

Pro-X1™ Trochanteric Nailing System

X-Bolt
Trauma Orthopedics

Surgical Technique



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Design Features



TROCHANTERIC NAIL, X-BOLT AND INTERLOCKING SCREWS

Manufactured in Grade 23 Titanium alloy (Ti 6Al-4V ELI). Grade 23 is very similar to Grade 5 but with lower oxygen, nitrogen and iron, resulting in better ductility and fracture toughness. Type-2 anodizing provides a toughened surface finish with reduced friction.

X-BOLT® (EXPANDING BOLT)

- > 10.5mm shaft diameter
- > 10 length options: 80mm-125mm
- > 9.0mm diameter expandable section
- > 20.0mm maximum expandable span
- > Four grooves allow dynamic sliding
- > T20 Torx (star drive) socket

SHORT NAIL

- > 15.5mm proximal diameter
- > Length: 195mm
- > 125° neck-shaft angle
- > 11.0mm shaft diameter
- > 4° valgus bend
- > Distal taper and prongs

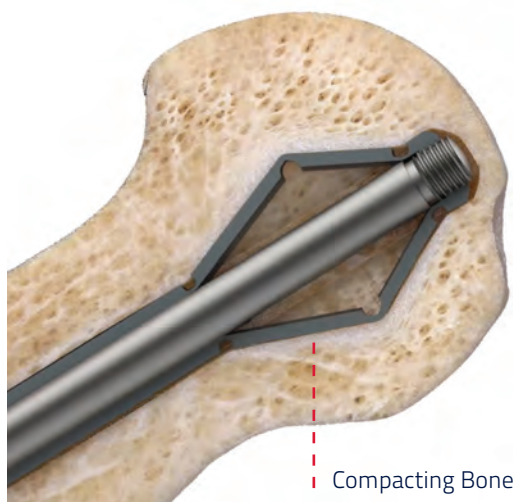
LONG NAIL

- > 15.5mm proximal diameter
- > 6 length options: 300mm-425mm
- > left and right sides
- > 125° neck-shaft angle
- > 11.0mm shaft diameter
- > 4° valgus bend
- > Distal taper and prongs
- > Radius of curvature: 1.25m-1.50m

INTERLOCKING SCREWS

- > 5.0mm diameter, self-tapping
- > Lengths: 30mm-55mm in 5mm increments

How It Works



Compacting Bone

METRO™ JIG

- > Curved jig
- > Flexi-drive
- > Flexible screwdriver
- > Operable outside of surgical field
- > Faster surgery
- > Easy to uncouple
- > Useful in obese/overweight patients

HOW AN X-BOLT® WORKS

- > Drive screw with opposing threads
- > Actuated with screwdriver
- > In-situ deployment of four wings
- > Compacts surrounding cancellous bone
- > Tip-apex point preserved
- > No spinning of femoral head
- > Easily reversible

1 > Assemble Implants



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INSTRUMENTS USED:

- > Long Nail ruler
- > Metro™ Jig
- > Flexi-drive
- > Screwdriver to tighten
- > Drill sleeves x4

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ASSEMBLE IMPLANTS

Anatomically reduce fracture.

For long nails, measure from the greater trochanter to the superior aspect of patella with long nail ruler under fluoroscopy to gauge nail length.

Mount appropriate nail to Metro Jig using flexi-drive. Can tighten flexi-drive using shaft of screwdriver. Check alignment of Metro Jig is correct with drill sleeves.

2 > Entry Point and Proximal Reaming



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INSTRUMENTS USED:

- > Cannulated awl
- > Proximal sleeves x2
- > Proximal reamer
- > 3.2mm K-wire
- > Long guidewire

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ENTRY POINT AND PROXIMAL REAMING

Entry point is just medial to the tip of greater trochanter. This helps prevent lateral drift later when reaming.

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Make proximal skin incision in line with expected path. Use cannulated awl to initiate and progress entry point. Pass long guidewire down intramedullary canal into distal fragment.

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Alternatively, use Ø3.2mm K-wire, proximal sleeves and conical reamer to precisely locate entry point and develop proximal channel.

