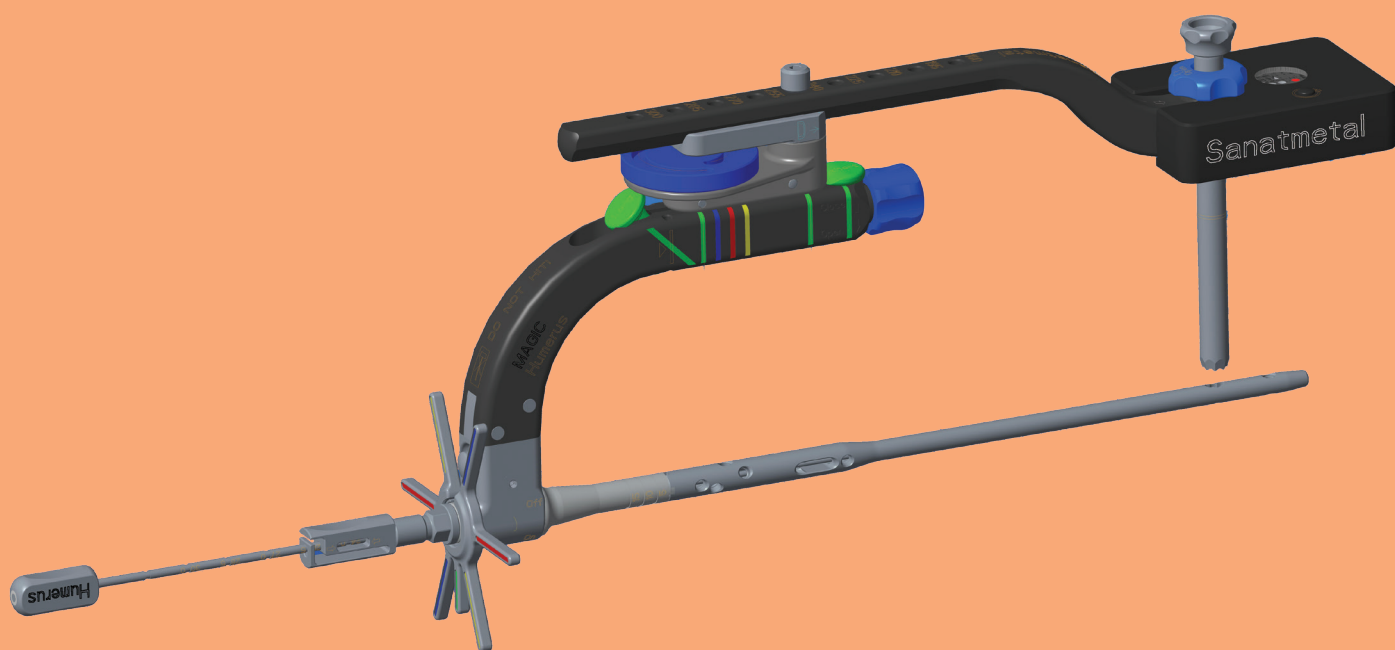


# MAGIC Humerus



The following surgical description contains general outlines for intramedullary nailings performed on the tibia with Magic Humerus system. However, the operating surgeon shall adapt the content to the patient, fracture type and all other relevant factors that may have influence on the outcome of the surgery.

Therefore, Sanatmetal Ltd. strongly recommends participation on workshops and trainings prior to the initial operation.

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**MAGIC Humerus** implant and instrument system - similarly to other, Sanatmetal designed nailing systems – aims to significantly reduce x-ray during operation. The already well proven magnetic targeting was designed to be wireless while the new nail prevents rotator cuff injuries thus increasing intraoperative security and comfort and increases the chances of a full recovery.

## 1.1 | The implant

### The MAGIC Humerus nail

- Straight nail to prevent rotator cuff
- Short nail for proximal fractures with a 45 degree oblique hole
- Locking holes in multiple angles for wide fixation
- Screw can be put to the surgical neck
- Special hole for accepting manual targeting device
- Anodized titanium make

### Locking screws

- 3,8 mm locking screws
- 3,8 mm proximal locking screws

## 1.2 | Instruments

- Wireless magnetic targeting for reduced x-ray during surgery
- Rotatable color coded proximal arm for assembly free proximal targeting
- Compression tool
- Distal manual targeting device
- No-fall-out sleeves

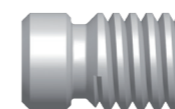
## 1.3 | Indications

- Humerus diaphysis fractures
- Proximal humerus fractures (short nail)

## 2.1 | MAGIC Humerus nails

	Short	Long
Dia (mm)		7
	8	8
	9	
Length (mm)		
	140	
	160	
		180
		195
		210
		225
		240
		255
		270
		285
		300
Raw material	anodized Titanium	anodized Titanium

## 2.2 | Closing cap



Length (mm)

0
5
10
15

Raw material

anodized Titanium

## 2.3 | Locking screw Ø3,8 mm



Length (mm)

20 - 80

Raw material

anodized Titanium

## 2.4 | Proximal locking screw



Length (mm)

20 - 60

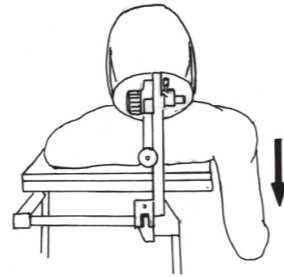
Raw material

anodized Titanium

# 3 | Surgical procedure

## 3.1 | Patient positioning

In beach chair position where the arm hangs by the side of the trunk, helping the reposition. It is important to isolate the whole upper limb. For the secure holding of the arm use mobile radiolucent armrest. Perform fracture reduction when the guide wire and the nail are inserted.



## 3.2 | Determining nail length and diameter

To determine the nail length measure the length of the guide wire outside the bone and subtract it from the total length. For determining diameter image intensifier is used.

