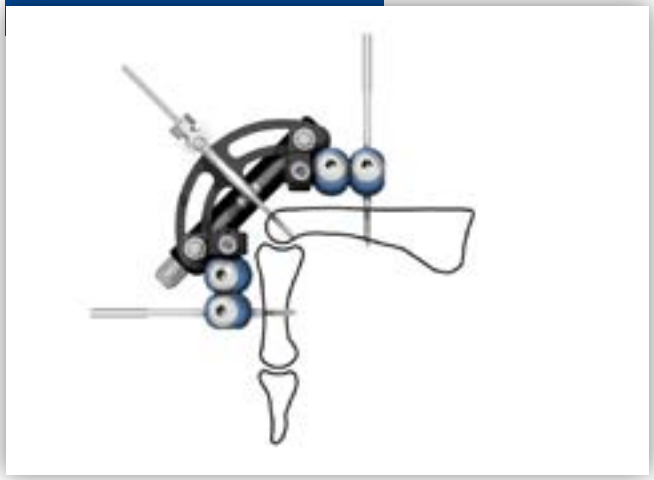
Figure 18



Fixator positioning

The fixator is positioned by inserting the K-wire in the MiniFlo key hole up to the reference.
The fixator shafts are positioned parallel to each bone axis.

Figure 19

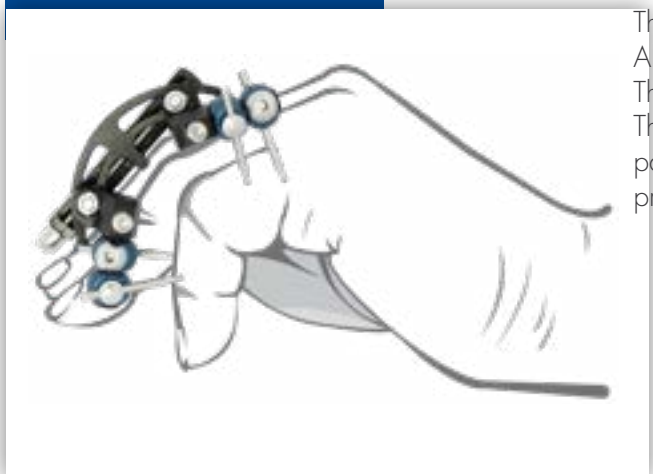


Placement of the first bone screw

The fixator is held close to the skin by the assistant while the first bone screw is inserted into the clamp (start with most proximal clamp if possible). The bone screw is then percutaneously drilled into the bone (bicortically).
Before the clamp is locked the fixator is positioned according to the mark on the K-wire thus making sure that the arc of the fixator is centered on the rotation axis of the joint.
The second screw is then inserted into the distal clamp.

Note *The mark on the K-wire allows precise positioning of the fixator over the center of the joint. However attention should be paid to the skin-fixator distance: if this is too small the fixator may be moved out to allow for postoperative swelling. Minor joint distraction during this manoeuvre will not harm the structures.*

Figure 20

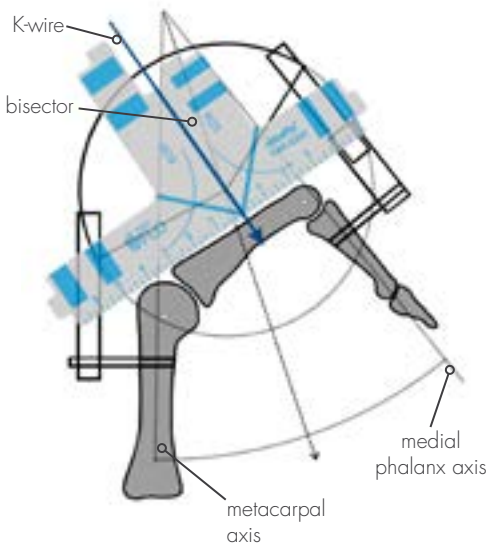


Final assembly

The remaining two bone screws are inserted.
All Bone Screw Clamps are locked with the 3 mm Allen wrench.
The MiniFlo Key and K-wire are removed.
The bone screw shafts are cut off to make the assembly more patient friendly, it is hovewer necessary to leave at least 3 mm of protruding shaft for bone screw removal.

Operative Technique. Metacarpo-phalangeal application Treatment over Two Joints

Figure 21



Identification of the center of rotation

It is not uncommon for the metacarpo-phalangeal (MCP) and the proximal inter-phalangeal joints (PIP) to be simultaneously involved by the contracture.