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If distal reaming needed, use flexible reamers in increments to Ø13.0mm (Ø2.0mm greater than the nail diameter).

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3 > Insert Nail



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INSERT NAIL

Insert nail over the long guidewire. Remove guidewire when nail in distal fragment. Advance nail, following on fluoroscopy, until expected trajectory into femoral head is correct.

Advance nail by hand only. Do not hit Metro Jig with mallet.

4 Femoral Head K-Wire



INSTRUMENTS USED:

- > Outer X-Bolt sleeve
- > Inner X-Bolt sleeve
- > 3.2mm K-wire
- > X-Bolt ruler

FEMORAL HEAD K-WIRE

Insert inner and outer X-Bolt sleeves through jig. Via skin incision and blunt dissection, advance sleeves onto lateral cortex of femur. Through the inner sleeves, place Ø3.2mm femoral head K-wire centre-centre in femoral head within 2mm-3mm of the joint line (optimum tip-apex point). Check position on both views on fluoroscopy. Measure length using ruler, with the tip of the inner sleeve up against the lateral cortex.

Focus

To select X-Bolt length, add 1mm-5mm to the measurement, as X-Bolt shortens by 2mm from base end on expansion, and also allow for dynamic compression of the fracture that will occur with weight-bearing.

Tips

If multiple unsuccessful attempts to get K-wire into optimum position is occurring, widen cortical channel with step-reamer to give freedom for K-wire to choose correct path.

5 Reaming



INSTRUMENTS USED:

> Step drill-reamer

REAMING

Remove inner X-Bolt sleeve. Ream with step reamer over K-wire to create X-Bolt channel.

Focus

> **Follow closely on fluoroscopy to ensure K-wire does not advance into pelvis and to confirm channel created to tip-apex point.**

Remove reamer and K-wire leaving a clear bone channel.

Ensure reaming fully to tip-apex point, as X-Bolt is blunt nosed and cannot advance deeper than the reamed channel. K-wire usually removes itself with reamer, but should no longer be needed.

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Bone Crusher



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INSTRUMENTS USED:

> Bone crusher

BONE CRUSHER

Insert bone crusher fully deep to tip-apex point. Deploy at orthogonal plates to Metro Jig.

Focus

In strong bone it may be necessary to fan out bone crushing steps 5° - 10° in each orthogonal plane.

Tips

Bone crusher may be used as an rotational aid to reduction if fracture is rotationally mal-aligned.



Insert X-Bolt and Engage Set-Screw



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INSTRUMENTS USED:

- > T20 Torx screwdriver
- > Flexible screwdriver

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INSERT X-BOLT AND ENGAGE SET-SCREW

Insert X-Bolt, mounted on T20 screwdriver, and advance fully to tip-apex point. Rotate the X-Bolt so that a groove for the set-screw is directly superior.

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Insert set-screw using the flexible screwdriver through the flexi-drive. Advance set-screw to engage in the groove on superior aspect of X-Bolt, and then loosen back slightly with screwdriver by no more than a quarter turn to allow for dynamic sliding. The set screw prevents rotation, whilst allowing dynamic sliding.

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Focus

If set-screw is not properly engaged in groove, the X-Bolt will spin rather than expand.

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Tips

Gentle rocking back and forth of both screwdrivers will give tactile feedback on set-screw engagement within the groove.

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8 > Expand X-Bolt



INSTRUMENTS USED:

> T20 Torx screwdriver

EXPAND X-BOLT

Clockwise turns with the T20 screwdriver expand the X-Bolt until the desired expansion, or until a stop is felt, or to the screwdriver torque limit. Do not use excessive force. If inadvertent resistance is felt, remove X-Bolt and repeat bone crusher step. Reversal, if necessary, is performed by anticlockwise rotation. The X-Bolt must be discarded and replaced if full expansion has been reversed, or has been damaged in any way.

Focus

The torque necessary to expand the X-Bolt gives excellent tactile feedback on the quality of the bone.

