**Early User:**

We would like to thank all surgeons who contributed the development of the Gamma3 U-Blade Lag Screw in the early clinical phase.

**Literature**

We recommend the below listed books. These books refer to nearly 300 clinical publications and include special and detailed information about the treatment using the Gamma Nail. Publications are available on request.

The Gamma Locking Nail, Ten Years and Surgical Experience, Gahr, R. H.; Leung, K.-S.; Rosenwasser, M. P.; Roth, W. (Hrsg.) Einhorn-Presse Verlag, ISBN 3-88756-808-7

Patients treated with the long Gamma nail, R. van Doorn

Bedrijfsnaam: Castellum Drukwerk Vof.
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Design Features of the Gamma3 U-Blade Lag Screw System

The implant components of the Gamma3 U-Blade Lag Screw System are made of titanium alloy (Ti6Al4V) (Fig. 1 & 1a) with anodized type II surface. They are designed for use with the Gamma3 Trochanteric (Fig. 2) and Gamma3 Long Nails.

The unique Gamma3 U-Blade Lag Screw concept and its straightforward instrumentation enables quick insertion. The procedure is similar to the current Gamma3 Lag Screw System.

Design Benefits of the Gamma3 U-Blade Lag Screw System

The Gamma3 U-Blade Lag Screw System has a special design and is easy to use. In the literature, a cut-out rate of 2–8% is reported [1, 2, 3]. An other benefit of this design is to provide a monoaxial rotational stability of the head and neck fragment, a useful feature for treating special unstable fracture situations.

The Gamma3 U-Blade spreads at the end of the Gamma3 U-Screw thread (see Fig 1a) and increases the surface in the cranial-caudal direction.

This effect offers several major benefits:

• Increased resistance to cut-out of the femoral head due to the larger implant surface [4]
• Monoaxial rotational stability of the femur head and neck fragment [4] (no second lag screw or pin is needed as with other implant designs)
• Full compatibility with the Gamma3 Nail System.

Indications

The Gamma3 U-Blade Lag Screw is recommended for the following indications:

• Highly osteoporotic bone in the femur head
• Short femoral head/neck fragment
• Unstable per- or intertrochanteric fractures with missing medial-caudal bone support as shown in the preoperative X-Rays (Fig. 2a & 2b).

Note:
Follow the Gamma3 Operative Technique for Trochanteric or Long Nails, depending which nail you are using, up to the part of the chapter entitled Lag Screw Insertion where the K-Wire is in place, the Lag Screw length determination has been done and the value of the length measurement has been transferred to adjustable stop of the Lag Screw Step Drill. At this point, continue with this Operative Technique. The instructions for the Gamma3 U-Blade Lag Screw Operative Technique should not interfere with or replace any chapters in the Gamma3 Operative Technique except for those detailing Lag Screw insertion and fixation. This manual is describing the surgical technique using a Gamma3 Trochanteric Nail 180.

For optimal positioning of the Gamma3 U-Screw, use of the Gamma3 One Shot Device® is recommended.

The Gamma3 One Shot Device® is a radiolucent instrument that is used to find the ideal position for the Lag Screw before skin incision and opening the lateral cortex for K-Wire placement.
Operative Technique

Gamma3 U-Blade Lag Screw Placement

The K-Wire Sleeve is removed and the adjusted Lag Screw Step Drill is passed over the K-Wire, through the Lag Screw Guide Sleeve. The canal for the Gamma3 U-Blade Lag Screw is prepared using the T-Handle connected to the Lag Screw Step Drill (Fig. 3).

If exceptional resistance is encountered, a power drill may be used with great care. Drilling should continue until the stop of the Step Drill comes into contact with the Lag Screw Guide Sleeve (Fig. 3a). Ensure that the Targeting Device is well supported to prevent it from slipping back or rotating.

The drilling process, especially when the tip of the drill comes close to its final position in the femur head, should be controlled under an image intensifier to avoid hip joint penetration. The K-Wire also may be observed in the K-Wire Window of the Step Drill (Fig. 3b).

