

SURGICAL TECHNIQUE

# NX Nail System Phalanx Use



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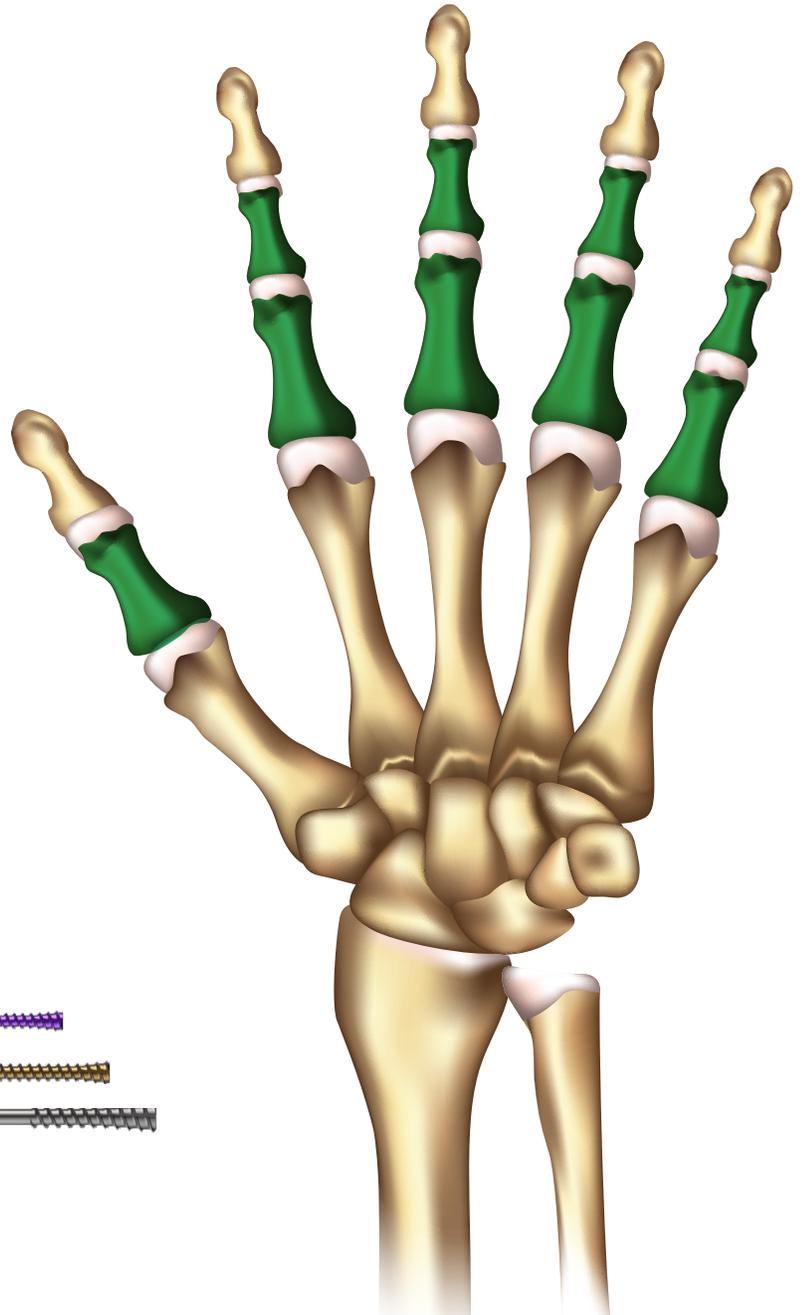
# Indications for Use

The FO BTES Screw Range, including the NX Nail System, is intended for use in the fixation of fractures, osteotomies, and arthrodesis, appropriate for the size of the device, in adults and both children (2-12 years) and adolescents (12-21 years), in which growth plates have fused or in which growth plates will not be crossed by screw fixation.



# Phalanx Size Guide

| PHALANX             |                |
|---------------------|----------------|
| INDICATION          | P1 & P2        |
| SIZE RECOMMENDATION | 2.0 - 3.0mm    |
| LENGTH RANGE        | 2.0: 12 - 40mm |
|                     | 2.5: 12 - 60mm |
|                     | 3.0: 25 - 70mm |



| COLOR   | SIZE  | LENGTH    | IMAGE   |
|---------|-------|-----------|---|
| GOLD    | 2.0mm | 12 - 40mm |  |
| MAGENTA | 2.5mm | 12 - 60mm |  |
| TEAL    | 3.0mm | 25 - 70mm |  |
| PURPLE  | 3.5mm | 25 - 70mm |  |
| BRONZE  | 4.0mm | 35 - 80mm |  |
| GREY    | 5.0mm | 35 - 90mm |  |

# Procedural Technique

## MIDDLE AND PROXIMAL PHALANX

An antegrade or retrograde approach can be used depending on the fracture pattern, location, presence of adjacent fractures and integrity of soft tissue structures. This procedural technique outlines a single NX Nail construct using both the antegrade (intra-articular and trans-articular) and retrograde approach. Additional constructs are outlined in the construct technique sections.

### Pre-operative Planning

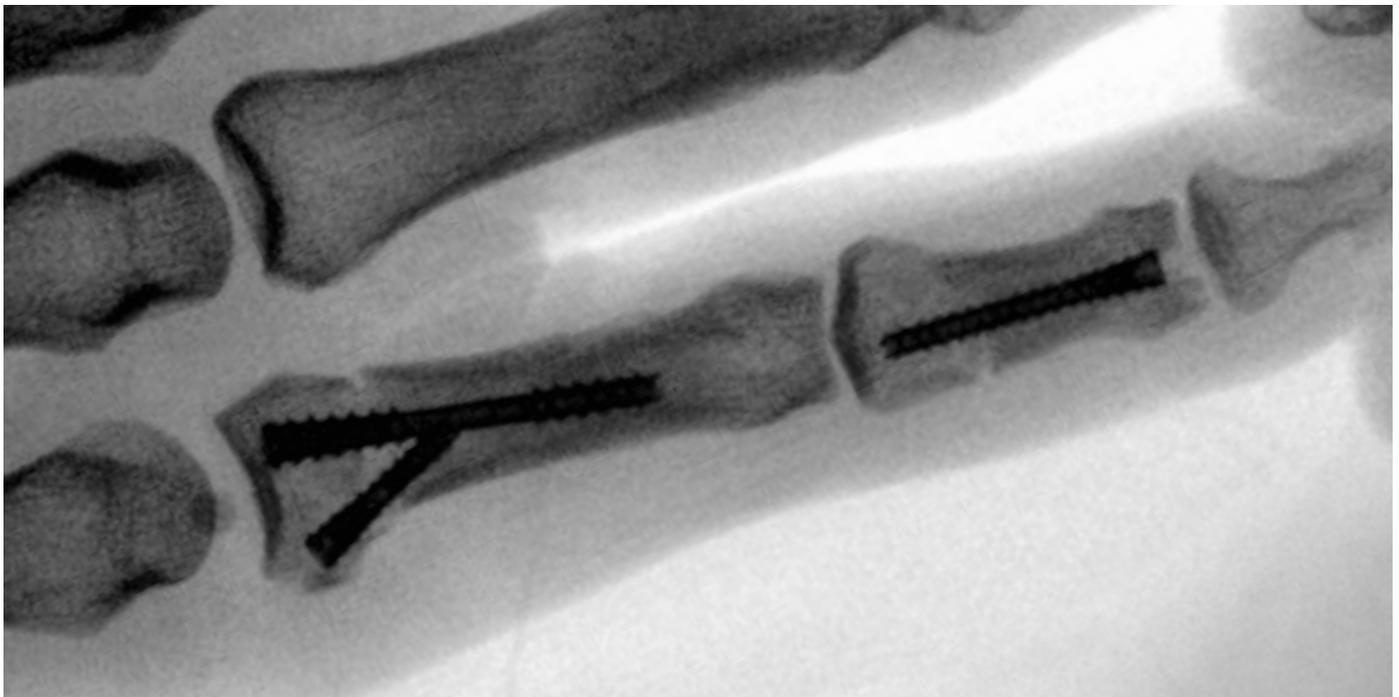
Each of the phalanges in the hand is unique in its anatomy; convex dorsally while appearing flat in the transverse plane and concave in the sagittal plane. Due to the variations in length and shape, the phalanges require consideration in multiple dimensions.

### Review Radiographs

- Measure the intramedullary canal radiographically prior to commencing the procedure to minimize implant interference with the isthmus.

**TIP:** Posteroanterior (PA), lateral and oblique views are recommended.

- Consider measurements from these multiple projection angles and use the smallest of these measurements taking into account the shape of the isthmus.
- If passing through the isthmus, identify the size and location to ensure the leading tip can pass through without causing fracture or getting lodged.
- Refer to the size range at the back of this document to guide implant selection.



# Antegrade Intra-Articular

## PROCEDURAL TECHNIQUE

The antegrade approach is often appropriate for fractures of the proximal one-third where passing leading thread through the fracture can be difficult.<sup>1</sup> The intra-articular approach produces minimal cartilage damage, provides good visibility of the entry point and limits damage to the extensor tendon.<sup>2</sup>



## 1. Reduce the Fracture

- Closed reduction can typically be achieved with gentle axial traction and direct pressure near the apex.
- Fractures not reducible by closed means should be reduced percutaneously using reduction clamps and Kirschner wires (K-wires) as required.

**TIP:** Use of K-wires less than 1mm in diameter is not recommended for reduction of the fracture due to the high risk of bending.

### Middle Phalanx

- After closed reduction is achieved, make a small incision over the proximal interphalangeal joint (PIPJ), through the skin to the central slip.
- A longitudinal split is made in the middle of the central extensor tendon (proximal to the central slip insertion) to allow for direct visualization of the K-wire entering the middle phalanx.
- Retract the skin and extensor complex.

**TIP:** The use of skin hooks is helpful for delicate retraction of the tendon complex.

- Flex the PIPJ 60-90 degrees while the proximal end of the middle phalanx is translated dorsally to expose the articular surface of the base of the middle phalanx.

### Proximal Phalanx

- After closed reduction is achieved, make a small incision over the metacarpophalangeal joint (MCPJ), through the skin to the extensor hood complex.
- A longitudinal split is made in the middle of the extensor hood to allow for direct visualization of the K-wire entering the proximal phalanx.
- Retract the skin and extensor complex.
- Flex the MCPJ 60-90 degrees while translating the proximal end of the phalanx dorsally. This will expose the articular surface of the base of the proximal phalanx.
- A 90 degree flexion position of the MCPJ can prevent dorsal displacement of the proximal phalanx resulting from tightness of the dorsal capsule and collateral ligaments.<sup>2</sup>
- Rotation and digit cascade should be closely monitored both clinically and fluoroscopically at this stage and throughout the duration of K-wire placement and fixation.

# Antegrade Intra-Articular

PROCEDURAL TECHNIQUE CONTINUED

## 2. Achieve Temporary Fixation

- Place a K-wire centrally on the dorsal side of the joint.<sup>1</sup>
- Oscillate the K-wire down the entire length of the phalanx in an antegrade direction under fluoroscopic guidance.
- Advance the K-wire into the distal cortex at the base of the phalanx to avoid inadvertent removal of K-wire during drilling.
- Confirm placement on anteroposterior (AP), lateral and oblique views.



**TIP.** An angiocath can be used as a drill guide to facilitate K-wire insertion at subluxation.

**TIP.** The K-wire can also be advanced in the base of the phalanx in an oblique direction without articular violation, particularly if subluxation of the PIPJ/MCPJ is difficult. This technique is outlined further below on page 11 as the modified antegrade intra-articular technique.

## 3. Measure and Select Nail

- Once reduced, use the depth gauge to determine the diameter and length of the implant required.
- Use the longest implant possible to maintain stability, ensuring it is not too long as this can distract the fracture site.



### Confirming Diameter:

- Using the depth gauge, ensure the text 'BONE DIAMETER CAN BE MEASURED HERE' is facing up. The position of this text can change throughout the size ranges so take care to identify it and ensure it is facing up.
- Under fluoroscopy, using the projection angle which gave the smallest isthmus measurement, align the depth gauge with the borders of the isthmus.
- Refer to the size range at the back of this document.
- If passing through the isthmus, select a size smaller than the line-to-line fit, to ensure the implant can pass through the isthmus without making contact with cortical bone.

**TIP.** The NX Nail achieves stability with the compaction taper head and leading tip. There is no need to achieve fixation within the isthmus. If presented with a line-to-line fit or 'beyond', consider downsizing to avoid stuffing the isthmus.

# Antegrade Intra-Articular

## PROCEDURAL TECHNIQUE CONTINUED

### Confirming Length:

- Hold the depth gauge against the base of the phalanx, with the protruding K-wire seated in the groove along the shaft of the depth gauge.
- Measure the exposed length of the K-wire against the markings on the depth gauge.
- This measurement indicates the length to which the K-wire has been inserted into the phalanx. It may be appropriate to subtract up to 5mm to ensure correct implant placement.
- If the fracture pattern permits and the fragments are adequately reduced, measurement may be taken under fluoroscopy with notches on the depth gauge corresponding to the lengths of the nails provided in the set.



- Further confirmation of appropriate size can be made by screening the selected nail over the fracture under fluoroscopy.

### 4A. Prepare the Phalanx

- Once implant selection has been confirmed, use the corresponding drill to make the insertion tunnel.
- Pass the cannulated drill bit over the K-wire to the depth required for adequate fixation.
- Remove the drill while taking care to maintain the position of the K-wire.
- Do not remove the K-wire.



