

Unique  
anatomies,  
customised  
solutions

PROTOCOLO RADIOLÓGICO

# HAND



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# Radiological protocol

## CT - Hand

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The basic requirement for digital surgical planning is a high-quality computed tomography scan with clear and well-defined bone edges. These qualities are essential for the correct design of personalised instruments and implants.


### Indications

This protocol is indicated for personalised surgical planning studies of trapeziometacarpal (TMC) and schafo-trapezio-trapezoid (STT) interposition implants. Acquisition is performed unilaterally, unless otherwise indicated by the surgical team.

### Recommendations

The X and Y centres should be not modified between scans, nor should the table be raised or lowered between slices. The scan should be performed using the same field of view and reconstruction centre.

### Acquisition:

|                            |   |
|----------------------------|---|
| <b>Topogram</b>            | <p>The entire hand, from the fingertips to the distal third of the radius and ulna.</p>  |
| <b>Field of view (FOV)</b> | Adjust the FOV so that no anatomical region is cropped  |
| <b>Matrix</b>              | 512 x 512   |

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|                                   |  |
|-----------------------------------|--|
| <b>Detector collimation</b>       | 0.625 mm. Continuous slice increment                               |
| <b>Pitch</b>                      | $\leq 1$   |
| <b>kVp</b>                        | 90-120 if the patient is obese, elderly or has metallic components |
| <b>Automatic exposure control</b> | Enabled  |
| <b>Rotation time</b>              | $\leq 1$ s   |

**Reconstrucción:**

|   |  |
|---|--|
| <b>Multiplanar reconstruction (MPR)</b> | Reconstruction of the complete study in all three planes                           |
| <b>Algoritmo de reconstrucción</b>      | Soft tissue/moderate algorithm. Do not use the bone algorithm. Use a single window |
| <b>Grosor de corte MPR</b>              | 0.625 mm   |

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# Appendix- Reduction of metal artefacts (MAR) and noise

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## Objective

Minimise artefacts caused by metallic material (prostheses, screws or osteosynthesis) in the hand region, while preserving bone and soft tissues diagnostic image quality and enabling valid reconstructions for 3D planning and STL export.

## Acquisition settings (add without modifying the original ROI)

| Parameter                   | Recommended  | Notes / Justification                                   |
|-----------------------------|--|---|
| Region                      | Include the entire area including implants and the complete bone structure | Prevents implant truncation                             |
| kVp                         | 140 kVp (fallback 120 kVp)   | Reduces beam hardening from metallic materials          |
| mA / AEC                    | Automatic with upper limit +20-30% over standard                           | Compensates for increased noise due to MAR and high kVp |
| Rotation time               | 0.5-1.0 s (prioritise 0.5 s)   | Minimises motion artefacts                              |
| Pitch                       | 0.6-1.0 (recommended. 0.8)   | Balance between coverage and resolution                 |
| Collimation/slice thickness | ≤0.625 mm  | Isotropy for MAR and 3D reconstructions                 |

|                              |   |   |
|------------------------------|---|---|
| <b>FOV</b>                   | 100–160 mm centred on the hand  | Prevents the prosthesis from being located at the detector edge |
| <b>Posición del paciente</b> | Prone o supine with arms extended forward, hand in a neutral position and geometrically centred | Centring the metal reduces asymmetrical streaks                 |

### **ALWAYS generate paired series with and without MAR**

- Reference (without MAR): Soft/moderate kernel, FBP or mild IR; slices 0.6 mm / 0.4 mm increment.
- MAR activated: Soft/moderate kernel + manufacturer algorithm (iMAR/O-MAR/Smart MAR/SEMAR).
- DECT / Spectral (if available): VMI 100–140 keV (save at least 100, 120, and 140 keV); consider 70 keV for soft tissues if artefact saturation is absent.
- 3D volume (planning): Use the series without MAR, isotropic 0.6 mm, intended for STL export.

### **Post-processing and verification**

- Check bone and soft tissue windows; confirm cortical continuity near metal.
- If streak artifacts persist, increase VMI keV (120 → 140 keV) and/or compare with the series without MAR.
- Confirm implant centering and absence of truncation before sending to PACS.
- Always export STL from the series without MAR (MAR can alter geometries).

### **Console setup sheet**

Name: ORTO\_[HAND]\_MAR  
 kVp: 140 (fallback 120)  
 mA (AEC): ON, upper limit +20–30%  
 Rotation: 0.5–1.0 s  
 Pitch: 0.8 ( $\leq 1$ )  
 Collimation: 0.6 mm (recon 0.6 / inc. 0.4)  
 Kernels: B40s (soft) + B70f (bone)  
 Series:  
 1) Standard IR (B70f)  
 2) MAR ON  
 3) VMI 100–140 keV (if DECT)  
 4) 3D export (without MAR)

FOV: 100–160 mm centred on the hand