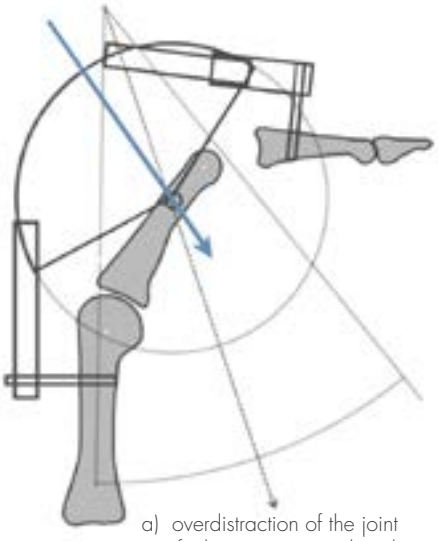
The center of rotation can be located, to a good approximation, on the bisector of the angle between the axes of the metacarpal and the middle phalanx of the involved finger.
Ensure that the proximal shaft of the fixator is parallel to the metacarpal axis.

In clinical practice, this point is difficult to define accurately. As indicated in the figure the target K-wire is inserted approximately in the middle of the proximal phalanx perpendicular to the bone axis.

Center of rotation correction

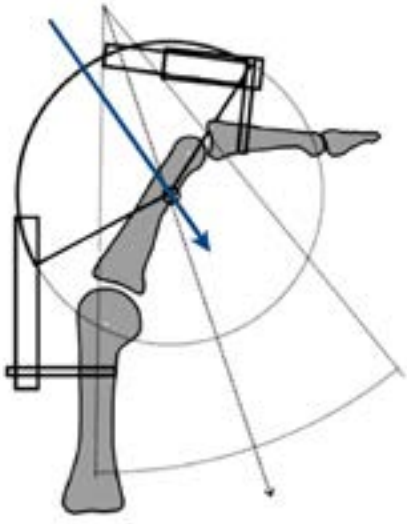
With the configuration illustrated in Fig. 22a over-distraction of the involved joints may occur.
To avoid this problem the telescopic extension Offset or Straight has been developed to compensate for the variability of the theoretical center of articulation with that of the MiniFlo fixator (Fig. 22b).

Figure 22 a



a) overdistraction of the joint if telescopic unit is closed

Figure 22 b



b) overdistraction of the joint is avoided if the telescopic unit is open

Operative Technique. Metacarpo-phalangeal Application Treatment over Two Joints

Figure 23

Assembly of the MiniFlo Extension

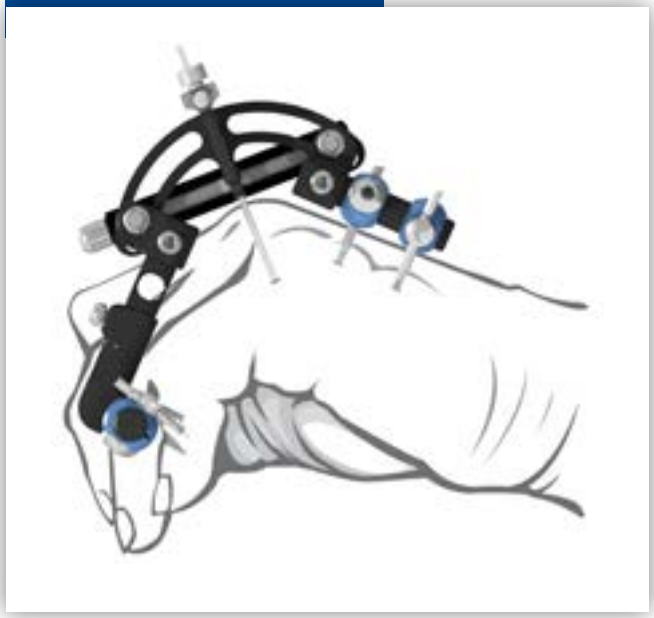
a) The Bone Screw Clamps are removed from the standard configuration. They are then applied to the MiniFlo Offset or Straight Extension.

b) The screw ① on the MiniFlo Offset or Straight Extension is opened wide enough to allow insertion of the device on the fixator shaft.

c) Once maximum extension of the Offset or Straight module is achieved, lock the screw ① and reassemble the clamps and the related screws on the Offset or Straight Extension.
During application of the fixator this screw remains locked to allow for precise bone screw placement. However during distraction the locking screw of the telescopic unit remains open.