9 > Distal Locking



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INSTRUMENTS USED:

- > Outer distal locking sleeve
- > Inner distal locking sleeve
- > Measuring hook
- > Depth gauge
- > Long or short hex screwdriver

DISTAL LOCKING

Short nail

Insert sleeves through distal locking aperture and advance via skin incision and blunt dissection. Use Ø4.0mm x 305mm drill bit via inner sleeve, and measure from drill bit markings. Remove inner sleeve. Confirm screw length using measuring hook. Insert appropriate length Ø5.0mm distal interlocking screw, using long hex screwdriver.

Long Nail

Use Ø4.0mm x 150mm drill bit for freehand distal locking. Screw length is measured with standard depth gauge. Insert appropriate length Ø5.0mm distal interlocking screw with short hex screwdriver.

10 > De-Couple Metro™ Jig



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INSTRUMENTS USED:

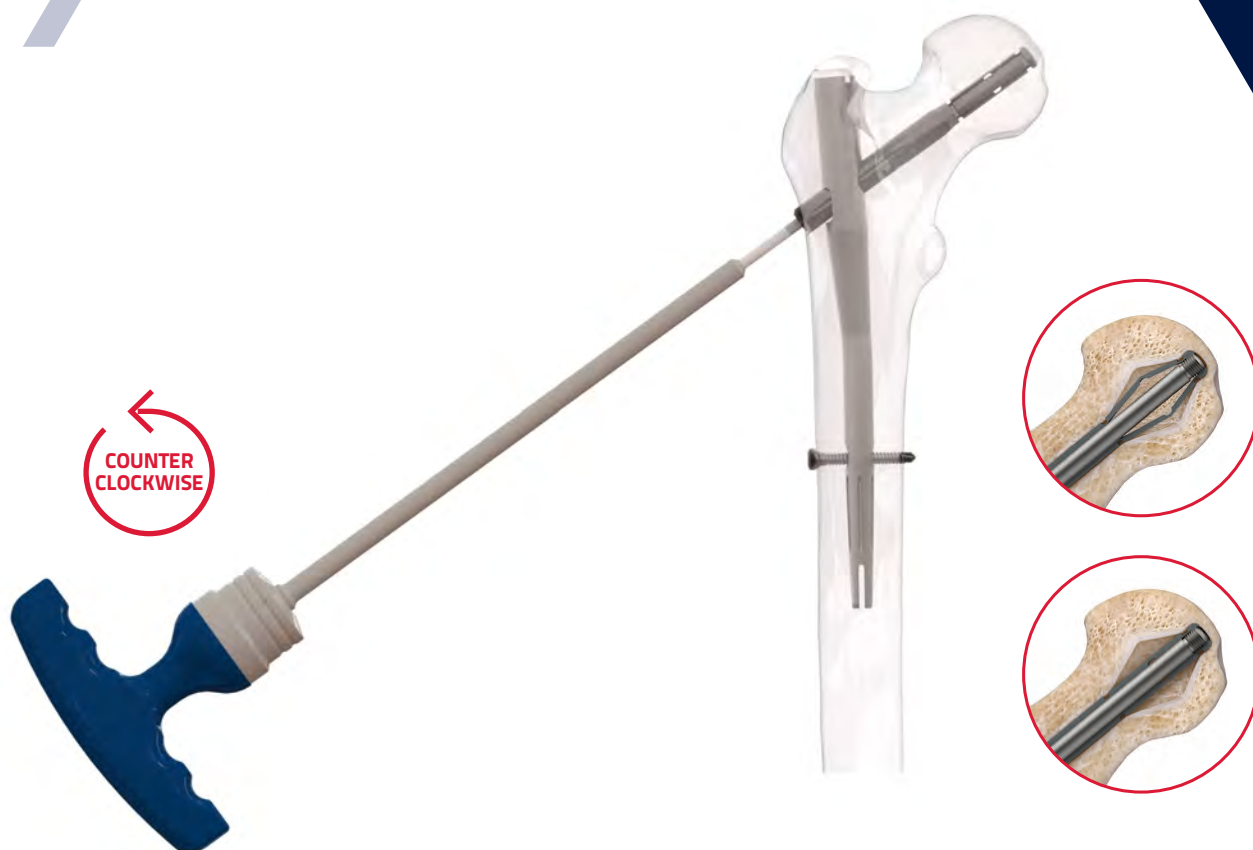
> Any screwdriver

DE-COUPLE JIG

Remove flexi-drive using screwdriver shaft through horizontal apertures if greater leverage is required.