## 3.3 | Approach and the opening of the intramedullary cavity

Make the incision in the upper third of the deltoïd muscle, starting from the frontal peak of the acromion. Separate the muscles while avoiding the injury of the axillary nerve. Cut the rotator cuff open at the medial edge of the greater tubercle and trepanate the intramedullary cavity in the axis of the bone. When preparing the place for the nail use the 10 mm cannulated drill through the respective soft tissue protector.

The ideal entry point is the tip of humerus head in line with the intramedullary cavity in both AP and lateral directions. This point is postero-lateral from the biceps tendon and medial from the area between the greater tubercle and the humeral head.

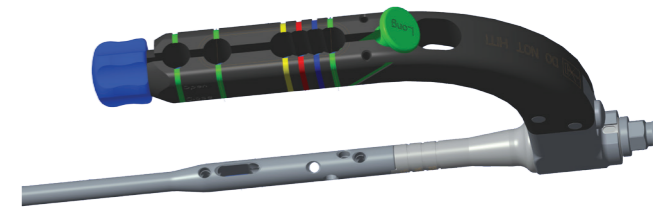
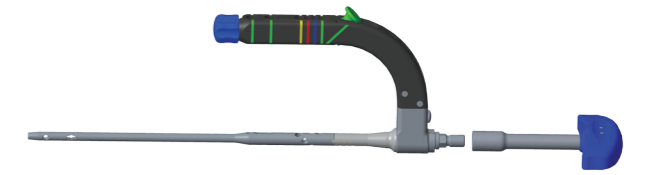
If the shoulder tip hinders insertion position the shoulder in such a way that the tip of the humeral head shall be in front of the shoulder tip.

## 3.4 | Assembly of the nail and the targeting arm

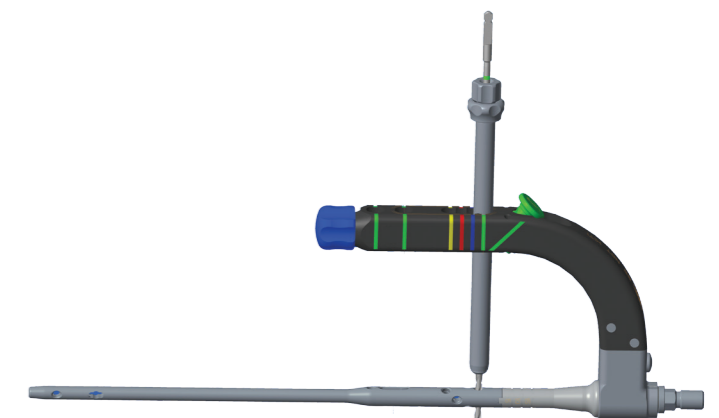
Rotate the proximal arm into green position by pressing the button. With the connecting screw and the T wrench connect the nail firmly to the targeting arm.

### ATTENTION!

Depending on whether you are using long or short nail put the closing plug into the respective hole of the targeting arm corresponding to the chosen nail. This way drilling into the nail can be prevented.



Prior to nail insertion always check the setup. Push the soft tissue protector into the green hole and lock with the blue knob. Turn the 3,2 mm drill sleeve into the soft tissue protector. Push the 3,2 mm drillbit through the drill sleeve. In optimal case the sleeve guides the drillbit into the appropriate hole. Repeat at the other colored holes as well by rotating the proximal arm.

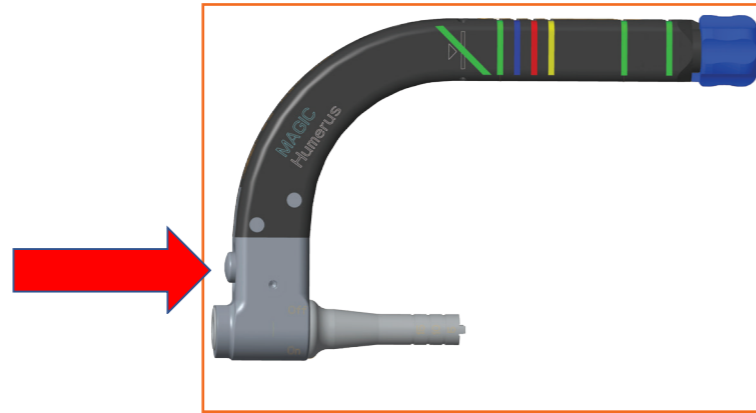


# 3 Surgical procedure

## Disassembly of the rotating mechanism

1. This is how you receive your Magic Humerus proximal targeting arm.

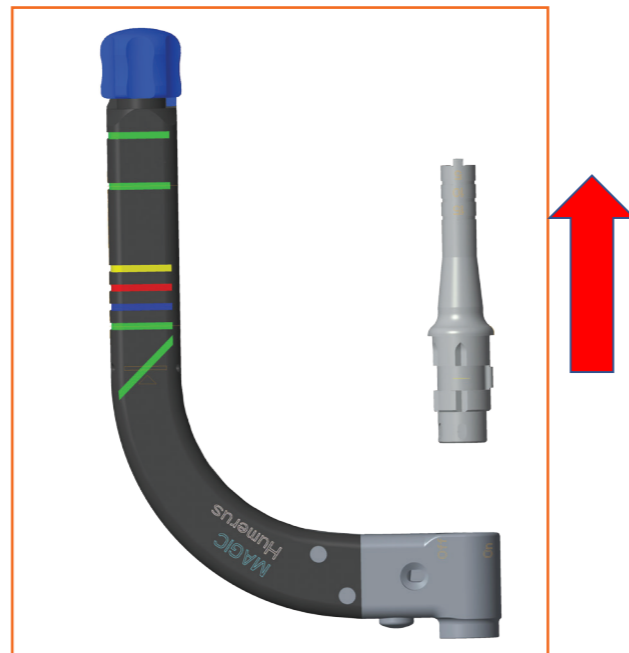
Szétszereléshez nyomjuk meg a gombot és tartjuk nyomva.



