

OPERATIVE TECHNIQUE



Reconstruction Compression Humeral Nail

Table of contents

INSTRUMENT SET 4-50-06-00 - SET 1.....	8
INSTRUMENT SET 4-50-06-00 - SET 2.....	9
SUGGESTED POSITION OF PATIENT FOR SURGERY.....	10
INDICATIVE POINTS OF NAIL INSERTION.....	11
TARGETING DEVICE ASSEMBLING.....	12
TARGETING DEVICE POSITIONING.....	13
BONE PREPARATION.....	15
NAIL POSITIONING.....	17
POSITION THE TARGETING DEVICE AS WELL SO THAT THE TROCAR IS IN DIRECTION OF THE LESSER TUBERCLE:	
LEFT NAIL: MARK "X" AND "LEFT X"	
RIGHT NAIL: MARK "II" AND "RIGHT II".....	18
NAIL REMOVING.....	28
TARGETING DEVICE ASSEMBLING - COMPRESSION NAIL.....	30
ASSEMBLY CHECK.....	31
NAIL INSERTION.....	32
STATIC METHOD.....	34
FREEHAND TARGETING DEVICE.....	36
COMPRESSION METHOD (COMPRESSION SCREW).....	39
COMPRESSION METHOD (EXTRACTOR).....	41



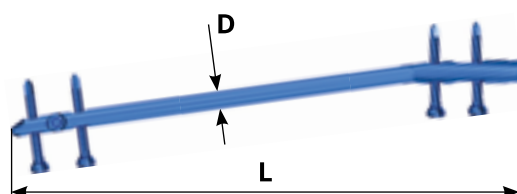
THE INSTRUCTIONS PROVIDED ARE NOT A DETAILED OPERATING MANUAL!

SELECTION OF APPROPRIATE SURGICAL TECHNIQUE IS AT THE DISCRETION OF THE PHYSICIAN.

L (mm)	D (mm)	REF
150 i and 160÷400 co by 20 mm	6	X-09-07-L
	7	X-09-08-L
	8	X-09-01-L
	9	X-09-02-L
	10	X-09-03-L
	11	X-09-04-L
	12	X-09-05-L

- Dostępne na zamówienie Available on request

Gwoździe ze skokiem co 10 mm dostępne na zamówienie
Nails with a pitch of 10 mm available on request



Dostępne odmiany (X): Available types (X):

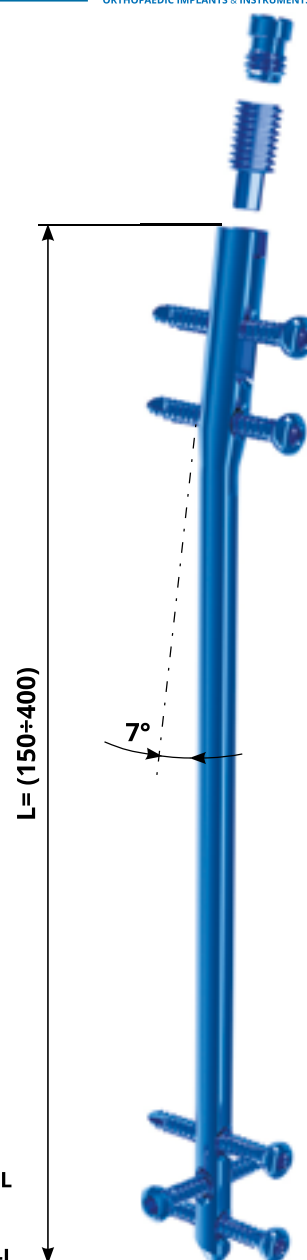
1 - gwoździe lity ze stopu tytanu solid titanium alloy nail ISO 5832-3

3 - gwoździe lity ze stali steel solid nail ISO 5832-1

21 - gwoździe lity ze stopu tytanu + Si-DLC

solid titanium alloy nail + Si-DLC ISO 5832-3

dla D = 6÷7 wkręt:
for D = 6÷7 screw:
X-01-51-L / X-01-221-L
dla D ≥ 8 wkręt:
for D ≥ 8 screw:
X-01-86-L / X-01-354-L



Elementy blokujące Locking elements	Rozmiar Size	L (mm)	Średnica Diameter	HEX 3.5 REF	T25 REF
Śruba zaślepiająca End cap	0	14		X-07-95-30	X-07-95-30.1
	+5 ÷ +30	19÷44		X-07-95-31÷36	X-07-95-31.1÷36.1
Śruba kompresyjna Compression screw		14		X-07-96-05	X-07-96-05.TX
Wkręt blokujący do gwoździ Nail locking screw		16÷115	4.5	X-01-86-L	X-01-354-L
				HEX 2.5	T15
Wkręt korowy Cortical screw		8÷90	3.5	X-01-51-L	X-01-221-L
Stosować z instrumentarium Use with instrument set no.				4-50-06-00 lub or 4-50-18-00 99-50-34-2.AOR	4-50-06-00.TX lub or 4-50-18-00.TX 99-50-34-2.AOR

Dostępne odmiany wkrętów (X): Available screws types (X):

1 - stop tytanu titanium alloy ISO 5832-3

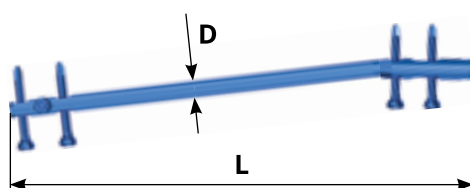
4 - stal steel ISO 5832-1

21 - stop tytanu + Si-DLC titanium alloy + Si-DLC ISO 5832-3

L (mm)	D (mm)	REF
150 i and 160÷400 co by 20 mm	6	X-09-07-L
	7	X-09-08-L
	8	X-09-01-L
	9	X-09-02-L
	10	X-09-03-L
	11	X-09-04-L
	12	X-09-05-L

- Dostępne na zamówienie Available on request

Gwoździe ze skokiem co 10 mm dostępne na zamówienie
Nails with a pitch of 10 mm available on request



Dostępne odmiany (X): Available types (X):

2 - gwoździe kaniulowany ze stopu tytanu

cannulated titanium alloy nail **ISO 5832-3**

4 - gwoździe kaniulowany ze stali cannulated steel nail **ISO 5832-1**

22 - gwoździe kaniulowany ze stopu tytanu + Si-DLC

cannulated titanium alloy nail + Si-DLC **ISO 5832-3**

dla D = 6÷7 wkręt:
for D = 6÷7 screw:
X-01-51-L / X-01-221-L
dla D ≥ 8 wkręt:
for D ≥ 8 screw:
X-01-86-L / X-01-354-L

L = (150÷400)

7°

Elementy blokujące Locking elements	Rozmiar Size	L (mm)	Średnica Diameter	HEX 3.5 REF	T25 REF
Śruba zaślepiająca End cap	0	14		X-07-95-30	X-07-95-30.1
	+5 ÷ +30	19÷44		X-07-95-31÷36	X-07-95-31.1÷36.1
Śruba kompresyjna Compression screw		14		X-07-96-05	X-07-96-05.TX
Wkręt blokujący do gwoździ Nail locking screw		16÷115	4.5	X-01-86-L	X-01-354-L
				HEX 2.5	T15
Wkręt korowy Cortical screw		8÷90	3.5	X-01-51-L	X-01-221-L
Stosować z instrumentarium Use with instrument set no.				4-50-06-00 lub or 4-50-18-00 99-50-34-2.AOR	4-50-06-00.TX lub or 4-50-18-00.TX 99-50-34-2.AOR

Dostępne odmiany wkrętów (X): Available screws types (X):

1 - stop tytanu titanium alloy **ISO 5832-3**

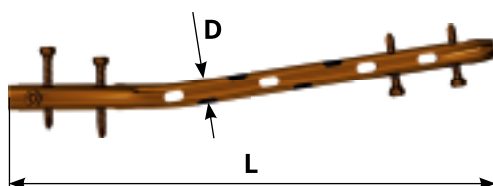
4 - stal steel **ISO 5832-1**

21 - stop tytanu + Si-DLC titanium alloy + Si-DLC **ISO 5832-3**

L (mm)	D (mm)	REF
150 i and 160÷400 co by 20 mm	8	X-09-01-L
	9	X-09-02-L
	10	X-09-03-L
	11	X-09-04-L
	12	X-09-05-L

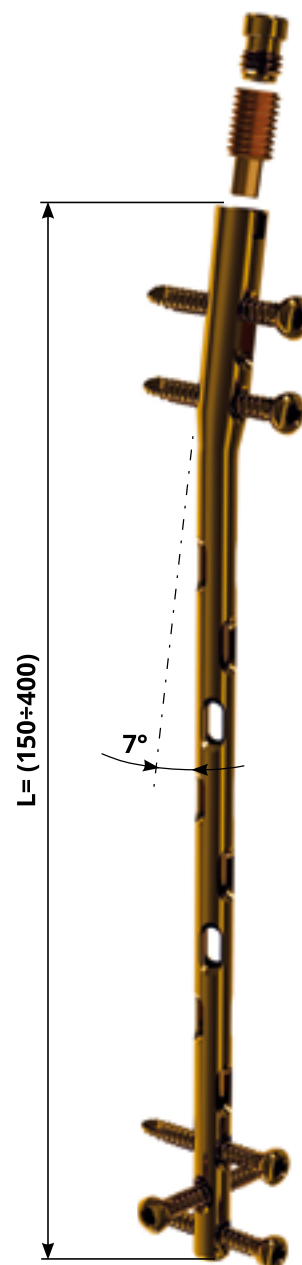
- Dostępne na zamówienie Available on request

Gwoździe ze skokiem co 10 mm dostępne na zamówienie
Nails with a pitch of 10 mm available on request



Dostępne odmiany (X): Available types (X):

28 - gwoździe kaniulowany ze stopu tytanu, ażurowy + Si-DLC
cannulated titanium alloy nail, openwork + Si-DLC **ISO 5832-3**



Elementy blokujące Locking elements	Rozmiar Size	L (mm)	Średnica Diameter	HEX 3.5 REF	T25 REF
Śruba zaślepiająca End cap	0	14		X-07-95-30	X-07-95-30.1
	+5 ÷ +30	19÷44		X-07-95-31÷36	X-07-95-31.1÷36.1
Śruba kompresyjna Compression screw		14		X-07-96-05	X-07-96-05.TX
Wkręt blokujący do gwoździ Nail locking screw		16÷115	4.5	X-01-86-L	X-01-354-L
Stosować z instrumentarium Use with instrument set no.				4-50-06-00 lub or 4-50-18-00 99-50-34-2.AOR	4-50-06-00.TX lub or 4-50-18-00.TX 99-50-34-2.AOR

Dostępne odmiany wkrętów (X): Available screws types (X):

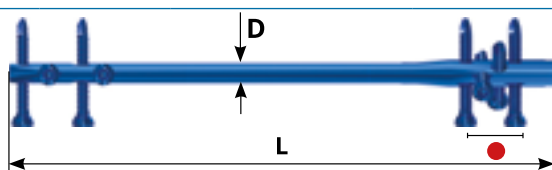
21 - stop tytanu + Si-DLC titanium alloy + Si-DLC **ISO 5832-3**

GWÓZDŹ LEWY LEFT NAIL **GWÓZDŹ PRAWY RIGHT NAIL**

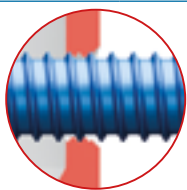
L (mm)	D (mm)	REF	REF
150 i and 160÷320 co by 20 mm	6	X-09-21-L	X-09-31-L
	7	X-09-22-L	X-09-32-L
	8	X-09-23-L	X-09-33-L
	9	X-09-24-L	X-09-34-L
	10	X-09-25-L	X-09-35-L
	11	X-09-26-L	X-09-36-L
	12	X-09-27-L	X-09-37-L

- Dostępne na zamówienie Available on request

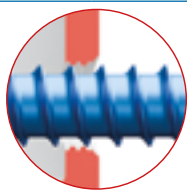
Gwoździe ze skokiem co 10 mm dostępne na zamówienie
Nails with a pitch of 10 mm available on request



• - otwory gwintowane threaded holes



blokowy
locking
X-01-88-L / X-01-359-L



nieblokowy
non-locking
X-01-86-L / X-01-354-L

Dostępne odmiany (X): Available types (X):

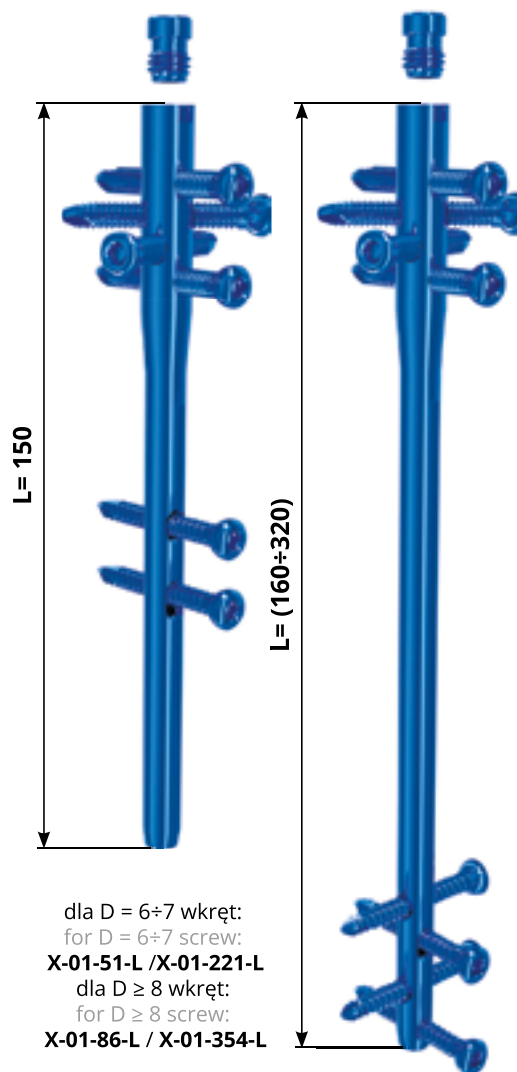
2 - gwoździe kaniulowany ze stopu tytanu

cannulated titanium alloy nail **ISO 5832-3**

4 - gwoździe kaniulowany ze stali cannulated steel nail **ISO 5832-1**

22 - gwoździe kaniulowany ze stopu tytanu + Si-DLC

cannulated titanium alloy nail + Si-DLC **ISO 5832-3**



dla D = 6÷7 wkręt:
for D = 6÷7 screw:
X-01-51-L / X-01-221-L
dla D ≥ 8 wkręt:
for D ≥ 8 screw:
X-01-86-L / X-01-354-L

Elementy blokujące Locking elements	Rozmiar Size	L (mm)	Średnica Diameter	HEX 3.5 REF	T25 REF
Śruba zaślepiająca End cap	0	14		X-07-95-30	X-07-95-30.1
	+5 ÷ +30	19÷44		X-07-95-31÷36	X-07-95-31.1÷36.1
Wkręt blokujący do gwoździ Nail locking screw		14÷100	5.0	X-01-88-L	X-01-359-L
Wkręt blokujący do gwoździ Nail locking screw		16÷115	4.5	X-01-86-L	X-01-354-L
				HEX 2.5	T15
Wkręt korowy Cortical screw		8÷90	3.5	X-01-51-L	X-01-221-L
Stosować z instrumentarium Use with instrument set no.				4-50-06-00 99-50-34-2.AOR	4-50-06-00.TX 99-50-34-2.AOR

Dostępne odmiany wkrętów (X): Available screws types (X):

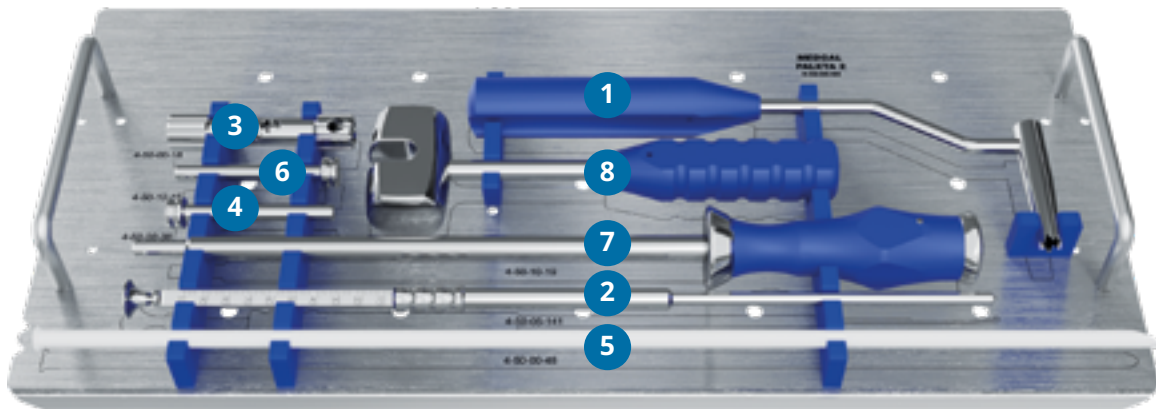
1 - stop tytanu titanium alloy **ISO 5832-3**

4 - stal steel **ISO 5832-1**

21 - stop tytanu + Si-DLC titanium alloy + Si-DLC **ISO 5832-3**



1	Sleeve 8/12/145 x2	4-50-00-06
2	Trocar d8	4-50-00-07
3	Control pin 4.6/12/170	4-50-00-08
4	Screwdriver HEX 3.5	4-50-00-09
5	Drill 3.7	4-50-00-30
6	Sleeve 3.7/8/155 x2	4-50-00-31
7	Wrench 14 x2	4-50-00-41
8	Targeting arm handle	4-50-10-01
9	Targeting arm for humeral reconstruction nail	4-50-10-02
10	Fixation screw	4-50-10-03
11	Fixation nut	4-50-10-04
12	Sleeve	4-50-10-05
13	Fixation nut	4-50-10-07
14	Control pin 4.6/12/170	4-50-10-08
15	Targeting arm for humeral compression nail	4-50-10-09
16	Sleeve	4-50-10-10
17	Trepan drill	4-50-10-11
18	Trepan guide	4-50-10-12
19	Control pin 3.6/12/170	4-50-10-13
20	Sleeve 2.5/8/155	4-50-10-14
21	Drill 2.5/250	4-50-10-16
22	Screwdriver HEX 2.5	4-50-10-17
23	Impactor	4-50-10-18

