LINK®

# Interprosthetic and Mono RescueSleeve®

## Custom-Made Prostheses

customLINK®

Presented by:

Waldemar Link GmbH & Co. KG

Barkhausenweg 10 · 22339 Hamburg, Germany
Tel.: +49 40 53995-0 · Fax: +49 40 5386929
info@linkhh.de · www.linkorthopaedics.com

# Interprosthetic and Mono RescueSleeve®
## Custom-Made Prostheses

## Features of the Interprosthetic Twin RescueSleeve®

- **Sleeves to take the proximal and distal stem**
- **Strength proven [6,7] modular bridge**
- **Stem fixation screws**
- **Modular bridge „Pocket Coupling“ and security screws**

The increasing use of stem prostheses in arthroplasty means that stems of hip and/or knee implants quite often have to be coupled in the femur.
According to Soenen[1], there is a dramatic increase in the risk of interprosthetic fracture, when the two stem tips are less than 100 mm apart. This scenario was tested in a four point bending test.

Weiser et al[2] conducted similar tests and concluded that the distance between the stem tips has scarcely any influence on the risk of fracture, whereas the bone quality of the cortex is the decisive factor.
No matter what the main factor is, good permanent stabilization of such interprosthetic fractures can be achieved with LINK® RescueSleeve®.

Sleeve couplings by their nature do not require narrow tolerances and they have proved very successful for stem/stem coupling[3]. This applies both to stems of LINK implants and to combinations of LINK and other makes of prosthesis (stem dia. must be available).

Essentially, these sleeves can be either single-sided or double-sided (twin sleeve). In the case of the single-sided sleeve, the component that is in contact with the sleeve can comprise an intramedullary stem or a joint component that anchors the prosthesis, which following coupling is held by the sleeve in the medullary canal, or connects it with it opposite side modularly to another joint prosthesis. The double-sided sleeve connects two opposite prostheses stems usually following an interprosthetic fracture, often after a failed osteosynthesis.
The RescueSleeve® can be designed so that an anatomical angle (varus/valgus) is provided in the coupling of the connecting components.

The sleeves are manufactured, for example, in the following sizes:

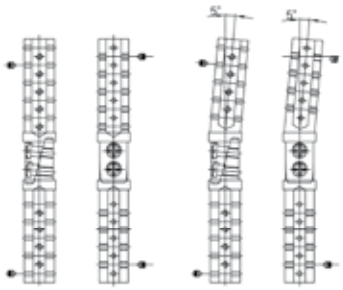
| | |
|---|---|
| 50 mm depths | 8 fixation screws |
| 60 mm depths | 12 fixation screws |
| 80 mm depths | 16 fixation screws |

These sleeve connections always entail a certain bone loss of 130 - 170 mm, but the coupling is so strong that the held prosthesis stem usually would bend or fracture before the connection fails.
The pocket-coupling between the sleeves has a length of 50 mm and is usually applicable.
In few cases of short interprosthetic space the CS (Cardan-Short) coupling has to be eployed as that has only 30 mm of length.
Most importantly, the joint regions in the knee or hip of the prosthesis in situ are not impaired by the intervention. Tests on the stability of the sleeve coupling were performed by Professor Morlock at Hamburg University of Technology (TUHH).[4,6]

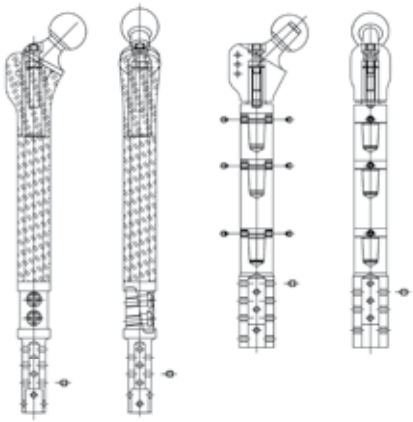
To create the sleeve/stem coupling, the sleeve is first filled with bone cement before the male in situ component (stem) is pushed into the sleeve while the cement is still soft. Primary fixation of the male component is then achieved with the circumferentially arranged fixation screws. Once the bone cement has hardened, the result is a stable, loadable connection between the in situ prosthesis stem and the attached sleeve (see surgical technique).
In case of the twin RescueSleeve®, the opposing fracture segment is attached to the adjacent sleeve in the same way before both sleeve components are interconnected via the ‚Pocket Coupling‘ and secured with two assembly screws.