2. Position the proximal arm as per the image while pressing the button. Rotate the connecting part until the black laser marks align.



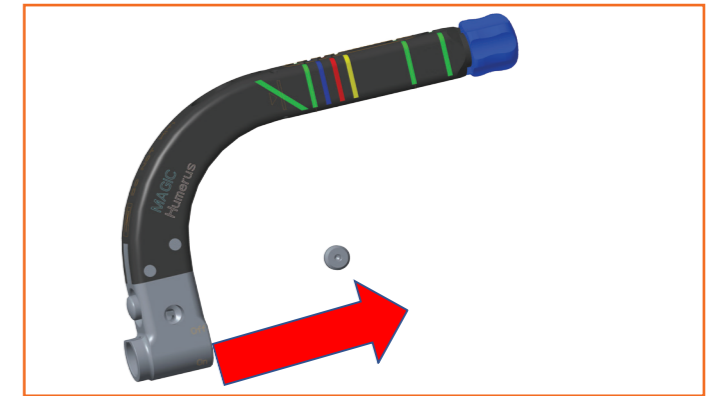
3. Pull the connecting part out of the targeting arm. Mind the position of the targeting arm. Keep the button pressed.



4. While still pressing the button, turn the targeting arm upside down and let the small peg fall into your palm.



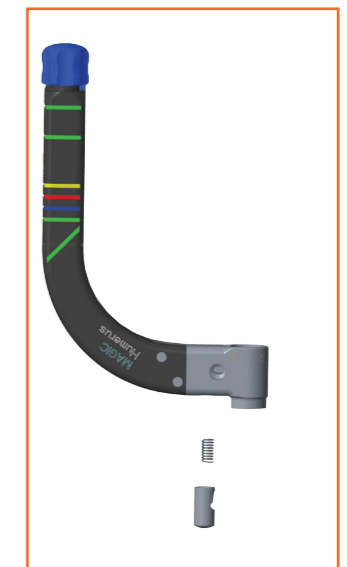
5. Release the button and with a 3,5 mm screwdriver remove the small protective screw.



6. Press the button and rotate the arm until the fixing pin falls out. Release the button.



7. Pull out the button and the spring.



# 3 Surgical procedure

## Assembly of the rotating mechanism

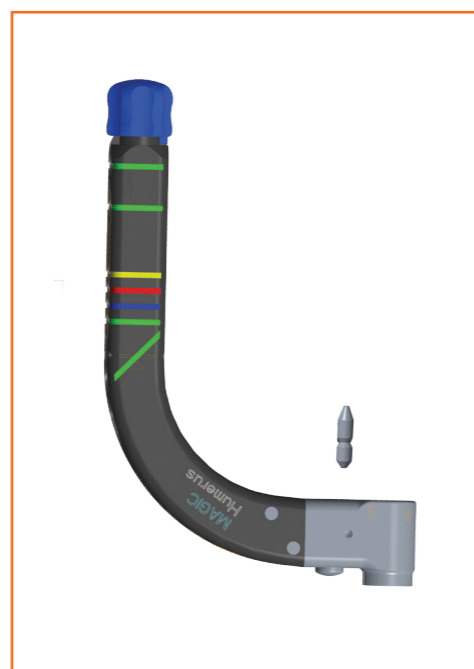
1. Put the spring and the button into the targeting arm. Mind the position of the button: the groove shall face upwards.



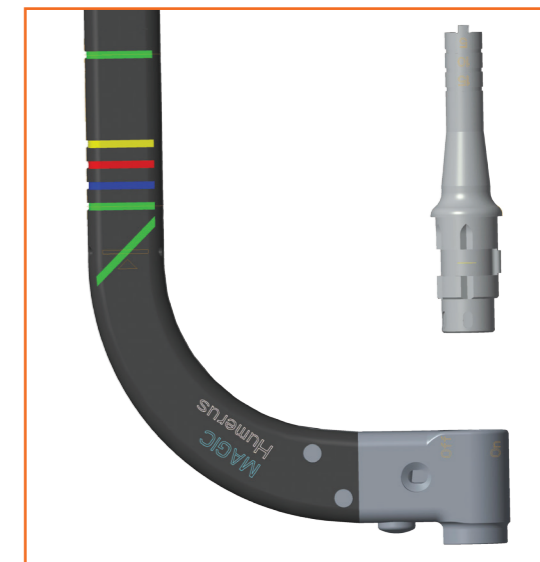
2. Press the button and push the fixing pin into the hole. Release the button: the pin shall keep it from falling out. Drive the protective screw to its position above the fixing pin with a 3,5 mm screwdriver.



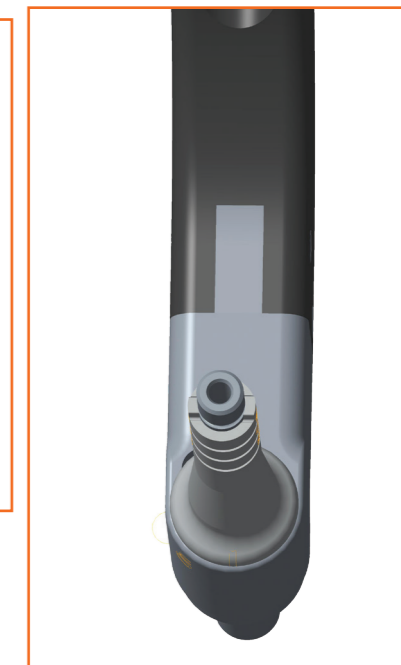
3. While pressing the button put the peg into its groove. Keep the button pressed.