Operative Technique. Metacarpo-phalangeal Application Treatment over Two Joints

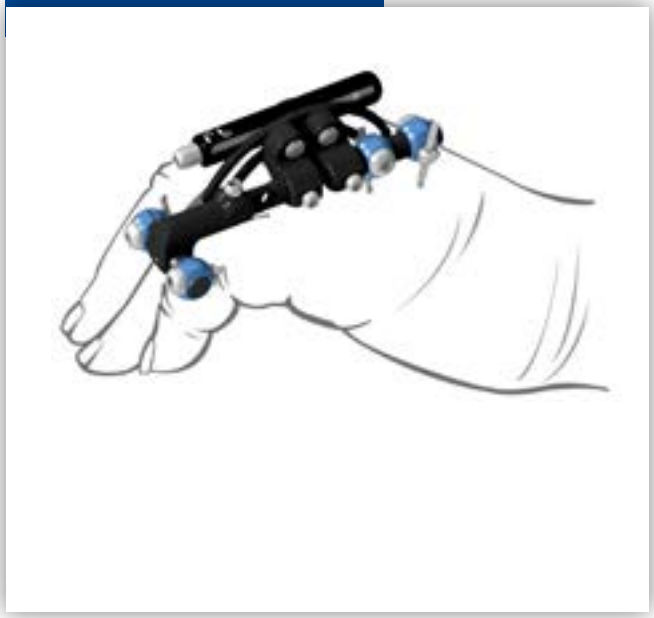
Figure 24



Correction of deformities up to 90°

Insert the K-wire dorsally in the center of the proximal phalanx, perpendicular to the long axis and just through the second cortex. The "center" of articulation is situated dorsally on the proximal phalanx surface.
The MiniFlo fixator is centered over the target K-wire with the proximal shaft parallel to the bone axis (Fig. 23).
It is important to maintain enough space between the clamps and the skin.
Should it be necessary to insert the distal screws perpendicularly to the bone, the Offset Extension can be used.

Figure 25



Deformity correction above 90°

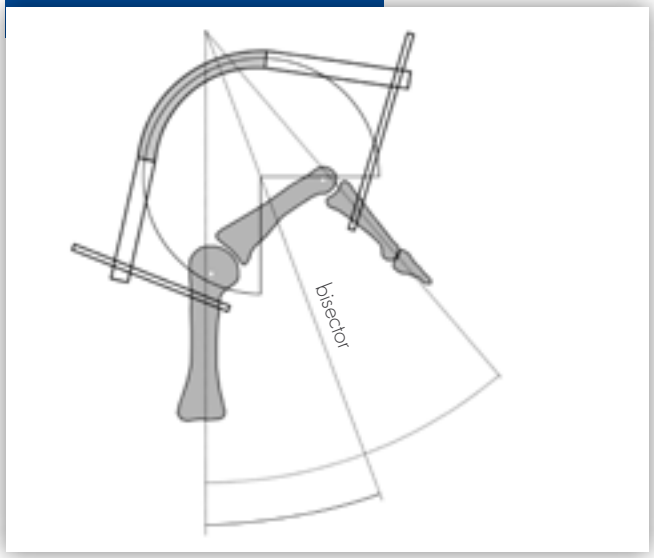
The MiniFlo fixator allows a 90° range of correction in one-step procedure.
In order to obtain complete extension, if the deformity is greater than 90°, a second step of correction is necessary.
Whilst an assistant holds the fingers in the achieved position:

- fixator clamps are opened;
- the fixator is set back to the original position;
- fixator clamps are closed again allowing another 90° correction to reach complete extension.

The procedure is schematically illustrated in Fig. 26 and 27.

Adjustments of the Point of Rotation

Figure 26



Schematic drawing of a Dupuytren grade IV with both joints involved

Fixator application with a telescopic extension.

Adjustments of the point of rotation

a) Completion of the first phase of distraction.
b) Whilst the assistant hold the fingers in the distracted position, the fixator clamps are opened.
c) The fixator is set back to the original position and moved a little further from the skin as the bone screws are sufficiently long.
d) The point of rotation can be adjusted if necessary by using the MiniFlo Offset or Straight Extensions. With the finger held in the distracted position by the assistant, the Bone Screw Clamps are unlocked. The angle of the fixator is altered so that the shafts are aligned with the angle of the articulation.
The Bone Screw Clamps are then locked again and distraction is continued.