**These implants are only available as custom-made products.**

## Twin RescueSleeve® with modular bridge coupling for interprosthetic fractures

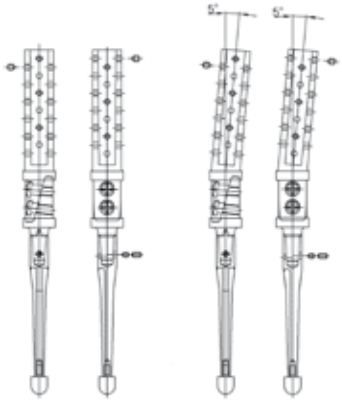


## Mono RescueSleeve® as custom (A) or MEGASYSTEM-C® (B) coupling

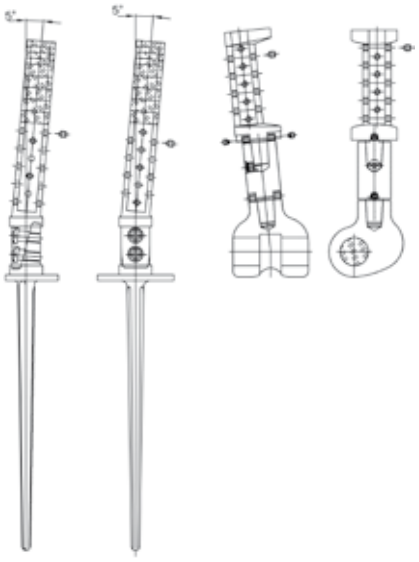


A B

## Mono RescueSleeve® with stem or hinge-connection

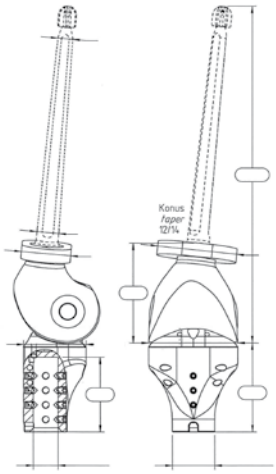


## Mono RescueSleeve® with stem or hinge-connection



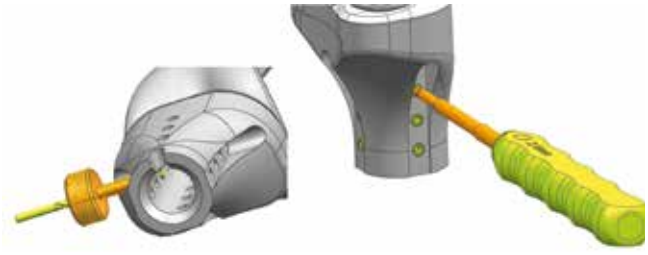
A B

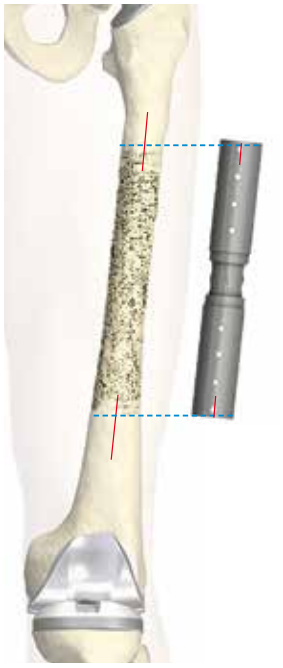
## Mono RescueSleeve® attached to Endo-Model® Knee prosthesis with mounting screws to secure a circular stem



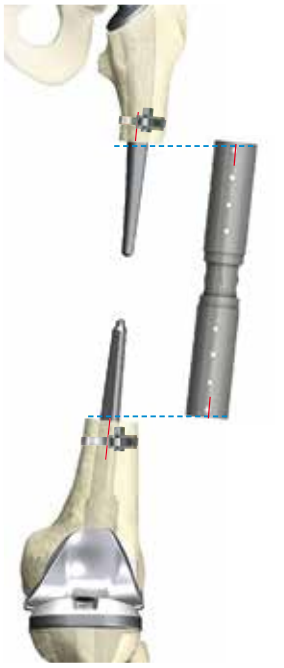

We suggest our drill sleeve (15-8006/03) and our screwdriver (10-5373/02).

- for drilling the tibia component in situ
- to achieve sufficient fixation of the screws





Following site approach the resection length is determined and resection markings are applied to the bone using the coupled sleeve for templating.

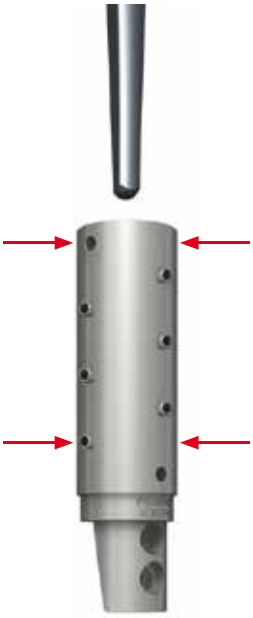


Then the proximal and distal stem portion of the prostheses in situ are freed of bone under observation of the resection marks.
Temporary protective cerclages or bone clamps must be used during this procedure.
(see pages 07 and 20)

Next step is a trial positioning. First the stem fixation screws are introduced into the respective bores but only as far to allow the stem to be introduced. It has to be observed that the screws of proximal and distal sleeve might be of different length, due to the variations of proximal and distal stem diameters.
Consequently the screws must not be mixed and only used for their destined sleeve. After provisional fixation of a stem at one side the opposite stem is as well provisionally fixed in the opposite sleeve under observation of the correct rotational position.