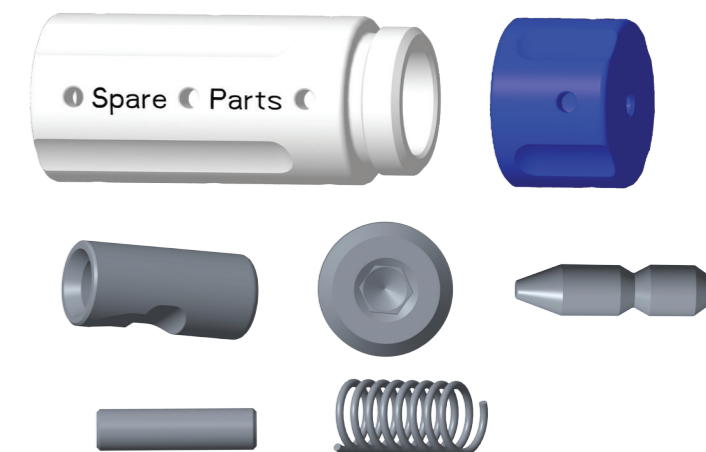
4. While still pressing the button push the connecting part into the hole of the targeting arm in such a position when laser marks align.



5. Rotate the connecting part into green position. Release the button. Magic Humerus proximal targeting arm is ready for use.



6. Spare parts are included in the instrument set.



# 3 | Surgical procedure

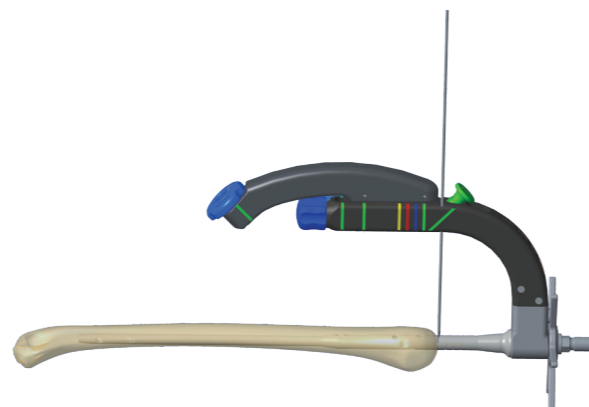
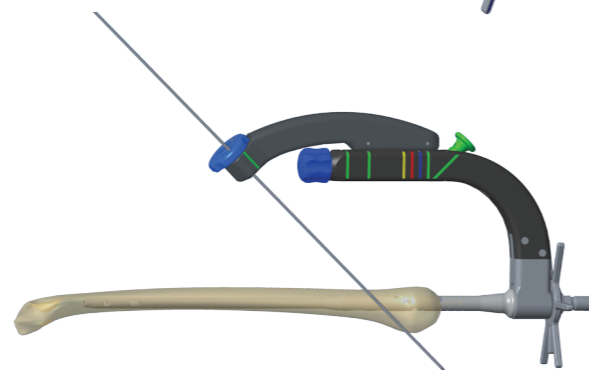
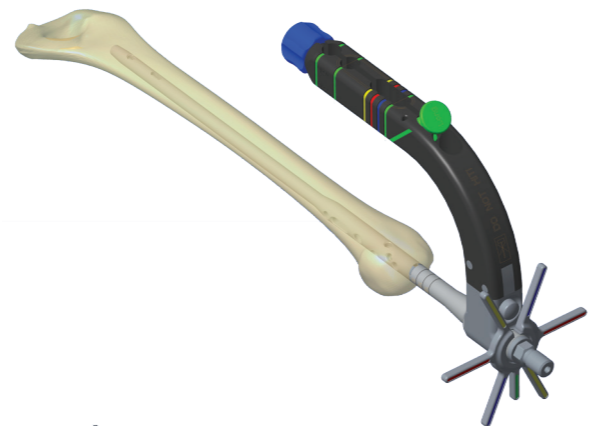
## 3.5 | Nail insertion

When inserting the nail the targeting arm shall be in green position. When in this position the orienting star tool can be fixed which shows the positions of the proximal holes. This way the nail can be rotated into a position where the screws do not hurt important anatomical features.

When using the oblique technique where the screw is laid onto the humeral neck check nail depth after checking the orientation described previously. To do this the additional targeting arm shall be placed on the proximal arm. Then check optimal position on the humeral neck with a Kirschner wire led through the blue knob.

After checking the distal locking can be performed in the red position with the MAGIC unit in case of long nail while with the short nail we can continue in the green position.

To determine the position of the end of the nail there are two methods. One of them is the hole on the proximal arm where a Kirschner wire shall be placed. The tip of the wire shows the end of the nail. The other method uses the three grooves on the part of the proximal arm where the nail connects. The tip of the nail is distally in the same distance from the third groove as the other grooves are from each other.



## 3.6 | Distal locking

### Short nail

When using a short nail the distal locking is done through the proximal arm. To lock the 45° oblique hole position the targeting arm into the green position. The drill sleeve is put into the green colored 45° oblique hole. After drilling and length gauging drive the screw in. When drilling start carefully so that the drillbit shall not slip on the cortex.

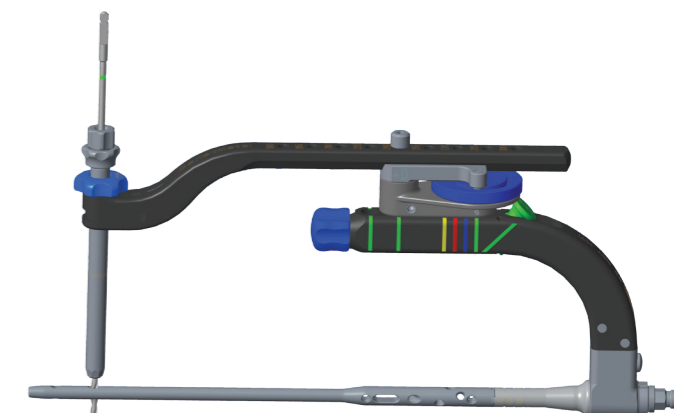
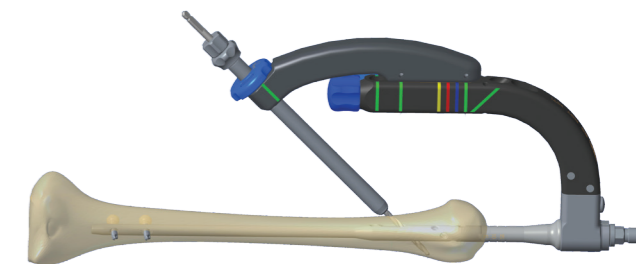
### Long nail

The distal locking holes of the long nails can be found with MAGIC unit and a hand targeting device. For accurate targeting always perform drytest.