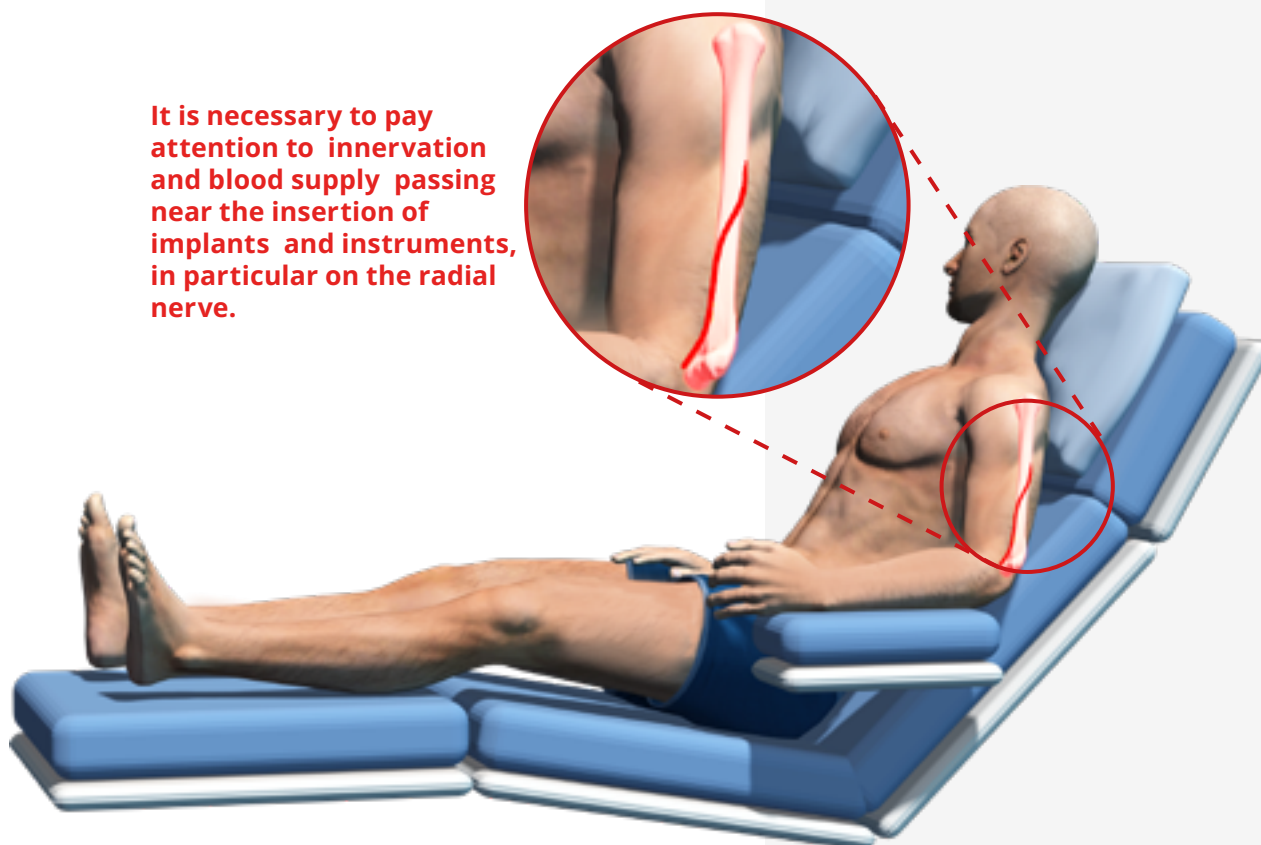


1	Hand targeting device	4-50-00-03
2	Bone thickness gauge	4-50-05-141
3	Wire grip	4-50-00-18
4	Handheld sight sleeve d3.7	4-50-00-38
5	Tube guide	4-50-00-48
6	Sleeve 2.5	4-50-10-15
7	Extractor rod M8	4-50-10-19
8	Hammer	4-51-01-16

SUGGESTED POSITION OF PATIENT FOR SURGERY



It is necessary to pay attention to innervation and blood supply passing near the insertion of implants and instruments, in particular on the radial nerve.

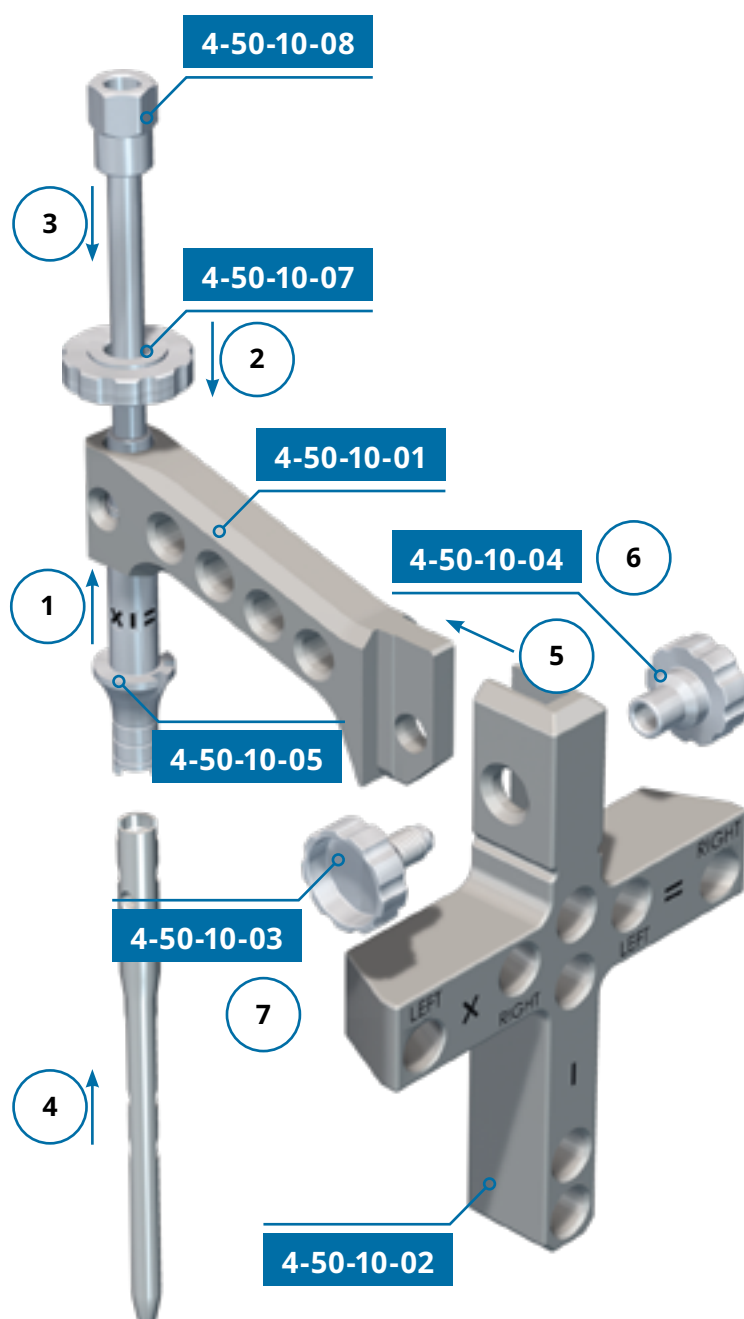


INDICATIVE POINTS OF NAIL INSERTION

1



TARGETING DEVICE ASSEMBLING

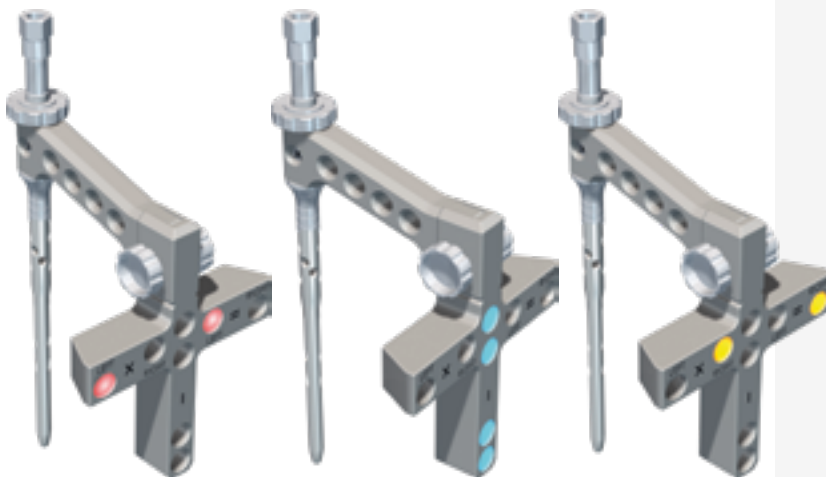


- 1** Insert the sleeve adapter for the reconstruction humeral nail **4-50-10-05** into the handle **4-50-10-01**.
- 2** Lock the sleeve using the fixation nut **4-50-10-07**.
- 3** Insert the nail holding screw M8 **4-50-10-08** into sleeve adapter **4-50-10-05**.
- 4** Connect the reconstruction humeral nail with the holding screw using wrench.
- 5** Connect the targeting arm for the reconstruction humeral nail **4-50-10-02** with the handle.
- 6** Insert the fixation nut **4-50-10-04** through the targeting arm of handle.
- 7** Drive the fixation screw **4-50-10-03** into fixation nut.

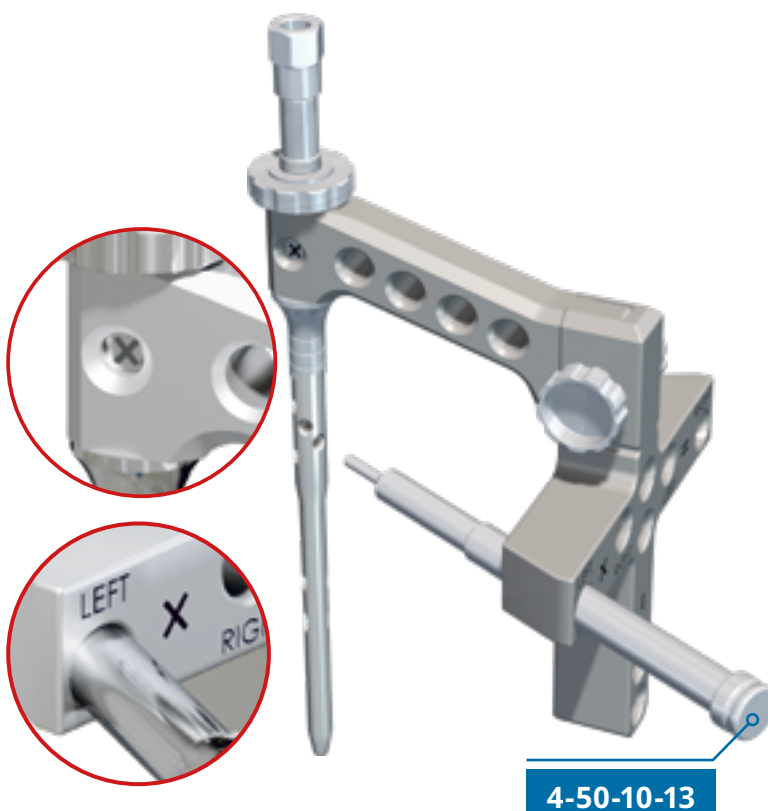
TARGETING DEVICE POSITIONING

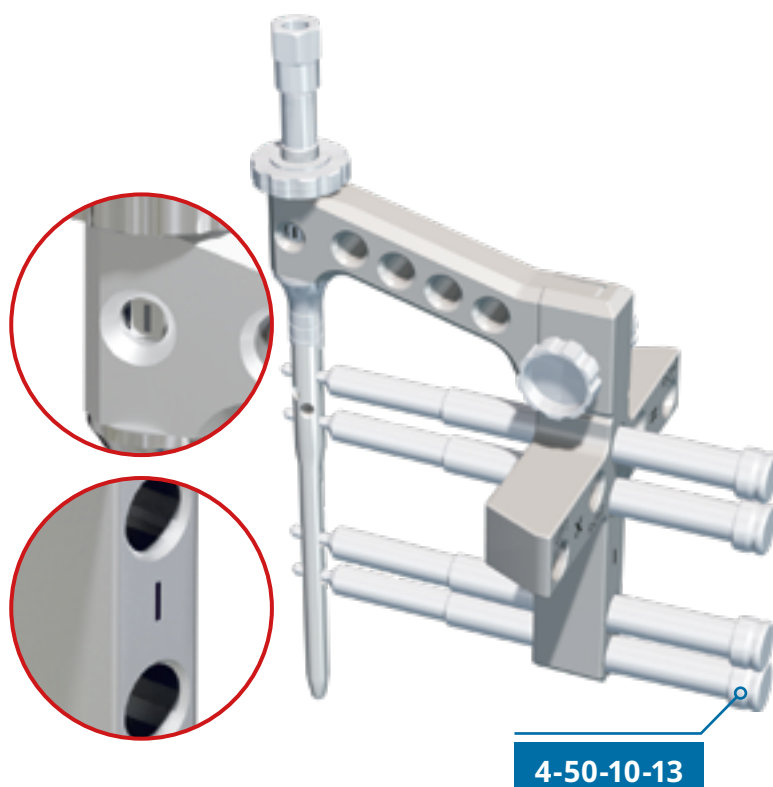
1

Using the left nail, in the aiming device use holes marked in red, for the right nail - yellow. The middle-proximal and distal holes are common for the right and left nail.

**2**

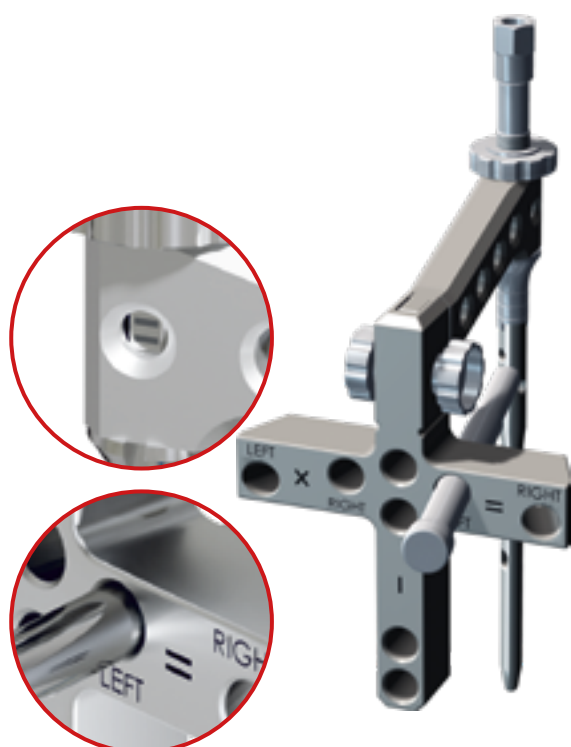
Position the targeting device to see the mark „X” in the hole of the handle. Insert control pin **4-50-10-13** into the nail through the hole of the targeting arm with the mark „LEFT X”.





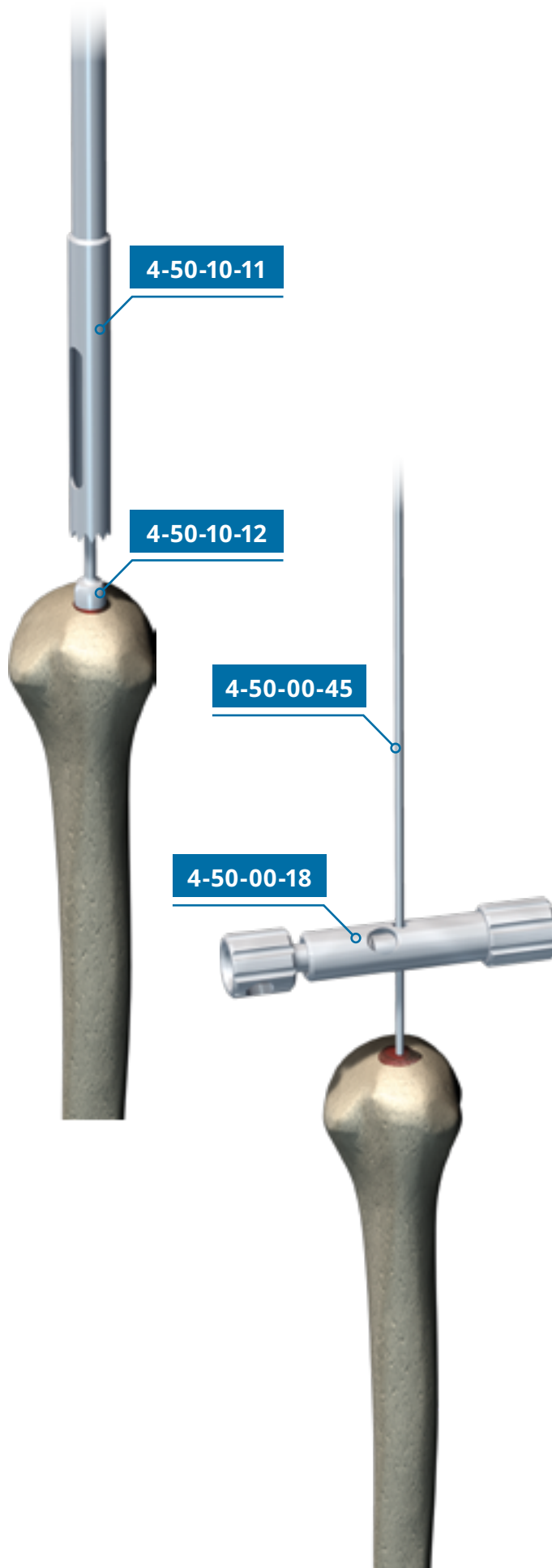
3

Position the targeting device to see the mark „I” in the hole of the handle. Insert the control pin **4-50-10-13** into the proximal nail hole through the holes of the targeting arm with the mark „I”. Distal holes should be checked using control pin **4-50-10-13** for nail diameters 6-7 mm; or with the control pin **4-50-00-08** for nail diameters 8 and bigger.