↑  
Color band corresponds to implant color which identifies size range.

|         |       |           |  |
|---------|-------|-----------|--|
| GOLD    | 2.0mm | 12 - 40mm |  |
| MAGENTA | 2.5mm | 12 - 60mm |  |
| TEAL    | 3.0mm | 25 - 70mm |  |
| PURPLE  | 3.5mm | 25 - 70mm |  |
| BRONZE  | 4.0mm | 35 - 80mm |  |
| GREY    | 5.0mm | 35 - 90mm |  |

# Antegrade Intra-Articular

## PROCEDURAL TECHNIQUE CONTINUED

### 4B. Metaphyseal Preparation

- The metaphyseal drills are provided to prepare the bone for the implant and reduce forces generated by the implant head.
- Use of a metaphyseal drill is recommended for every case.

**TIP.** It is recommended to use a hand drill not a power drill for this section of the technique. This will reduce the risk of drilling further than required.

#### Standard Metaphyseal Drill

- Designed to match the shape of the nail taper excluding the threads.
- Alleviates head forces without altering pull out performance.

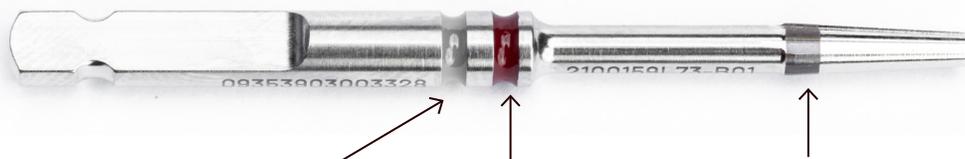


Color band corresponds to implant color which identifies size range.

**TIP.** If using the standard metaphyseal drill, it is recommended to sink the head completely. This will provide a tight interference fit.

#### Extended Metaphyseal Drill

- Offers an extended taper (by 2mm) compared to the standard option to facilitate deeper insertion or alleviate head forces.



Color band corresponds to implant color and size range.

Distinguishes from Standard Meta Drill

Laser marking identifies 2mm taper extension when compared to the standard.

**TIP.** If using the extended metaphyseal drill, it is recommended to sink the drill head to the bottom of the black laser marking band ensuring it is still visible. This will provide a tight interference fit and assist in alleviating head forces.

#### Using the Metaphyseal Hand Drills

- Connect the metaphyseal drill to the handle included in the instrument kit.
- Pass the metaphyseal drill over the K-wire.
- Over drill the insertion hole to prepare the bone for the implant head.
- Remove the drill taking care to maintain K-wire position.
- Do not remove the K-wire.

# Antegrade Intra-Articular

## PROCEDURAL TECHNIQUE CONTINUED

### 5. Nail Insertion

- Connect the driver to the handle included in the instrument kit.
- When connecting the driver tip to the implant head, push firmly to ensure the instrument is fully seated.
- Pass the implant over the K-wire.
- Attach the driver to the implant head and turn in a clockwise direction.

**TIP:** Ensure axial force is maintained between the driver and the head of the NX Nail during insertion as this will reduce the risk of the driver-implant interface disengaging.

**TIP:** If resistance is felt as the nail is inserted into the isthmus it is suggested to stop, remove the nail and use the drill from the next diameter up to open the isthmus further. Do not drill beyond the isthmus as this will reduce the purchase of the leading thread of the nail. Re-insert the nail after re-drilling.

**TIP:** Choose a smaller diameter nail if you experience high resistance or are concerned with propagating a fracture. The nail may also need to be slightly longer than previously selected to ensure the leading tip obtains purchase in cancellous bone.

- During insertion, pay attention to the bone while seating the head and take care to avoid distraction or rotation of the fracture.

**TIP:** For anterograde techniques fingers are prone to internal rotation therefore it may be beneficial to take off half a turn during insertion.

- Confirm that the NX Nail head is buried beneath the articular surface into the subchondral bone to avoid joint arthrosis or block motion.
- After confirming the placement of the NX Nail on anteroposterior (AP), lateral and oblique views, the K-wire may be removed.
- Bring the digit through full passive Range of Motion (ROM) to confirm the fracture is stable and there is no obstruction to motion.
- Check digit cascade to assess for any malrotation.

**Note:** A hex driver head is used for 2.0 and 2.5 NX Nails. A torx driver head is used for 3.0 NX Nail and above.



### 6. Close

- Due to the small size of the dorsal defect required to obtain the starting position, repair of the capsule or extensor mechanism is not routinely performed.
- If a larger entry point was required for fixation, repair is to be carried out.
- Close in your preferred method.

# Modified Antegrade Intra-Articular

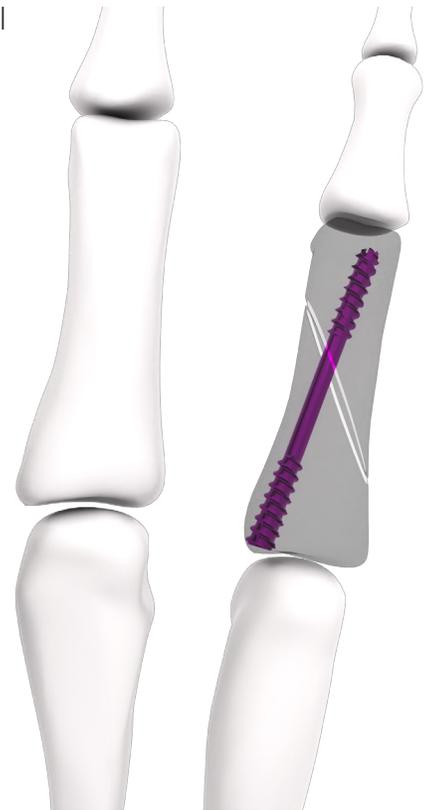
## PROCEDURAL TECHNIQUE

If subluxation of the proximal interphalangeal joint (PIPJ)/ metacarpophalangeal joint (MCPJ) is difficult, the modified antegrade intra-articular technique allows for the K-wire to be placed in an oblique fashion without articular violation.<sup>3</sup>

Phalanges with a very thick metaphyseal layer may not be suitable for this technique as it can cause the K-wire trajectory to sit too proximal.

### 1. Reduce the Fracture

- Closed reduction can typically be achieved with gentle axial traction and direct pressure near the apex.
- Fractures not reducible by closed means should be reduced percutaneously using reduction clamps and K-wires as required.
- Oscillate the K-wire in an antegrade direction towards the head of the proximal phalanx. Aim for the ulna or radial condyle, opposite to the entry point so that the nail is positioned across the isthmus.



**TIP:** Use of K-wires less than 1mm in diameter is not recommended for reduction of the fracture due to the high risk of bending.

### 2. Achieve Temporary Fixation

#### Middle Phalanx

- After reduction is achieved, choose a radial or ulna entry point, at the base of the middle phalanx. The entry point is chosen based on fracture anatomy.
- Make a small incision at the entry point and introduce a K-wire percutaneously, without injuring the PIPJ.
- Oscillate the K-wire in an antegrade direction toward the head of the middle phalanx. Aim for the ulna or radial condyle, opposite to the entry point so that the nail is positioned across the isthmus.

#### Proximal Phalanx

- After reduction is achieved, choose a radial or ulna entry point, at the base of the proximal phalanx. The entry point is chosen based on fracture anatomy.
- Make a small incision at the entry point and introduce a K-wire percutaneously, without injuring the PIPJ.
- Oscillate the K-wire in an antegrade direction toward the head of the proximal phalanx. Aim for the ulna or radial condyle, opposite to the entry point so that the nail is positioned across the isthmus.
- Advance the K-wire into the distal cortex at the head of the phalanx to avoid inadvertent removal of the K-wire during drilling.
- Rotation and digit cascade should be closely monitored both clinically and fluoroscopically at this stage and throughout the duration of K-wire placement and fixation.
- Confirm placement on anteroposterior (AP), lateral and oblique views.

# Modified Antegrade Intra-Articular

## PROCEDURAL TECHNIQUE CONTINUED

### 3. Measure and Select Nail

- Once reduced, use the depth gauge to determine the diameter and length of the implant required
- Use the longest implant possible to maintain stability, ensuring it is not too long as this can distract the fracture site.

#### Confirming Diameter:

- Using the depth gauge, ensure the text 'BONE DIAMETER CAN BE MEASURED HERE' is facing up. The position of this text can change throughout the size ranges so take care to identify it and ensure it is facing up.
- Under fluoroscopy, using the projection angle which gave the smallest isthmus measurement, align the depth gauge with the borders of the isthmus.
- Refer to the size range at the back of this document.
- If passing through the isthmus select a size smaller than the line-to-line fit to ensure the implant can pass through the isthmus without making contact with cortical bone.

**TIP.** The NX Nail achieves stability with the compaction taper head and leading tip. There is no need to achieve fixation within the isthmus. If presented with a line-to-line fit or 'beyond', consider downsizing to avoid stuffing the isthmus.



#### Confirming Length:

- Hold the depth gauge against the base of the phalanx, with the protruding K-wire seated in the groove along the shaft of the depth gauge.
- Measure the exposed length of the K-wire against the markings on the depth gauge.
- This measurement indicates the length to which the K-wire has been inserted into the phalanx. It may be appropriate to subtract up to 5mm to ensure correct implant placement.
- If the fracture pattern permits and the fragments are adequately reduced, measurement may be taken under fluoroscopy with notches on the depth gauge corresponding to the lengths of the nails provided in the set
- Further confirmation of appropriate size can be made by screening the selected nail over the fracture under fluoroscopy.



# Modified Antegrade Intra-Articular

## PROCEDURAL TECHNIQUE CONTINUED

### 4A. Prepare the Phalanx

- Once implant selection has been confirmed, use the corresponding drill to make the insertion tunnel.
- Pass the cannulated drill bit over the K-wire to the depth required for adequate fixation.
- Remove the drill while taking care to maintain the position of the K-wire.
- Do not remove the K-wire.



Color band corresponds to implant color which identifies size range.

|         |       |           |  |
|---------|-------|-----------|--|
| GOLD    | 2.0mm | 12 - 40mm |  |
| MAGENTA | 2.5mm | 12 - 60mm |  |
| TEAL    | 3.0mm | 25 - 70mm |  |
| PURPLE  | 3.5mm | 25 - 70mm |  |
| BRONZE  | 4.0mm | 35 - 80mm |  |
| GREY    | 5.0mm | 35 - 90mm |  |

### 4B. Metaphyseal Preparation

- The metaphyseal drills are provided to prepare the bone for the implant and reduce forces generated by the implant head.
- Use of a metaphyseal drill is recommended for every case.

**TIP** It is recommended to use a hand drill not a power drill for this section of the technique. This will reduce the risk of drilling further than required.

#### Standard Metaphyseal Drill

- Designed to match the shape of the nail taper excluding the threads.
- Alleviates head forces without altering pull out performance.



Color band corresponds to implant color which identifies size range.

**TIP** If using the standard metaphyseal drill, it is recommended to sink the head completely. This will provide a tight interference fit.

# Modified Antegrade Intra-Articular

## PROCEDURAL TECHNIQUE CONTINUED

### Extended Metaphyseal Drill

- Offers an extended taper (by 2mm) compared to the standard option to facilitate deeper insertion or alleviate head forces.



**TIP:** If using the extended metaphyseal drill, it is recommended to sink the drill head to the bottom of the black laser marking band ensuring it is still visible. This will provide a tight interference fit and assist in alleviating head forces.

### Using the Metaphyseal Hand Drills

- Connect the metaphyseal drill to the handle included in the instrument kit.
- Pass the metaphyseal drill over the K-wire.
- Over drill the insertion hole to prepare the bone for the implant head.
- Remove the drill taking care to maintain K-wire position.
- Do not remove the K-wire.

## 5. Nail Insertion

- Connect the driver to the handle included in the instrument kit.
- When connecting the driver tip to the implant head, push firmly to ensure the instrument is fully seated.
- Pass the implant over the K-wire.
- Attach the driver to the implant head and turn in a clockwise direction.

**TIP:** Ensure axial force is maintained between the driver and the head of the NX Nail during insertion as this will reduce the risk of the driver-implant interface disengaging.

**TIP:** If resistance is felt as the nail is inserted into the isthmus then the nail can be removed and the drill from the next diameter nail used to open the isthmus. Do not drill beyond the isthmus since this will reduce the purchase of the leading thread of the nail. Re-insert the nail after redrilling.

**TIP:** Choose a smaller diameter nail if you experience high resistance or are concerned with propagating a fracture. This nail may also need to be slightly longer than previously selected to ensure the leading tip obtains purchase in cancellous bone.

# Modified Antegrade Intra-Articular

## PROCEDURAL TECHNIQUE CONTINUED

- During insertion, pay attention to the bone while seating the head and take care to avoid distraction or rotation of the fracture.

**TIP.** For anterograde techniques fingers are prone to internal rotation therefore it may be beneficial to take off half a turn during insertion.

- Confirm that the NX Nail head is buried beneath the articular surface into the subchondral bone to avoid joint arthrosis or block motion.
- After confirming the placement of the NX Nail on anteroposterior (AP), lateral and oblique views, the K-wire may be removed.
- Bring the digit through full passive ROM to confirm the fracture is stable and there is no obstruction to motion.
- Check digit cascade to assess for any malrotation.