### Drytest

When using the long nail set the targeting arm into the red position. Set the length of the distal arm according to the nail length. The fixing screw shall always be tightened by a 3,5 mm screwdriver.

Place the distal arm on the proximal arm which is in the red position and fix it with the blue knob. The soft tissue protector placed into the hole of the distal arm shall be exactly above the special hole in the correct position of the moving spiral.

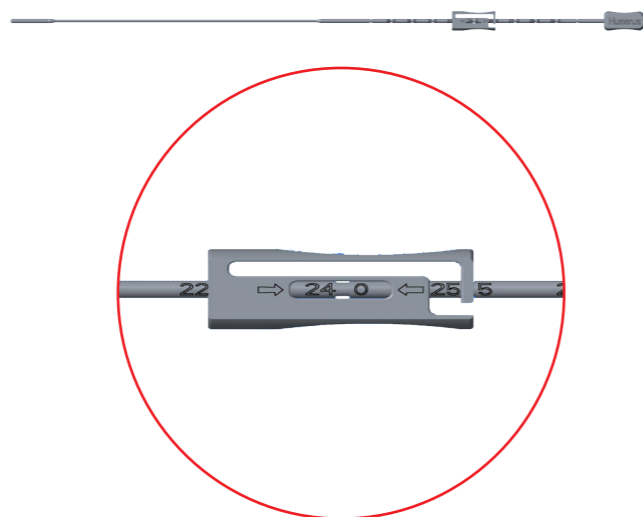


# 3 | Surgical procedure

## 3.7 | Using the MAGIC unit

### Setting the nail length on the magnetic signal source

Set the nail length on the magnetic signal source with the stop. Press the stop and move along the rod until the laser marks corresponding to the nail length show up in the window of the stop.



### Assembly

Put the MAGIC unit on the arm and fix it with the red line marked, corrugated sleeve. The sleeve shall be in such height that it should not interfere with the soft tissues when turning the arm, optimally in the height of the laser mark.



### Calibration

DO NOT insert the magnetic signal source rod into the nail for calibration. For correct calibration move the rod to a distance of twice its length from MAGIC unit. For optimal calibration set the arrow on the moving spiral to the peg of the moving unit.

Turn on the MAGIC unit. It maps magnetic sources in 10 seconds in its neighborhood. The green and the yellow leds are shining during calibration. During this time do not move any metallic objects in the proximity of the system. Do not wear a watch, magnetic bracelet, keys or any ferromagnetic materials.

When only the green led is flashing the calibration is ended. IT IS IMPORTANT to always wait for the end of the calibration process.

MAGIC unit is ready for use.

**ATTENTION!** During calibration the nail and the mounted targeting arm may rotate in the intramedullary cavity when the bone is porotic. Therefore, the targeting arm shall be held by an assistant.



# 3 | Surgical procedure

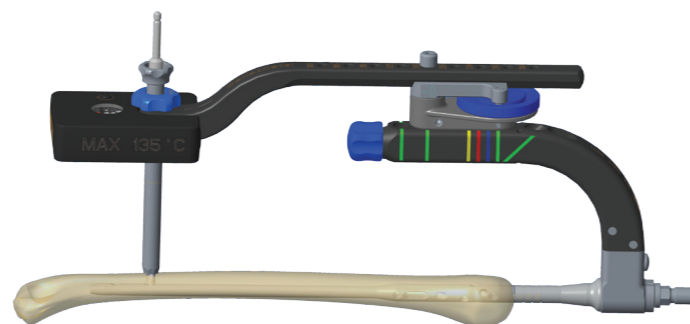
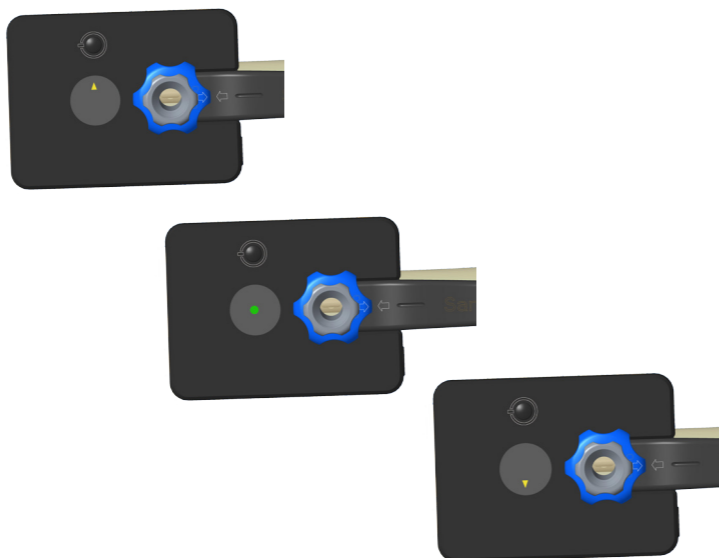
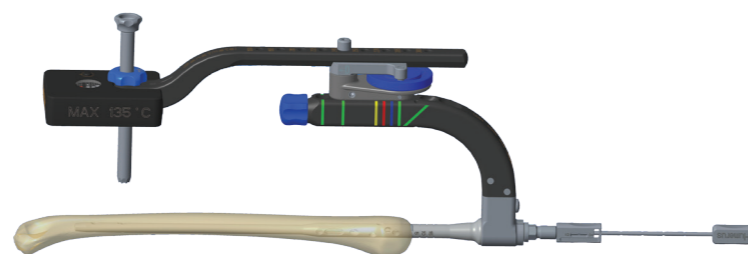
## Targeting with MAGIC

After calibration (green led flashing) push the magnetic signal source rod until the preset stop, corresponding to nail length.