Remove Metro Jig.

Wound closure and post-operative management as per surgeon's instructions.



INSTRUMENTS USED:

- > T20 Torx screwdriver
- > Hex screwdriver
- > Removal rod

REVERSE EXPANSION. Retract X-Bolt with anticlockwise rotation of T20 screwdriver. The X-Bolt mechanism can crush new cancellous bone formed under the expanded wings.

REMOVE X-BOLT. Loosen set screw to enable unimpeded free passage of X-Bolt through nail aperture. Insert removal rod into base of X-Bolt and remove X-Bolt.

REMOVE NAIL. If bony ingrowth at top of nail, use 3.2mm K-wire and rigid proximal reamer under fluoroscopy to re-create path. Insert removal rod before removing distal interlocking screw, so as to prevent the nail from spinning. Remove interlocking screw. Remove nail.

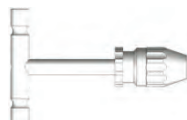
BROKEN X-BOLT WINGS. In the rare event of the X-Bolt wings being broken, continue anticlockwise turns to disengage drive screw from deep fragment. Loosen set screw. Remove the X-Bolt shaft and drive screw, leaving the deep fragment in-situ. Remove nail and distal interlocking screw as above.

DEEP FRAGMENT. May be left in-situ or removed with femoral head if converting to arthroplasty. Otherwise fragment may be retrieved using an arthroscopy grasper or spinal grasper under fluoroscopy.

Instruments



XNI-002 CURVED AWL



XNI-003 T-HANDLE QUICK-FIT JACOBS CHUCK



XNI-004 OUTER PROXIMAL REAMER SLEEVE



XNI-005 INNER PROXIMAL REAMER SLEEVE



XNI-006 RIGID PROXIMAL REAMER



XNI-007 FLEXI-DRIVE



XNI-008 OUTER DRILL SLEEVE



XNI-009 INNER DRILL SLEEVE



XNI-011 K-WIRE RULER

Instruments



XNI-012 STEP REAMER FOR X-BOLT



XNI-014 BONE CRUSHER



XNI-015 OUTER DISTAL LOCKING SLEEVE



XNI-016 INNER DISTAL LOCKING SLEEVE



XNI-017 REMOVAL ROD



XNI-018 DEPTH HOOK



XNI-019 METRO™ JIG



**XNI-020 T20 TORX SCREWDRIVER
(4.5NM TORQUE LIMIT)**

Instruments



**XNI-021 LONG SCREWDRIVER SHAFT
(3.5MM HEX)**



**XNI-022 SHORT SCREWDRIVER SHAFT
(3.5MM HEX)**



**XNI-023 FLEXIBLE SCREWDRIVER SHAFT
(3.5MM HEX)**



XNI-024 IN-LINE SCREWDRIVER HANDLE



XNI-025 FLEXIBLE SCREWDRIVER HANDLE



XNI-028 LONG NAIL RULER

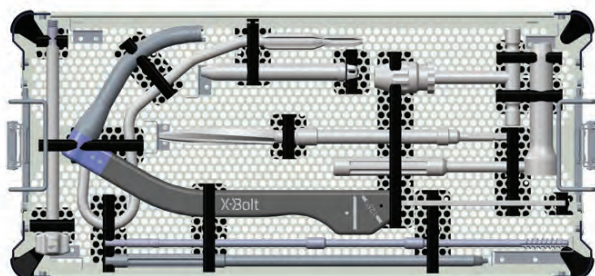


XNI-030 DEPTH GAUGE

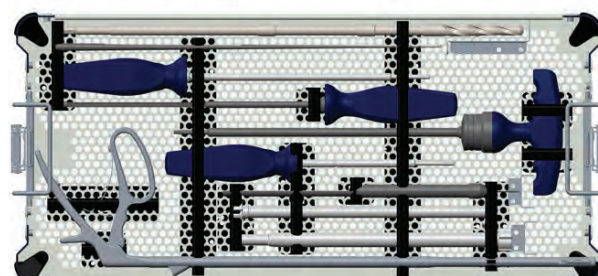


XNI-032 LAG SCREW TAP

SET 'X'