**Note:** A hex driver head is used for 2.0 and 2.5 NX Nails. A torx driver head is used for 3.0 NX Nail and above.



## 6. Close

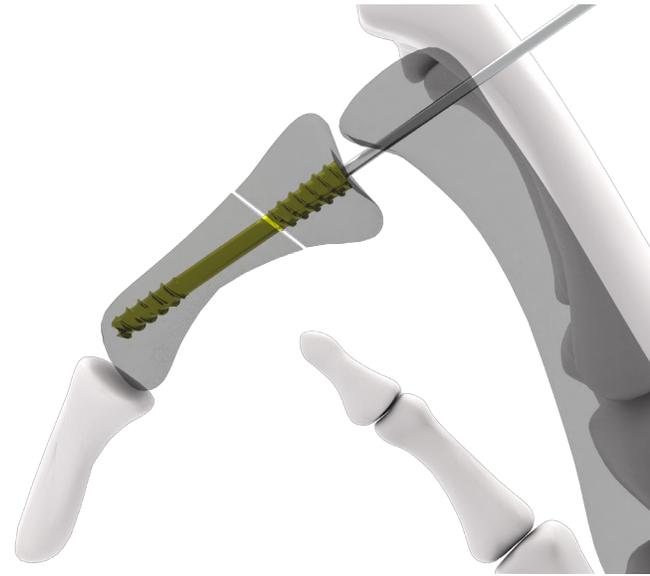
- Close in your preferred method.

# Antegrade Trans-Articular

## PROCEDURAL TECHNIQUE

The antegrade trans-articular approach is useful for fixation of fractures where it is difficult to push the fragment dorsally, unstable multi-fragmentary fractures or cases requiring reconstruction with bone graft.

The trans-articular approach is also advised when it is impossible to achieve sufficient dorsal subluxation of the phalanx.<sup>4</sup> The trans-articular approach permits access to the starting point without requiring excessive flexion or translation through the fracture which can contribute to malrotation. It also provides more stability to the base of the proximal phalanx which in turn limits movements in the axial plane of the phalanx during nail insertion.<sup>5</sup>



**TIP.** A challenge of the antegrade trans-articular technique for proximal phalanx fixation is that the cartilage of the metacarpal head and the base of the proximal phalanx is at risk of damage as the screw is passed through the metacarpophalangeal joint (MCPJ). Similarly, cartilage of the head of the proximal phalanx and the base of the middle phalanx are at risk of damage for middle phalanx fixation as the screw passes through the proximal interphalangeal joint (PIPJ).<sup>6</sup>

## 1. Reduce the Fracture

- Closed reduction can typically be achieved with gentle axial traction and direct pressure near the apex.
- Fractures not reducible by closed means should be reduced percutaneously using reduction clamps and K-wires as required.

### Middle Phalanx

- After closed reduction is achieved, make an incision over the PIPJ.
- Flex the PIPJ to 90 degrees to avoid the risk of fracturing the head of the proximal phalanx during introduction of the nail.

### Proximal Phalanx

- After closed reduction is achieved, make an incision over the MCPJ.
- Flex the MCPJ 60-90 degrees.
- Rotation and digit cascade should be closely monitored both clinically and fluoroscopically at this stage and throughout the duration of K-wire placement and fixation.

**TIP.** Use of K-wires less than 1mm in diameter is not recommended for reduction of the fracture due to the high risk of bending.

## 2. Achieve Temporary Fixation

### Middle Phalanx

- Percutaneously insert a K-wire antegrade from the dorsum of the proximal phalangeal head.
- Progress the K-wire through the middle phalanx along the longitudinal axis. This will temporarily transfix the PIPJ.

# Antegrade Trans-Articular

## PROCEDURAL TECHNIQUE CONTINUED

### Proximal Phalanx

- Percutaneously insert a K-wire antegrade from the dorsum of the metacarpal head.
- Progress the K-wire through the metacarpal into the base of the proximal phalanx along the longitudinal axis. This will temporarily transfix the MCPJ.
- Confirm placement on anteroposterior (AP), lateral and oblique views.

### 3. Measure and Select Nail

- Once reduced, use the depth gauge to determine the diameter and length of the implant required
- Use the longest implant possible to maintain stability, ensuring it is not too long as this can distract the fracture site.

**TIP:** To avoid imposing on the isthmus, measure again on all three radiographs and take the smallest of the three measurements.

#### Confirming Diameter:

- Using the depth gauge, ensure the text 'BONE DIAMETER CAN BE MEASURED HERE' is facing up. The position of this text can change throughout the size ranges so take care to identify it and ensure it is facing up.
- Under fluoroscopy, using the projection angle which gave the smallest isthmus measurement, align the depth gauge with the borders of the isthmus.
- Refer to the size range at the back of this document.
- If passing through the isthmus select a size smaller than the line-to-line fit to ensure the implant can pass through the isthmus without making contact with cortical bone.

**TIP:** The NX Nail achieves stability with the compaction taper head and leading tip. There is no need to achieve fixation within the isthmus. If presented with a line-to-line fit or 'beyond', consider downsizing to avoid stuffing the isthmus.



#### Confirming Length:

- Hold the depth gauge at the proximal entry point of the transfixation k-wire (head of metacarpal or head of proximal phalanx) with the protruding k-wire seated in the groove along the shaft of the depth gauge.
- Traditional measurement based off the exposed length of the k-wire will be incorrect with this technique due to the inclusion of either the metacarpal or proximal phalangeal head.
- For this approach, measurement is best performed under fluoroscopy with notches on the depth gauge matching the lengths of the nails provided in the set.
- Further confirmation of appropriate size can be made by screening the selected nail over the fracture under fluoroscopy.



# Antegrade Trans-Articular

## PROCEDURAL TECHNIQUE CONTINUED

### 4A. Prepare the Phalanx

- Once implant selection has been confirmed, use the corresponding drill to make the insertion tunnel.
- Pass the cannulated drill bit over the K-wire to the depth required for adequate fixation.
- Remove the drill while taking care to maintain the position of the K-wire.
- Do not remove the K-wire.



Color band corresponds to implant color which identifies size range.

|         |       |           |  |
|---------|-------|-----------|--|
| GOLD    | 2.0mm | 12 - 40mm |  |
| MAGENTA | 2.5mm | 12 - 60mm |  |
| TEAL    | 3.0mm | 25 - 70mm |  |
| PURPLE  | 3.5mm | 25 - 70mm |  |
| BRONZE  | 4.0mm | 35 - 80mm |  |
| GREY    | 5.0mm | 35 - 90mm |  |

### 4B. Metaphyseal Preparation

- The metaphyseal drills are provided to prepare the bone for the implant and reduce forces generated by the implant head.
- Use of a metaphyseal drill is recommended for every case.

**TIP.** It is recommended to use a hand drill not a power drill for this section of the technique. This will reduce the risk of drilling further than required.

#### Standard Metaphyseal Drill

- Designed to match the shape of the nail taper excluding the threads.
- Alleviates head forces without altering pull out performance.



Color band corresponds to implant color which identifies size range.

**TIP.** If using the standard metaphyseal drill, it is recommended to sink the head completely. This will provide a tight interference fit.

# Antegrade Trans-Articular

## PROCEDURAL TECHNIQUE CONTINUED

### Extended Metaphyseal Drill

- Offers an extended taper (by 2mm) compared to the standard option to facilitate deeper insertion or alleviate head forces.



**TIP:** If using the extended metaphyseal drill, it is recommended to sink the drill head to the bottom of the black laser marking band ensuring it is still visible. This will provide a tight interference fit and assist in alleviating head forces.

### Using the Metaphyseal Hand Drills

- Connect the metaphyseal drill to the handle included in the instrument kit.
- Pass the metaphyseal drill over the K-wire.
- Over drill the insertion hole to prepare the bone for the implant head.
- Remove the drill taking care to maintain K-wire position.
- Do not remove the K-wire.

## 5. Nail Insertion

- Connect the driver to the handle included in the instrument kit.
- When connecting the driver tip to the implant head, push firmly to ensure the instrument is fully seated.
- Pass the implant over the K-wire.
- Attach the driver to the implant head and turn in a clockwise direction.

**TIP:** Ensure axial force is maintained between the driver and the head of the NX Nail during insertion as this will reduce the risk of the driver-implant interface disengaging.

**TIP:** If resistance is felt as the nail is inserted into the isthmus then the nail can be removed and the drill from the next diameter nail used to open the isthmus. Do not drill beyond the isthmus since this will reduce the purchase of the leading thread of the nail. Re-insert the nail after re-drilling.

**TIP:** Choose a smaller diameter nail if you experience high resistance or are concerned with propagating a fracture. This nail may also need to be slightly longer than previously selected to ensure the leading tip obtains purchase in cancellous bone.

# Antegrade Trans-Articular

## PROCEDURAL TECHNIQUE CONTINUED

- Confirm that the NX Nail head is buried beneath the articular surface into the subchondral bone to avoid joint arthrosis or block motion.
- After confirming the placement of the NX Nail on anteroposterior (AP), lateral and oblique views, the K-wire may be removed.
- Bring the digit through full passive ROM to confirm the fracture is stable and there is no obstruction to motion.
- Check digit cascade to assess for any malrotation.

**Note:** A hex driver head is used for 2.0 and 2.5 NX Nails. A torx driver head is used for 3.0 NX Nail and above.



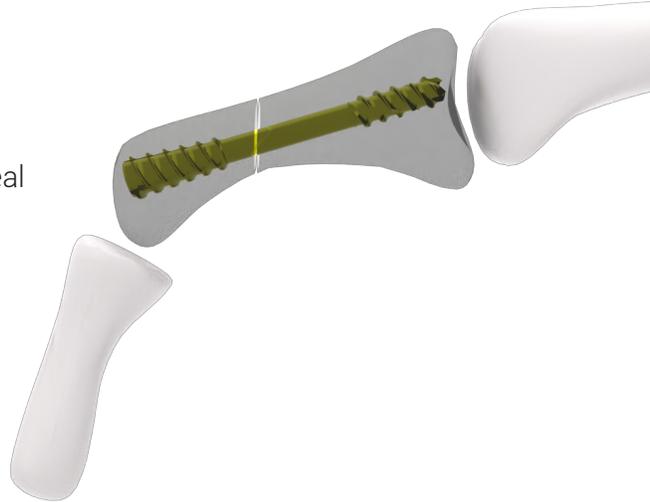
## 6. Close

- Close in your preferred method.

# Retrograde Intra-Articular

## PROCEDURAL TECHNIQUE

The retrograde intra-articular approach can be helpful for unstable extra-articular middle and proximal phalangeal shaft fractures. Retrograde techniques that maximally flex the proximal interphalangeal joint (PIPJ) have also been found to be the most effective for transverse to short oblique fractures.<sup>7</sup>



**TIP.** A challenge of the retrograde technique is ensuring the soft tissue structures are not compromised, including the extensor tendon when approaching through the distal interphalangeal joint (DIPJ) and the central slip when accessing through the PIPJ.

## 1. Reduce the Fracture

### Middle Phalanx

- Make a small longitudinal incision overlying the DIPJ. Care must be taken not to violate the extensor tendon insertion.
- Approach the middle phalanx head between the two lateral bands.
- Flex the DIPJ to 90 degrees.

### Proximal Phalanx

- Make an incision overlying the PIPJ. Approach the head of the proximal phalanx by splitting the central extensor tendon longitudinally proximal to the central slip insertion.
- Flex the PIPJ to 90 degrees.

**TIP.** Use of K-wires less than 1mm in diameter is not recommended for reduction of the fracture due to the high risk of bending.

## 2. Achieve Temporary Fixation

### Middle Phalanx

- Place the K-wire centrally in the head of the middle phalanx and advance it longitudinally down to the base of the middle phalanx in a retrograde direction.

### Proximal Phalanx

- Place the K-wire centrally in the head of the proximal phalanx and advance it longitudinally down to the base of the proximal phalanx in a retrograde direction.
- Rotation and digit cascade should be closely monitored both clinically and fluoroscopically at this stage and throughout the duration of K-wire placement and fixation.
- Confirm placement on anteroposterior (AP), lateral and oblique views.

# Retrograde Intra-Articular

## PROCEDURAL TECHNIQUE CONTINUED

### 3. Measure and Select Nail

- Once reduced, use the depth gauge to determine the diameter and length of the implant required
- Use the longest implant possible to maintain stability, ensuring it is not too long as this can distract the fracture site.

#### Confirming Diameter:

- Using the depth gauge, ensure the text 'BONE DIAMETER CAN BE MEASURED HERE' is facing up. The position of this text can change throughout the size ranges so take care to identify it and ensure it is facing up.
- Under fluoroscopy, using the projection angle which gave the smallest isthmus measurement, align the depth gauge with the borders of the isthmus.
- Refer to the size range at the back of this document.
- If passing through the isthmus select a size smaller than the line-to-line fit to ensure the implant can pass through the isthmus without making contact with cortical bone.

**TIP:** The NX Nail achieves stability with the compaction taper head and leading tip. There is no need to achieve fixation within the isthmus. If presented with a line-to-line fit or 'beyond', consider downsizing to avoid stuffing the isthmus.



#### Confirming Length:

- Hold the depth gauge against the head of the phalanx, with the protruding K-wire seated in the groove along the shaft of the depth gauge.
- Measure the exposed length of the K-wire against the markings on the depth gauge.
- This measurement indicates the length to which the K-wire has been inserted into the phalanx. It may be appropriate to subtract up to 5mm to ensure correct implant placement.
- If the fracture pattern permits and the fragments are adequately reduced, measurement may be taken under fluoroscopy with notches on the depth gauge corresponding to the lengths of the nails provided in the set.



- Further confirmation of appropriate size can be made by screening the selected nail over the fracture under fluoroscopy.

# Retrograde Intra-Articular

## PROCEDURAL TECHNIQUE CONTINUED

### 4A. Prepare the Phalanx

- Once implant selection has been confirmed, use the corresponding drill to make the insertion tunnel.
- Pass the cannulated drill bit over the K-wire to the depth required for adequate fixation.
- Remove the drill while taking care to maintain the position of the K-wire.
- Do not remove the K-wire.