4

Position the targeting device to see mark „=” in the hole of the handle. Insert the control pin **4-50-10-13** into the nail hole through the hole of the targeting arm with the mark „LEFT II”.



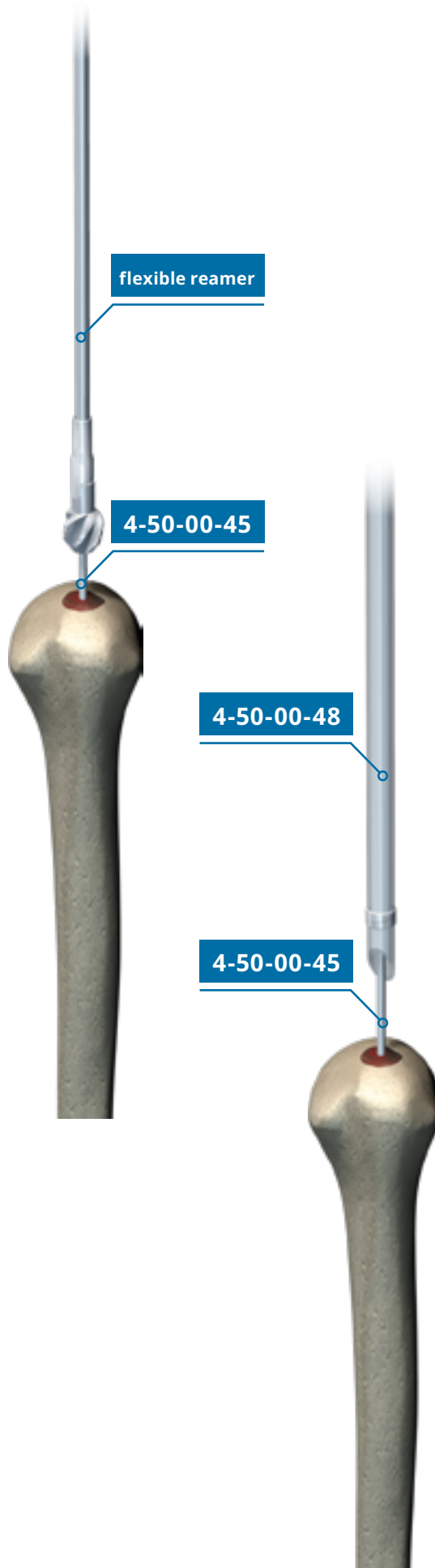
BONE PREPARATION

1

Insert the trepan guide wire **4-50-10-12** into the bone using wire handle **4-50-00-18** or a power tool. Open the intramedullary canal using the trepan drill **4-50-10-11**.

2

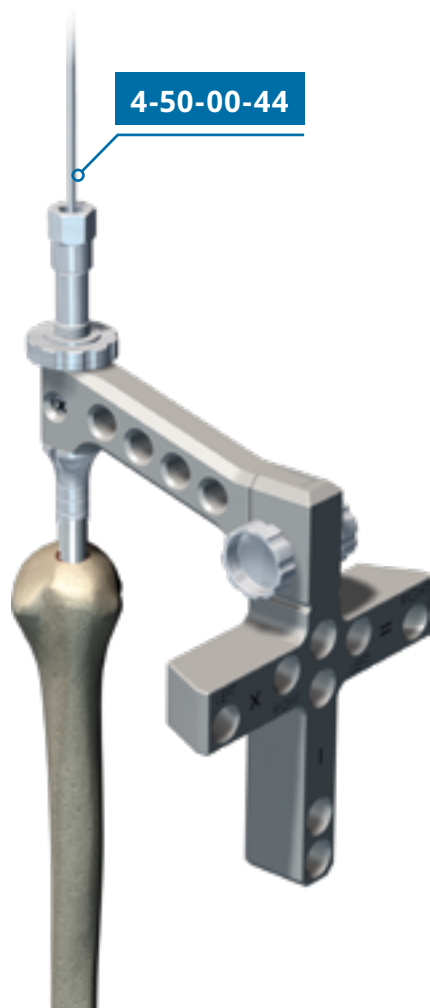
Remove the drill **4-50-10-11** and trepan guide wire **4-50-10-12**. Insert the guide wire with limiter **4-50-00-45** into intramedullary canal using guide wire handle **4-50-00-18**.

**3**

Prepare the intramedullary canal using the flexible reamer (starting with the Ø 8,0 mm reaming head) ream to a diameter of 1-2 mm greater than the nail diameter. Ream in 0,5 mm increments. Do not force the reamer.

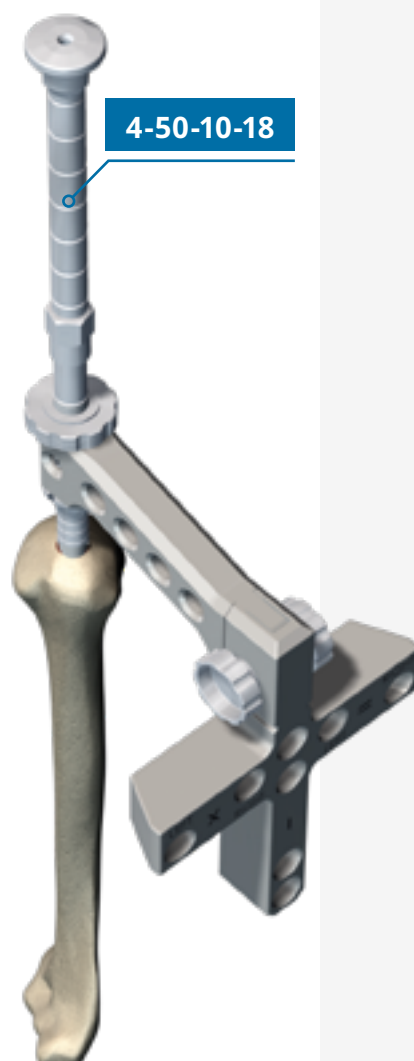
4

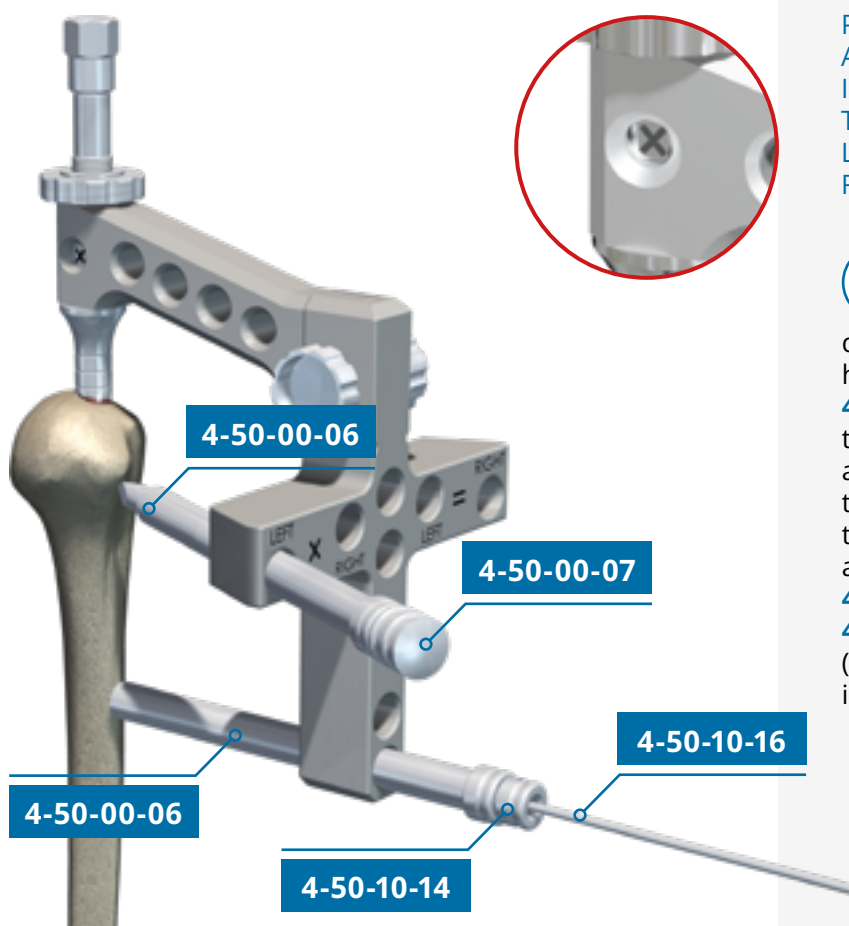
Insert the tubular slide **4-50-00-48** onto guide wire **4-50-00-45**, and change guide wire to **4-50-00-44**.



NAIL POSITIONING

- 1 Insert the nail into the bone using the assembled targeting device onto guide wire to **4-50-00-44**.





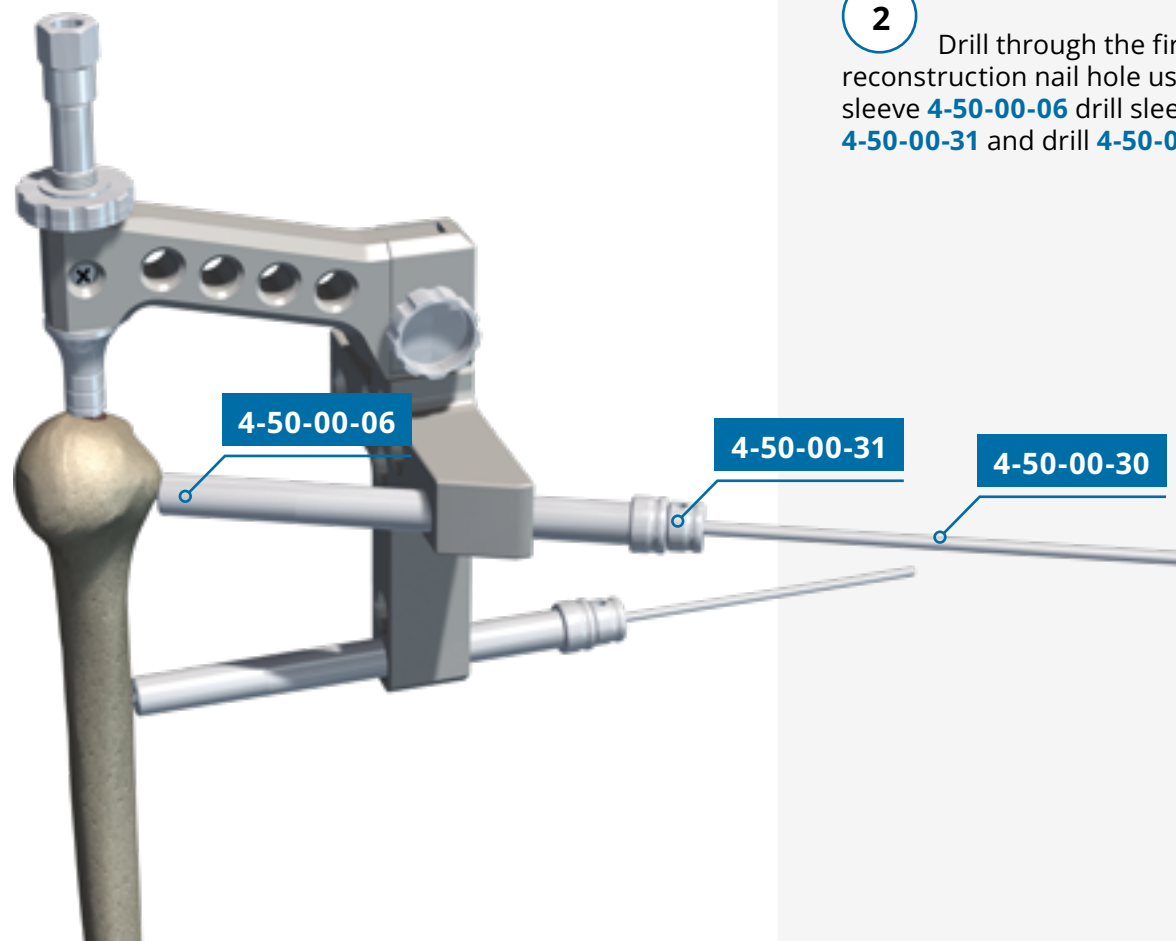
POSITION THE TARGETING DEVICE AS WELL SO THAT THE TROCAR IS IN DIRECTION OF THE LESSER TUBERCLE:
LEFT NAIL: MARK "X" AND "LEFT X"
RIGHT NAIL: MARK "II" AND "RIGHT II"

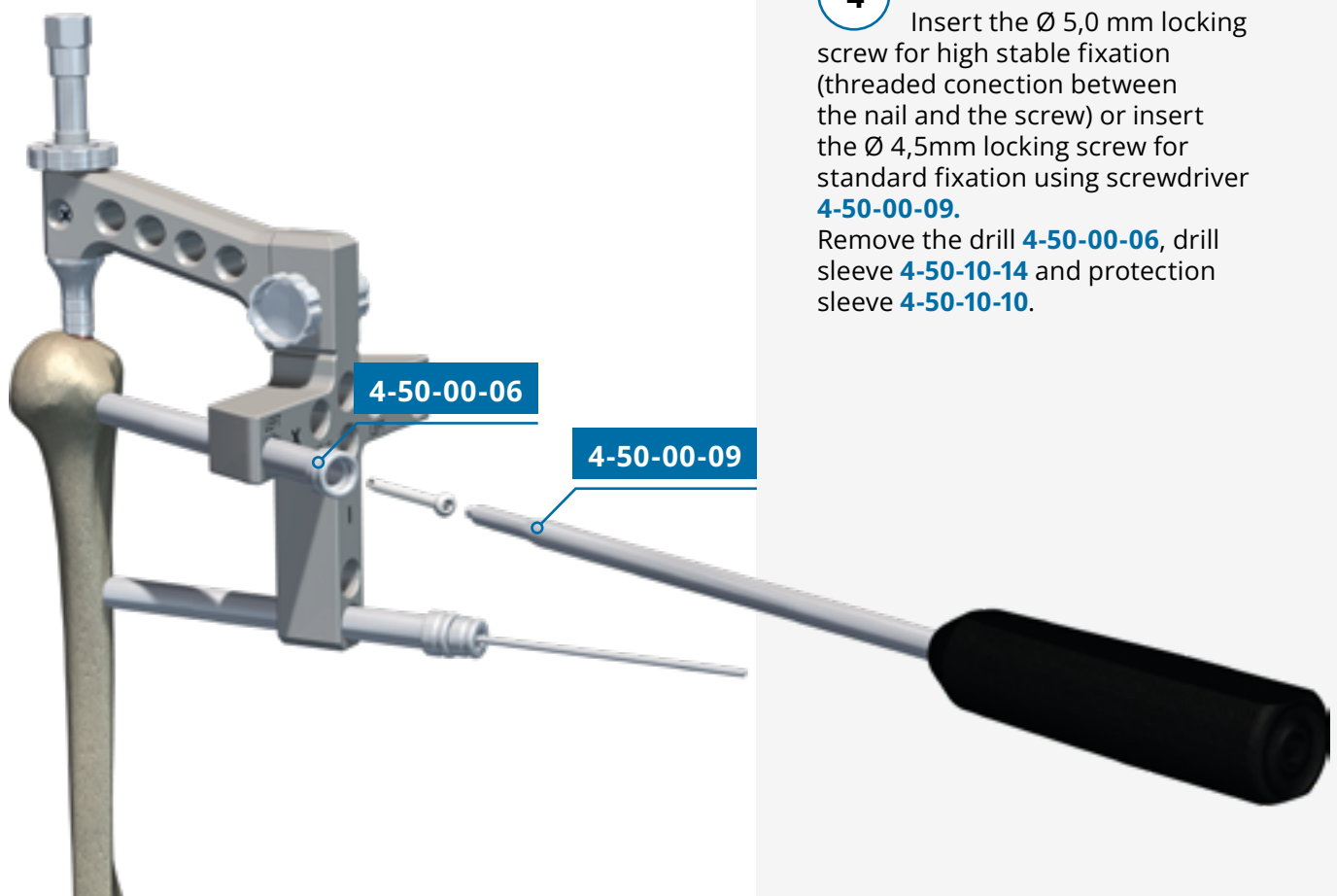
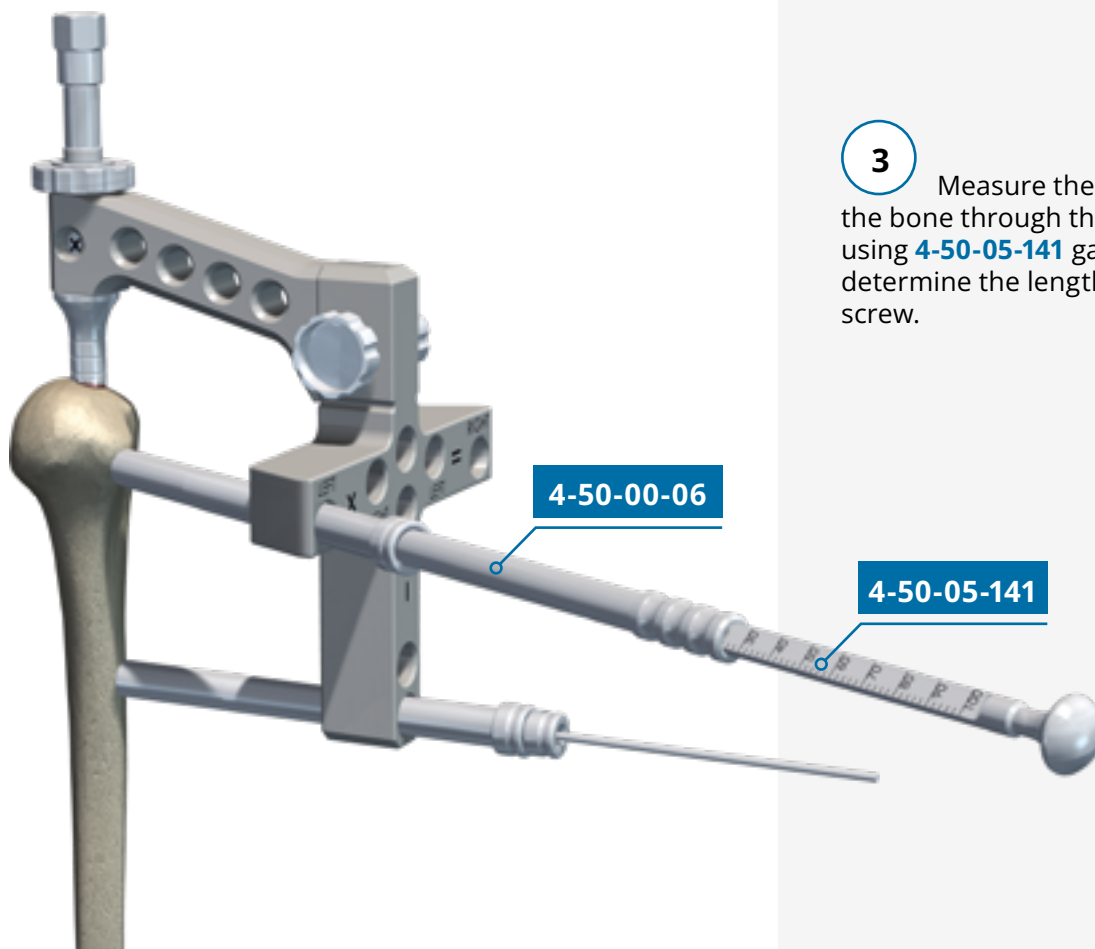
1