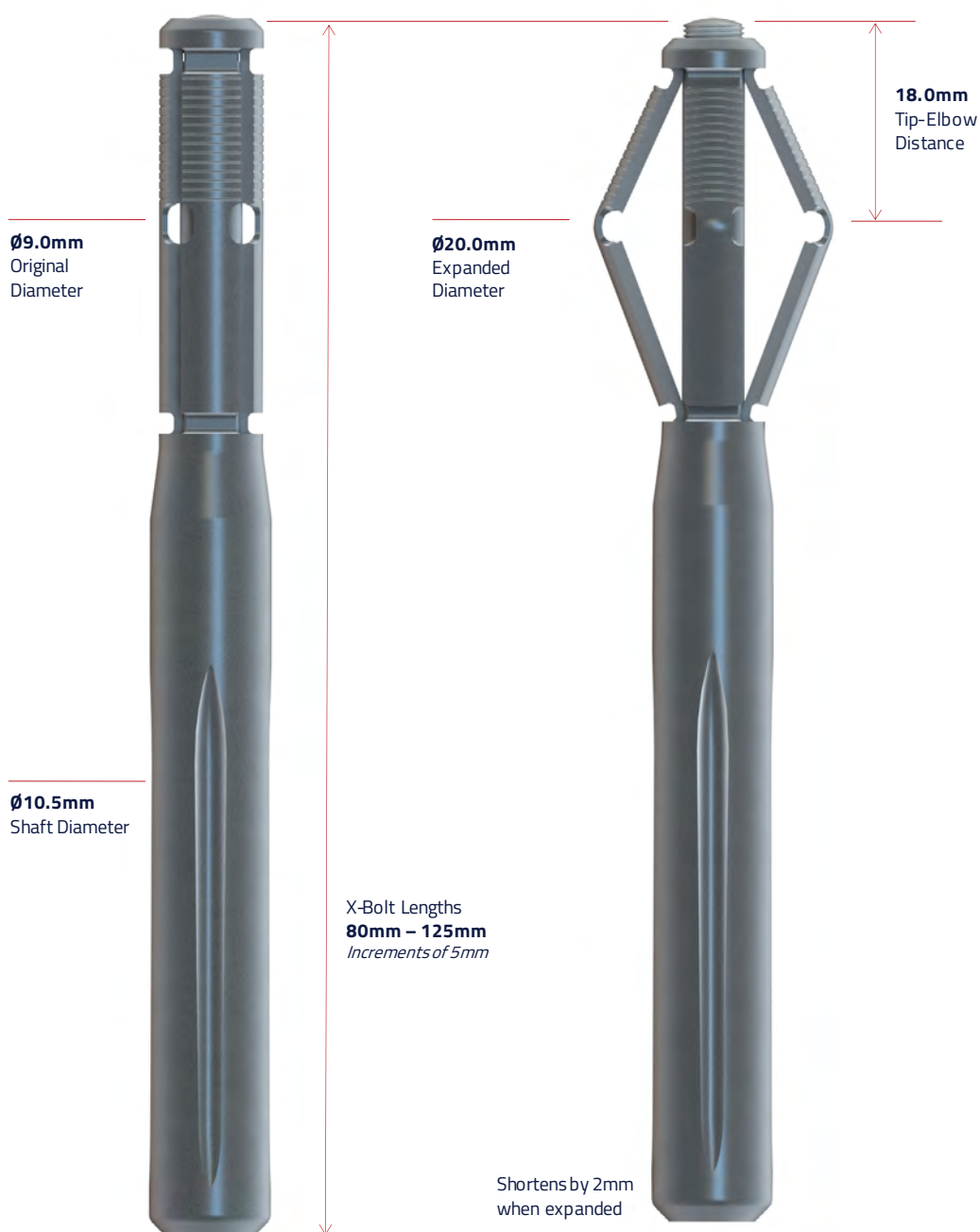
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