Color band corresponds to implant color which identifies size range.

|         |       |           |  |
|---------|-------|-----------|--|
| GOLD    | 2.0mm | 12 - 40mm |  |
| MAGENTA | 2.5mm | 12 - 60mm |  |
| TEAL    | 3.0mm | 25 - 70mm |  |
| PURPLE  | 3.5mm | 25 - 70mm |  |
| BRONZE  | 4.0mm | 35 - 80mm |  |
| GREY    | 5.0mm | 35 - 90mm |  |

### 4B. Metaphyseal Preparation

- The metaphyseal drills are provided to prepare the bone for the implant and reduce forces generated by the implant head.
- Use of a metaphyseal drill is recommended for every case.

**TIP:** It is recommended to use a hand drill not a power drill for this section of the technique. This will reduce the risk of drilling further than required.

#### Standard Metaphyseal Drill

- Designed to match the shape of the nail taper excluding the threads.
- Alleviates head forces without altering pull out performance.



Color band corresponds to implant color which identifies size range.

**TIP:** If using the standard metaphyseal drill, it is recommended to sink the head completely. This will provide a tight interference fit.

# Retrograde Intra-Articular

## PROCEDURAL TECHNIQUE CONTINUED

### Extended Metaphyseal Drill

- Offers an extended taper (by 2mm) compared to the standard option to facilitate deeper insertion or alleviate head forces.



**TIP:** If using the extended metaphyseal drill, it is recommended to sink the drill head to the bottom of the black laser marking band ensuring it is still visible. This will provide a tight interference fit and assist in alleviating head forces.

### Using the Metaphyseal Hand Drills

- Connect the metaphyseal drill to the handle included in the instrument kit.
- Pass the metaphyseal drill over the K-wire.
- Over drill the insertion hole to prepare the bone for the implant head.
- Remove the drill taking care to maintain K-wire position.
- Do not remove the K-wire.

## 5. Nail Insertion

- Connect the driver to the handle included in the instrument kit.
- When connecting the driver tip to the implant head, push firmly to ensure the instrument is fully seated.
- Pass the implant over the K-wire.
- Attach the driver to the implant head and turn in a clockwise direction.

**TIP:** Ensure axial force is maintained between the driver and the head of the NX Nail during insertion as this will reduce the risk of the driver-implant interface disengaging.

**TIP:** If resistance is felt as the nail is inserted into the isthmus then the nail can be removed and the drill from the next diameter nail used to open the isthmus. Do not drill beyond the isthmus since this will reduce the purchase of the leading thread of the nail. Re-insert the nail after re-drilling.

**TIP:** Choose a smaller diameter nail if you experience high resistance or are concerned with propagating a fracture. This nail may also need to be slightly longer than previously selected to ensure the leading tip obtains purchase in cancellous bone.

# Retrograde Intra-Articular

## PROCEDURAL TECHNIQUE CONTINUED

- During insertion, pay attention to the bone while seating the head and take care to avoid distraction or rotation of the fracture.
- Confirm that the NX Nail head is buried beneath the articular surface into the subchondral bone to avoid joint arthrosis or block motion.
- After confirming the placement of the NX Nail on anteroposterior (AP), lateral and oblique views, the K-wire may be removed.
- Bring the digit through full passive ROM to confirm the fracture is stable and there is no obstruction to motion.
- Check digit cascade to assess for any malrotation.



**Note:** A hex driver head is used for 2.0 and 2.5 NX Nails. A torx driver head is used for 3.0 NX Nail and above.



## 6. Close

- Due to the small size of the dorsal defect required to obtain the starting position, repair of the extensor mechanism is not routinely performed.
- If a larger entry point was required for fixation, repair is to be carried out.
- Close in your preferred method.

# Retrograde Intra-Articular with Blocking Screw

## PROCEDURAL TECHNIQUE

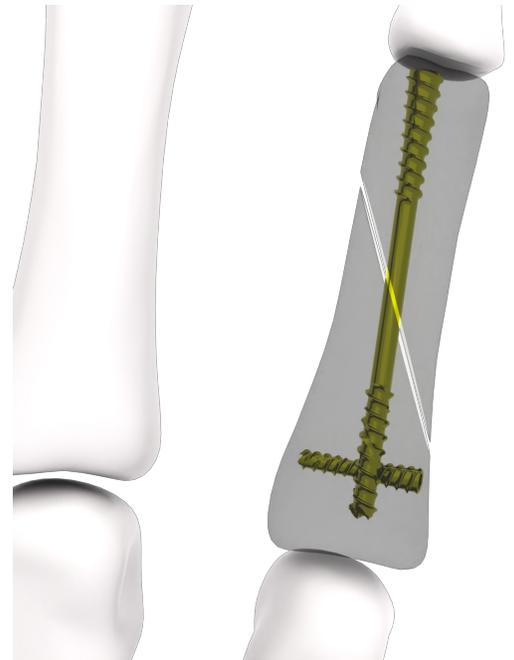
Blocking constructs are used in conjunction with an intramedullary nail for proximal and shaft fractures requiring increased stability.<sup>8</sup>

The blocking nail is placed radial to ulna, or ulna to radial, along the volar aspect of the phalanx. By decreasing the width and functional size of the capacious medullary canal rotational stability of the construct is improved.<sup>8</sup>

**First, follow surgical technique outlined above for retrograde intramedullary nail (IM nail) approach.**

## 1. Blocking Screw Insertion

- Percutaneously place a K-wire volar (anterior) to the IM nail from either radial to ulna or ulna to radial (pending fracture pattern) into the metaphyseal portion of the base of the proximal or middle phalanx.
- Use the depth gauge to determine the length of the implant required by seating the protruding K-wire in the groove along the shaft of the depth gauge and measuring the exposed length of the K-wire against the markings on the depth gauge.
- Pass the implant over the K-wire. Attach the driver to the implant head and turn in a clockwise direction to insert the nail.
- Confirm placement of both NX Nails on anteroposterior (AP), lateral and oblique views.
- Remove the K-wires.
- Bring the digit through full passive ROM to confirm the fracture is stable and there is no obstruction to motion.
- Check digit cascade to assess for any malrotation.
- Close the percutaneous entry point using your preferred method.



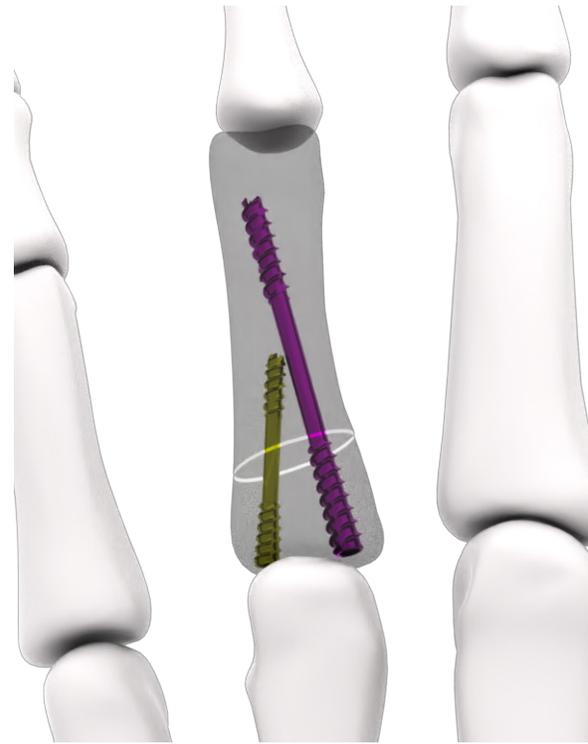
# Modified Y Construct

## Dual Antegrade Intra-Articular

### PROCEDURAL TECHNIQUE

The modified Y construct<sup>6</sup> is achieved by sequentially inserting first one long NX Nail and one shorter oblique NX Nail in a Y configuration. This approach requires an intentional split of the extensor mechanism.

This construct has been shown to be useful for unstable proximal third fractures and significantly comminuted, extraarticular or subchondral fractures of the phalanx. The modified Y construct aims to increase stability in fractures lacking in circumferential cortical support.<sup>9</sup>



**TIP:** Ensure the canal is wide enough for two implants in the anteroposterior dimension to minimize risk of malrotation.

## 1. Reduce the Fracture

- Closed reduction can typically be achieved with gentle axial traction and direct pressure near the apex.
- Fractures not reducible by closed means should be reduced percutaneously using reduction clamps and K-wires as required.

**TIP:** Use of K-wires less than 1mm in diameter is not recommended for reduction of the fracture due to the high risk of bending.

## 2. Achieve Temporary Fixation

### Middle Phalanx

- Make an incision over the proximal interphalangeal joint (PIPJ).
- Flex the PIPJ 60-75 degrees while pressing the proximal end of the middle phalanx dorsally. Gently subluxing the joint will facilitate K-wire insertion.
- Direct the K-wire in a slightly oblique trajectory along the long axis of the phalanx.
- Pending fracture configuration, insert a second K-wire into the base of the middle phalanx via either the radial or ulna side.

### Proximal Phalanx

- Make an incision over the metacarpophalangeal joint (MCPJ).
- Flex the MCPJ 60-75 degrees while pressing the proximal end of the phalanx dorsally. Gently subluxing the joint will facilitate K-wire insertion.
- Direct the K-wire in a slightly oblique trajectory along the long axis of the phalanx.
- Pending fracture configuration, insert a second K-wire into the base of the proximal phalanx via either the radial or ulna side.
- This will create a triangular construct with the first K-wire in multiple planes.
- Confirm placement on anteroposterior (AP), lateral and oblique views.

# Modified Y Construct

## Dual Antegrade Intra-Articular

PROCEDURAL TECHNIQUE CONTINUED

### 3. Measure and Select Nail

- Once reduced, use the depth gauge to determine the diameter and length of the implant required

**TIP:** The second implant is positioned more obliquely than the first and will therefore be shorter.

#### Confirming Diameter:

- Using the depth gauge, ensure the text 'BONE DIAMETER CAN BE MEASURED HERE' is facing up. The position of this text can change throughout the size ranges so take care to identify it and ensure it is facing up.
- Under fluoroscopy, using the projection angle which gave the smallest isthmus measurement, align the depth gauge with the borders of the isthmus.
- Refer to the size range at the back of this document.
- If passing through the isthmus select a size smaller than the line-to-line fit to ensure the implant can pass through the isthmus without making contact with cortical bone.

**TIP:** The NX Nail achieves stability with the compaction taper head and leading tip. There is no need to achieve fixation within the isthmus. If presented with a line-to-line fit or 'beyond', consider downsizing to avoid stuffing the isthmus.



#### Confirming Length:

- Hold the depth gauge, with the protruding K-wire seated in the groove along the shaft of the depth gauge.
- Measure the exposed length of the K-wire against the markings on the depth gauge.
- This measurement indicates the length to which the K-wire has been inserted into the phalanx. It may be appropriate to subtract up to 5mm to ensure correct implant placement.
- If the fracture pattern permits and the fragments are adequately reduced, measurement may be taken under fluoroscopy with notches on the depth gauge corresponding to the lengths of the nails provided in the set.



- Further confirmation of appropriate size can be made by screening the selected nail over the fracture under fluoroscopy.

# Modified Y Construct Dual Antegrade Intra-Articular

PROCEDURAL TECHNIQUE CONTINUED

## 4A. Prepare the Phalanx

- Once implant selection has been confirmed, use the corresponding drill to make the insertion tunnel.
- Pass the cannulated drill bit over the K-wire to the depth required for adequate fixation.
- Remove the drill while taking care to maintain the position of the K-wire.
- Do not remove the K-wire.



Color band corresponds to implant color which identifies size range.

|         |       |           |   |
|---------|-------|-----------|---|
| GOLD    | 2.0mm | 12 - 40mm |    |
| MAGENTA | 2.5mm | 12 - 60mm |    |
| TEAL    | 3.0mm | 25 - 70mm |    |
| PURPLE  | 3.5mm | 25 - 70mm |    |
| BRONZE  | 4.0mm | 35 - 80mm |    |
| GREY    | 5.0mm | 35 - 90mm |  |

## 4B. Metaphyseal Preparation

- The metaphyseal drills are provided to prepare the bone for the implant and reduce forces generated by the implant head.
- Use of a metaphyseal drill is recommended for every case.

**TIP.** It is recommended to use a hand drill not a power drill for this section of the technique. This will reduce the risk of drilling further than required.

### Standard Metaphyseal Drill

- Designed to match the shape of the nail taper excluding the threads.
- Alleviates head forces without altering pull out performance.



Color band corresponds to implant color which identifies size range.

**TIP.** If using the standard metaphyseal drill, it is recommended to sink the head completely. This will provide a tight interference fit.

# Modified Y Construct Dual Antegrade Intra-Articular

## PROCEDURAL TECHNIQUE CONTINUED

### Extended Metaphyseal Drill

- Offers an extended taper (by 2mm) compared to the standard option to facilitate deeper insertion or alleviate head forces.



**TIP.** If using the extended metaphyseal drill, it is recommended to sink the drill head to the bottom of the black laser marking band ensuring it is still visible. This will provide a tight interference fit and assist in alleviating head forces.

### Using the Metaphyseal Hand Drills

- Connect the metaphyseal drill to the handle included in the instrument kit.
- Pass the metaphyseal drill over the K-wire.
- Over drill the insertion hole to prepare the bone for the implant head.
- Remove the drill taking care to maintain K-wire position.
- Do not remove the K-wire.

## 5. Nail Insertion

- Connect the driver to the handle included in the instrument kit.
- When connecting the driver tip to the implant head, push firmly to ensure the instrument is fully seated.
- Pass the implant over the K-wire.
- Attach the driver to the implant head and turn in a clockwise direction.

**TIP.** Ensure axial force is maintained between the driver and the head of the NX Nail during insertion as this will reduce the risk of the driver-implant interface disengaging.