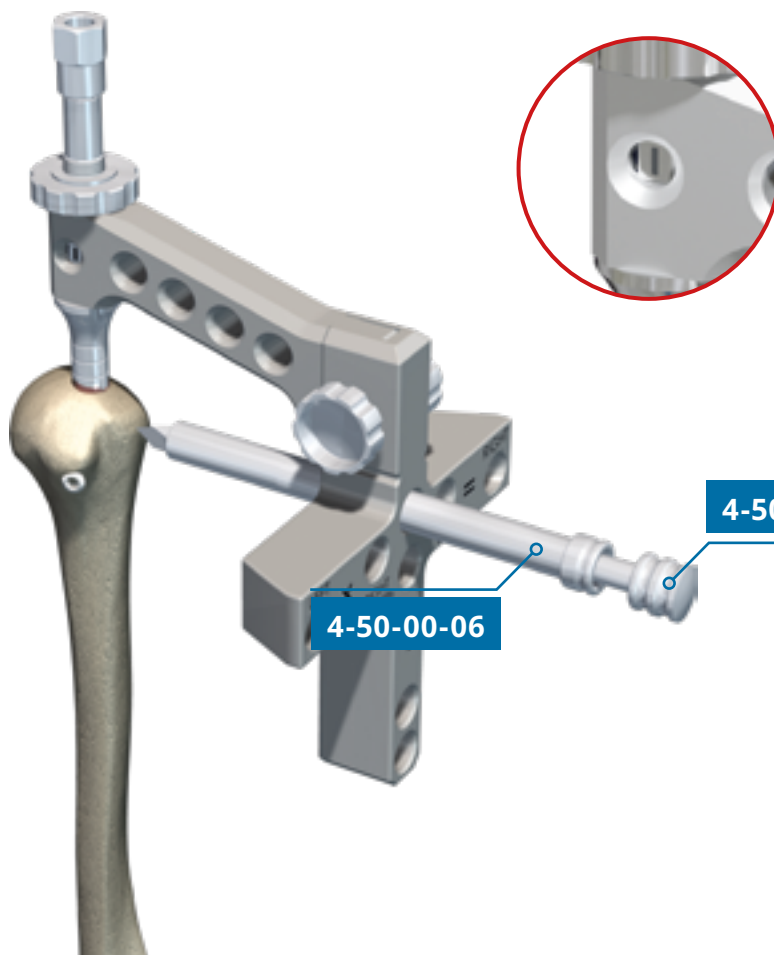
Position the targeting device to see the mark "X" in the hole of the handle. Insert the trocar **4-50-00-07** with sleeve **4-50-00-06** through the hole of the targeting arm with mark "LEFT X". Position the trocar in direction of the lesser tubercle. Lock the targeting device against rotation using $\varnothing 2,5$ drill **4-50-10-16** sleeve **4-50-00-06** and **4-50-10-14** into the lower distal hole (the drill should be inserted only into the first cortex).

2

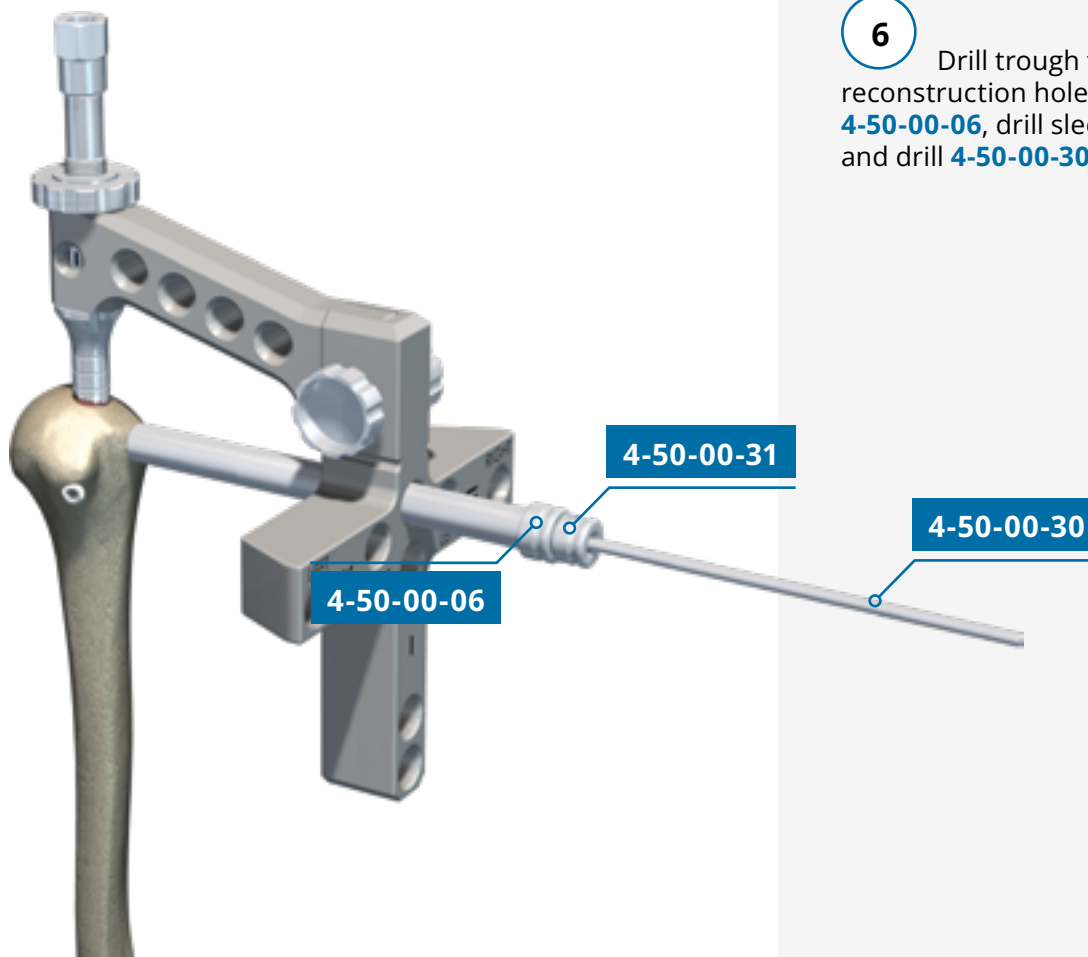
Drill through the first reconstruction nail hole using sleeve **4-50-00-06** drill sleeve **4-50-00-31** and drill **4-50-00-30**.



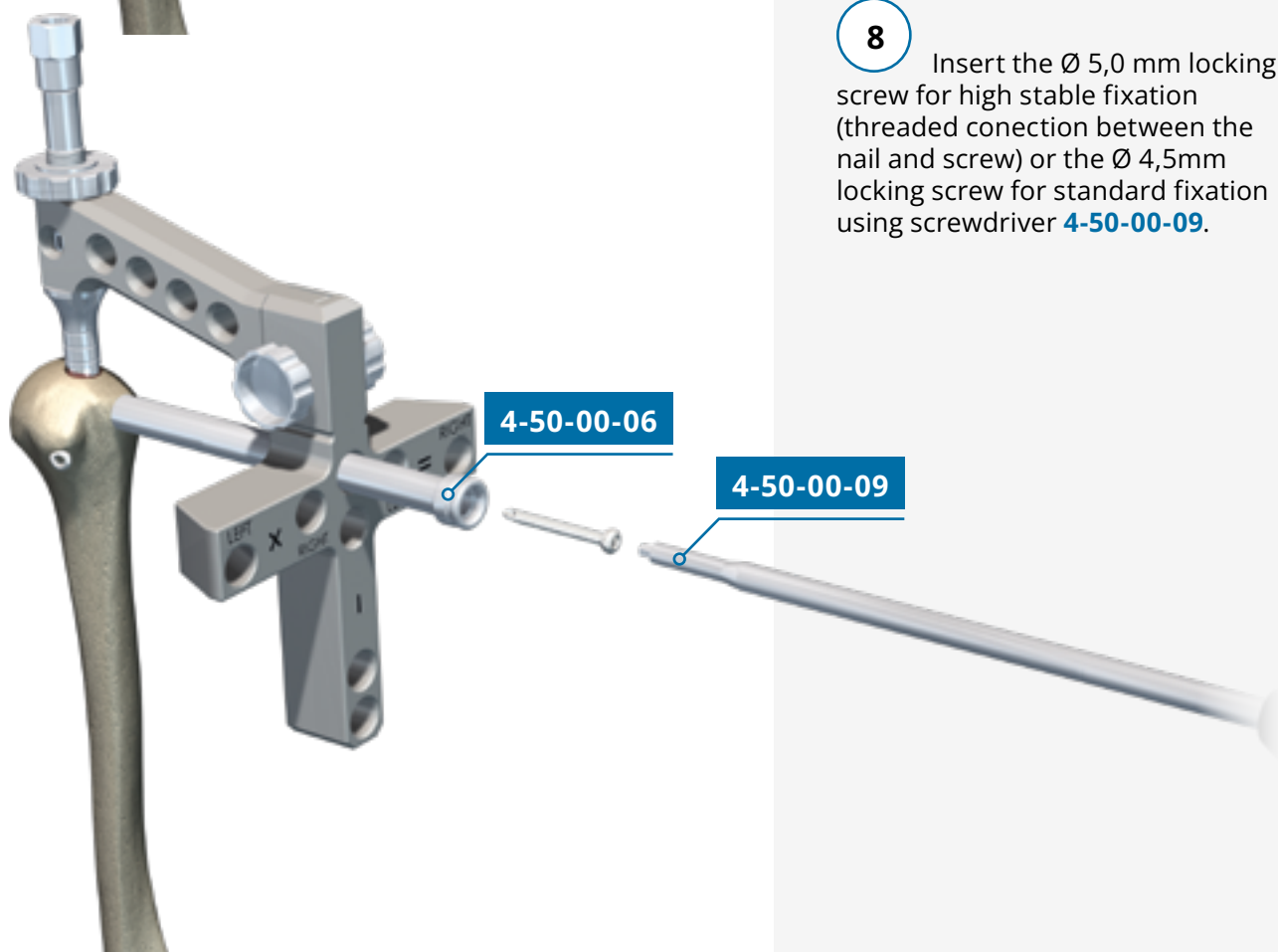
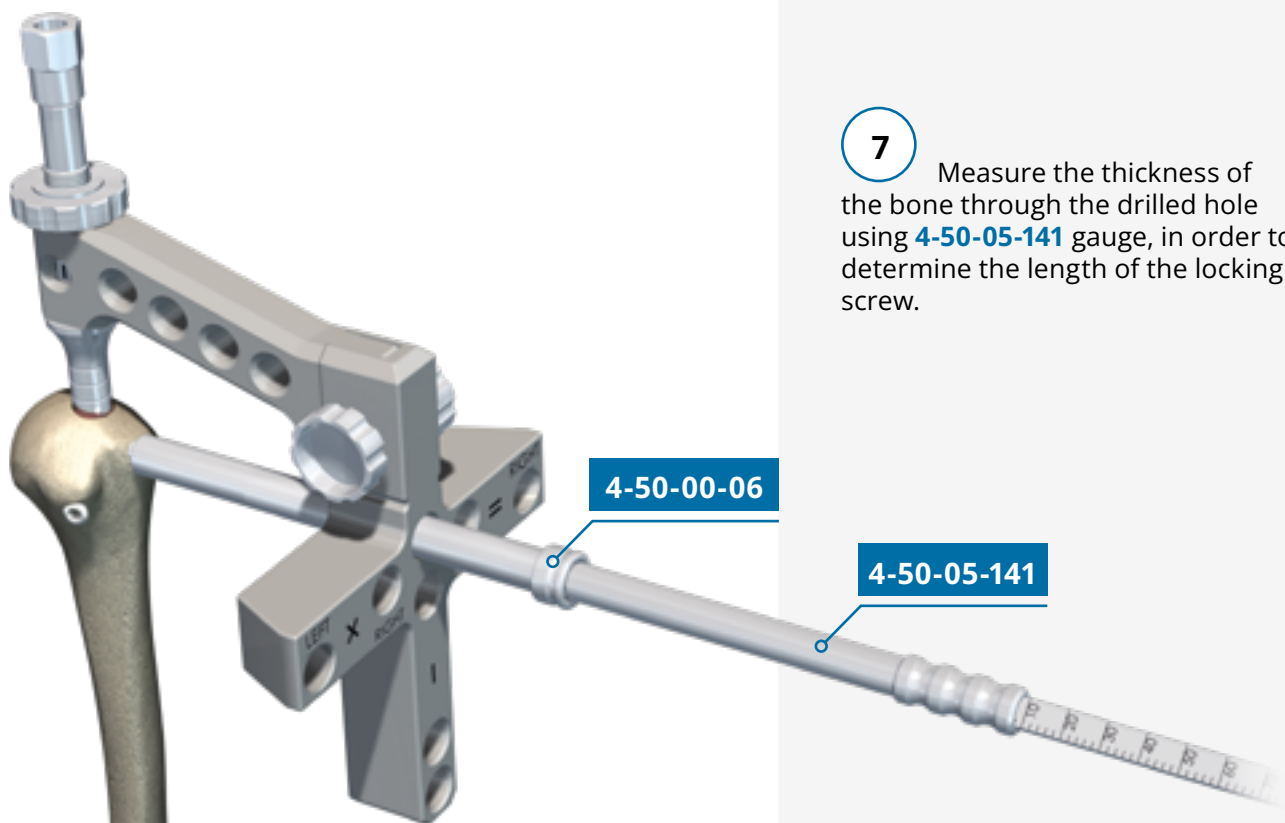




- 5** Change the position of the targeting device to see the mark "I" in the hole of handle. Insert trocar **4-50-00-07** into sleeve **4-50-00-06**. Remove the trocar leaving the sleeve as close to the bone as possible.

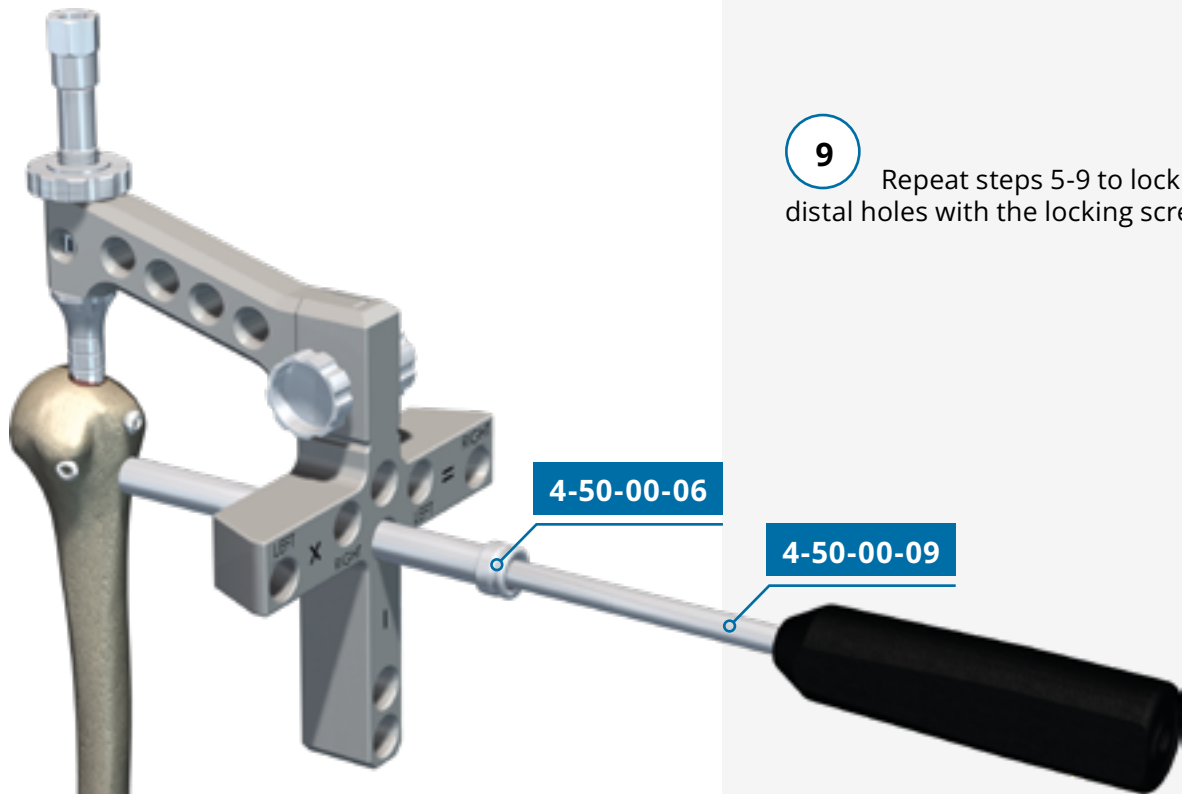


- 6** Drill through the first reconstruction hole using sleeve **4-50-00-06**, drill sleeve **4-50-00-31** and drill **4-50-00-30**.