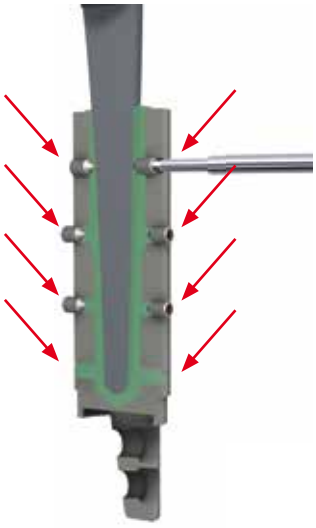
Thereafter the rotational position is marked with a sterile pen at the stem and correspondingly the edge of the opening of the second sleeve.

Leg length and rotation are controlled with both sleeves provisionally connected at their coupling ends.



The stem fixation screws to be actively used are left in place (a minimum of at least one pair screws near to the coupling and one pair at the sleeve opening is necessary).

In each of the sleeves two screws holes next to the coupling should be left blank to allow the air to exhaust, when the cement is introduced, preferably performed with a cement gun having a nozzle.



Finally the stem of the first component is pushed the whole way into the cement-filled sleeve and the fix screws are alternately tightened while the cement is still soft. Consecutively hardening of the bone cement has to be waited for.

Then the second stem is introduced in the cement filled sleeve of the second component, under observation of the rotational marks and the screws are alternately tightened as well before cement hardens.

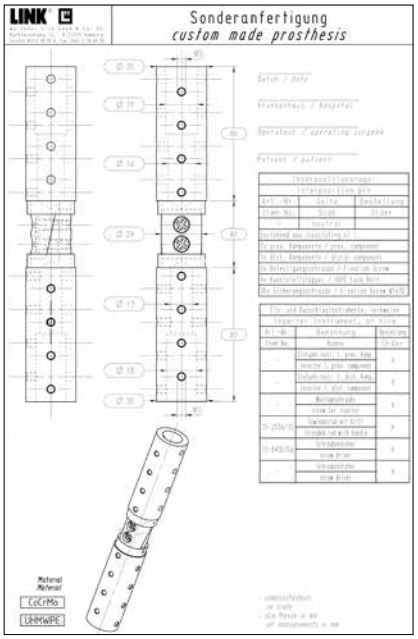
Following hardening of the cement both Rescue Sleeves are coupled in the pocket coupling and secured with the two assembly screws having their UHMWPE lock bolts in place in the screws threaded portion.
Note: The fixation screws have a 2,5 mm hex head.

**Titanium Cerclage Band with Lock**

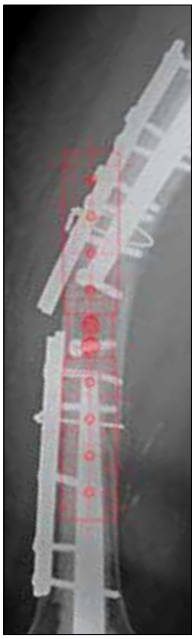
## Case 1

### Interprosthetic fracture due to patient downfall - Twin RescueSleeve®.

Interprostetic fracture with pseudoarthrosis and fracture of osteosynthesis plate.