The MAGIC unit indicates with leds to which direction the distal arm shall be rotated to by the moving spiral to find the special locking hole. When the green led shines constantly the hole is found. In this position remove the signal source rod. When removing the rod the unit automatically turns off to save battery life.

After targeting the skin is opened from a short longitudinal incision. Put a 3,2 mm drill sleeve into the corrugated soft tissue protector and after releasing the blue tightening knob push it to the bone surface.

The cortex above the special hole is drilled with a 6,5 mm drillbit through the corrugated sleeve. We apply only gentle axial pressure. This hole is monocortical, finish drilling when the drill reached the nail. This is indicated by the metallic sound of the drillbit. If the hole is ready remove the distal targeting arm, paying attention not to move the blue spiral.



Then the manual distal targeting device is pushed into the special hole. Drill and lock the distal hole.

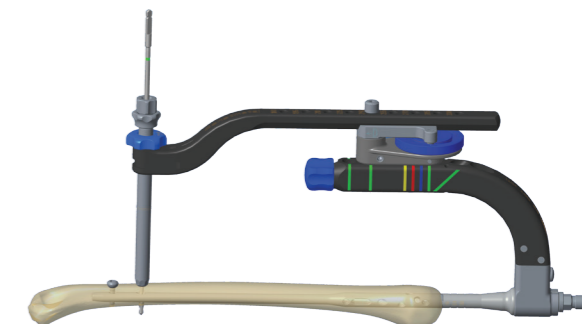
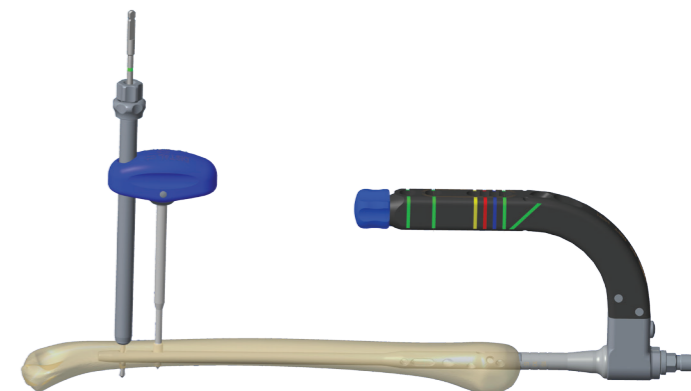
Locking screw can be put into the special hole as well. If the blue spiral has not been moved put the distal arm back on the proximal, put a 3,2 mm drill sleeve into the corrugated soft tissue protector, drill dorsal cortex, measure length and insert screw.

**ATTENTION!**  
If the hole may be in the proximity of the nervus radialis perform careful preparation when pushing the sleeve to the bone.

## Energy saving

After the calibration the unit switches off automatically within 60 seconds for energy saving purposes. This time interval is enough for targeting. If however, the surgeon fails to perform the targeting with this time and the MAGIC switches off then the process must be repeated from the calibration.

After targeting the removal of the magnetic signal source rod also deactivates MAGIC unit.



# 3 | Surgical procedure

## 3.8 | Proximal locking

Long nails can be locked proximally by two techniques. We can select compression or oblique hole technique.

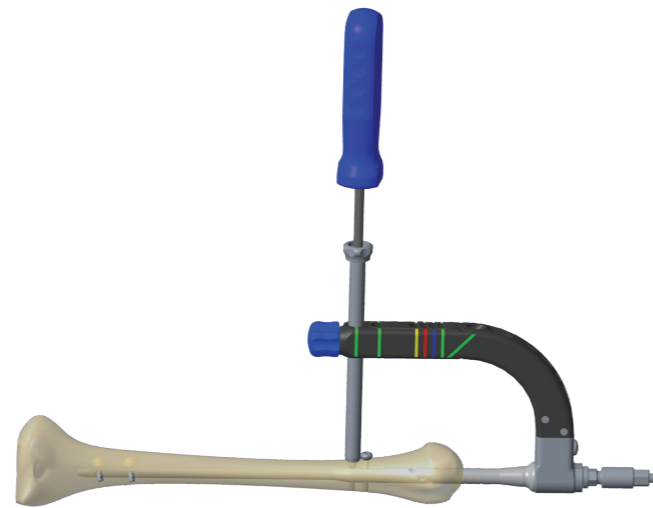
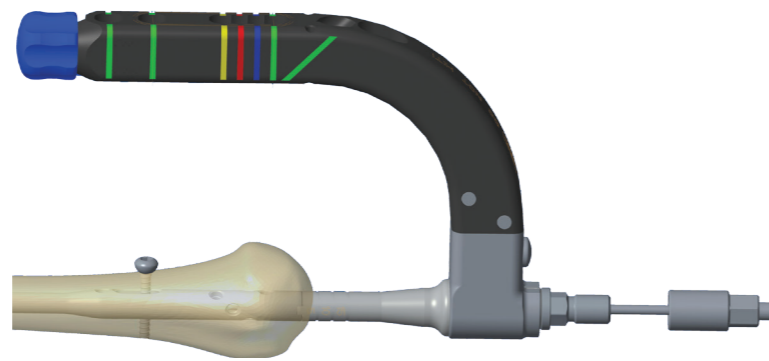
### Compression

In case of the long nails compression can be performed on the screw placed into the oval hole. In this case only 3,8 mm normal headed screw can be used. Compression can be performed only after the distal locking with the MAGIC unit.