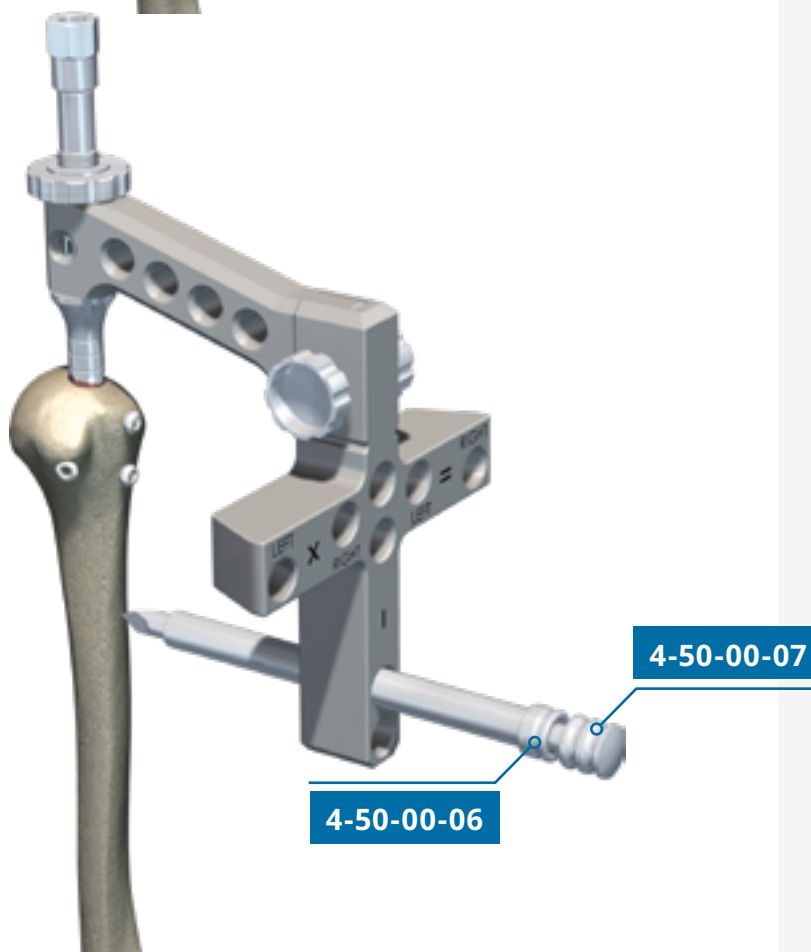
9

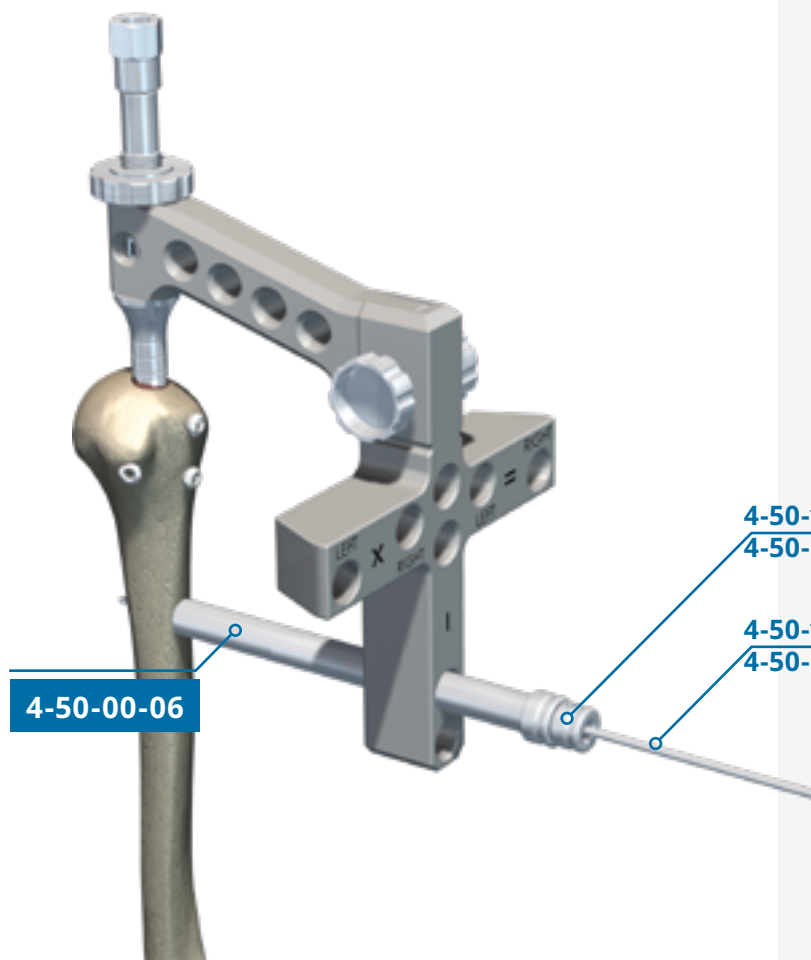
Repeat steps 5-9 to lock the distal holes with the locking screw.



10

Prepare the cortical bone by inserting the trocar **4-50-00-07** with the **4-50-00-06** sleeve into the upper distal hole. Remove the trocar leaving the sleeve as close to the bone as possible.





11

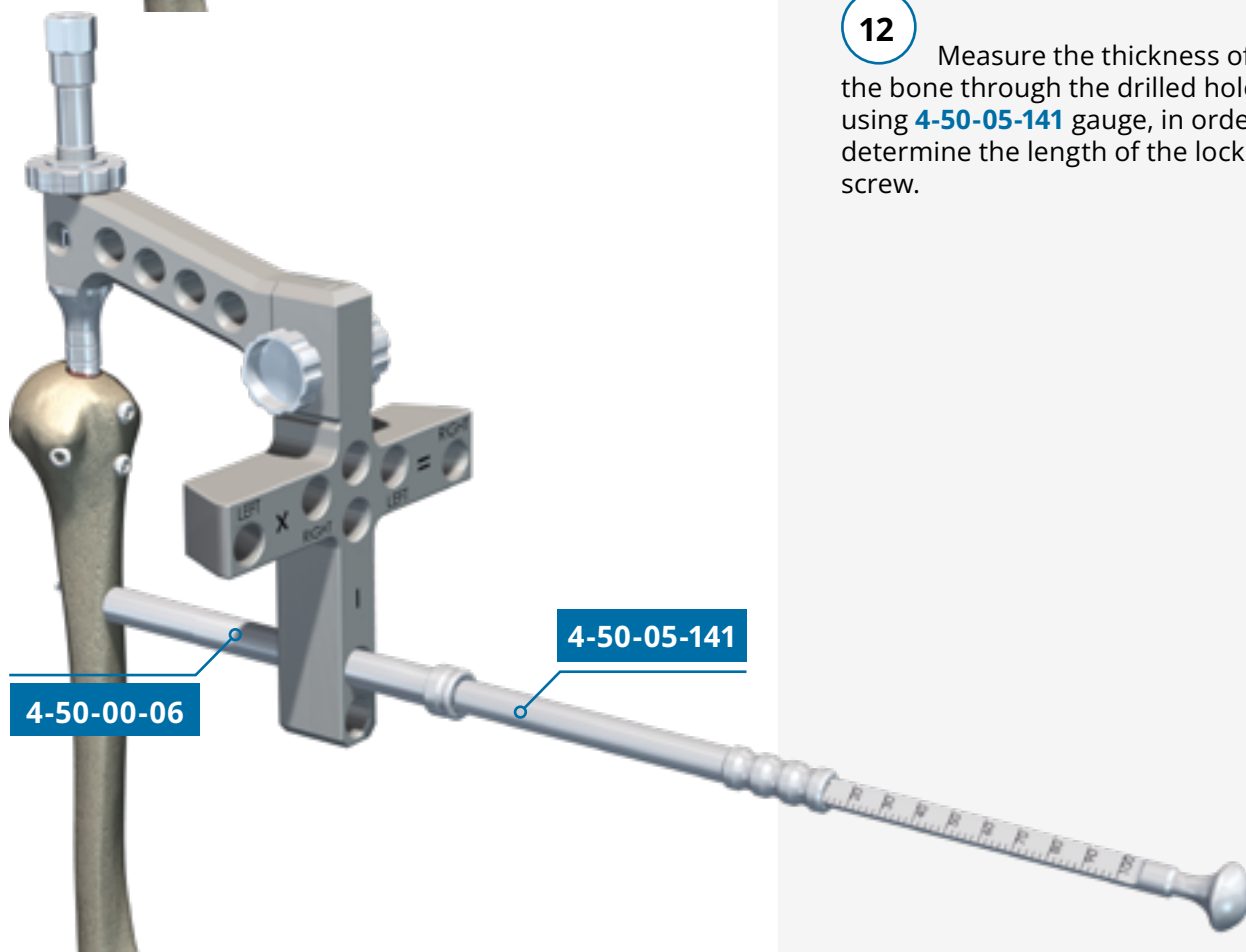
Drill through the distal nail holes.

4-50-10-14 Ø2.5mm for nails Ø6-7mm

4-50-00-31 Ø3.7 for nails Ø8-10mm

4-50-10-16 Ø2.5mm for nails Ø6-7mm

4-50-00-30 Ø3.7 for nails Ø8-10mm



12

Measure the thickness of the bone through the drilled hole using **4-50-05-141** gauge, in order to determine the length of the locking screw.

- 13** Insert the screw using screwdriver.

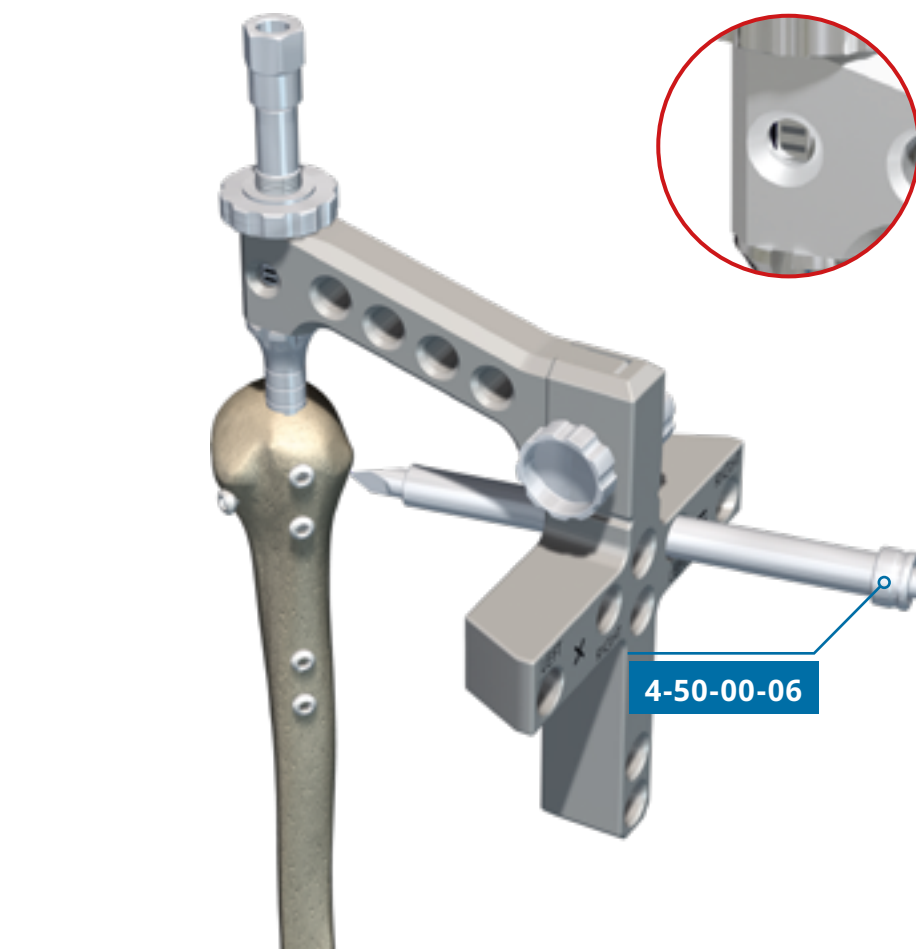
4-50-00-09 for locking screws Ø4.5mm
4-50-10-17 for cortical screws Ø3.5mm

4-50-00-06

- 14** Repeat steps 10-13 to lock the lower distal hole using the locking screw and screwdriver.

cortical screw Ø3.5 mm
for nails Ø 6-7 mm
locking screw Ø4.5 mm
for nails Ø 8-10 mm

4-50-00-06

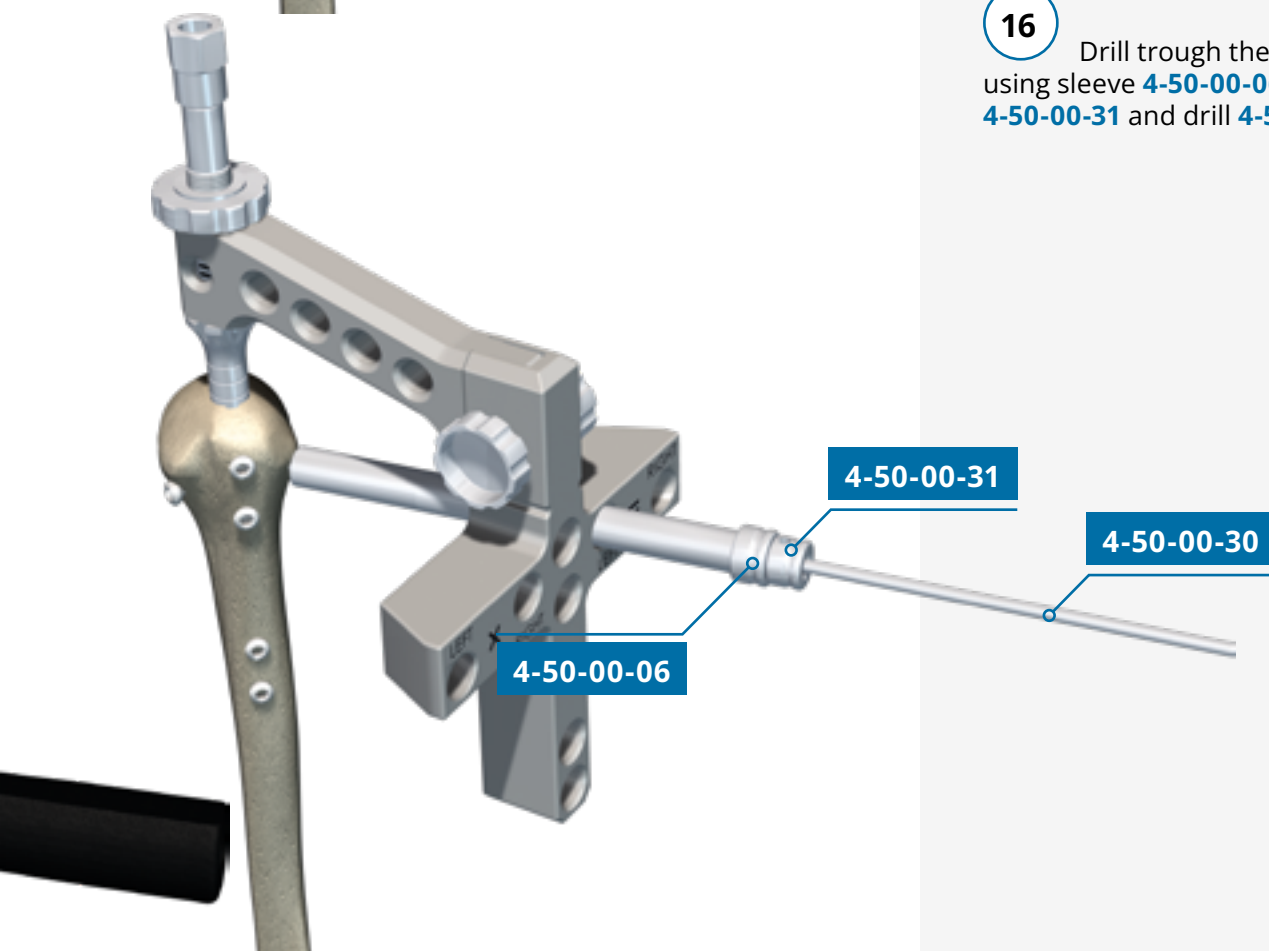


15

Position the targeting device to see the mark "II" in the hole of the handle. Insert the trocar **4-50-00-07** and sleeve **4-50-00-06** into the nail through the hole of the targeting arm with the mark "LEFT II". Remove the trocar leaving the sleeve as close to the bone as possible.