Technical proposal



The implant

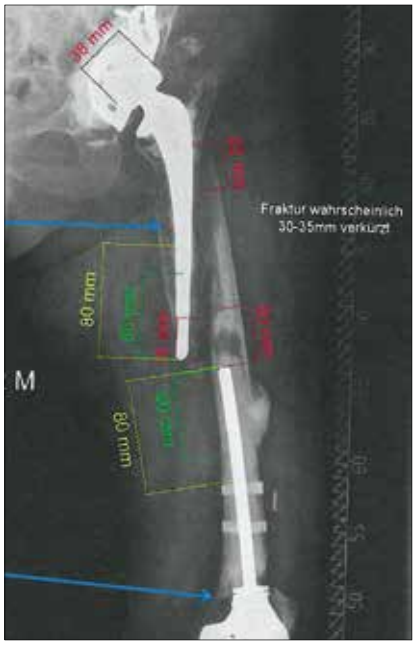
‚Pocket Coupling' disassembled

‚Pocket Coupling' assembled

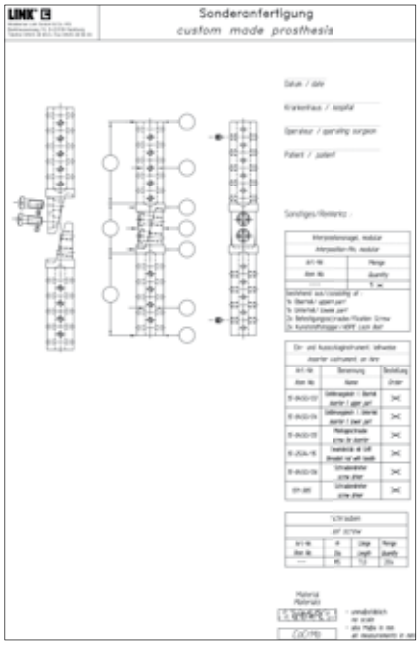
Post-OP X-ray

## Case 2

### Interprosthetic fracture due to patient downfall - Twin RescueSleeve®.



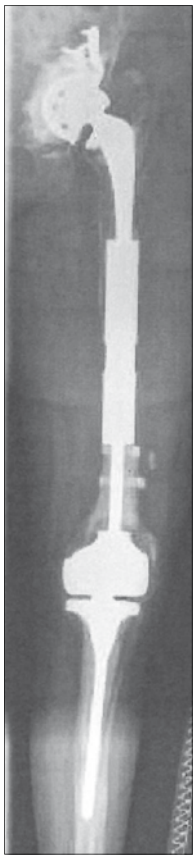

Interprosthetic fracture between hip and knee prostheses




Technical proposal

The implant

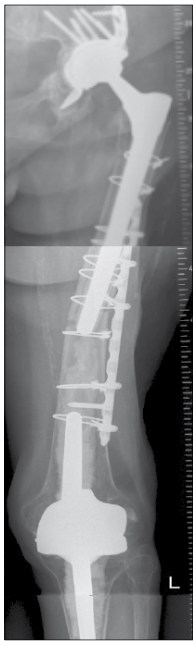
‚Pocket Coupling' disassembled



Post-OP X-ray

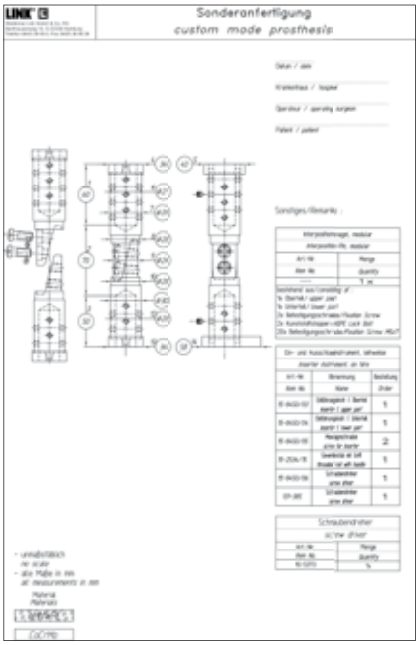
## Case 3

**Interprosthetic fracture due to patient downfall - Twin RescueSleeve® and coupling to MEGASYSTEM-C® components.**

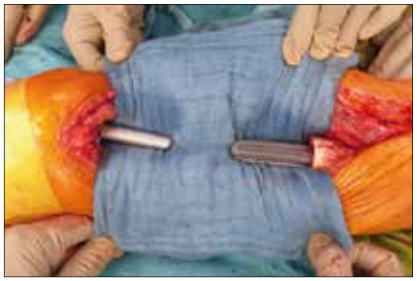


Interprosthetic fracture

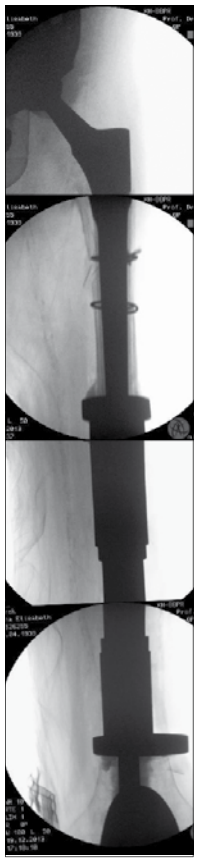
Secondary dislocation




Technical proposal



Intraoperative

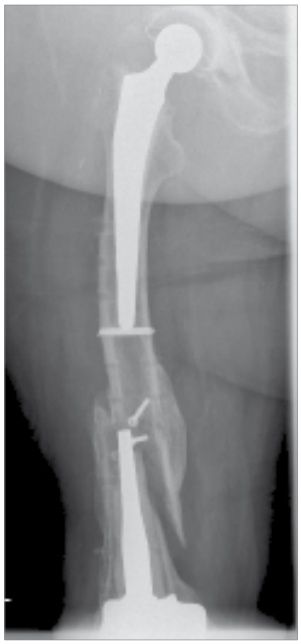


Intraoperative X-ray

One week Post-OP

