

# INTRAMEDULLARY NAILING - HUMERAL MAT LOCK HUMERAL, ANTEROGRADE AND RETROGRADE NAIL SYSTEM

# **TITANIUM & STEEL NAIL SYSTEM**

HUMERAL NAILING IMPLANTS AND OPERATING MANUAL

SOLUTION WITHOUT



# **INTRODUCING OURSELVE**

Manufacturer of surgical implants and medical devices. Solutions for patient orthopaedic and osteosyntheses fracture treatments, osteosyntheses customized orthopaedic innovations and solutions.

# CORPORATE COMPANY PHILOSOPHY, SOLUTION WITHOUT COMPROMISE

MAT GmbH & Co.KG. design, develop and manufacture implants and instruments for use in specific treatments of trauma orthopedic systems, fracture reconstruction treatment systems.

- Plate- and screw systems (mini, small- and large fragment systems)
- Locking plate- and screw systems (small- and large fragment systems)
- Interlocking nailing systems
- Cranio maxillo facial plate- and screw systems
- Cannulated screw system
- Flexible reamer systems
- Hand and Foot implants (screws- and staple systems)
- External fixator systems
- Oscillating saw blades
- Power tool systems, battery- and air drive systems
- General surgical instruments
- Hemi arthroplasty instruments for hip surgeries and cement extraction







MAT GmbH & Co. KG. innovative and exiting product portfolio is updated and expanded in line with technological advances to satisfy the current and future needs of both, patients and healthcare professionals. MAT GmbH & Co. KG. is committed to playing our part in achieving improved healthcare outcomes worldwide.

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# GENERAL INFORMATION HUMERAL NAILING

## **BEFORE USING THE PRODUCT**



Before every use you should carefully check the operability of the implants and the operating instruments. They should be free of damages. If there are any cracks, fractures, discolouration, deformation or any damages on the implants, which may be due to unsuitable storing, imperfect sterilization or preliminary inefficient treatment, the use of the implant is prohibited. The assembly, perfect fitting and operation of the implants and all the necessary instruments should be tested. Perfect fitting and operation, appropriate dimensions and positions should be checked in all cases.

### **REQUIREMENTS TOWARDS THE USER**

The set of tools and implants can only be applied by doctors with appropriate qualifications and special information and experience in the field of using implants.

The doctor who performs the operation is responsible for choosing the correct indication, the type of the implants and the operation technology.

## **CONTRAINDICATION**

Implantation is not recommended if the patient's health condition makes it difficult to accept it or problems are expected during the recovery process e.g. decreased circulation, weak quality or quantity bone system, impossibility of rehabilitation due to the mental condition of the patient etc.

### **GENERAL WARNINGS**

Before the operation the patient should be informed about the possible disadvantages of the implant. By choosing the appropriate implant the type of the bone fracture, the weight and activity of the patient should be taken into consideration. The solidity of the implant is restricted, so it is necessary to avoid overloading it by overweight. The biomechanical loading of the implant should be minimized, as much as possible.

During the application of the implant the process of recovering is to be controlled. By repetitive loading or by protracted bone recovering the implants may be deformed, dislocated. This needs intervention in time. Repeated deformation of the implant should be avoided. The implants are only for one-time use, a re-implantation is prohibited. The type and the size of the implants should be defined according to the specific case. Before operation the user's manual of the implants should be studied carefully.

## **APPLIED MATERIALS**

The applied materials are of best quality, specially developed for implants with high solidity, made of non magnetic stainless steel and titan alloys.

Combined use of products of other manufacturers may start damaging processes, which the MAT GmbH & Co.KG can't take the responsibility for.

## **PROTECTION OF THE PRODUCT, PACKAGING, PREPARATION FOR USE**

The implants come clean, without any production pollution for packaging. Before use circumstances are to be assured where the integrity of the packaging will be preserved. The storage should be in a clean, dry place avoiding extra temperature and chemicals.

## **STERILISATION**

Before use unpack the implant and sterilize due to the prescriptions. Avoid the touch by bare hand. The sterilisation of the instruments should be done together with the tray. The instructions of the producers should always be considered.

### **INTERACTION WITH MEDICINES**

An interaction of the implants with medicines is not known.