4-50-00-07

4-50-00-06



16

Drill trough the nail hole using sleeve **4-50-00-06**, drill sleeve **4-50-00-31** and drill **4-50-00-30**.

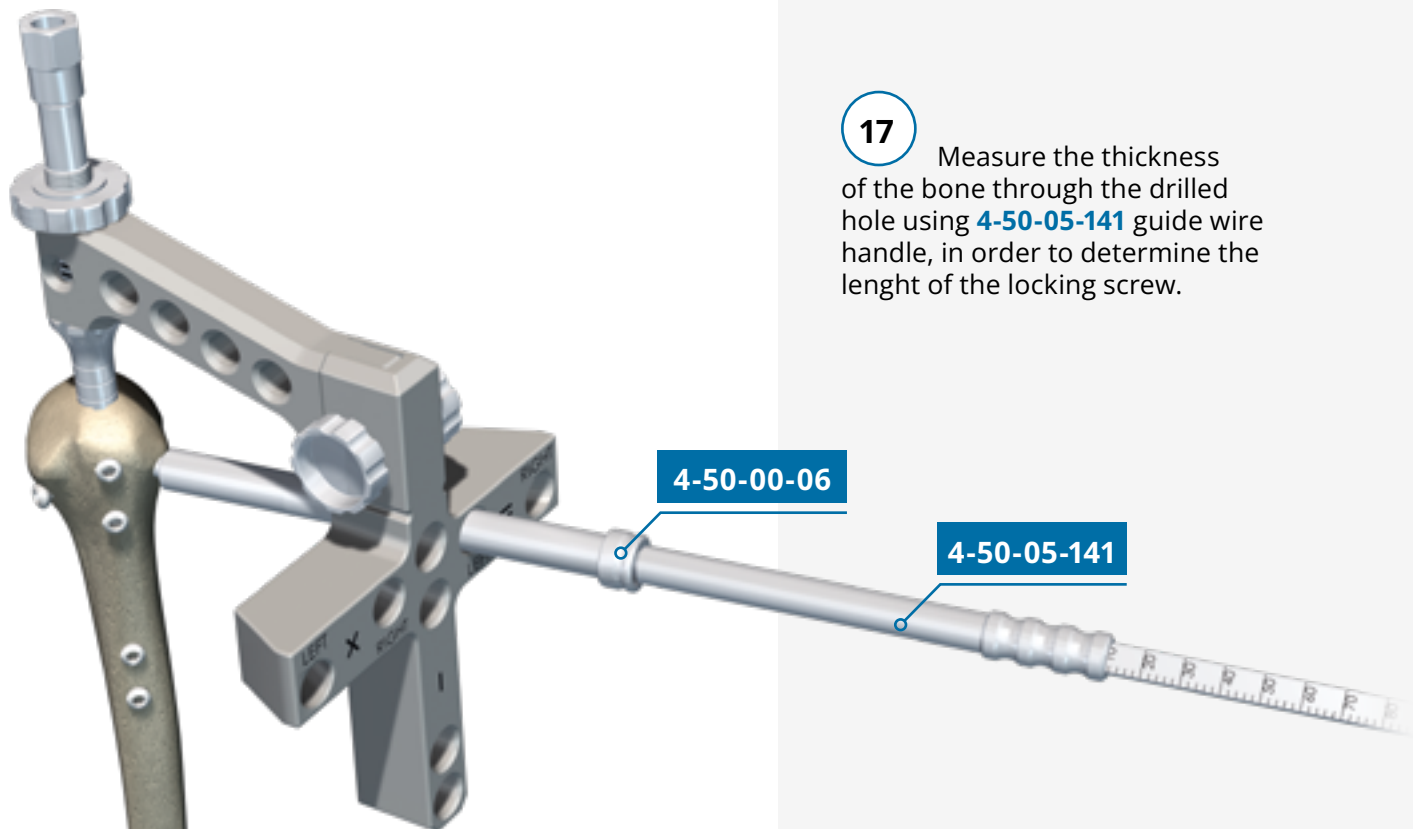
4-50-00-31

4-50-00-30

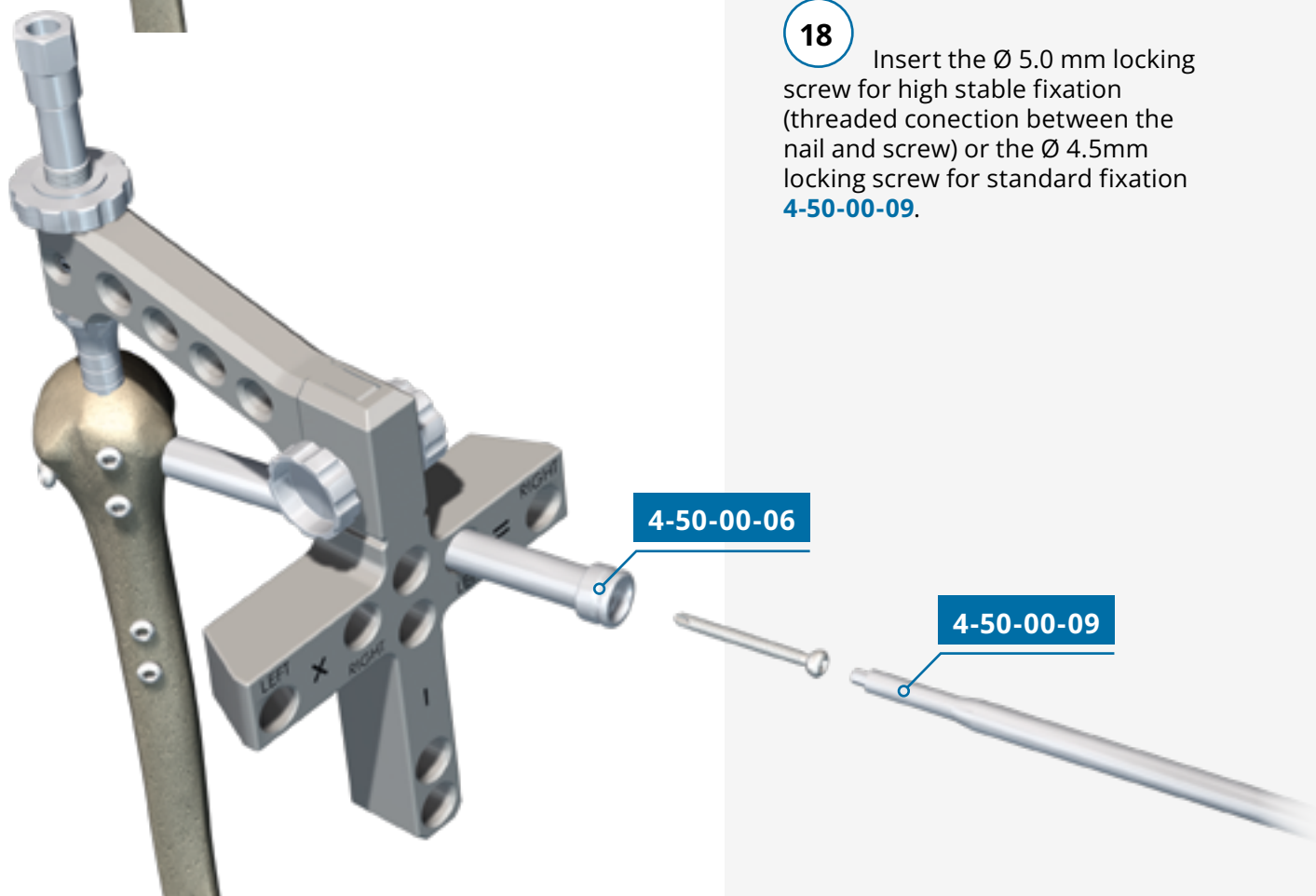
4-50-00-06

17

Measure the thickness of the bone through the drilled hole using **4-50-05-141** guide wire handle, in order to determine the length of the locking screw.

**18**

Insert the $\varnothing$ 5.0 mm locking screw for high stable fixation (threaded connection between the nail and screw) or the $\varnothing$ 4.5mm locking screw for standard fixation **4-50-00-09**.





19

Remove targeting device.

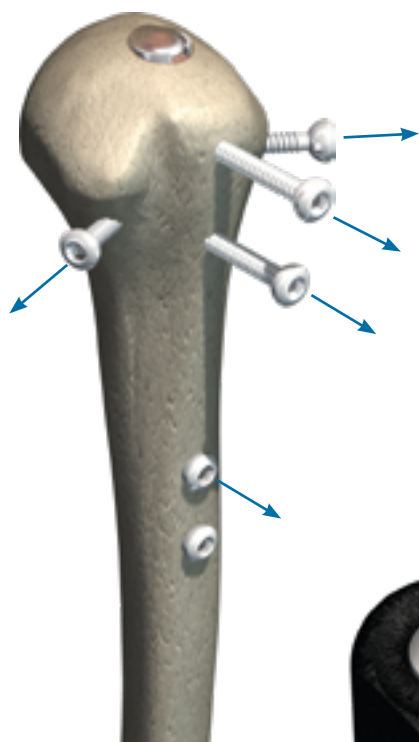
20

Insert the end cap using screwdriver **4-50-00-09**.

NAIL REMOVING

1

Clear sockets of locking screws from any tissue ingrowth. Remove all locking screws except one of the distal locking screws.

**2**

Remove end cap.



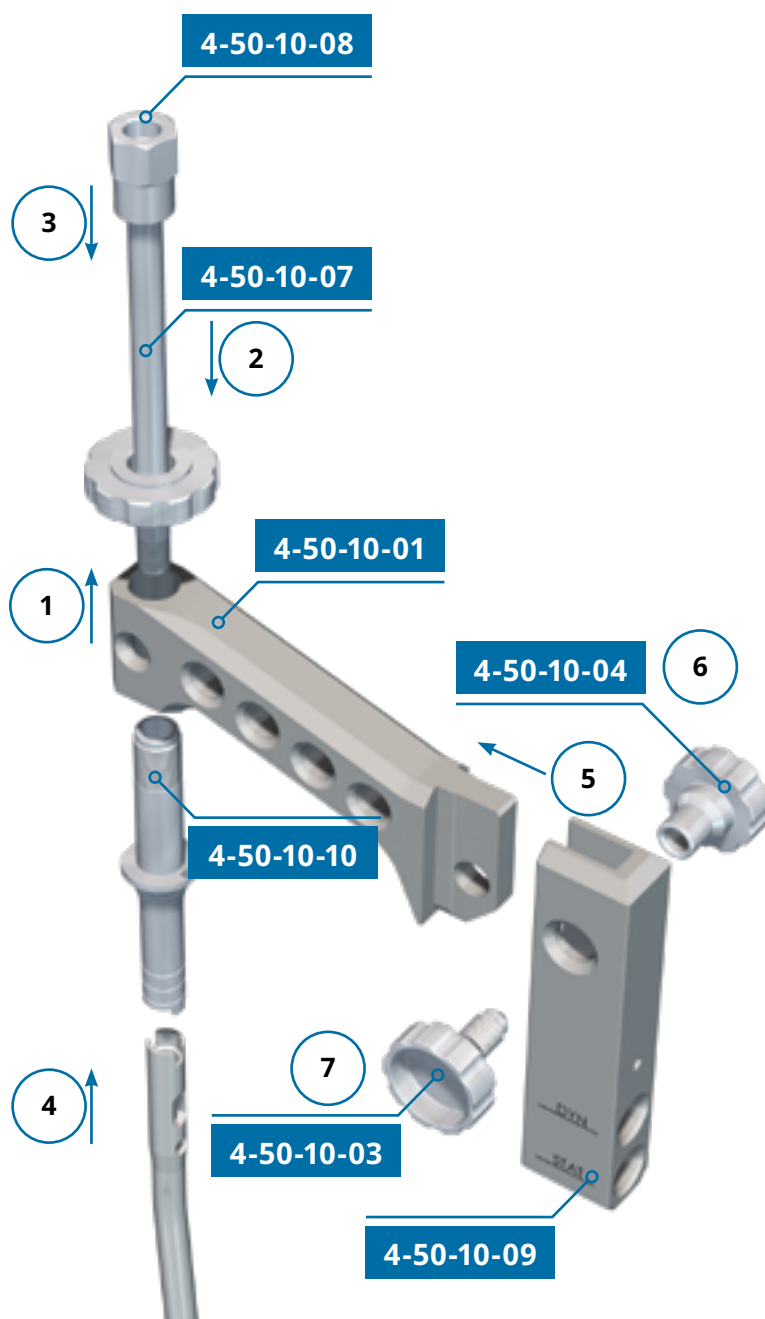
**3**

Insert the extractor **4-50-10-19** and remove the last distal locking screw. Remove the nail.

4-51-01-16

After use the instruments should be properly prepared for cleaning by removing the remaining bone fragments, carry out the cleaning process and re-sterilization.

TARGETING DEVICE ASSEMBLING - COMPRESSION NAIL



1 Insert the sleeve adapter for the compression humeral nail **4-50-10-10** into the handle **4-50-10-01**.

2 Lock the sleeve using the fixation nut **4-50-10-07**.

3 Insert the nail holding screw M8 **4-50-10-08** into sleeve **4-50-10-10**.

4 Connect the compression humeral nail with the holding screw using the wrench.

5 Connect the targeting arm for the compression humeral nail **4-50-10-09** with the handle.

6 Insert the fixation nut **4-50-10-04** through the targeting arm and handle.

7 Drive the fixation screw **4-50-10-03** into fixation nut.

ASSEMBLY CHECK

1

Check proximal holes using control pin **4-50-00-08**.



NAIL INSERTION

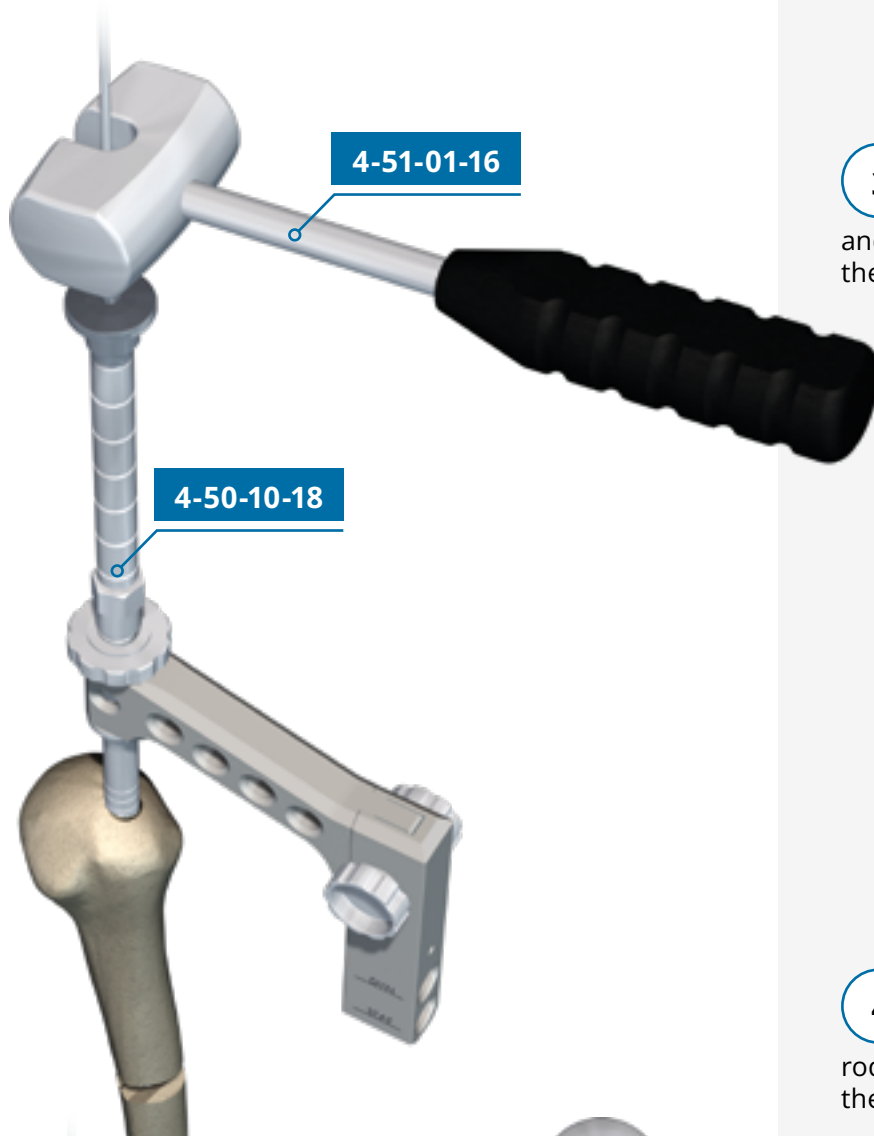
1

Prepare bone using trocar in the same way as in reconstruction nail (steps 1-4).