Figure 27 a-b

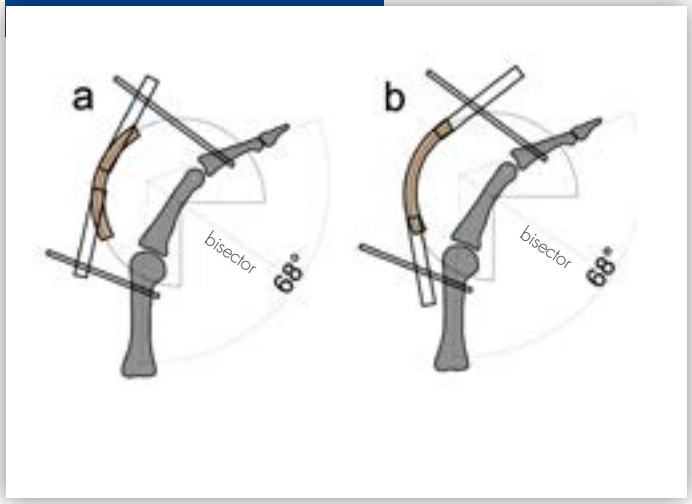
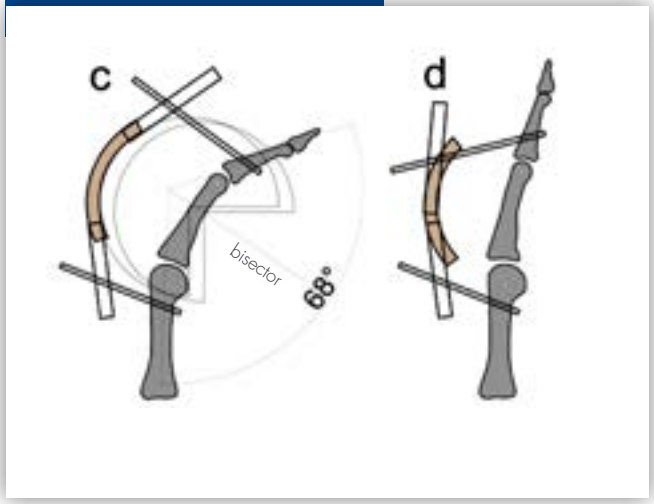


Figure 27 c-d



Post-operative Management Suggestions

Post-operative Management

Distraction begins on the first postoperative day.
The surgeon should instruct the patient on the method of distraction, and the MiniFlo Key is given to the patient.

The postoperative distraction period (ca. 2 weeks) varies from patient to patient according to the feeling of tension, the degree of pain and the magnitude of the deformity.

The suggested distraction rate is of 1 turn of the MiniFlo Key per day (which corresponds to ca. 3°).

Pain should be avoided. If distraction becomes
painful, it is advised to stop until the pain disappears. Should pain continue it is necessary to find the cause.
An x-ray should be taken to check stability of the bone screws, as this is the most frequent cause of persistent pain.

Given the short duration of use, complications due to bone screws are rare on condition that they have been correctly inserted in the bone, in the center of its axis, avoiding skin tethering if possible.

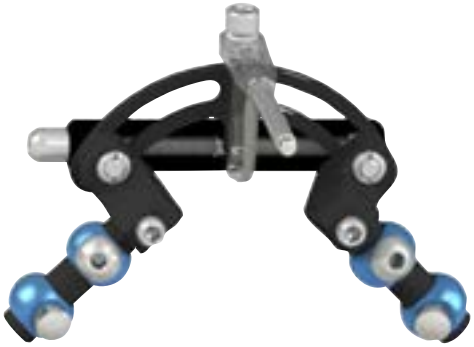
During treatment, infection of the involved soft tissues is possible as in any other external fixator application.
This appears as localized redness or pain around the entry points of the bone screws. In these cases, dressing of the bone screws should be intensified and distraction temporarily stopped. Appropriate treatment of the infection may be necessary.
Rarely bone screw repositioning may be necessary.

Figure 28

Start of treatment

Ordering information

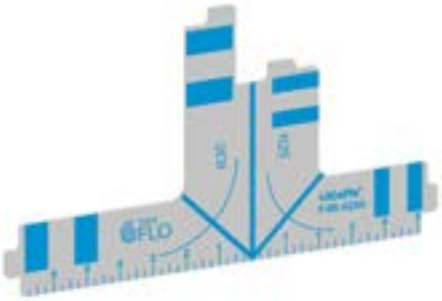
STERILE

	Code	Description
	F4R-1025	MiniFlo Fixator R25 (supplied with 1.5 mm K-wire and 3 mm Allen wrench)
	**F4R-1030**	MiniFlo Fixator R30 (supplied with 1.5 mm K-wire and 3 mm Allen wrench)
	F4R-2020	MiniFlo Extension (only for F4R-1030)
	F4R-2021	MiniFlo Offset Extension (only for F4R-1030)
	F4R-2022	MiniFlo Straight Extension (only for F4R-1030)

Ordering information

STERILE

Code	Description
Bone Screw, total length 100 mm, thread length 13 mm	
SF32160	Shaft ø2.5 mm, thread ø1.6 mm
SF32200	Shaft ø2.5 mm, thread ø2.0 mm
SF32250	Shaft ø2.5 mm, thread ø2.5 mm



F4R-0200 Template MiniFlo

NOT STERILE

F4R-0130 3 mm Allen wrench

mini FLO

Treating hands like flowers

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