## SYSTEM OF IMPLANTS

Material: steel or titanium alloy



| Locking humeral nail, cannulated, diameter 7 - 8 - 9 mm, cat. no.: |   |                  |  |  |  |  |
|--|---|------------------|--|--|--|--|
|  | from NA-14294-70180 to NA-14294-70310               | (steel)          |  |  |  |  |
|  | from NA-34294-70180 to NA-34294-70310               | (titanium alloy) |  |  |  |  |
|  | from NA-14294-80180 to NA-14294-80310               | (steel)          |  |  |  |  |
|  | from NA-34294-80180 to NA-34294-80310               | (titanium alloy) |  |  |  |  |
|  | from NA-14294-90180 to NA-14291-90310               | (steel)          |  |  |  |  |
|  | from NA-34294-90180 to NA-34294-90310               | (titanium alloy) |  |  |  |  |
| Locking screw, diame   | ter 3,9 mm, cat. no.:                               |                  |  |  |  |  |
|  | from LS-12200-39020 to LS-12200-39065               | (steel)          |  |  |  |  |
|  | from LS-32200-39020 to LS-32200-39065               | (titanium alloy) |  |  |  |  |
| End cap, cat. no.:   |   |                  |  |  |  |  |
|  | LS-12400-07011                                      | (steel)          |  |  |  |  |
|  | LS-32400-07011                                      | (titanium alloy) |  |  |  |  |
| Surgical set for lockin  | Surgical set for locking humeral nailing, cat. no.: |                  |  |  |  |  |
|  | SET-94290-00000                                     |                  |  |  |  |  |

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# IMPLANTS FOR LOCKING HUMERAL NAILING

## LOCKING HUMERAL NAIL, CANNULATED

|      | Catalogue Number |                |                |                |                |                |  |  |
|------|------------------|----------------|----------------|----------------|----------------|----------------|--|--|
| L    | Ø                | 7              | Ø              | 8              | Ø۹             |                |  |  |
| (mm) | steel            | titanium alloy | steel          | titanium alloy | steel          | titanium alloy |  |  |
| 180  | NA-14294-70180   | NA-34294-70180 | NA-14294-80180 | NA-34294-80180 | NA-14294-90180 | NA-34294-90180 |  |  |
| 205  | NA-14294-70205   | NA-34294-70205 | NA-14294-80205 | NA-34294-80205 | NA-14294-90205 | NA-34294-90205 |  |  |
| 220  | NA-14294-70220   | NA-34294-70220 | NA-14294-80220 | NA-34294-80220 | NA-14294-90220 | NA-34294-90220 |  |  |
| 230  | NA-14294-70230   | NA-34294-70230 | NA-14294-80230 | NA-34294-80230 | NA-14294-90230 | NA-34294-90230 |  |  |
| 240  | NA-14294-70240   | NA-34294-70240 | NA-14294-80240 | NA-34294-80240 | NA-14294-90240 | NA-34294-90240 |  |  |
| 250  | NA-14294-70250   | NA-34294-70250 | NA-14294-80250 | NA-34294-80250 | NA-14294-90250 | NA-34294-90250 |  |  |
| 260  | NA-14294-70260   | NA-34294-70260 | NA-14294-80260 | NA-34294-80260 | NA-14294-90260 | NA-34294-90260 |  |  |
| 270  | NA-14294-70270   | NA-34294-70270 | NA-14294-80270 | NA-34294-80270 | NA-14294-90270 | NA-34294-90270 |  |  |
| 280  | NA-14294-70280   | NA-34294-70280 | NA-14294-80280 | NA-34294-80280 | NA-14294-90280 | NA-34294-90280 |  |  |
| 295  | NA-14294-70295   | NA-34294-70295 | NA-14294-80295 | NA-34294-80295 | NA-14294-90295 | NA-34294-90295 |  |  |
| 310  | NA-14294-70310   | NA-34294-70310 | NA-14294-80310 | NA-34294-80310 | NA-14294-90310 | NA-34294-90310 |  |  |