Note:
It is important to observe the K-Wire tip during drilling using the intensifier. The K-Wire window provides an additional possibility to double check the K-Wire end position. Ensure that under no circumstances the K-Wire is advanced into the pelvis.

The correct length of the Gamma3 U-Blade Lag Screw is chosen by selecting a size that was measured previously with the Lag Screw Ruler. It is important that the assembled Gamma3 U-Blade Lag Screw protrudes through the lateral femoral cortex. This will ensure rotational stability in the nail axis and allows the Gamma3 U-Blade Lag Screw to slide laterally.

Note:
The disassembled Gamma3 U-Screw (without Gamma3 U-Blade and Gamma3 End Cap) is 4 mm shorter than the regular Gamma3 Lag Screw. Because of this, the end of the Gamma3 U-Screw itself will not protrude through the lateral cortical bone until the Gamma3 U-Blade and the End Cap have been completely assembled (Fig. 13, page 14).
Operative Technique

Separate the selected Gamma3 U-Blade Lag Screw Set from the End Cap and the Gamma3 U-Blade and attach the Gamma3 U-Blade Lag Screw to the Gamma3 U-Blade Lag Screwdriver (Fig. 4b) by turning the end thumbwheel clockwise (Fig. 4). Make sure that the pins of the U-Blade Screwdriver are in the slot of the Gamma3 U-Blade Lag Screw (Fig. 4b).

Tighten the thumbwheel. Make sure that the compression wheel of the Lag Screwdriver (Fig. 4a) is positioned closest to the handle.

**Note:**
The Gamma3 U-Screw CAN NOT be connected to the regular Gamma3 Lag Screwdriver (1320-0200) because their designs differ.
The U-Screw assembly is now passed over the K-Wire, through the Lag Screw Guide Sleeve, and threaded up to the end of the predrilled hole of the femur head. Check the end position of the U-Screw on the image intensifier. A double check of the end position is also possible with the indicator ring on the U-Blade Lag Screwdriver when it reached the end of the Lag Screw Guide Sleeve.

**Compression / Apposition**

If compression or apposition of the fracture gap is required, this can be achieved by gently turning the thumb-wheel of the Lag Screwdriver clockwise against the Guide Sleeve. Before starting compression, make sure that the Lag Screw Guide Sleeve is unlocked to allow its free sliding. To unlock the Lag Screw Guide Sleeve, the Knob has to be turned counter clockwise.

In osteoporotic bone care must be taken to prevent Lag Screw pullout in the femoral head. The U-Blade Lag Screw must be chosen shorter depending on the expected amount of compression.

**Note:**
The handle MUST be perpendicular to the Targeting Device, when the U-Blade Lag Screw is in the final position.
Operative Technique

Lag Screw Fixation

Assemble the Set Screw to the Set Screw Driver. Insert the Set Screw as shown in Fig. 6 along the opening of the post of the Targeting Device and advance it through the Nail Holding Screw pushing the Set Screwdriver. **Push the Set Screw Driver down until you are sure, that the Set Screw engages the corresponding thread in the nail.** During pushing down the assembly, you may feel a slight resistance.

Turn the Screwdriver handle clockwise under continuous pressure. You may notice a slight resistance when turning the Set Screw. This is because the Set Screw thread is equipped with the “Nylstop” system to prevent spontaneous loosening. Turn the Set Screw until you feel contact in one of the two grooves of the U-Blade Lag Screw.

**On slightly tightening the Set Screw, make sure that the handle of the Lag Screwscrewdriver is at right angles (90°) to the target arm (Fig. 5a).** The Set Screw alignment indicator will help to find the right position of the T-handle.

This ensures that the Set Screw will engage in one of the two Lag Screw sliding grooves (Fig. 6a). To verify the engagement the Set Screw in sliding groove of the Lag Screw, try to turn the U-Blade Lag Screwdriver gently clockwise and counter-clockwise. If it is not possible to turn the U-Blade Lag Screwdriver the Set Screw is engaged in one of the two sliding grooves. If the U-Blade Lag Screw moves, recorrect the T-Handle position and tighten the Set Screw again until it engages in one of the two Lag Screw sliding grooves.