**TIP.** If resistance is felt as the nail is inserted into the isthmus then the nail can be removed and the drill from the next diameter nail used to open the isthmus. Do not drill beyond the isthmus since this will reduce the purchase of the leading thread of the nail. Re-insert the nail after re-drilling.

**TIP.** Choose a smaller diameter nail if you experience high resistance or are concerned with propagating a fracture. This nail may also need to be slightly longer than previously selected to ensure the leading tip obtains purchase in cancellous bone.

# Modified Y Construct

## Dual Antegrade Intra-Articular

### PROCEDURAL TECHNIQUE CONTINUED

- During insertion, pay attention to the bone while seating the head and take care to avoid distraction or rotation of the fracture.
- Confirm that the heads of both NX Nails are buried beneath the articular surface into the subchondral bone to avoid joint arthrosis or block motion.
- After confirming the placement of the NX Nails on anteroposterior (AP), lateral and oblique views, the K-wires may be removed.
- Bring the digit through full passive ROM to confirm the fracture is stable and there is no obstruction to motion.
- Check digit cascade to assess for any malrotation.

**Note:** A hex driver head is used for 2.0 and 2.5 NX Nails. A torx driver head is used for 3.0 NX Nail and above.



## 6. Close

- Close in your preferred method.

# V Construct

## Double Barrel Fixation

### PROCEDURAL TECHNIQUE

Implant convergence resists shortening, while uniform nail lengths distribute loads more evenly.<sup>10</sup> Maximizing nail length enhances resistance against bending and rotation, as well as providing greater stability through increased bony purchase. Studies demonstrate that using two implants improves rotational stability compared to a single implant.<sup>11</sup>

**TIP:** Nails are converging but not crossing.

## 1. Reduce the Fracture

### Middle Phalanx

- Make an incision over the proximal interphalangeal joint (PIPJ).
- Flex the PIPJ 60-75 degrees while pressing the proximal end of the middle phalanx dorsally. Gently sublaxing the joint will facilitate K-wire insertion.

### Proximal Phalanx

- Make an incision over the metacarpophalangeal joint (MCPJ).
- Flex the MCPJ 60-75 degrees while pressing the proximal end of the phalanx dorsally. Gently sublaxing the joint will facilitate K-wire insertion.

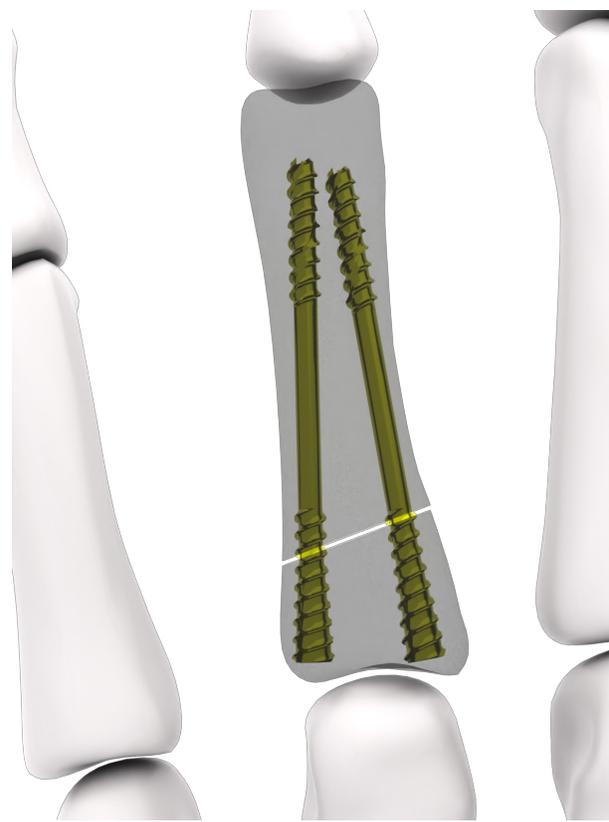
## 2. Achieve Temporary Fixation

### Middle Phalanx

- Direct a K-wire centrally through the base of the middle phalanx into the intramedullary canal to maintain reduction.

**TIP:** In very unstable fractures, this K-wire can be placed over the head of the proximal phalanx into the base of the middle phalanx in a dorsally sublaxated position and then advanced after the shaft is reduced to the base, provisionally stabilizing the reduction. This allows antegrade access to the middle phalanx intramedullary canal from the phalangeal

- Confirm placement radiographically.
- Manually maintain flexion of the PIPJ obtained during reduction for the remaining process of fixation.
- Make small stab incisions at the level of the collateral recess of the proximal phalanx head, both medially and laterally.
- Insert a K-wire through each incision into the base of the middle phalanx on the radial and ulna aspect of the central K-wire to minimize trauma to the central portion of the extensor mechanism.
- Advance the K-wire distally across the fracture site, spanning the entire length of the phalanx into the subchondral bone of the middle phalangeal head.
- A second K-wire is placed on the other side of the central K-wire in a similar manner.
- Confirm placement on anteroposterior (AP), lateral and oblique views.



# V Construct

## Double Barrel Fixation

PROCEDURAL TECHNIQUE CONTINUED

### Proximal Phalanx

- Direct a K-wire centrally through the base of the proximal phalanx into the intramedullary canal to maintain reduction.

**TIP.** In very unstable fractures, this K-wire can be placed over the head of the proximal phalanx into the base of the middle phalanx in a dorsally subluxated position and then advanced after the shaft is reduced to the base, provisionally stabilizing the reduction. This allows antegrade access to the middle phalanx intramedullary canal from the phalangeal base.

- Confirm placement radiographically.
- Manually maintain flexion of the MCPJ obtained during reduction for the remaining process of fixation.
- Make small stab incisions at the level of the collateral recess of the metacarpal heads, both medially and laterally.
- Insert a K-wire through each incision into the base of the proximal phalanx on the radial and ulna aspect of the central K-wire to minimize trauma to the central portion of the extensor mechanism.
- Advance the K-wire distally across the fracture site, spanning the entire length of the phalanx into the subchondral bone of the proximal phalangeal head.
- A second K-wire is placed on the other side of the central K-wire in a similar manner.
- Confirm placement on anteroposterior (AP), lateral and oblique views.

**TIP.** Subchondral placement helps prevent premature K-wire pullout during drilling.

### 3. Measure and Select Nail

- Once reduced, use the depth gauge to determine the diameter and length of the implant required

#### Confirming Diameter:

- Using the depth gauge, ensure the text 'BONE DIAMETER CAN BE MEASURED HERE' is facing up. The position of this text can change throughout the size ranges so take care to identify it and ensure it is facing up.
- Under fluoroscopy, using the projection angle which gave the smallest isthmus measurement, align the depth gauge with the borders of the isthmus.
- Refer to the size range at the back of this document.
- If passing through the isthmus select a size smaller than the line-to-line fit to ensure the implant can pass through the isthmus without making contact with cortical bone.

**TIP.** The NX Nail achieves stability with the compaction taper head and leading tip. There is no need to achieve fixation within the isthmus. If presented with a line-to-line fit or 'beyond', consider downsizing to avoid stuffing the isthmus.



# V Construct

## Double Barrel Fixation

PROCEDURAL TECHNIQUE CONTINUED

### Confirming Length:

- Hold the depth gauge, with the protruding K-wire seated in the groove along the shaft of the depth gauge.
- Measure the exposed length of the K-wire against the markings on the depth gauge.
- This measurement indicates the length to which the K-wire has been inserted into the phalanx. It may be appropriate to subtract up to 5mm to ensure correct implant placement.
- If the fracture pattern permits and the fragments are adequately reduced, measurement may be taken under fluoroscopy with notches on the depth gauge corresponding to the lengths of the nails provided in the set.



- Further confirmation of appropriate size can be made by screening the selected nail over the fracture under fluoroscopy.

### 4A. Prepare the Phalanx

- Once implant selection has been confirmed, use the corresponding drill to make the insertion tunnel.
- Pass the cannulated drill bit over the K-wire to the depth required for adequate fixation.
- Remove the drill while taking care to maintain the position of the K-wire.
- Do not remove the K-wire.



Color band corresponds to implant color which identifies size range.

|         |       |           |  |
|---------|-------|-----------|--|
| GOLD    | 2.0mm | 12 - 40mm |  |
| MAGENTA | 2.5mm | 12 - 60mm |  |
| TEAL    | 3.0mm | 25 - 70mm |  |
| PURPLE  | 3.5mm | 25 - 70mm |  |
| BRONZE  | 4.0mm | 35 - 80mm |  |
| GREY    | 5.0mm | 35 - 90mm |  |

# V Construct

## Double Barrel Fixation

PROCEDURAL TECHNIQUE CONTINUED

### 4B. Metaphyseal Preparation

- The metaphyseal drills are provided to prepare the bone for the implant and reduce forces generated by the implant head.
- Use of a metaphyseal drill is recommended for every case.

**TIP.** It is recommended to use a hand drill not a power drill for this section of the technique. This will reduce the risk of drilling further than required.

#### Standard Metaphyseal Drill

- Designed to match the shape of the nail taper excluding the threads.
- Alleviates head forces without altering pull out performance.



Color band corresponds to implant color which identifies size range.

**TIP.** If using the standard metaphyseal drill, it is recommended to sink the head completely. This will provide a tight interference fit.

#### Extended Metaphyseal Drill

- Offers an extended taper (by 2mm) compared to the standard option to facilitate deeper insertion or alleviate head forces.



Color band corresponds to implant color and size range.

Distinguishes from Standard Meta Drill

Laser marking identifies 2mm taper extension when compared to the standard.

**TIP.** If using the extended metaphyseal drill, it is recommended to sink the drill head to the bottom of the black laser marking band ensuring it is still visible. This will provide a tight interference fit and assist in alleviating head forces.

#### Using the Metaphyseal Hand Drills

- Connect the metaphyseal drill to the handle included in the instrument kit.
- Pass the metaphyseal drill over the K-wire.
- Over drill the insertion hole to prepare the bone for the implant head.
- Remove the drill taking care to maintain K-wire position.
- Do not remove the K-wire.

# V Construct

## Double Barrel Fixation

PROCEDURAL TECHNIQUE CONTINUED

### 5. Nail Insertion

- Connect the driver to the handle included in the instrument kit.
- When connecting the driver tip to the implant head, push firmly to ensure the instrument is fully seated.
- Pass the implant over the K-wire.
- Attach the driver to the implant head and turn in a clockwise direction.

**TIP:** Ensure axial force is maintained between the driver and the head of the NX Nail during insertion as this will reduce the risk of the driver-implant interface disengaging.

**TIP:** If resistance is felt as the nail is inserted into the isthmus then the nail can be removed and the drill from the next diameter nail used to open the isthmus. Do not drill beyond the isthmus since this will reduce the purchase of the leading thread of the nail. Re-insert the nail after re-drilling.

**TIP:** Choose a smaller diameter nail if you experience high resistance or are concerned with propagating a fracture. This nail may also need to be slightly longer than previously selected to ensure the leading tip obtains purchase in cancellous bone.

- During insertion, pay attention to the bone while seating the head and take care to avoid distraction or rotation of the fracture.
- Confirm that the heads of both NX Nails are buried beneath the articular surface into the subchondral bone to avoid joint arthrosis or block motion.
- After confirming the placement of the NX Nails on anteroposterior (AP), lateral and oblique views, the K-wires may be removed.
- Bring the digit through full passive ROM to confirm the fracture is stable and there is no obstruction to motion.
- Check digit cascade to assess for any malrotation.

**Note:** A hex driver head is used for 2.0 and 2.5 NX Nails. A torx driver head is used for 3.0 NX Nail and above.



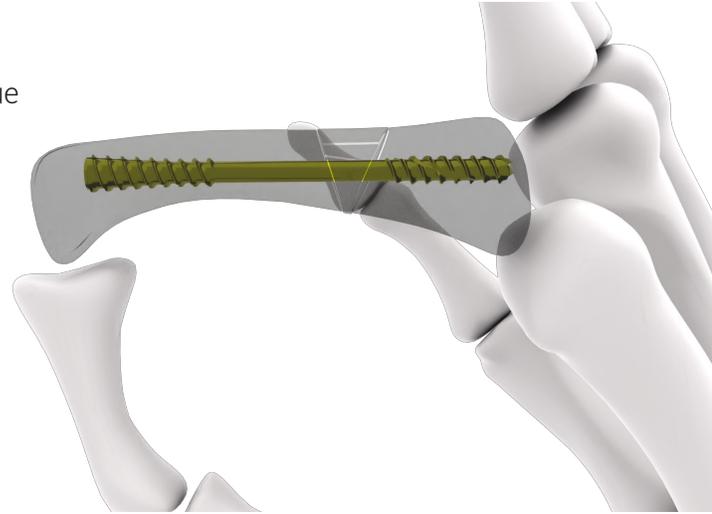
### 6. Close

- Close in your preferred method.

# Axial Strutting Construct

## PROCEDURAL TECHNIQUE

In axial strutting, the NX Nail is inserted as dorsally as possible within the phalanx at a shorter length than the standard technique so that the nail head is buried deep within the medullary canal once the leading tip of the nail engages the distal subchondral bone. This allows the implant to act as a girder because of its proximal fixation within the isthmus of the medullary canal, providing a dorsal cortical substitution.<sup>7</sup>



## 1. Reduce the Fracture

### Middle Phalanx

- Make an incision over the head of the middle phalanx.
- Maximally flex the distal interphalangeal joint (DIPJ).

### Proximal Phalanx

- Make an incision over the head of the proximal phalanx.
- Maximally flex the proximal interphalangeal joint (PIPJ).
- Split the central band longitudinally and retract to expose the head of the proximal phalanx.

## 2. Achieve Temporary Fixation

- Position a K-wire into the head of the phalanx and advance it in a retrograde direction along the medullary canal as dorsally as possible.
- Confirm placement radiographically.