-----

## LOCKING SCREW

| Thread diameter: | 3,9 mm  | Core diameter: | 3,2 mm |
|------------------|---------|----------------|--------|
| Pitch:           | 1,75 mm | Hex width:     | 2,5 mm |

| L    | Catalogue Number |                | L    | Catalogue Number |                |
|------|------------------|----------------|------|------------------|----------------|
| (mm) | steel            | titanium alloy | (mm) | steel            | titanium alloy |
| 20   | LS-12200-39020   | LS-32200-39020 | 44   | LS-12200-39044   | LS-32200-39044 |
| 22   | LS-12200-39022   | LS-32200-39022 | 45   | LS-12200-39045   | LS-32200-39045 |
| 24   | LS-12200-39024   | LS-32200-39024 | 46   | LS-12200-39046   | LS-32200-39046 |
| 26   | LS-12200-39026   | LS-32200-39026 | 48   | LS-12200-39048   | LS-32200-39048 |
| 28   | LS-12200-39028   | LS-32200-39028 | 50   | LS-12200-39050   | LS-32200-39050 |
| 30   | LS-12200-39030   | LS-32200-39030 | 52   | LS-12200-39052   | LS-32200-39052 |
| 32   | LS-12200-39032   | LS-32200-39032 | 54   | LS-12200-39054   | LS-32200-39054 |
| 34   | LS-12200-39034   | LS-32200-39034 | 55   | LS-12200-39055   | LS-32200-39055 |
| 35   | LS-12200-39035   | LS-32200-39035 | 56   | LS-12200-39056   | LS-32200-39056 |
| 36   | LS-12200-39036   | LS-32200-39036 | 58   | LS-12200-39058   | LS-32200-39058 |
| 38   | LS-12200-39038   | LS-32200-39038 | 60   | LS-12200-39060   | LS-32200-39060 |
| 40   | LS-12200-39040   | LS-32200-39040 | 65   | LS-12200-39065   | LS-32200-39065 |
| 42   | LS-12200-39042   | LS-32200-39042 |      |                  |                |

# END CAP FOR LOCKING HUMERAL NAIL

| Catalogue Number |                |  |  |  |
|------------------|----------------|--|--|--|
| steel            | titanium alloy |  |  |  |
| LS-12400-07011   | LS-32400-07011 |  |  |  |



## SURGICAL INSTRUMENTS FOR LOCKING HUMERAL NAILING



| Pos. | Cat.no.         | Description   | pcs |
|------|-----------------|---|-----|
| 1    | INS-94290-00105 | Fixing screw, M8  | 1   |
| 2    | INS-94290-00100 | Proximal targeting arm                                    | 1   |
| 3    | INS-94290-00503 | M5 screw for auxiliary arm and<br>targeting shaft         | 5   |
| 4    | INS-94290-00500 | Auxiliary targeting arm                                   | 1   |
| 5    | INS-94290-00400 | Threaded stem, cannulated                                 | 1   |
| 6    | INS-99000-00009 | Wrench, 17 mm   | 1   |
| 7    | INS-94290-00103 | Targeting shaft<br>left (retrograde), right (anterograde) | 1   |
| 8    | INS-94290-00104 | Targeting shaft<br>right (retrograde), left (anterograde) | 1   |
| 9    | INS-94290-00700 | Reamer 10 mm, cannulated                                  | 1   |
| 10   | INS-99150-35106 | Screw driver, quick coupling,<br>3,5 x 106 mm             | 1   |
| 11   | INS-99150-25150 | Screw driver, quick coupling,<br>2,5 x 150 mm             | 1   |
| 12   | INS-94290-01600 | Impactor, cannulated                                      | 1   |
| 13   | INS-94290-01400 | Soft tissue protector, 8/6 mm                             | 2   |

| Pos. | Cat.no.         | Description                                   | pcs |
|------|-----------------|---|-----|
| 14   | INS-94290-00600 | Threaded removal shaft                        | 1   |
| 15   | INS-99000-00008 | Wrench, 11 mm                                 | 1   |
| 16   | INS-15000-20250 | Kirschner-wire, 2 x 250 mm                    | 3   |
| 17   | INS-99010-32190 | Spiral drill, quick coupling,<br>3,2 x 190 mm | 1   |
| 18   | INS-99010-45145 | Spiral drill, 4,5 x 145 mm                    | 1   |
| 19   | INS-94290-01500 | Screw length gauge                            | 1   |
| 20   | INS-94290-01700 | Length gauge                                  | 1   |
| 21   | INS-94290-01800 | Burr  | 1   |
| 22   | INS-94290-01003 | Removal - impactor bumper                     | 1   |
| 23   | INS-99031-10200 | Spiral drill, cannulated,<br>10/2,2 x 200 mm  | 1   |
| 24   | INS-94290-01100 | Hammer  | 1   |
| 25   | INS-94290-01300 | Drill sleeve 6/3,2 mm                         | 2   |
| 26   | INS-99000-00012 | Quick coupling handle                         | 1   |
| 27   | INS-94290-01200 | Pointer                                       | 1   |
| 28   | INS-94290-01000 | Removal - impactor shaft                      | 1   |