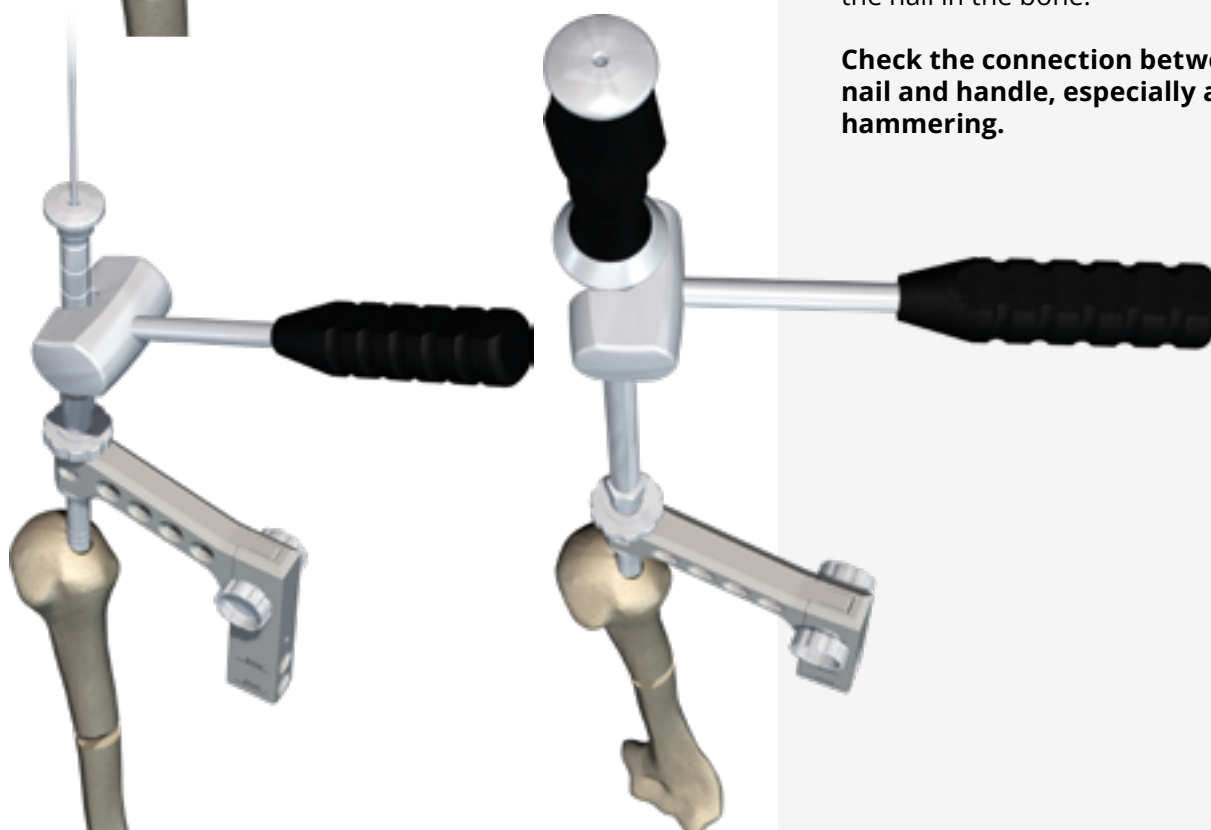
4-50-00-44**2**

Insert the nail into the bone using targeting device and wire **4-50-00-44**.





- 3** Use impactor **4-50-10-18** and hammer **4-51-01-16** to position the nail.

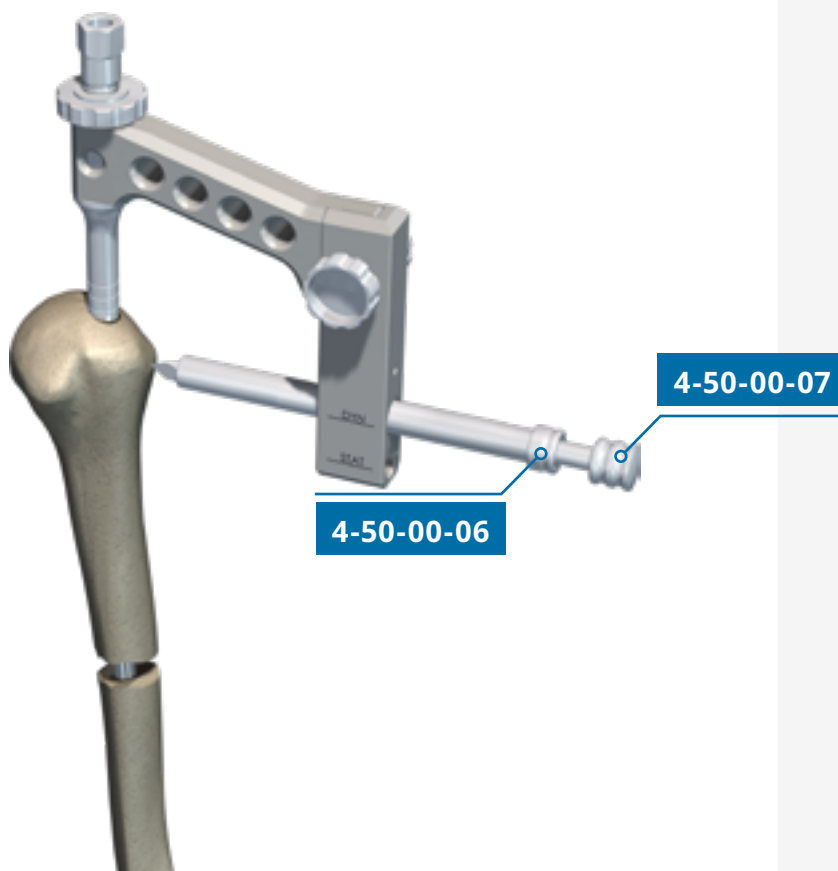


- 4** If necessary - use extractor rod **4-50-10-19** to change position of the nail in the bone.

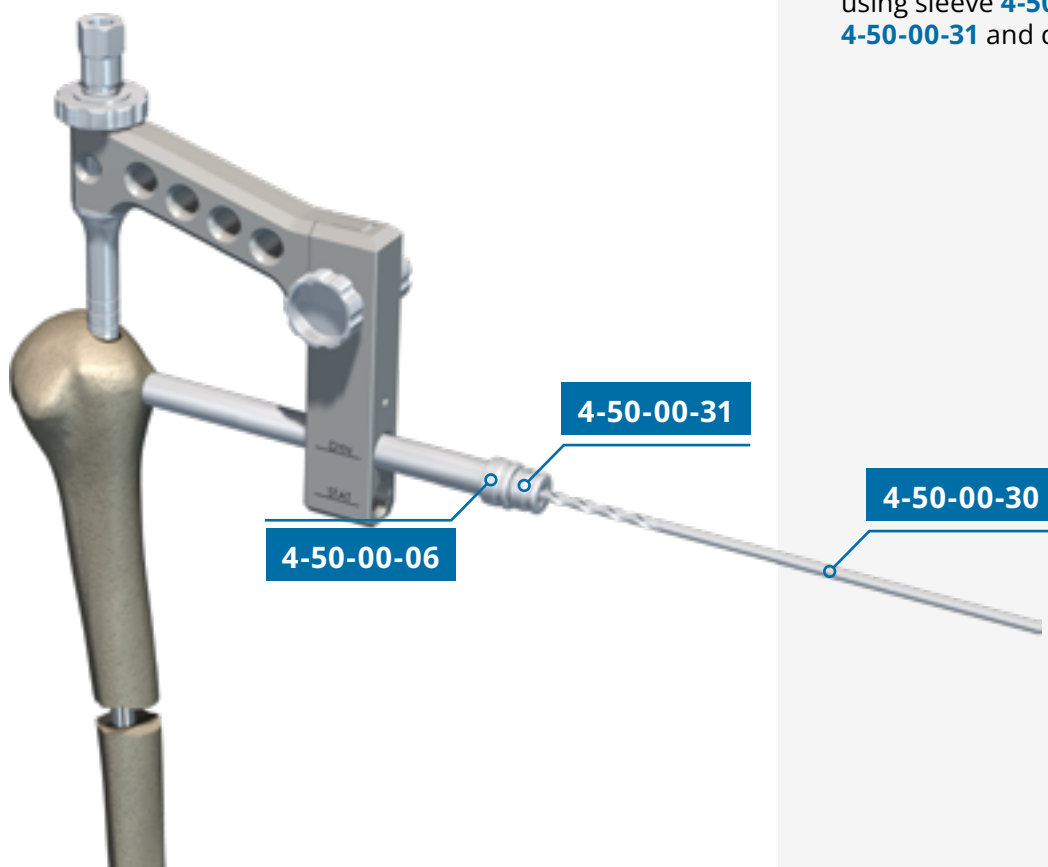
Check the connection between nail and handle, especially after hammering.

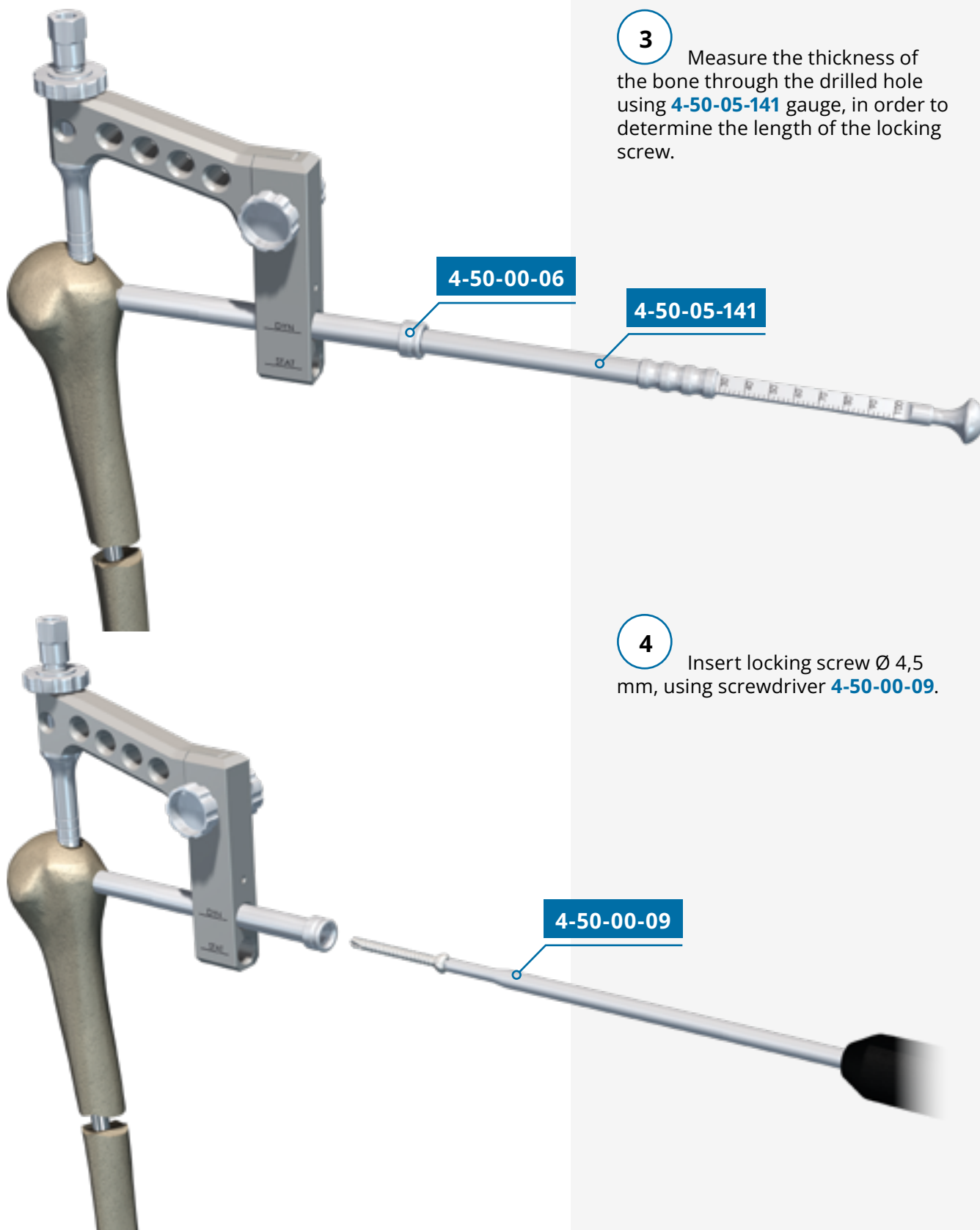
STATIC METHOD

- 1 Prepare the bone using trocar **4-50-00-07** through sleeve **4-50-00-06**. Remove the trocar leaving the sleeve as close to the bone as possible.



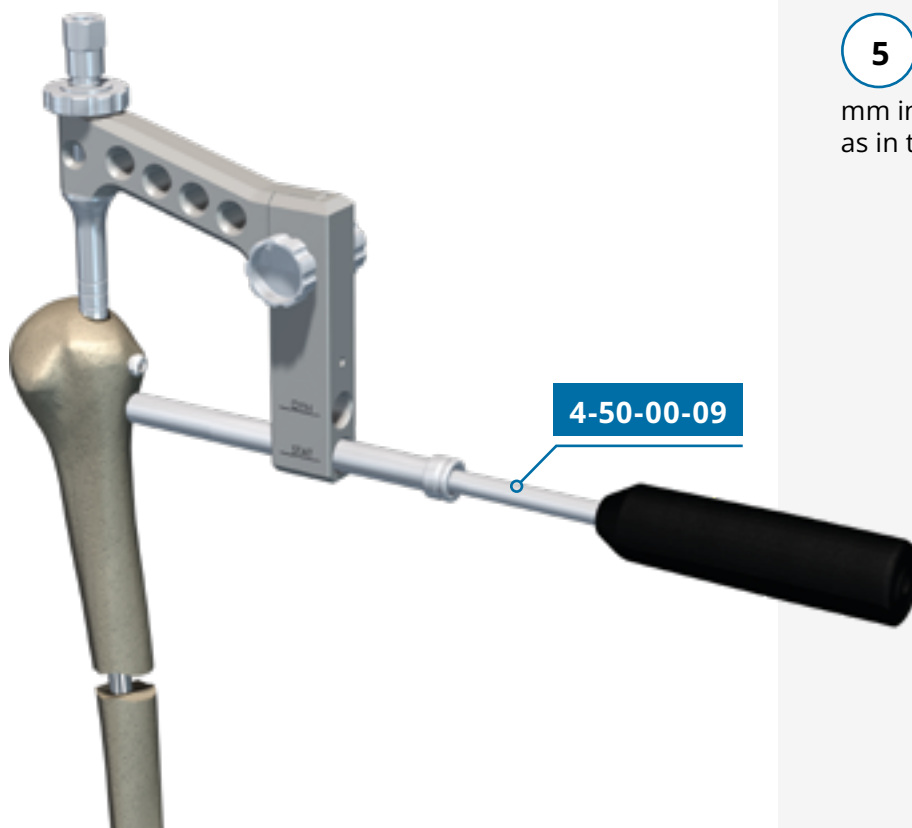
- 2 Drill through first nail hole using sleeve **4-50-00-06**, sleeve **4-50-00-31** and drill **4-50-00-30**.



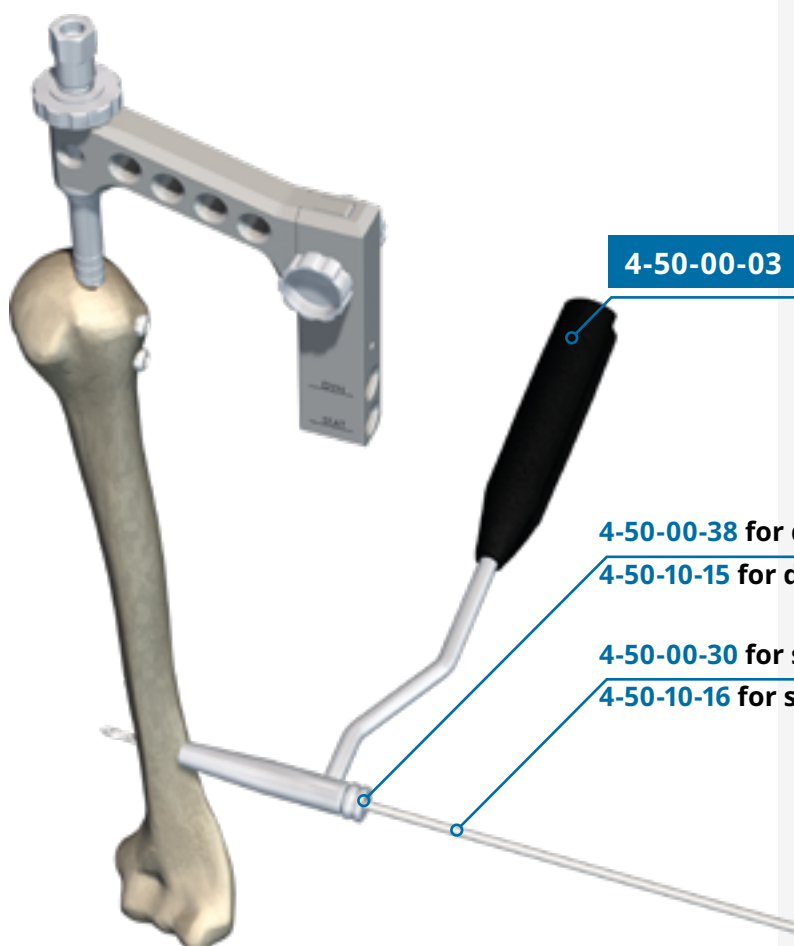


3 Measure the thickness of the bone through the drilled hole using **4-50-05-141** gauge, in order to determine the length of the locking screw.

4 Insert locking screw Ø 4,5 mm, using screwdriver **4-50-00-09**.



- 5** Insert locking screw Ø 4,5 mm in static hole in the same way as in the compression hole.