After slightly tightening the Set Screw it should then be unscrewed by one quarter (¼) of a turn, until a small play can be felt at the U-Blade Lag Screwdriver. This ensures a free sliding of the U-Blade Lag Screw. Make sure that the Set Screw is still engaged in the sliding groove by checking that it is still not possible
to turn the U-Blade Lag Screw with the U-Blade Lag Screwdriver.

**Note:**
*Do not unscrew the Set Screw more than ¼ of a turn.*

**Note:**
*If the Gamma3 U-Blade Lag Screw is not correctly secured with the Set Screw, rotational stability of the head fragment cannot be assured.*

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Fig. 6: Set Screw insertion through the Targeting Device

Fig. 6a: Gamma3 U-Blade Lag Screw; sliding possible after unscrewing the Set Screw by 1/4 turn
Before inserting the Gamma3 U-Blade, disconnect the Gamma3 U-Blade Lag Screwdriver from the Gamma3 U-Blade Lag Screw by turning the thumbwheel counterclockwise. Remove the Gamma3 U-Blade Lag Screwdriver and the K-Wire.

The Gamma3 U-Blade Lag Screw Connector has to be preattached to the T-Handle first (Fig. 7).

Pass this assembly through the Lag Screw Guide Sleeve (Fig. 8) and turn it clockwise using the T-Handle (Fig. 8a). Turning stops when the Gamma3 U-Blade Lag Screw Connector has reached its end position. Remove the T-Handle from the connector.
Operative Technique

Gamma3 U-Blade Insertion

Now connect the Gamma3 U-Blade to the Gamma3 U-Blade Connector by turning the Gamma3 U-Blade Connector clockwise (Fig. 9).

Push the Gamma3 U-Blade assembly gently over the Gamma3 U-Blade Lag Screw Connector and into the flutes of the Gamma3 U-Blade Lag Screw. If you do not hit the flutes directly turn your Gamma3 U-Blade Connector assembly by hand until the assembly glides in easily. The Gamma3 U-Blade should be inserted in the position shown in Fig. 10 & 10a so that it glides easily along the flutes of the Gamma3 U-Blade Lag Screw. This is done by hand until the Gamma3 U-Blade stops when it reaches the bone. At this point, the Gamma3 U-Blade should be approximately 25 mm away from its final position.

Approx. 25 mm
Operative Technique

Gamma3 U-Blade Insertion

The Gamma3 U-Blade Inserter is required to move the Gamma3 U-Blade into its final position. The Gamma3 U-Blade will now start to spread to the anterior and posterior side. This procedure requires greater force and cannot be done by hand.

**Note:**
*Never use a hammer!*

The Gamma3 U-Blade Inserter is designed to provide the force that will bring the Gamma3 U-Blade in its final position, by spreading the blades.

Position the Gamma3 U-Blade Inserter over the Gamma3 U-Blade Lag Screw Connector until it contacts the Gamma3 U-Blade Connector (Fig. 11).
Press the lever several times and the Gamma3 U-Blade Inserter will push the Gamma3 U-Blade forward (Fig. 11a). The Gamma3 U-Blade Inserter stops mechanically when the Gamma3 U-Blade has been inserted completely. The final position of the Gamma3 U-Blade is indicated when the peg of the Gamma3 U-Blade Inserter is in line with the indicator ring on the Gamma3 U-Blade Lag Screw Connector (Fig. 11b).

A visual check with the intensifier in the axial view is recommended to affirm the Gamma3 U-Blade’s final position.

Remove the Gamma3 U-Blade Inserter by moving it backwards away from the Gamma3 U-Blade Lag Screw Connector.