# IMPLANTS FOR LOCKING HUMERAL NAILING

| And  | Pos.         | Cat. no.        | Description   | pcs |
|--|--------------|-----------------|---|-----|
|  | 1            | INS-94290-00105 | Fixing screw, M8  | 1   |
| 0  |              |                 |   |     |
| D  |              |                 |   |     |
| and the second s | Pos.         | Cat. no.        | Description   | pcs |
|  | 2            | INS-94290-00100 | Proximal targeting arm                                  | 1   |
| 0  |              |                 |   |     |
|  |              |                 |   |     |
|  | Pos.         | Cat. no.        | Description   | pcs |
|  | 3            | INS-94290-00503 | M5 screw for auxiliary arm and targeting shaft          | 5   |
| L  |              |                 |   |     |
|  |              |                 |   |     |
|  | Pos.         | Cat. no.        | Description   | pcs |
|  | 4            | INS-94290-00500 | Auxiliary targeting arm                                 | 1   |
|  |              |                 |   |     |
| •  |              |                 |   |     |
|  | Pos.         | Cat. no.        | Description   | pcs |
| And an and a second  | 5            | INS-94290-00400 | Threaded stem, cannulated                               | 1   |
| L  | -            |                 |   |     |
|  |              |                 |   |     |
|  | Pos.         | Cat. no.        | Description   | pcs |
|  | 6            | INS-99000-00009 | Wrench, 17 mm   | 1   |
|  |              |                 |   |     |
|  |              |                 |   |     |
|  | P <u>os.</u> | Cat. no         | Description   | pcs |
|  | 7            | INS-94290-00103 | Targeting shaft, left (retrograde), right (anterograde) | 1   |
|  |              | _               |   |     |
|  |              |                 |   |     |
|  | Pos.         | Cat. no         | Description   | pcs |
|  | 8            | INS-94290-00104 | Targeting shaft, right (retrograde), left (anterograde) | 1   |
|  |              |                 |   |     |
| 0  |              |                 |   |     |
|  | Pos.         | Cat. no         | Description   | pcs |
|  | 9            | INS-94290-00700 | Reamer 10 mm, cannulated                                | 1   |
| U -  |              |                 |   |     |
| •  |              |                 |   |     |
|  | Pos.         | Cat. no.        | Description   | pcs |
|  | 10           | INS-99150-35106 | Screw driver, quick coupling, 3,5 x 106 mm              | 1   |
| L  |              |                 |   |     |



## SURGICAL INSTRUMENTS FOR LOCKING HUMERAL NAILING

|  | Pos. | Cat. no.        | Description                                | pcs |
|--|------|-----------------|--|-----|
|  | 11   | INS-99150-25150 | Screw driver, quick coupling, 2,5 x 150 mm | 1   |
|  |      |                 |  |     |
|  |      |                 |  |     |
|  | Pos. | Cat. no.        | Description                                | pcs |
|  | 12   | INS-94290-01600 | Impactor, cannulated                       | 1   |
| _  |      |                 |  |     |
|  |      |                 |  |     |
| AL   | Pos. | Cat. no.        | Description                                | pcs |
|  | 13   | INS-94290-01400 | Soft tissue protector, 8/6 mm              | 2   |
|  | L    |                 |  |     |
|  |      |                 |  |     |
| Annual   | Pos. | Cat. no.        | Description                                | pcs |
| Constant of the owner | 14   | INS-94290-00600 | Threaded removal shaft                     | 1   |
|  |      |                 |  |     |
|  |      |                 |  |     |
|  | Pos. | Cat. no.        | Description                                | pcs |
| 2  | 15   | INS-99000-00008 | Wrench, 11 mm                              | 1   |
|  | L    |                 |  |     |
|  |      |                 |  |     |
|  | Pos. | Cat. no.        | Description                                | pcs |
|  | 16   | INS-15000-20250 | Kirschner-wire, 2 x 250 mm                 | 3   |
|  |      |                 |  |     |
|  |      |                 |  |     |
|  | Pos. | Cat. no         | Description                                | pcs |
|  | 17   | INS-99010-32190 | Spiral drill, quick coupling, 3,2 x 190 mm | 1   |
|  |      |                 |  |     |
|  |      |                 |  |     |
|  | Pos. | Cat. no         | Description                                | pcs |
| Cartatai Ima   | 18   | INS-99010-45145 | Spiral drill, 4,5 x 145 mm                 | 1   |
|  | L    |                 |  |     |
|  |      |                 |  |     |
|  | Pos. | Cat. no.        | Description                                | pcs |
|  | 19   | INS-94290-01500 | Screw length gauge                         | 1   |
|  |      | 2, 2            |  |     |