After placing the screw into the oval hole and the removal of the sleeves connect the compression tool to the connecting screw of the targeting arm. Then by turning the rod of the compression tool with a 3,5 mm screwdriver inwards more than 6 mm compression can be obtained by pressing the screw downwards. According to the magnitude of the compression the nail end emerges from the bone which shall be taken into account when initially positioning the nail.

In order to keep this compression the hole right distally from the oval hole shall be locked as seen on the image. During this procedure the compression tool shall remain in place, it shall be removed only after the locking screw is driven in.

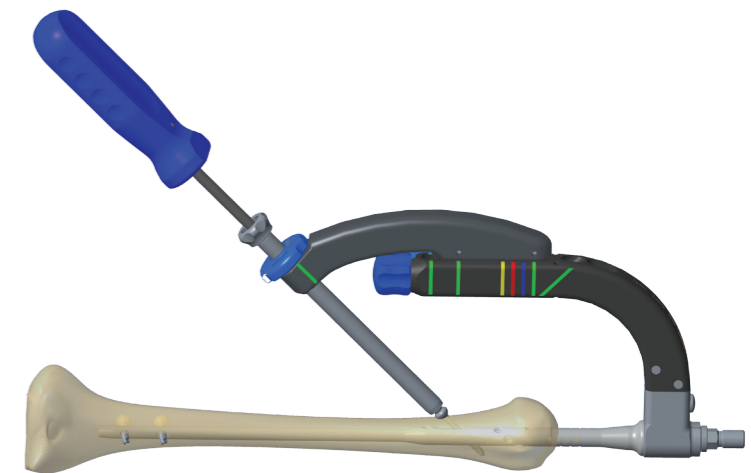
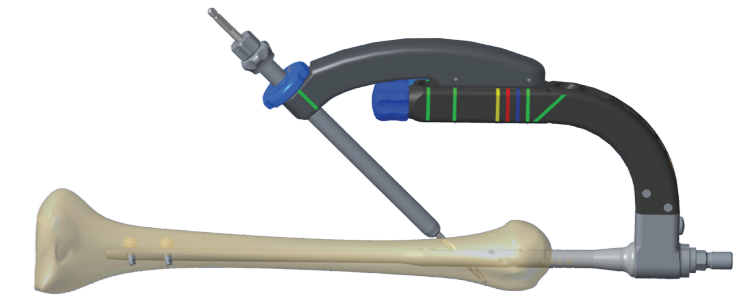
**ATTENTION!** After applying compression the oblique locking screw cannot be implanted. On the short nail there is no compression hole and also no compression holding hole. The oblique hole of the short nail is for accepting a screw from proximal to distal.



### Technique of the oblique hole

Perform distal locking with MAGIC unit as per the above. Then, by using the additional targeting arm we can guide the drill onto the humeral neck. After drilling and length gauging the screw can be inserted.

In case of the long nails when the oblique hole was used compression cannot be made.



### Further proximal locking

Place the further proximal locking screws according to the number and position of fragments.

Always make sure that the proximal arm is in the same color coded position as the drill sleeve is.

### 3 | Surgical procedure

Place the soft tissue protector and the drill sleeve into the same colored hole as the arm's position and after incision and careful soft tissue preparation push them on the bone surface. Drill with the 3,2 mm drillbit and remove the drill sleeve.

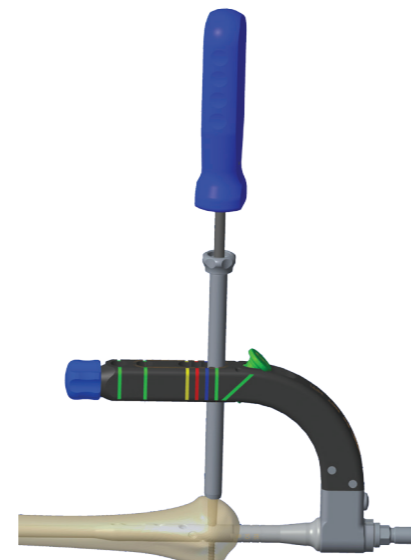
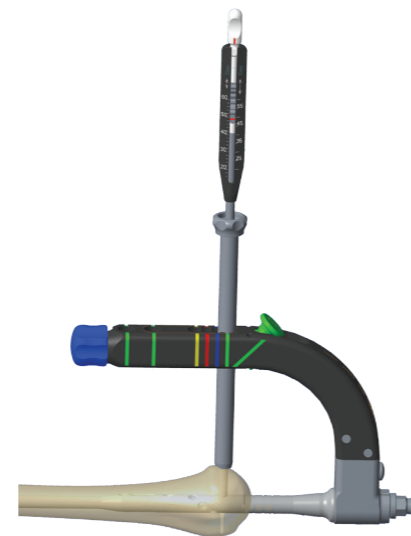
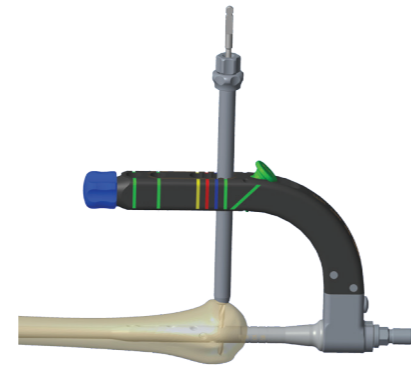
Determine the necessary screw length with the gauge through the soft tissue protector. Hit the gauge on the bone surface and read the value at the red sign. Drive in the selected length 3,8 mm screw. In case of proximal locking after screw insertion make sure that the medial end of the screws does not interfere with shoulder movement.

After removing the soft tissue protector push the button of the targeting arm and rotate the arm until another color is seen under the button. By releasing the button the arm fixes itself. The soft tissue protector is placed into the hole with the same color as under the button and perform locking screw insertion as described earlier.