## 3. Measure and Select Nail

- Once reduced, use the depth gauge to determine the diameter and length of the implant required
- Use the longest implant possible to maintain stability, ensuring it is not too long as this can distract the fracture site.

### Confirming Diameter:

- Using the depth gauge, ensure the text 'BONE DIAMETER CAN BE MEASURED HERE' is facing up. The position of this text can change throughout the size ranges so take care to identify it and ensure it is facing up.
- Under fluoroscopy, using the projection angle which gave the smallest isthmus measurement, align the depth gauge with the borders of the isthmus.
- Refer to the size range at the back of this document.

**TIP:** The NX Nail achieves stability with the compaction taper head and leading tip. There is no need to achieve fixation within the isthmus. If presented with a line-to-line fit or 'beyond', consider downsizing to avoid stuffing the isthmus.

← BONE DIAMETER CAN BE MEASURED HERE →

# Axial Strutting Construct

## PROCEDURAL TECHNIQUE CONTINUED

### Confirming Length:

- Hold the depth gauge against the head of the phalanx, with the protruding K-wire seated in the groove along the shaft of the depth gauge.
- Measure the exposed length of the K-wire against the markings on the depth gauge.
- This measurement indicates the length to which the K-wire has been inserted into the phalanx. It may be appropriate to subtract up to 5mm to ensure correct implant placement.
- If the fracture pattern permits and the fragments are adequately reduced, measurement may be taken under fluoroscopy with notches on the depth gauge corresponding to the lengths of the nails provided in the set.



- Further confirmation of appropriate size can be made by screening the selected nail over the fracture under fluoroscopy.

### 4A. Prepare the Phalanx

- Once implant selection has been confirmed, use the corresponding drill to make the insertion tunnel.
- Pass the cannulated drill bit over the K-wire to the depth required for adequate fixation.
- Remove the drill while taking care to maintain the position of the K-wire.
- Do not remove the K-wire.



Color band corresponds to implant color which identifies size range.

|         |       |           |  |
|---------|-------|-----------|--|
| GOLD    | 2.0mm | 12 - 40mm |  |
| MAGENTA | 2.5mm | 12 - 60mm |  |
| TEAL    | 3.0mm | 25 - 70mm |  |
| PURPLE  | 3.5mm | 25 - 70mm |  |
| BRONZE  | 4.0mm | 35 - 80mm |  |
| GREY    | 5.0mm | 35 - 90mm |  |

# Axial Strutting Construct

## PROCEDURAL TECHNIQUE CONTINUED

### 4B. Metaphyseal Preparation

- The metaphyseal drills are provided to prepare the bone for the implant and reduce forces generated by the implant head.
- Use of a metaphyseal drill is recommended for every case.

**TIP.** It is recommended to use a hand drill not a power drill for this section of the technique. This will reduce the risk of drilling further than required.

#### Standard Metaphyseal Drill

- Designed to match the shape of the nail taper excluding the threads.
- Alleviates head forces without altering pull out performance.



Color band corresponds to implant color which identifies size range.

**TIP.** If using the standard metaphyseal drill, it is recommended to sink the head completely. This will provide a tight interference fit.

#### Extended Metaphyseal Drill

- Offers an extended taper (by 2mm) compared to the standard option to facilitate deeper insertion or alleviate head forces.



Color band corresponds to implant color and size range.

Distinguishes from Standard Meta Drill

Laser marking identifies 2mm taper extension when compared to the standard.

**TIP.** If using the extended metaphyseal drill, it is recommended to sink the drill head to the bottom of the black laser marking band ensuring it is still visible. This will provide a tight interference fit and assist in alleviating head forces.

#### Using the Metaphyseal Hand Drills

- Connect the metaphyseal drill to the handle included in the instrument kit.
- Pass the metaphyseal drill over the K-wire.
- Over drill the insertion hole to prepare the bone for the implant head.
- Remove the drill taking care to maintain K-wire position.
- Do not remove the K-wire.

# Axial Strutting Construct

## PROCEDURAL TECHNIQUE CONTINUED

### 5. Nail Insertion

- Connect the driver to the handle included in the instrument kit.
- When connecting the driver tip to the implant head, push firmly to ensure the instrument is fully seated.
- Pass the implant over the K-wire.
- Attach the driver to the implant head and turn in a clockwise direction.

**TIP:** Ensure axial force is maintained between the driver and the head of the NX Nail during insertion as this will reduce the risk of the driver-implant interface disengaging.

**TIP:** If resistance is felt as the nail is inserted into the isthmus then the nail can be removed and the drill from the next diameter nail used to open the isthmus. Do not drill beyond the isthmus since this will reduce the purchase of the leading thread of the nail. Re-insert the nail after re-drilling.

**TIP:** Choose a smaller diameter nail if you experience high resistance or are concerned with propagating a fracture. This nail may also need to be slightly longer than previously selected to ensure the leading tip obtains purchase in cancellous bone.

- During insertion, pay attention to the bone while seating the head and take care to avoid distraction or rotation of the fracture.
- Confirm that the heads of both NX Nails are buried beneath the articular surface into the subchondral bone to avoid joint arthrosis or block motion.
- After confirming the placement of the NX Nails on anteroposterior (AP), lateral and oblique views, the K-wires may be removed.
- Bring the digit through full passive ROM to confirm the fracture is stable and there is no obstruction to motion.
- Check digit cascade to assess for any malrotation.

**Note:** A hex driver head is used for 2.0 and 2.5 NX Nails. A torx driver head is used for 3.0 NX Nail and above.



### 6. Close

- Due to the small size of the dorsal defect required to obtain the starting position, repair of the extensor mechanism is not routinely performed.
- If a larger entry point was required for fixation, repair is to be carried out.
- Close in your preferred method.

# X Construct

## Dual Antegrade Intra-Articular

### PROCEDURAL TECHNIQUE

Antegrade insertion of dual NX Nails is performed through the base of the phalanx with a crossed configuration. This technique necessitates an intentional split of the extensor mechanism and risks malrotation if used in canals that are not wide enough for two implants in the anteroposterior dimension.

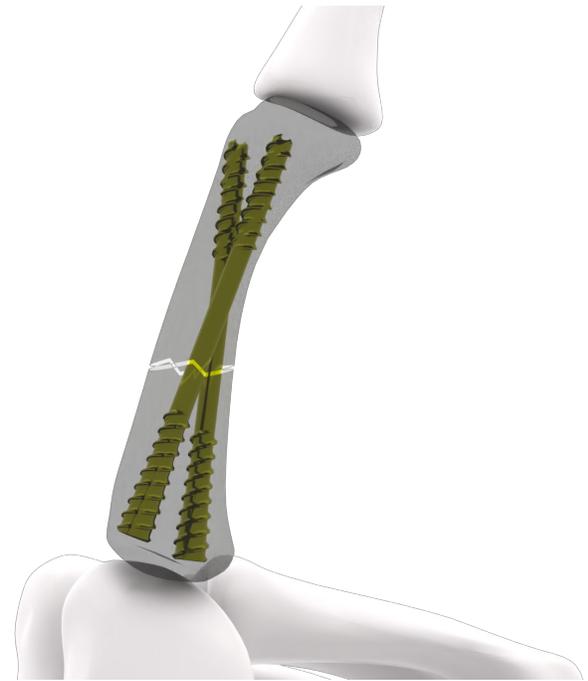
## 1. Reduce the Fracture

### Middle Phalanx

- Make an incision over the proximal interphalangeal joint (PIPJ).
- Flex the PIPJ 60-75 degrees while pressing the proximal end of the middle phalanx dorsally. Gently subluxing the joint will facilitate K-wire insertion.

### Proximal Phalanx

- Make an incision over the metacarpophalangeal joint (MCPJ).
- Flex the MCPJ 60-75 degrees while pressing the proximal end of the phalanx dorsally. Gently subluxing the joint will facilitate K-wire insertion.



## 2. Achieve Temporary Fixation

### Middle Phalanx

- Direct a K-wire centrally through the base of the middle phalanx into the intramedullary canal to maintain reduction.

**TIP.** In very unstable fractures, this K-wire can be placed over the head of the proximal phalanx into the base of the middle phalanx in a dorsally subluxated position and then advanced after the shaft is reduced to the base, provisionally stabilizing the reduction. This allows antegrade access to the middle phalanx intramedullary canal from the phalangeal

- Confirm placement radiographically.
- Manually maintain flexion of the PIPJ obtained during reduction for the remaining process of fixation.
- Make small stab incisions at the level of the collateral recess of the proximal phalanx head, both medially and laterally.
- Insert a K-wire through each incision into the base of the middle phalanx on the radial and ulna aspect of the central K-wire to minimize trauma to the central portion of the extensor mechanism.
- Advance the K-wire distally across the fracture site, spanning the entire length of the phalanx into the subchondral bone of the middle phalangeal head.
- A second K-wire is placed on the other side of the central K-wire in a similar manner.
- Confirm placement on anteroposterior (AP), lateral and oblique views.

# X Construct

## Dual Antegrade Intra-Articular

PROCEDURAL TECHNIQUE CONTINUED

### Proximal Phalanx

- Direct a K-wire centrally through the base of the proximal phalanx into the intramedullary canal to maintain reduction.

**TIP.** In very unstable fractures, this K-wire can be placed over the head of the proximal phalanx into the base of the middle phalanx in a dorsally subluxated position and then advanced after the shaft is reduced to the base, provisionally stabilizing the reduction. This allows antegrade access to the middle phalanx intramedullary canal from the phalangeal base.

- Manually maintain flexion of the MCPJ obtained during reduction for the remaining process of fixation.
- Make small stab incisions at the level of the collateral recess of the metacarpal heads, both medially and laterally.
- Insert a K-wire through each incision into the base of the proximal phalanx on the radial and ulna aspect of the central K-wire to minimize trauma to the central portion of the extensor mechanism.
- Advance the K-wire distally across the fracture site, spanning the entire length of the phalanx into the subchondral bone of the proximal phalangeal head.
- A second K-wire is placed on the other side of the central K-wire in a similar manner.
- Confirm placement on anteroposterior (AP), lateral and oblique views.

**TIP.** Subchondral placement helps prevent premature K-wire pullout during drilling.

### 3. Measure and Select Nail

- Once reduced, use the depth gauge to determine the diameter and length of the implant required

#### Confirming Diameter:

- Using the depth gauge, ensure the text 'BONE DIAMETER CAN BE MEASURED HERE' is facing up. The position of this text can change throughout the size ranges so take care to identify it and ensure it is facing up.
- Under fluoroscopy, using the projection angle which gave the smallest isthmus measurement, align the depth gauge with the borders of the isthmus.
- Refer to the size range at the back of this document.
- If passing through the isthmus select a size smaller than the line-to-line fit to ensure the implant can pass through the isthmus without making contact with cortical bone.

**TIP.** The NX Nail achieves stability with the compaction taper head and leading tip. There is no need to achieve fixation within the isthmus. If presented with a line-to-line fit or 'beyond', consider downsizing to avoid stuffing the isthmus.



# X Construct

## Dual Antegrade Intra-Articular

PROCEDURAL TECHNIQUE CONTINUED

### Confirming Length:

- Hold the depth gauge, with the protruding K-wire seated in the groove along the shaft of the depth gauge.
- Measure the exposed length of the K-wire against the markings on the depth gauge.
- This measurement indicates the length to which the K-wire has been inserted into the phalanx. It may be appropriate to subtract up to 5mm to ensure correct implant placement.
- If the fracture pattern permits and the fragments are adequately reduced, measurement may be taken under fluoroscopy with notches on the depth gauge corresponding to the lengths of the nails provided in the set.



- Further confirmation of appropriate size can be made by screening the selected nail over the fracture under fluoroscopy.

### 4A. Prepare the Phalanx

- Once implant selection has been confirmed, use the corresponding drill to make the insertion tunnel.
- Pass the cannulated drill bit over the K-wire to the depth required for adequate fixation.
- Remove the drill while taking care to maintain the position of the K-wire.
- Do not remove the K-wires.



Color band corresponds to implant color which identifies size range.

|         |       |           |  |
|---------|-------|-----------|--|
| GOLD    | 2.0mm | 12 - 40mm |  |
| MAGENTA | 2.5mm | 12 - 60mm |  |
| TEAL    | 3.0mm | 25 - 70mm |  |
| PURPLE  | 3.5mm | 25 - 70mm |  |
| BRONZE  | 4.0mm | 35 - 80mm |  |
| GREY    | 5.0mm | 35 - 90mm |  |

# X Construct

## Dual Antegrade Intra-Articular

PROCEDURAL TECHNIQUE CONTINUED

### 4B. Metaphyseal Preparation

- The metaphyseal drills are provided to prepare the bone for the implant and reduce forces generated by the implant head.
- Use of a metaphyseal drill is recommended for every case.

**TIP:** It is recommended to use a hand drill not a power drill for this section of the technique. This will reduce the risk of drilling further than required.

#### Standard Metaphyseal Drill

- Designed to match the shape of the nail taper excluding the threads.
- Alleviates head forces without altering pull out performance.



Color band corresponds to implant color which identifies size range.

**TIP:** If using the standard metaphyseal drill, it is recommended to sink the head completely. This will provide a tight interference fit.

#### Extended Metaphyseal Drill

- Offers an extended taper (by 2mm) compared to the standard option to facilitate deeper insertion or alleviate head forces.



Color band corresponds to implant color and size range.

Distinguishes from Standard Meta Drill

Laser marking identifies 2mm taper extension when compared to the standard.

**TIP:** If using the extended metaphyseal drill, it is recommended to sink the drill head to the bottom of the black laser marking band ensuring it is still visible. This will provide a tight interference fit and assist in alleviating head forces.