# IMPLANTS FOR LOCKING HUMERAL NAILING

| E 8 8 8 8 8    | Pos. | Cat. no.        | Description                               | pcs |
|----------------|------|-----------------|---|-----|
| Innimitantinut | 20   | INS-94290-01700 | Length gauge                              | 1   |
|                |      |                 |   |     |
|                |      |                 |   |     |
|                | Pos. | Cat. no.        | Description                               | pcs |
|                | 21   | INS-94290-01800 | Burr                                      | 1   |
|                |      |                 |   |     |
|                |      |                 |   |     |
|                | Dea  | Catura          | Description                               |     |
|                | POS. | Cat. no.        | Description                               | pcs |
|                | 22   | INS-94290-01003 | Removal - Impactor bumper                 | 1   |
|                |      |                 |   |     |
|                |      |                 |   |     |
|                | Pos. | Cat. no.        | Description                               | pcs |
|                | 23   | INS-99031-10200 | Spiral drill, cannulated, 10/2,2 x 200 mm | 1   |
|                |      |                 |   |     |
|                |      |                 |   |     |
|                | Pos  | Cat. no.        | Description                               | ncs |
| A MARCH MARK   | 24   | INS-94290-01100 | Hammer                                    | 1   |
|                |      |                 |   | -   |
|                |      |                 |   |     |
|                |      |                 |   |     |
|                | Pos. | Cat. no.        | Description                               | pcs |
| 14             | 25   | INS-94290-01300 | Drill sleeve 6/3,2 mm                     | 2   |
|                |      |                 |   |     |
|                |      |                 |   |     |
|                | Pos. | Cat. no.        | Description                               | pcs |
|                | 26   | INS-99000-00012 | Quick coupling handle                     | 1   |
|                |      |                 |   |     |
|                |      |                 |   |     |
| ~              | Pos  | Cat no          | Description                               | ncs |
|                | 27   | INS-04200-01200 | Pointer                                   | 1   |
|                | -1   | 110 94290-01200 |   |     |
|                |      |                 |   |     |
|                |      |                 |   |     |
|                | Pos. | Cat. no.        | Description                               | pcs |
|                | 28   | INS-94290-01000 | Removal - impactor shaft                  | 1   |



The Humerus Nail of MAT GmbH & Co. KG due to AO classification A,B and C types fit to all 3 subtypes for operation of fractures.

The correct placing of the nail depending on the direction of the insertion, do according to the medical prescriptions and the international literature.

- 1 For choosing the necessary implant with the help of Xray we define the appropriate sizes.
- 2 Knowing the length and diameter of the nail we assemble the prepared implant with the aimer. (2 - a proximal targeting arm, 5 - threaded stem, 7, 8 right-hand or left targeting shaft, 1 - a fixing screw).

We check fitting up, the punctuality of the borings, the anatomically correct position of the nail, the stiffness of the links.

- 3 Define the point of insertion.
- 4 Preparing countersink holes with 4.5 × 145 mm spiral drill (18).

Alternative technique: If the bone fracture requires, for effectiveness of the reposition we can choose either a leader-split. In this case we drill the penetration pont by Kirshner wire (16) we drive the wire in the necessary way of the intramedullary .The loose end of the wire with the help of the measuring strip (20) can identify the length of the nail.