At the proximal end of the nail 4 locking screws can be placed perpendicularly in 4 different directions (green, yellow, blue and red positions).

#### ATTENTION!

Pay attention in all locking positions not to damage nervus radialis. When the locking screw is possibly close to the potential position of the nerve perform careful preparation prior to insertion of the soft tissue protector.



# 4 | Implant list

## 4.1 | MAGIC Humerus short nail



Length:	Cat.no	Cat.no
	d = 8 mm	d = 9 mm
140 mm	393318140	393319140
160 mm	393318160	393319160

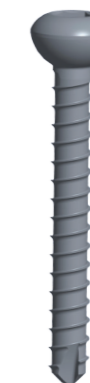
## 4.2 | MAGIC Humerus long nail



Length:	Cat.no	Cat.no
	d = 7 mm	d = 8 mm
180 mm	393317180	393318180
195 mm	393317195	393318195
210 mm	393317210	393318210
225 mm	393317225	393318225
240 mm	393317240	393318240
255 mm	393317255	393318255
270 mm	393317270	393318270
285 mm	393317285	393318285
300 mm	393317300	393318300

## 4.3 | Locking screw Ø3,8 mm

Length:	Cat.no
20 mm	364038020
22 mm	364038022
24 mm	364038024
26 mm	364038026
28 mm	364038028
30 mm	364038030
32 mm	364038032
34 mm	364038034
35 mm	364038035
36 mm	364038036
38 mm	364038038
40 mm	364038040
42 mm	364038042
44 mm	364038044
45 mm	364038045
46 mm	364038046
48 mm	364038048
50 mm	364038050
52 mm	364038052
54 mm	364038054
55 mm	364038055
56 mm	364038056
58 mm	364038058
60 mm	364038060
62 mm	364038062
64 mm	364038064
65 mm	364038065
66 mm	364038066
68 mm	364038068
70 mm	364038070
72 mm	364038072
76 mm	364038076
80 mm	364038080



# 4 | Implant list

## 4.4 | Proximal locking screw



Length:	Cat.no
20 mm	393373820
22 mm	393373822
24 mm	393373824
26 mm	393373826
28 mm	393373828
30 mm	393373830
32 mm	393373832
34 mm	393373834
36 mm	393373836
38 mm	393373838
40 mm	393373840
42 mm	393373842
44 mm	393373844
46 mm	393373846
48 mm	393373848
50 mm	393373850
52 mm	393373852
54 mm	393373854
56 mm	393373856
58 mm	393373858
60 mm	393373860

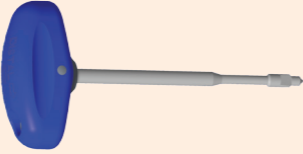
## 4.5 | Closing cap

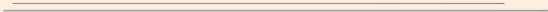




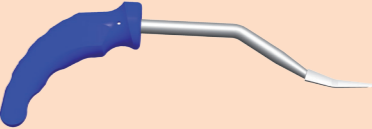




Height:	Cat.no
0 mm	393430001
5 mm	393430002
10 mm	393430003
15 mm	393430004

# 5 | Instruments

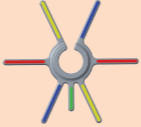




## 5.1 | Instruments

<p>Proximal targeting arm - MAGIC Humerus</p> <ul style="list-style-type: none"> <li>*soft tissue protector</li> <li>*drill sleeve</li> <li>*trocar</li> <li>*connecting screw</li> </ul>	 <p>253930001</p>
<p>Distal targeting arm - MAGIC Humerus</p> <ul style="list-style-type: none"> <li>*forked soft tissue protector</li> <li>*drill sleeve</li> </ul>	 <p>253930002</p>
<p>Distal jig - MAGIC Humerus</p>	 <p>253930003</p>
<p>Signal source - MAGIC Humerus</p>	 <p>253930004</p>
<p>Length gauge for locking screw (3,8 mm)</p>	 <p>253920015</p>
<p>Spiral drill (5,5 mm)</p>	 <p>257920004</p>
<p>Compression tool</p>	 <p>253930005</p>
<p>Measuring rod (500 mm)</p>	 <p>939999072</p>

<p>Impactor</p>	 <p>188560000</p>
<p>Guide rod (2,2x600 mm)</p>	 <p>939999100</p>
<p>Spiral drill (3,2x245 mm; 3,2x310 mm)</p>	 <p>939532310-1</p>
<p>Screwdriver (3,5 mm)</p>	 <p>210510002</p>
<p>T wrench</p>	 <p>253920006</p>
<p>Length gauge for closing cap</p>	 <p>253920007</p>
<p>Awl (8 mm)</p>	 <p>210510005</p>
<p>MAGIC sensor</p>	 <p>257920019</p>
<p>Drill stop (3,2 mm)</p>	 <p>210510232</p>

# 5 | Instruments

## 5.1 | Instruments

Gauge	 253930006
Nail removal tool	 253930009
Reamer (10 mm)	 253930007
Soft tissue protector (10 mm)	 253930008
Kirschner wire (2,5x300 mm)	 937525300
<b>Filled up tray (MAGIC Humerus)</b>	<b>253830000</b>

# Product family

## ■ TRAUMATOLOGY

- 1.1. IM nails
  - 1.1.1. **Humerus nailing**
  - 1.1.2. Ulna-radius nailing
  - 1.1.3. Trochanter nailing
  - 1.1.4. Femur nailing
  - 1.1.5. Tibia nailing
  - 1.1.6. Fibula nailing
  - 1.1.7. Sanat PIN
- 1.2. Plates
- 1.3. Screws
- 1.4. Fixateur
- 1.5. Other

## ■ ORTHOPEDICS

## ■ DENTAL

## ■ SPINE

# Contact

address: 5 Faiskola str. Eger, H3300

e-mail: [metal@sanatmetal.hu](mailto:metal@sanatmetal.hu)

phone: +36 36 512 900

fax: +36 36 512 932