#### Using the Metaphyseal Hand Drills

- Connect the metaphyseal drill to the handle included in the instrument kit.
- Pass the metaphyseal drill over the K-wire.
- Over drill the insertion hole to prepare the bone for the implant head.
- Remove the drill taking care to maintain K-wire position.
- Do not remove the K-wires.

# X Construct

## Dual Antegrade Intra-Articular

PROCEDURAL TECHNIQUE CONTINUED

### 5. Nail Insertion

- Connect the driver to the handle included in the instrument kit.
- When connecting the driver tip to the implant head, push firmly to ensure the instrument is fully seated.
- Pass the implant over the K-wire.
- Attach the driver to the implant head and turn in a clockwise direction.

**TIP:** Ensure axial force is maintained between the driver and the head of the NX Nail during insertion as this will reduce the risk of the driver-implant interface disengaging.

**TIP:** If resistance is felt as the nail is inserted into the isthmus then the nail can be removed and the drill from the next diameter nail used to open the isthmus. Do not drill beyond the isthmus since this will reduce the purchase of the leading thread of the nail. Re-insert the nail after redrilling.

**TIP:** Choose a smaller diameter nail if you experience high resistance or are concerned with propagating a fracture. This nail may also need to be slightly longer than previously selected to ensure the leading tip obtains purchase in cancellous bone.

- During insertion, pay attention to the bone while seating the head and take care to avoid distraction or rotation of the fracture.
- Confirm that the heads of both NX Nails are buried beneath the articular surface into the subchondral bone to avoid joint arthrosis or block motion.
- After confirming the placement of the NX Nails on anteroposterior (AP), lateral and oblique views, the K-wires may be removed.
- Bring the digit through full passive ROM to confirm the fracture is stable and there is no obstruction to motion.
- Check digit cascade to assess for any malrotation.

**Note:** A hex driver head is used for 2.0 and 2.5 NX Nails. A torx driver head is used for 3.0 NX Nail and above.



### 6. Close

- Close in your preferred method.

# Parallel Construct

## PROCEDURAL TECHNIQUE

The use of two implants has shown improved rotational stability compared to a single implant.<sup>11</sup> This construct risks malrotation if used in canals that are not wide enough for two implants in the anteroposterior dimension.

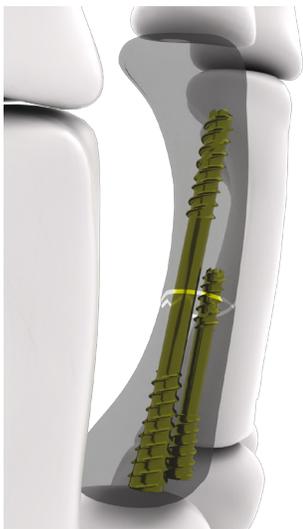
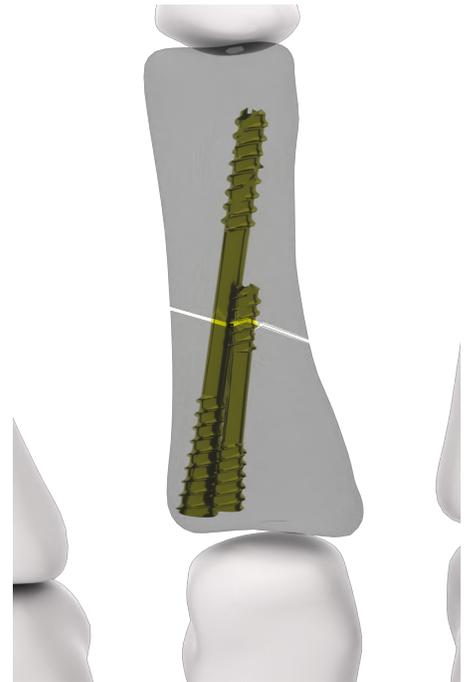
## 1. Reduce the Fracture

### Middle Phalanx

- Make an incision over the proximal interphalangeal joint (PIPJ).
- Flex the PIPJ 60-75 degrees while pressing the proximal end of the middle phalanx dorsally. Gently subluxing the joint will facilitate K-wire insertion.

### Proximal Phalanx

- Make an incision over the metacarpophalangeal joint (MCPJ).
- Flex the MCPJ 60-75 degrees while pressing the proximal end of the phalanx dorsally. Gently subluxing the joint will facilitate K-wire insertion.



## 2. Achieve Temporary Fixation

### Middle Phalanx

- Manually maintain flexion of the PIPJ obtained during reduction for the remaining process of fixation.
- Direct the first K-wire through the base of the middle phalanx into the intramedullary canal.
- Advance the K-wire across the fracture site, spanning the entire length of the phalanx into the subchondral bone of the middle phalangeal head.
- Place a second K-wire parallel to the first.
- Confirm placement on anteroposterior (AP), lateral and oblique views.

### Proximal Phalanx

- Manually maintain flexion of the MCPJ obtained during reduction for the remaining process of fixation.
- Direct the first K-wire through the base of the proximal phalanx into the intramedullary canal.
- Advance the K-wire distally across the fracture site, spanning the entire length of the phalanx into the subchondral bone of the proximal phalangeal head.
- Place a second K-wire parallel to the first.
- Confirm placement on anteroposterior (AP), lateral and oblique views.

# Parallel Construct

PROCEDURAL TECHNIQUE CONTINUED

## 3. Measure and Select Nail

- Once reduced, use the depth gauge to determine the diameter and length of the implants required.

### Confirming Diameter:

- Using the depth gauge, ensure the text 'BONE DIAMETER CAN BE MEASURED HERE' is facing up. The position of this text can change throughout the size ranges so take care to identify it and ensure it is facing up.
- Under fluoroscopy, using the projection angle which gave the smallest isthmus measurement, align the depth gauge with the borders of the isthmus.
- Refer to the size range at the back of this document.
- If passing through the isthmus select a size smaller than the line-to-line fit to ensure the implant can pass through the isthmus without making contact with cortical bone.

**TIP:** The NX Nail achieves stability with the compaction taper head and leading tip. There is no need to achieve fixation within the isthmus. If presented with a line-to-line fit or 'beyond', consider downsizing to avoid stuffing the isthmus.



### Confirming Length:

- Hold the depth gauge against the base of the phalanx, with the protruding K-wires seated in the groove along the shaft of the depth gauge.
- Measure the exposed length of the K-wires against the markings on the depth gauge.
- This measurement indicates the length to which the K-wires has been inserted into the phalanx. It may be appropriate to subtract up to 5mm to ensure correct implant placement.
- If the fracture pattern permits and the fragments are adequately reduced, measurement may be taken under fluoroscopy with notches on the depth gauge corresponding to the lengths of the nails provided in the set.



- Further confirmation of appropriate size can be made by screening the selected nail over the fracture under fluoroscopy.

# Parallel Construct

## PROCEDURAL TECHNIQUE CONTINUED

### 4A. Prepare the Phalanx

- Once implant selection has been confirmed, use the corresponding drill to make the insertion tunnel.
- Pass the cannulated drill bit over the K-wire to the depth required for adequate fixation.
- Remove the drill while taking care to maintain the position of the K-wire.
- Do not remove the K-wires.



Color band corresponds to implant color which identifies size range.

|         |       |           |  |
|---------|-------|-----------|--|
| GOLD    | 2.0mm | 12 - 40mm |  |
| MAGENTA | 2.5mm | 12 - 60mm |  |
| TEAL    | 3.0mm | 25 - 70mm |  |
| PURPLE  | 3.5mm | 25 - 70mm |  |
| BRONZE  | 4.0mm | 35 - 80mm |  |
| GREY    | 5.0mm | 35 - 90mm |  |

### 4B. Metaphyseal Preparation

- The metaphyseal drills are provided to prepare the bone for the implant and reduce forces generated by the implant head.
- Use of a metaphyseal drill is recommended for every case.

**TIP:** It is recommended to use a hand drill not a power drill for this section of the technique. This will reduce the risk of drilling further than required.

#### Standard Metaphyseal Drill

- Designed to match the shape of the nail taper excluding the threads.
- Alleviates head forces without altering pull out performance.



Color band corresponds to implant color which identifies size range.

# Parallel Construct

## PROCEDURAL TECHNIQUE CONTINUED

### Extended Metaphyseal Drill

- Offers an extended taper (by 2mm) compared to the standard option to facilitate deeper insertion or alleviate head forces.



**TIP:** If using the extended metaphyseal drill, it is recommended to sink the drill head to the bottom of the black laser marking band ensuring it is still visible. This will provide a tight interference fit and assist in alleviating head forces.

### Using the Metaphyseal Hand Drills

- Connect the metaphyseal drill to the handle included in the instrument kit.
- Pass the metaphyseal drill over the K-wires.
- Over drill the insertion hole to prepare the bone for the implant head.
- Remove the drill taking care to maintain K-wire position.
- Do not remove the K-wires.

## 5. Nail Insertion

- Connect the driver to the handle included in the instrument kit.
- When connecting the driver tip to the implant head, push firmly to ensure the instrument is fully seated.
- Pass the implant over the K-wires.
- Attach the driver to the implant head and turn in a clockwise direction.

**TIP:** Ensure axial force is maintained between the driver and the head of the NX Nail during insertion as this will reduce the risk of the driver-implant interface disengaging.

**TIP:** If resistance is felt as the nail is inserted into the isthmus then the nail can be removed and the drill from the next diameter nail used to open the isthmus. Do not drill beyond the isthmus since this will reduce the purchase of the leading thread of the nail. Re-insert the nail after re-drilling.

**TIP:** Choose a smaller diameter nail if you experience high resistance or are concerned with propagating a fracture. This nail may also need to be slightly longer than previously selected to ensure the leading tip obtains purchase in cancellous bone.

# Parallel Construct

## PROCEDURAL TECHNIQUE CONTINUED

- During insertion, pay attention to the bone while seating the head and take care to avoid distraction or rotation of the fracture.
- Confirm that the NX Nail heads are buried beneath the articular surface into the subchondral bone to avoid joint arthrosis or block motion.
- After confirming the placement of the NX Nails on anteroposterior (AP), lateral and oblique views, the K-wires may be removed.
- Bring the digit through full passive ROM to confirm the fracture is stable and there is no obstruction to motion.
- Check digit cascade to assess for any malrotation.

**Note:** A hex driver head is used for 2.0 and 2.5 NX Nails. A torx driver head is used for 3.0 NX Nail and above.



## 6. Close

- Close in your preferred method.

# Removal

Indications for removal include joint protrusion, infection or implant fracture following repeat trauma. For removal it is recommended to place a K-wire down the cannulated center of the NX Nail as this will identify the cannulation and guide removal of the implant. It is always important to balance the risk of excavating the phalanx with the risk of leaving the nail *in situ*.

## Joint Protrusion

- Make a small incision over the joint to expose the implant head.
- Confirm the implant size and corresponding driver required.
- Attach the driver tip to the handle.
- Pass the driver over the K-wire and fully seat the instrument in the implant head. Make sure the driver and implant interface is precisely aligned in the axial direction.
- Rotate the driver anti-clockwise until the implant is free.

**TIP.** If removal is challenging you can bend the distal end of a very fine K-wire and insert this into the cannulated middle of the NX Nail. Use the bent tip to 'hook' the edge of the NX Nail and use it to drag the implant out.

## Implant Breakage

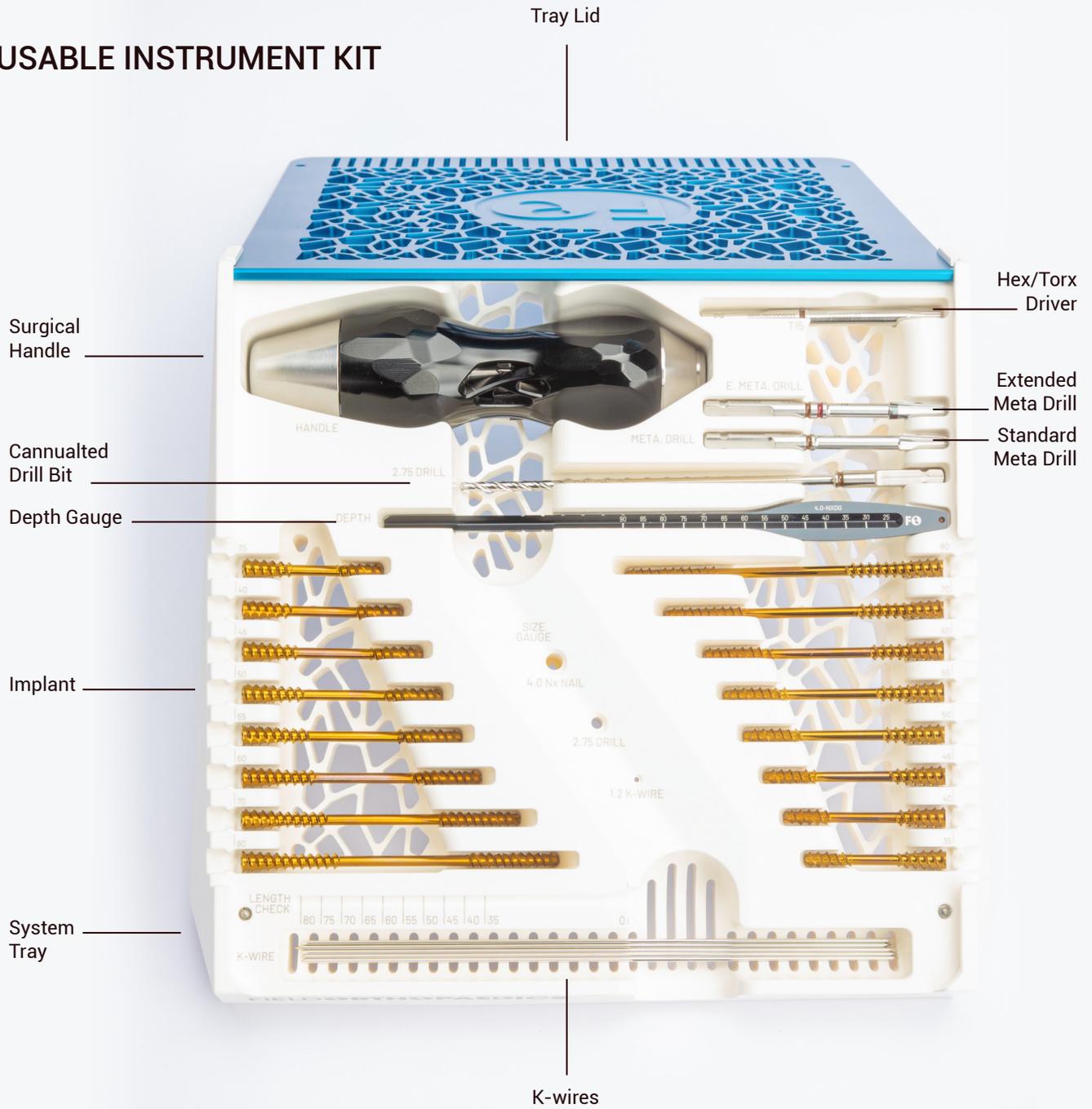
- Confirm the implant size and corresponding driver required.
- Attach the driver tip to the handle.
- Pass the driver over the K-wire and fully seat the instrument in the implant head. Make sure the driver and implant interface is precisely aligned in the axial direction.
- Remove the trailing end of the implant closest to the insertion point.