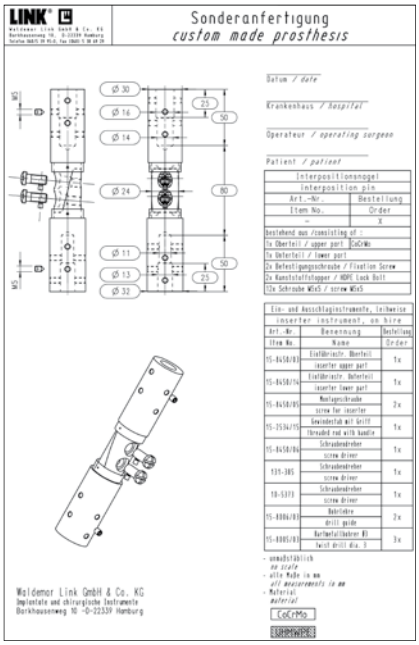
## Case 4

### Interprosthetic fracture due to patient downfall - Twin RescueSleeve®.



Interprosthetic fracture

Pre-OP Planning

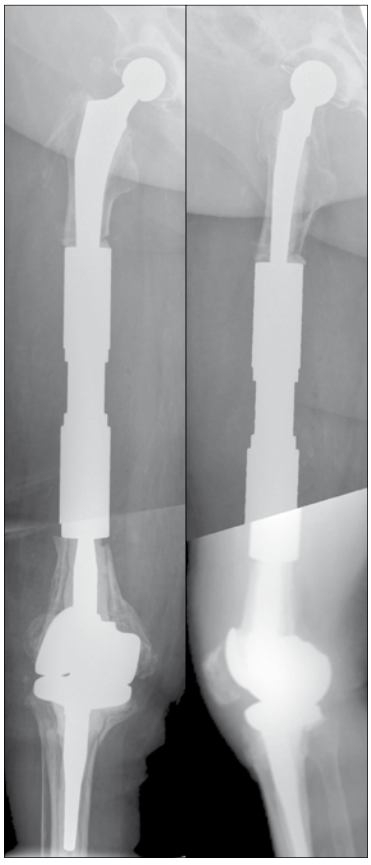



Technical proposal

Intraoperative

Intraoperative X-ray

The implant

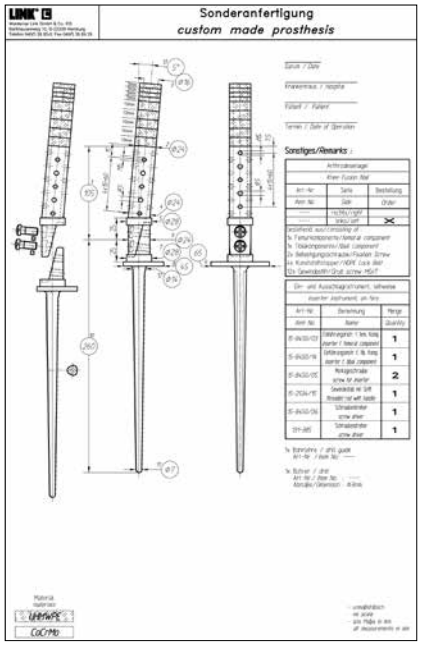


Post-OP X-rays

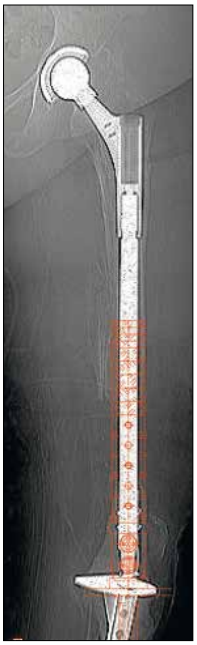
## Case 5

**Exchange of a knee prosthesis into one-sided Arthrodesis Nail. RescueSleeve® with tibial stem and attachement to a Push-through Femur in situ.**


Knee Fusion Nail with coupling for a Revitan push-through stem




Technical proposal



Pre-OP Planning

The implant

Post-OP X-rays

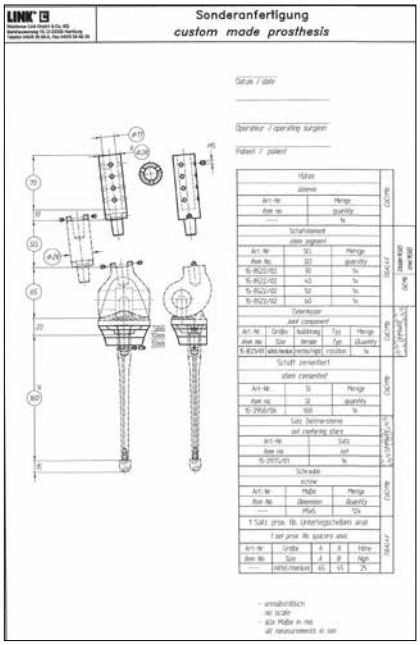
## Case 6

**RescueSleeve® after recurrent periprosthetic fractures. One-sided RescueSleeve® to Wagner stem with modular connection to MEGASYSTEM-C® Rotational Knee with modular proximal tibia replacement.**