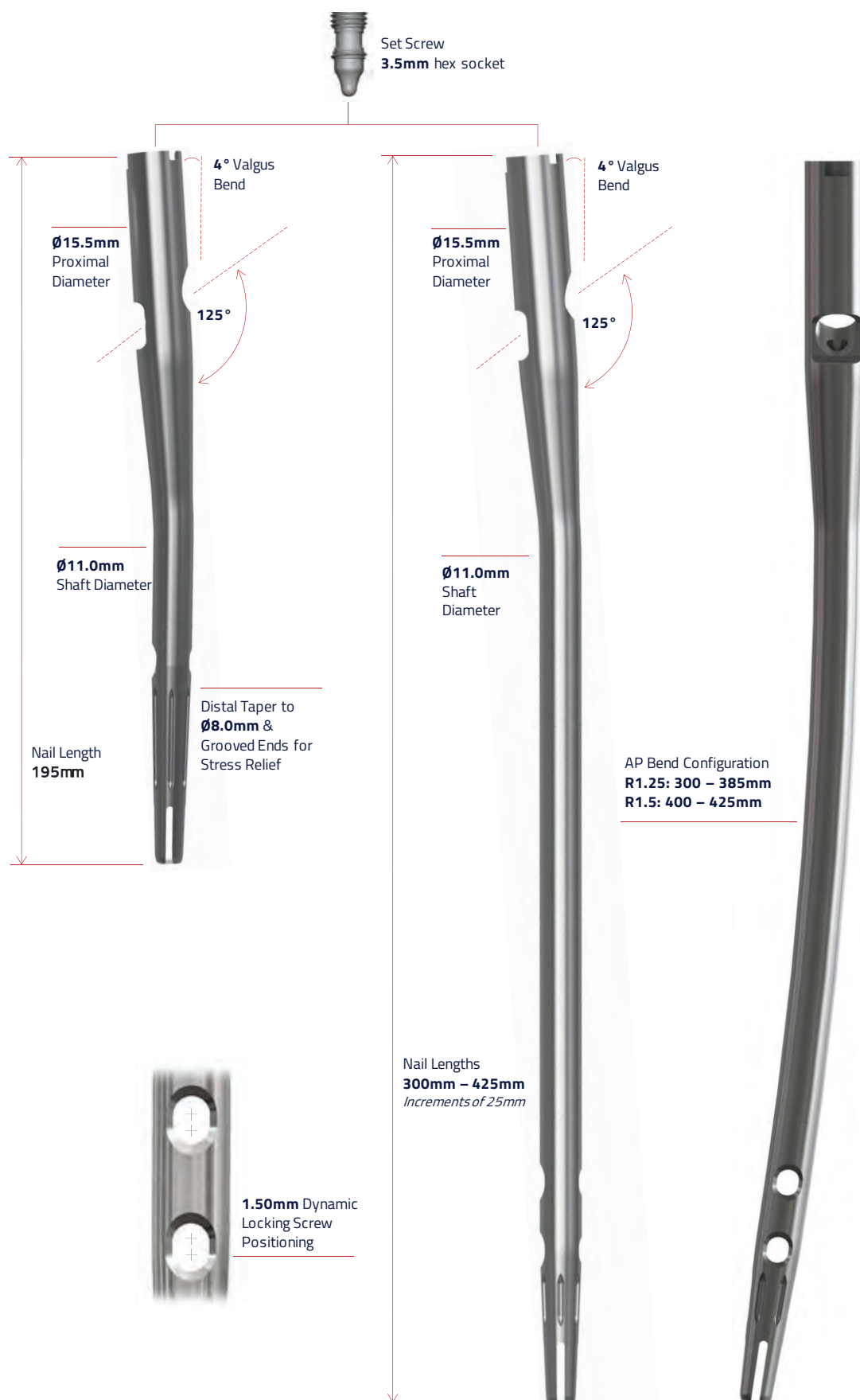
Implant Dimensions