The Gamma3 U-Blade Connector and the Gamma3 U-Blade Lag Screw Connector are disassembled in the opposite order.
Fixation of the Gamma3 U-Blade is always completed by securely fastening the End Cap into the Gamma3 U-Blade Lag Screw. Insert the End Cap through the Lag Screw Guide Sleeve using the Straight Screwdriver 4 mm and tighten firmly (Fig. 12). Gamma3 U-Blade insertion is now complete. Remove the Screwdriver and the Lag Screw Guide Sleeve (Fig. 13).

Follow the Gamma3 Operative Technique for Trochanteric or Long Nails, depending which nail is used. Beginning at the chapter entitled Distal Screw Locking, if distal locking is required. If no distal locking is required, continue with the chapter End Cap Insertion.
Operative Technique

Extraction of the Gamma3™ Implants

Where implant extraction is indicated, please proceed as follows:

**Step I** (Fig. 14)
Remove the distal screw using the 3.5 mm Screwdriver through a short incision.

**Step II** (Fig. 15)
When the end of the Gamma3 U-Blade Lag Screw is exposed in an incision remove any bony ingrowth which may be obstructing the End Cap to enable the Screwdriver to engage fully. Remove the End Cap.

**Step III** (Fig. 16)
The K-Wire is then introduced via the Gamma3 U-Blade Lag Screw into the head of the femur. The K-Wire provides an easy guide for the next instrument assemblies to be used.

**Step IV** (Fig. 17)
Mount the Gamma3 U-Blade Connector over the K-Wire to the Gamma3 U-Blade by turning it clockwise. Check that no ingrowth or soft tissue is between the connecting parts. If the thread of the Connector is engaged with the Gamma3 U-Blade, retract the Gamma3 U-Blade Connector. If the Gamma3 U-Blade is not loosened at this stage, a rod can be inserted through the holes of the Gamma3 U-Blade Connector assembly to provide a strong handle for pulling back the Gamma3 U-Blade.

**Step V** (Fig. 18)
The U-Blade Lag Screwdriver is passed over the K-Wire and engaged with the distal end of the U-Blade Lag Screw. Make sure that the two pegs of the Gamma3 U-Blade Lag Screwdriver fit to the Gamma3 U-Blade Lag Screw. Tighten the thumbwheel clockwise.

Check that tissue does not obstruct secure engagement of the Gamma3 U-Blade Lag Screwdriver, otherwise the U-Blade Lag Screw or Screwdriver may be damaged and extraction will be much more difficult.

**Step VI** (Fig. 19)
An incision is made over the proximal end of the nail, the proximal End Cap if used is removed using the Ball Tip Screwdriver or Strike Plate, and the Set Screwdriver is engaged with the Set Screw. The Set Screw is rotated anticlockwise until it is removed.

**Note:**
As the targeting device is not connected to the nail, we recommend using the Straight Set Screwdriver (1320-0210) for better guidance through the soft tissue to get access to the Set Screw.

**Step VII** (Fig. 20a)
The Conical Extraction Rod is then threaded and tightened into the proximal end of the nail. The U-Blade Lag Screw is extracted by anticlockwise rotation and pulling of the U-Blade Lag Screwdriver. The K-Wire must then be removed.

**Step VIII** (Fig. 20b)
After assembling the Universal Rod to the Conical Extraction Rod, an appropriate sliding hammer is attached to the assembly to extract the nail.

**Note:**
It is useful to turn the U-Blade Lag Screw Screwdriver clockwise slightly first to loosen the possibly bony ingrowth into the screw threads before turning it counter clockwise.
Operative Technique

Fig. 17: U-Blade Lag Screwdriver attachment

Fig. 18: Set Screw and End Cap removal

Fig. 19: Gamma3 U-Blade Lag Screw removal using Gamma3 U-Blade Lag Screwdriver

Fig. 20a: Nail extraction using Extraction Rod

Fig. 20b: Nail extraction using Extraction Rod
### Ordering Information - Instruments

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## Ordering Information - Implants

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*(End Cap can be ordered separately in case of a spare part)*

### End Cap

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*(End Cap can be ordered separately in case of a spare part)*

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* Implants are sterile packed.
Gamma3 U-Blade Lag Screw, Gamma3 U-Blade and End Cap are packaged together in one box.