5 With the burr (21) we expand and fuse the countersink holes. With this we prepare the point of inserting the nail.



## SURGICAL TECHNIQUE WITH RETROGRADE INSERTION





## SURGICAL TECHNIQUE WITH RETROGRADE INSERTION



10 The distal locking is to be done with the targeting device assembled to the nail. For the lateral locking we place a soft tissue protector (13) and a drill sleeve (25) into the hole of the targeting arm (7, 8). On the prepared boring with spiral drill  $3,2 \times 190$ mm (17) we do a length measuring like by the proximal locking and screw in the necessary locking screws.

If the direction of the fracture requires, we can do sagittal locking as well.In order to do it we have to use the auxiliary targeting arm (4) with a fixing screw (3). Preparing locking, the length measuring and locking is the same as previously described.

- **11** After finishing the locking we remove the targeting device (2),(7-8), (4) with the wrench (6), put an end cup into the nail and close the cut.
- 12 After the operation we check the reconstruction of the function of the shoulder. During the recovering process we control several times the process of the recovering. We control the position of the implants as needed but at least after 2 days and after 6 and 12 weeks with X-ray as well.
- 13 At appropriate stage of the bone-regeneration we can remove the medullary nail. At first we take out the locking screws then with removing the end cup we open the threaded link at the end of the nail.

We screw the threaded removal shaft (14) into the end of the nail, than fix the removal shaft (28) on it. We place the hammer (24) and close the shaft with the removal bumper (22). We remove the nail with indulgent use of the hammer.

## SURGICAL TECHNIQUE WITH ANTEROGRADE **INSERTION**

- 1 For choosing the necessary implant with the help of Xray we define the appropriate sizes.
- 2 Knowing the length and diameter of the nail we assemble the prepared implant with the aimer. (2 - a proximal targeting arm, 5 - threaded steam, 7, 8 - righthand or left targeting shaft, 1 - a fixing screw).

We check fitting up, the punctuality of the borings, the anatomically correct position of the nail, the stiffness of the links.

- 3 Draw aside the muscle fibres, then define the point of insertion. Open the medullary canal with 2 × 250 mm Kirschner wire (16).
- 4 While keeping the muscle fibres drawn aside using the correct position of the leader-spit (16) we enlarge the insertion point with the reamer (9) to the size of the nail. We remove both the spit (16) and the reamer (9).

Alternative technique: If the bone fracture requires, for effectiveness of the reposition we can choose either a leader-split. In this case we drill the penetration pont by Kirshner wire (16) we drive the wire in the necessary way of the intramedullary. The loose end of the wire with the help of the measuring strip (20) can identify the length of the nail.

5 We insert the nail assembled with the targeting arm (2), (7-8), (1) and with the impactor shaft (28), and the hammer (24) into the medullary canal. In case of the right nail position the end of the nail must be in any case under the cartilage surface.

We check the proper position with X-ray. The image of the Kirschner wire led through the targeting arm helps to control the right position of the nail. After reaching wished position we remove the impactor shaft (28) and the hammer (24).









## SURGICAL TECHNIQUE WITH ANTEROGRADE INSERTION



10 The distal locking is to be done with the targeting device assembled to the nail. For the lateral locking we place a soft tissue protector (13) and a drill sleeve (25) into the hole of the targeting arm (7, 8). On the prepared boring with spiral drill (17) we do a length measuring like by the proximal locking and screw in the necessary locking screws. If the direction of the fracture requires we can do sagittal locking as well.

In order to do it we have to use the auxiliary targeting arm (4) with a fixing screw (3). The preparing locking, the length measuring and the locking is the same as previously described.

- 11 After finishing locking we remove the targeting device (2),(7-8), (4) with the wrench (15), put an end cup into the nail and close the cut.
- 12 After the operation we check the reconstruction of the function of the shoulder. During the recovering process we control several times the process of the recovering. We control the position of the implants as needed but at least after 2 days and after 6 and 12 weeks with X-ray as well.
- 13 At appropriate stage of the bone-regeneration we can remove the medullary nail. At first we take out the locking screws then with removing the end cup we open the threaded link at the end of the nail.
- 14 We screw the threaded removal shaft (14) into the end of the nail, than fix the removal shaft (28) on it. We place the hammer (24) and close the shaft with the removal bumper (22). We remove the nail with indulgent use of the hammer.



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Intramedullary Nailing - Humeral © MAT / AtelierUrba

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