X-BOLT® (EXPANDING BOLT)

- > Tip-apex and tip-elbow distance maintained throughout expansion
- > Actuated or reversed using T20 screwdriver
- > Maximal expansion of the four wings visible on orthogonal x-ray views



Implant Dimensions



Ordering Information

Part Code	Description (implants)
XBT105080	80mm x Ø10.5mm Trochanteric X-Bolt and Set-Screw
XBT105085	85mm x Ø10.5mm Trochanteric X-Bolt and Set-Screw
XBT105090	90mm x Ø10.5mm Trochanteric X-Bolt and Set-Screw
XBT105095	95mm x Ø10.5mm Trochanteric X-Bolt and Set-Screw
XBT105100	100mm x Ø10.5mm Trochanteric X-Bolt and Set-Screw
XBT105105	105mm x Ø10.5mm Trochanteric X-Bolt and Set-Screw
XBT105110	110mm x Ø10.5mm Trochanteric X-Bolt and Set-Screw
XBT105115	115mm x Ø10.5mm Trochanteric X-Bolt and Set-Screw
XBT105120	120mm x Ø10.5mm Trochanteric X-Bolt and Set-Screw
XBT105125	125mm x Ø10.5mm Trochanteric X-Bolt and Set-Screw
XBT110195	Short Trochanteric Nail 125deg (Ø11x195mm)
XBT110300 L	300mm Left, Trochanteric Nail 125deg, Ø11mm
XBT110300 R	300mm Right, Trochanteric Nail 125deg, Ø11mm
XBT110325 L	325mm Left, Trochanteric Nail 125deg, Ø11mm
XBT110325 R	325mm Right, Trochanteric Nail 125deg, Ø11mm
XBT110350 L	350mm Left, Trochanteric Nail 125deg, Ø11mm
XBT110350 R	350mm Right, Trochanteric Nail 125deg, Ø11mm
XBT110375 L	375mm Left, Trochanteric Nail 125deg, Ø11mm
XBT110375 R	375mm Right, Trochanteric Nail 125deg, Ø11mm
XBT110400 L	400mm Left, Trochanteric Nail 125deg, Ø11mm
XBT110400 R	400mm Right, Trochanteric Nail 125deg, Ø11mm
XBT110425 L	425mm Left, Trochanteric Nail 125deg, Ø11mm
XBT110425 R	425mm Right, Trochanteric Nail 125deg, Ø11mm
XBT050030	30mm x Ø5.0mm interlocking screw, self-tapping
XBT050035	35mm x Ø5.0mm interlocking screw, self-tapping
XBT050040	40mm x Ø5.0mm interlocking screw, self-tapping
XBT050045	45mm x Ø5.0mm interlocking screw, self-tapping
XBT050050	50mm x Ø5.0mm interlocking screw, self-tapping
XBT050055	55mm x Ø5.0mm interlocking screw, self-tapping
Part Code	Description (single use instruments)
XBT032001	Ø3.2mm x 390mm femoral head K-wire
XBT040305	Ø4.0mm x 305mm drill bit, quick connect (Metro™ jig)
XBT040150	Ø4.0mm x 150mm drill bit, quick connect (freehand)
XBT024900	Ø2.4mm x 900mm long guidewire

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The information presented in this brochure is intended as an educational tool and clinical aid to assist properly licensed medical professionals in the usage of specific X-Bolt products. Always refer to the package insert, product label and instructions for use before using any X-Bolt product. Surgeons must always rely on their own clinical judgement, training and expertise when deciding which products and techniques to use with their patients.

X-Bolt® is a registered trademark of X-Bolt Orthopedics

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**European Patents: EP 2175790, EP 3496637, EP 2175790
US Patents: US 9724141B2, US 8911446B2, US 11259854B2**

ST-XBT-001

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