FREEHAND TARGETING DEVICE

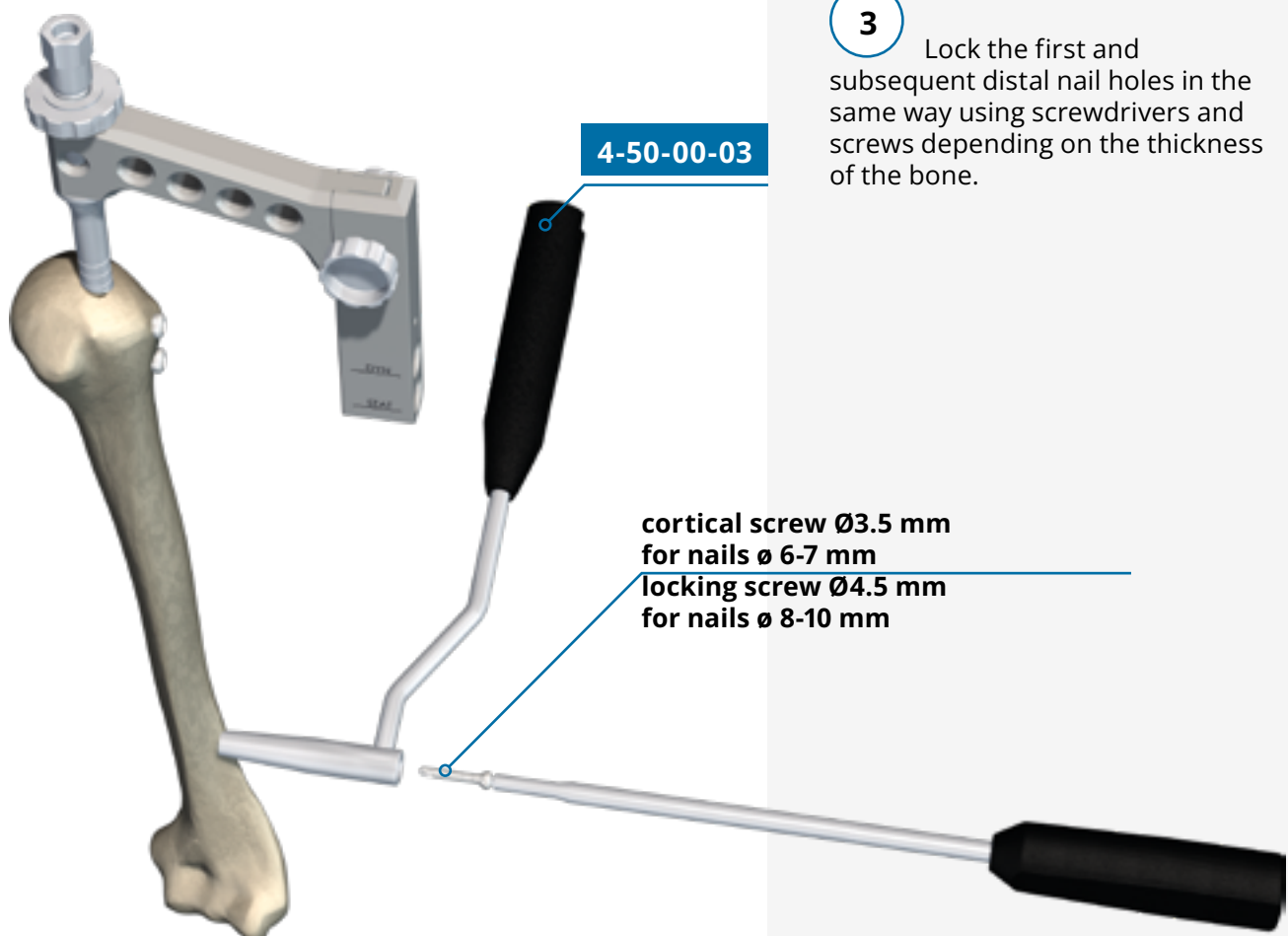
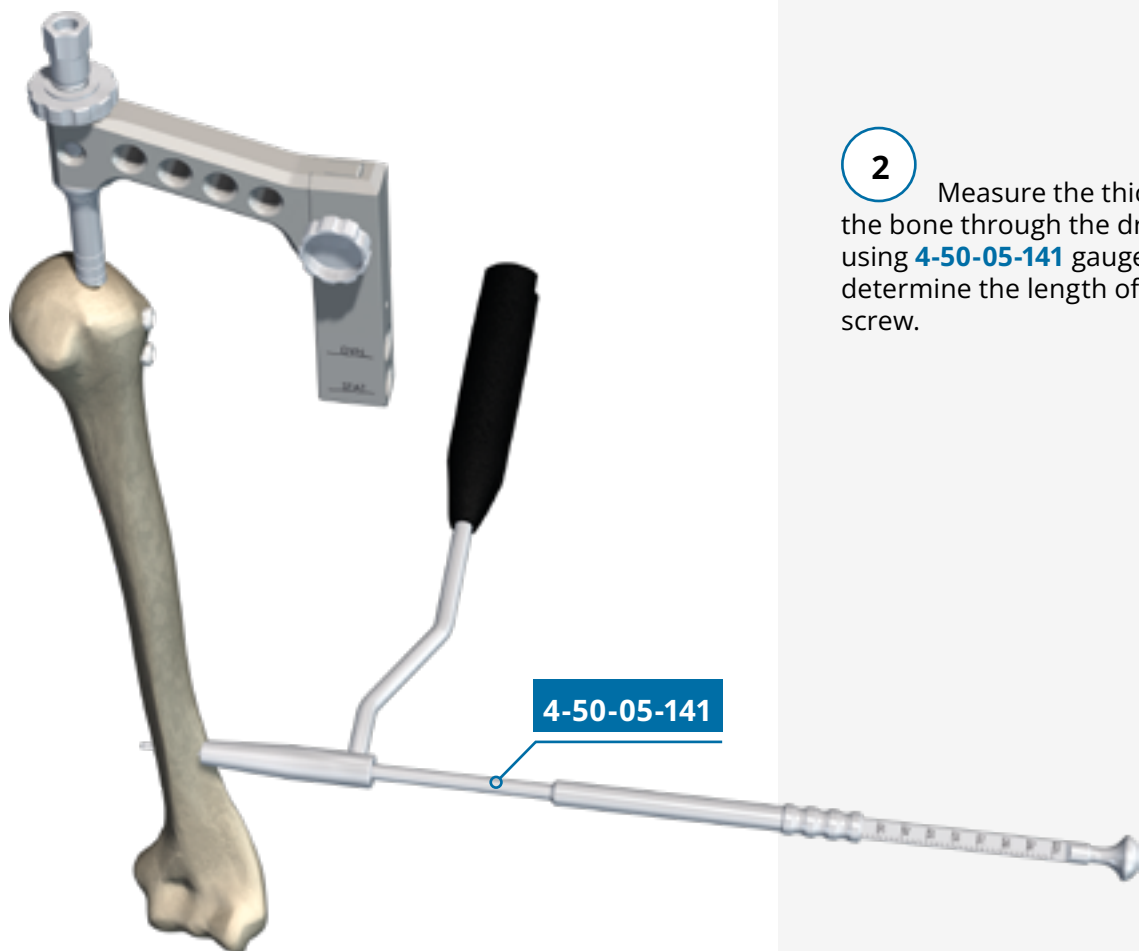
- 1** Drill through first nail hole using freehand device **4-50-00-03**, sleeves and drills (diameters depending on the thickness of the nail).

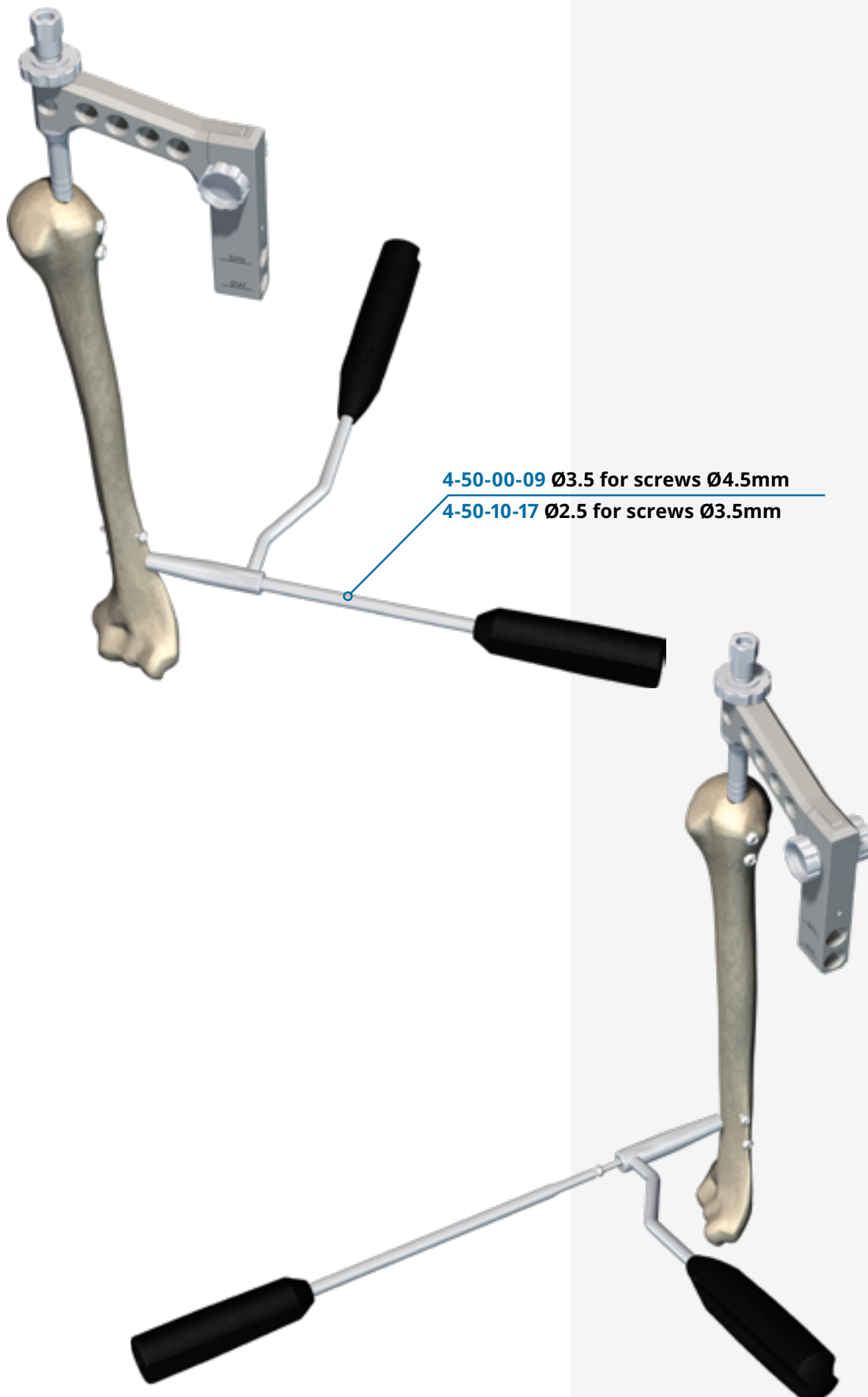
4-50-00-38 for drill Ø3.7mm

4-50-10-15 for drill Ø2.5mm

4-50-00-30 for screws Ø4.5mm

4-50-10-16 for screws Ø3.5mm





COMPRESSION METHOD (COMPRESSION SCREW)

1

Lock distal holes using freehand device (steps 6-8). Insert locking screw Ø 4,5 into compression hole, in the same way as in the static method (steps 1-4).

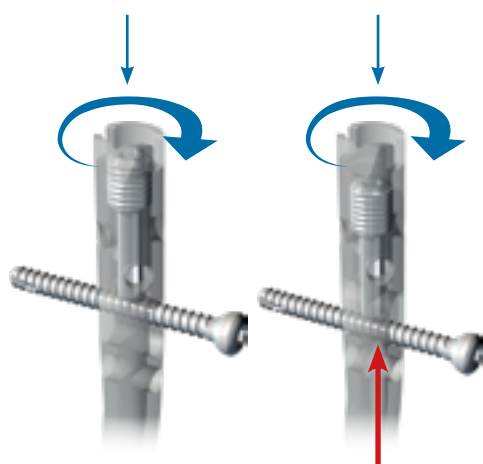
4-50-00-06**4-50-00-09****2**

Remove nail holding screw M8 **4-50-10-08** out of sleeve adapter.

4-50-10-08



- 3** Insert compression screw into nail, in order to compress the fracture.



NOTE:
AFTER USE AND LEAVING IN THE NAIL THE COMPRESSION SCREW, IT IS NOT POSSIBLE TO INSTALL THE END CAP.

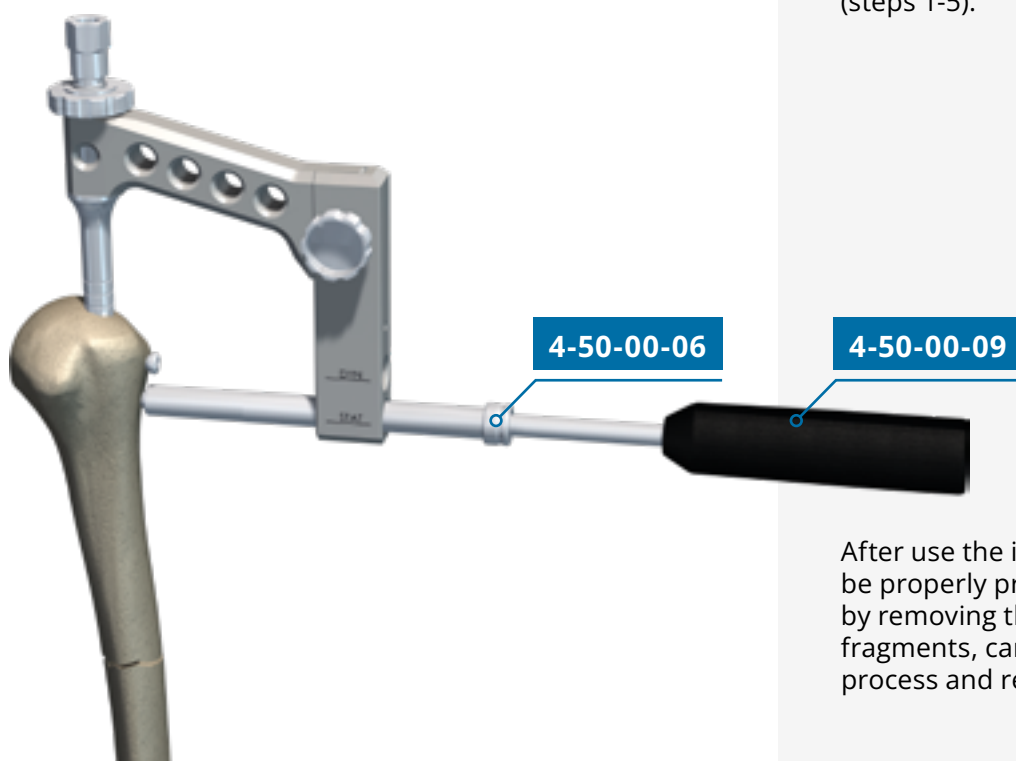
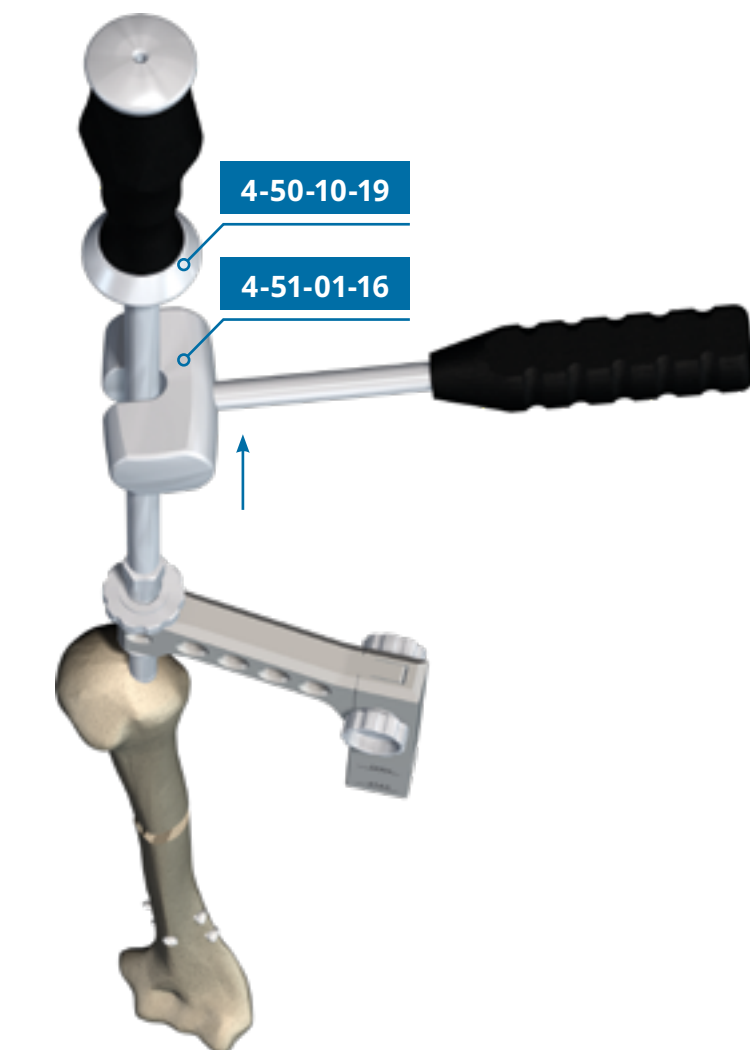
COMPRESSION METHOD (EXTRACTOR)

1

Lock only distal nail holes using freehead device (steps 6-8). Compress fracture using extractor **4-50-10-19** and hammer **4-51-01-16**.

2

Lock proximal nail holes in the same way as in static method (steps 1-5).



After use the instruments should be properly prepared for cleaning by removing the remaining bone fragments, carry out the cleaning process and re-sterilization.

[illegible]

MEDGAL[®]

ORTHOPAEDIC IMPLANTS & INSTRUMENTS



Manufacturer:

MEDGAL[®] sp. z o.o.
ul. Niewodnicka 26A
16-001 Książyno
POLAND

tel.: +48 85 663 23 44
www.medgal.com.pl

tel.: +48 85 663 29 99
fax +48 85 663 26 22
export@medgal.com.pl