**TIP.** If the head is buried the hyaline cartilage is replaced by a fibrocartilage plug which can be identified by close examination of the joint. This plug can be removed with a fine beaver blade which will then allow for the driver to engage with the NX Nail.

**TIP.** In the presence of an acceptable deformity the implant may be left *in situ* and the hand treated conservatively.

# Catalog

## REUSABLE INSTRUMENT KIT



# Catalog

## 2.0mm NX Nail System



| Cat No. / Ref No.  | Description                                    | QTY |
|--------------------|--|-----|
| <b>Instruments</b> |  |     |
| KWDT-08100/5       | 0.8mm x 100mm K-wire                           | 5   |
| NXDG-20/1          | 2.0mm NX Depth Gauge                           | 1   |
| NXMD-20/1          | 2.0 Metaphyseal Cannulated Hand Drill          | 1   |
| NXED-20/1          | 2.0 Extended Metaphyseal Cannulated Hand Drill | 1   |
| NXDL(c)-150/1      | 1.5mm Cannulated Drill Bit                     | 2   |
| NXHX(c)-15/1       | 1.5mm Cannulated Hex Driver                    | 2   |
| BTSC00030          | Small Surgical Handle                          | 1   |
| NXLD/1             | NX Nail System Tray Lid                        | 1   |
| NXTY-20/1          | 2.0mm NX Nail System Tray                      | 1   |
| <b>Implants</b>    |  |     |
| NXNC-2012/1        | 2.0mm x 12mm NX Nail                           | 1   |
| NXNC-2014/1        | 2.0mm x 14mm NX Nail                           | 1   |
| NXNC-2016/1        | 2.0mm x 16mm NX Nail                           | 1   |
| NXNC-2018/1        | 2.0mm x 18mm NX Nail                           | 1   |
| NXNC-2020/1        | 2.0mm x 20mm NX Nail                           | 4   |
| NXNC-2022/1        | 2.0mm x 22mm NX Nail                           | 4   |
| NXNC-2024/1        | 2.0mm x 24mm NX Nail                           | 4   |
| NXNC-2026/1        | 2.0mm x 26mm NX Nail                           | 4   |
| NXNC-2028/1        | 2.0mm x 28mm NX Nail                           | 4   |
| NXNC-2030/1        | 2.0mm x 30mm NX Nail                           | 4   |
| NXNC-2032/1        | 2.0mm x 32mm NX Nail                           | 4   |
| NXNC-2034/1        | 2.0mm x 34mm NX Nail                           | 4   |
| NXNC-2036/1        | 2.0mm x 36mm NX Nail                           | 4   |
| NXNC-2038/1        | 2.0mm x 38mm NX Nail                           | 4   |
| NXNC-2040/1        | 2.0mm x 40mm NX Nail                           | 4   |

# Catalog

## 2.5mm NX Nail System



| Cat No. / Ref No.  | Description                                    | QTY |
|--------------------|--|-----|
| <b>Instruments</b> |  |     |
| KWDT-10100/5       | 1.0mm x 100mm K-wire                           | 5   |
| NXDG-25/1          | 2.5mm NX Depth Gauge                           | 1   |
| NXMD-25/1          | 2.5 Metaphyseal Cannulated Hand Drill          | 1   |
| NXED-25/1          | 2.5 Extended Metaphyseal Cannulated Hand Drill | 1   |
| NXDL(c)-175/1      | 1.75mm Cannulated Drill Bit                    | 2   |
| NXHX(c)-17/1       | 1.7mm Cannulated Hex Driver                    | 2   |
| BTSC00030          | Small Surgical Handle                          | 1   |
| NXLD/1             | NX Nail System Tray Lid                        | 1   |
| NXTY-25/1          | 2.5mm NX Nail System Tray                      | 1   |
| <b>Implants</b>    |  |     |
| NXNC-2512/1        | 2.5mm x 12mm NX Nail                           | 2   |
| NXNC-2514/1        | 2.5mm x 14mm NX Nail                           | 2   |
| NXNC-2516/1        | 2.5mm x 16mm NX Nail                           | 2   |
| NXNC-2518/1        | 2.5mm x 18mm NX Nail                           | 2   |
| NXNC-2520/1        | 2.5mm x 20mm NX Nail                           | 2   |
| NXNC-2525/1        | 2.5mm x 25mm NX Nail                           | 2   |
| NXNC-2530/1        | 2.5mm x 30mm NX Nail                           | 2   |
| NXNC-2535/1        | 2.5mm x 35mm NX Nail                           | 2   |
| NXNC-2540/1        | 2.5mm x 40mm NX Nail                           | 2   |
| NXNC-2545/1        | 2.5mm x 45mm NX Nail                           | 2   |
| NXNC-2550/1        | 2.5mm x 50mm NX Nail                           | 2   |
| NXNC-2555/1        | 2.5mm x 55mm NX Nail                           | 2   |
| NXNC-2560/1        | 2.5mm x 60mm NX Nail                           | 2   |

# Catalog

## 3.0mm NX Nail System



| Cat No. / Ref No.  | Description                                    | QTY |
|--------------------|--|-----|
| <b>Instruments</b> |  |     |
| KWDT-10100/5       | 1.0mm x 100mm K-wire                           | 5   |
| NXDG-30/1          | 3.0mm NX Depth Gauge                           | 1   |
| NXMD-30/1          | 3.0 Metaphyseal Cannulated Hand Drill          | 1   |
| NXED-30/1          | 3.0 Extended Metaphyseal Cannulated Hand Drill | 1   |
| NXDL(c)-200/1      | 2.0mm Cannulated Drill Bit                     | 2   |
| NXTX(c)-T8/1       | T8 Cannulated Torx Driver                      | 2   |
| NXLH/1             | Large Ratcheting Surgical Handle               | 1   |
| NXLD/1             | NX Nail System Tray Lid                        | 1   |
| NXTY-30/1          | 3.0mm NX Nail System Tray                      | 1   |
| <b>Implants</b>    |  |     |
| NXNC-3025/1        | 3.0mm x 25mm NX Nail                           | 2   |
| NXNC-3030/1        | 3.0mm x 30mm NX Nail                           | 2   |
| NXNC-3035/1        | 3.0mm x 35mm NX Nail                           | 2   |
| NXNC-3040/1        | 3.0mm x 40mm NX Nail                           | 2   |
| NXNC-3045/1        | 3.0mm x 45mm NX Nail                           | 2   |
| NXNC-3050/1        | 3.0mm x 50mm NX Nail                           | 2   |
| NXNC-3055/1        | 3.0mm x 55mm NX Nail                           | 2   |
| NXNC-3060/1        | 3.0mm x 60mm NX Nail                           | 2   |
| NXNC-3070/1        | 3.0mm x 70mm NX Nail                           | 2   |

# Catalog

## 3.5mm NX Nail System



| Cat No. / Ref No.  | Description                                    | QTY |
|--------------------|--|-----|
| <b>Instruments</b> |  |     |
| KWDT-12150/5       | 1.2mm x 150mm K-wire                           | 5   |
| NXDG-35/1          | 3.5mm NX Depth Gauge                           | 1   |
| NXMD-35/1          | 3.5 Metaphyseal Cannulated Hand Drill          | 1   |
| NXED-35/1          | 3.5 Extended Metaphyseal Cannulated Hand Drill | 1   |
| NXDL(c)-240/1      | 2.4mm Cannulated Drill Bit                     | 2   |
| NXTX(c)-T10/1      | T10 Cannulated Torx Driver                     | 2   |
| NXLH/1             | Large Ratcheting Surgical Handle               | 1   |
| NXLD/1             | NX Nail System Tray Lid                        | 1   |
| NXTY-35/1          | 3.5mm NX Nail System Tray                      | 1   |
| <b>Implants</b>    |  |     |
| NXNC-3525/1        | 3.5mm x 25mm NX Nail                           | 2   |
| NXNC-3530/1        | 3.5mm x 30mm NX Nail                           | 2   |
| NXNC-3535/1        | 3.5mm x 35mm NX Nail                           | 2   |
| NXNC-3540/1        | 3.5mm x 40mm NX Nail                           | 2   |
| NXNC-3545/1        | 3.5mm x 45mm NX Nail                           | 2   |
| NXNC-3550/1        | 3.5mm x 50mm NX Nail                           | 2   |
| NXNC-3555/1        | 3.5mm x 55mm NX Nail                           | 2   |
| NXNC-3560/1        | 3.5mm x 60mm NX Nail                           | 2   |
| NXNC-3570/1        | 3.5mm x 70mm NX Nail                           | 2   |

# Catalog

## 4.0mm NX Nail System



| Cat No. / Ref No.  | Description                                    | QTY |
|--------------------|--|-----|
| <b>Instruments</b> |  |     |
| KWDT-12150/5       | 1.2mm x 150mm K-wire                           | 5   |
| NXDG-40/1          | 4.0mm NX Depth Gauge                           | 1   |
| NXMD(c)-40/1       | 4.0mm Metaphyseal Cannulated Hand Drill        | 1   |
| NXED-40/1          | 4.0 Extended Metaphyseal Cannulated Hand Drill | 1   |
| NXDL(c)-275/1      | 2.75mm Cannulated Drill Bit                    | 2   |
| NXTX(c)-T15/1      | T15 Cannulated Torx Driver                     | 2   |
| NXLH/1             | Large Ratcheting Surgical Handle               | 1   |
| NXLD/1             | NX Nail System Tray Lid                        | 1   |
| NXTY-40/1          | 4.0mm NX Nail System Tray                      | 1   |
| <b>Implants</b>    |  |     |
| NXNC-4035/1        | 4.0mm x 35mm NX Nail                           | 2   |
| NXNC-4040/1        | 4.0mm x 40mm NX Nail                           | 2   |
| NXNC-4045/1        | 4.0mm x 45mm NX Nail                           | 2   |
| NXNC-4050/1        | 4.0mm x 50mm NX Nail                           | 2   |
| NXNC-4055/1        | 4.0mm x 55mm NX Nail                           | 2   |
| NXNC-4060/1        | 4.0mm x 60mm NX Nail                           | 2   |
| NXNC-4070/1        | 4.0mm x 70mm NX Nail                           | 2   |
| NXNC-4080/1        | 4.0mm x 80mm NX Nail                           | 2   |

# Catalog

## 5.0mm NX Nail System



| Cat No. / Ref No.  | Description                                    | QTY |
|--------------------|--|-----|
| <b>Instruments</b> |  |     |
| KWDT-16150/5       | 1.6mm x 150mm K-wire                           | 5   |
| NXDG-50/1          | 5.0mm NX Depth Gauge                           | 1   |
| NXMD(c)-50/1       | 5.0mm Metaphyseal Cannulated Hand Drill        | 1   |
| NXED-50/1          | 5.0 Extended Metaphyseal Cannulated Hand Drill | 1   |
| NXDL(c)-350/1      | 3.5mm Cannulated Drill Bit                     | 2   |
| NXTX(c)-T20/1      | T20 Cannulated Torx Driver                     | 2   |
| NXLH/1             | Large Ratcheting Surgical Handle               | 1   |
| NXLD/1             | NX Nail System Tray Lid                        | 1   |
| NXTY-50/1          | 5.0mm NX Nail System Tray                      | 1   |
| <b>Implants</b>    |  |     |
| NXNC-5035/1        | 5.0mm x 35mm NX Nail                           | 2   |
| NXNC-5040/1        | 5.0mm x 40mm NX Nail                           | 2   |
| NXNC-5045/1        | 5.0mm x 45mm NX Nail                           | 2   |
| NXNC-5050/1        | 5.0mm x 50mm NX Nail                           | 2   |
| NXNC-5055/1        | 5.0mm x 55mm NX Nail                           | 2   |
| NXNC-5060/1        | 5.0mm x 60mm NX Nail                           | 2   |
| NXNC-5070/1        | 5.0mm x 70mm NX Nail                           | 2   |
| NXNC-5080/1        | 5.0mm x 80mm NX Nail                           | 2   |
| NXNC-5090/1        | 5.0mm x 90mm NX Nail                           | 2   |

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