Proximal:
Wagner revision stem



Distal: Knee TKA
Recurrent peri-prosthetic fractures




Technical proposal

Distal: Knee TKA
Recurrent peri-prosthetic fractures

The implant

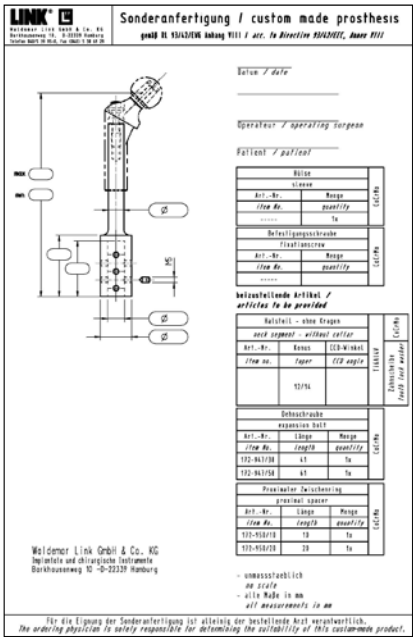

Post-OP X-rays

## Case 7

**One-sided modular RescueSleeve® with hip-joint replacement. PowerLock MP®-coupling allows for 5° increments of antetorsion adjustment.**


Pre-OP X-rays

Pre-OP Planning




Technical proposal

The implant

left:
The sleeve with push-through stem and temporary closure screw ...

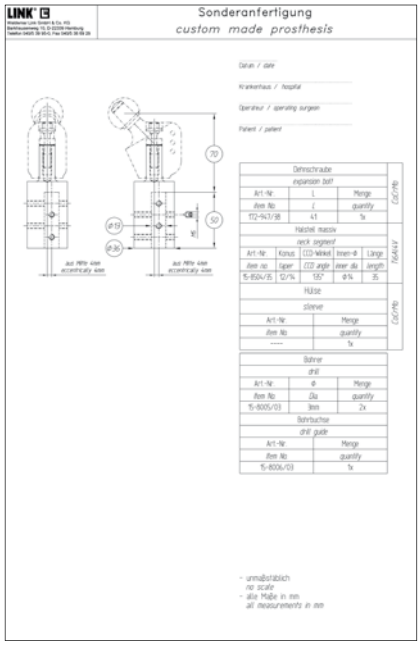
right:
... attached to head-neck segment.


Post-OP X-ray

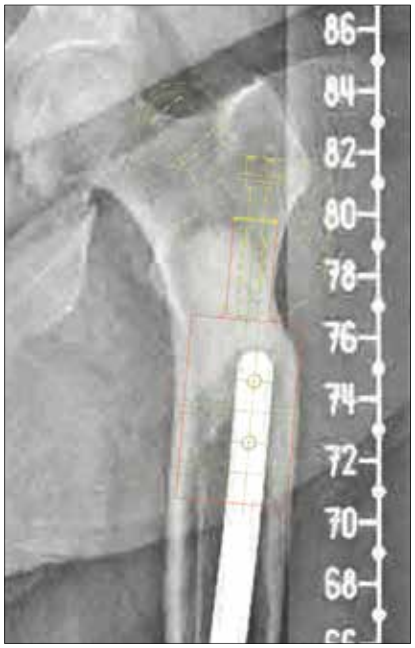
## Case 8

### One-sided RescueSleeve® with proximal femur and hip replacement.

Pre-OP X-rays




Technical proposal

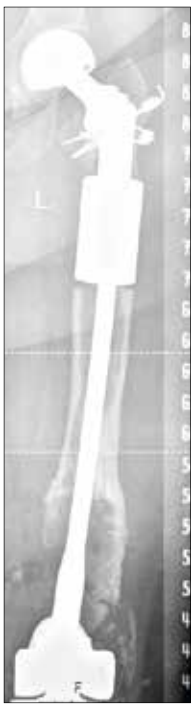


Pre-OP Planning

Connection to a femoral long stem of an Endo-Model® Rotational Knee Prosthesis in situ with lateral stem migration. Distal plasmozytome with low activity and osteolysis.

The RescueSleeve® with 'Power Lock' connection to a proximal head-neck component of the LINK® MP® Reconstruction Hip System.
The proximal part of the long stemmed knee could be coupled via RescueSleeve® with the MP® head-neck because LINK custom long stems standardwise receive the 'Power Lock' connection for possible future component attachments.

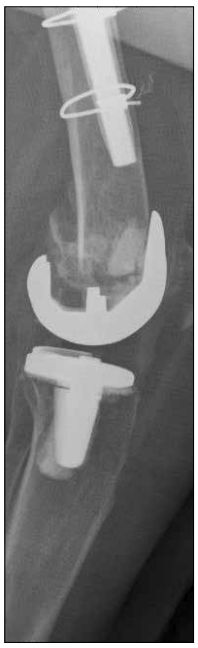
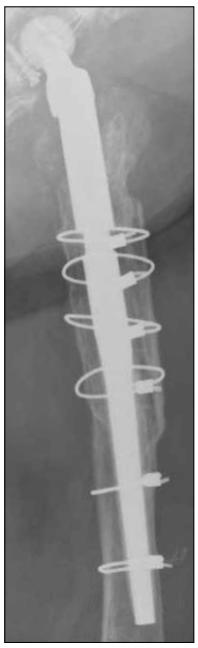
The implant



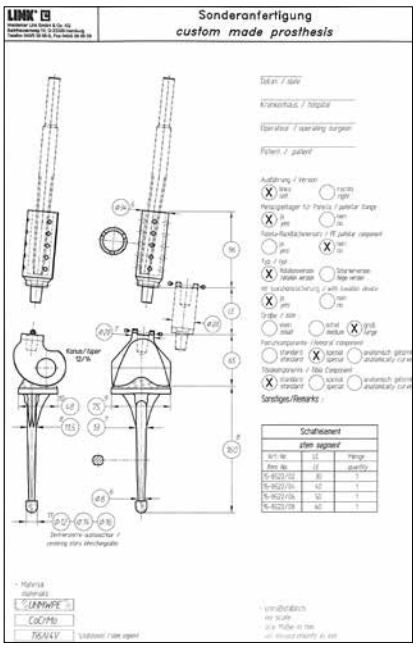
Post-OP X-rays

## Case 9

**MEGASYSTEM-C® distal femur replacement having one-sided modular RescueSleeve® for attachment to a 250 mm long 18 mm dia. MP® stem. The MEGASYSTEM-C® Knee replaces a surface replacement knee with periprosthetic fracture.**

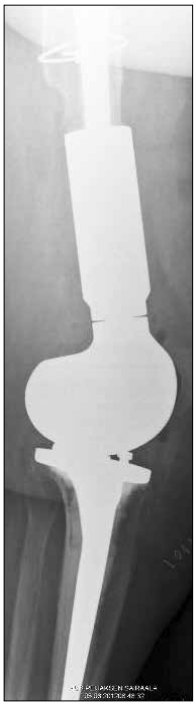
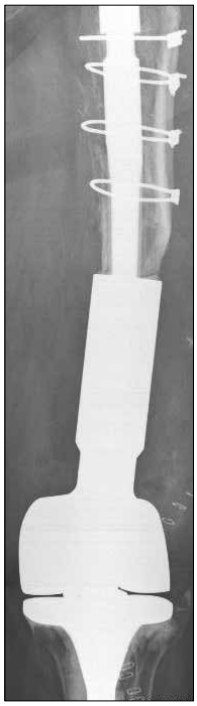
Pre-OP X-rays




Technical proposal

Pre-OP Planning

Intraoperative

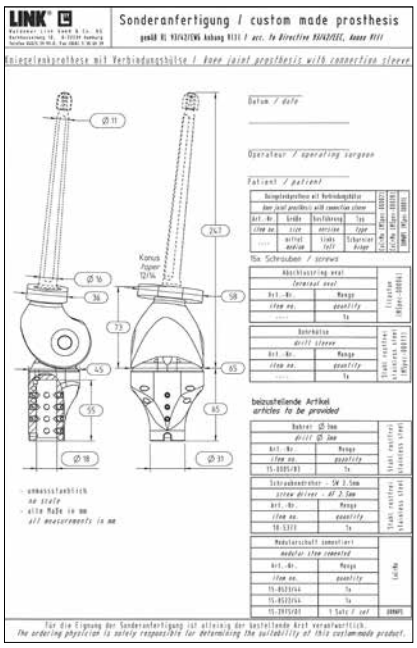




Post-OP X-rays

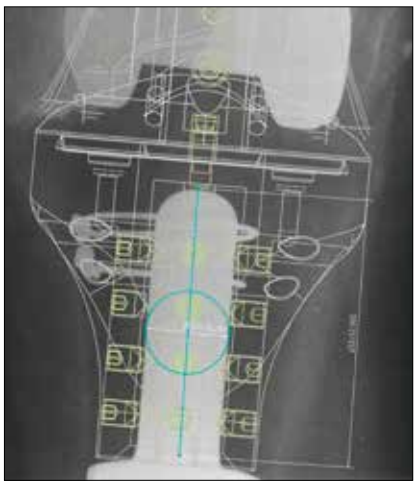
## Case 10

**MEGASYSTEM-C® distal femur replacement having one-sided modular RescueSleeve®. Hinged version. Tibial monoblock prosthesis, including RescueSleeve® and fixation screws.**

Pre-OP X-ray




Technical proposal



Pre-OP Planning

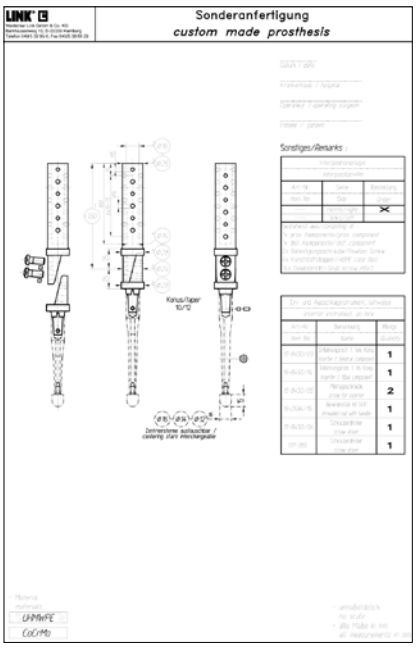
The implant


Post-OP X-rays

## Case 11

**One-sided RescueSleeve® with modular stem, to attach to a solid cemented proximal segment of a fractured long stem hip prosthesis and anchorage in the distal femur.**


Pre-OP X-ray




Technical proposal

Intraoperative

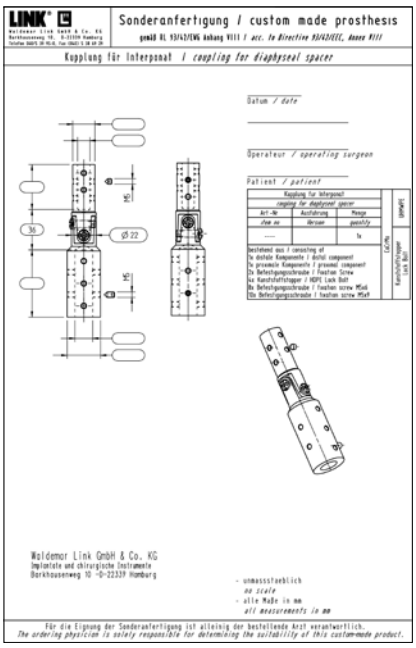
The implant


Post-OP X-ray

## Case 12

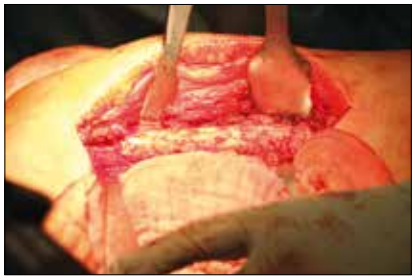
**A Twin RescueSleeve® CS (Cardan Short) coupling was chosen for coupling because there is only little space between the hip and knee prostheses.**

Pre-OP X-ray




Technical proposal

Pre-OP Planning



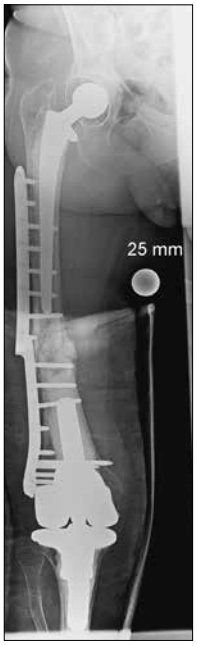
Intraoperative

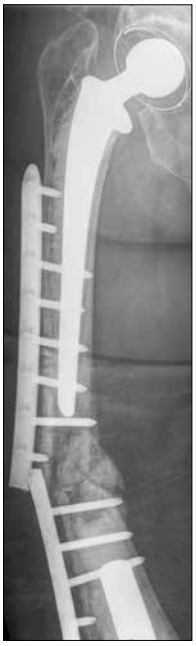
The implant

Post-OP X-ray

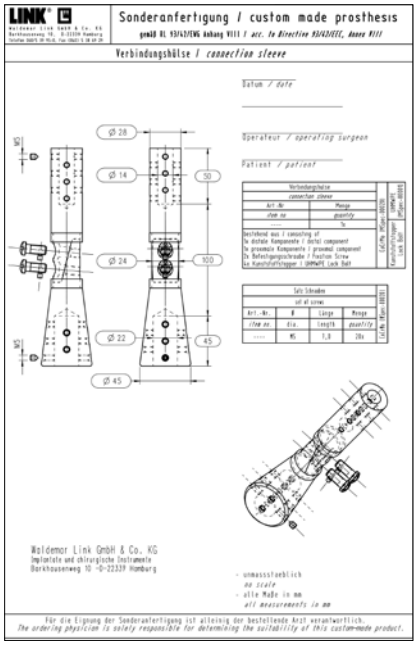
## Case 13

**Twin RescueSleeve® for interprosthetic fracture between the cemented SP II® stem and a cemented knee prosthesis (competitor implant) in following fracture of the bone plate.**

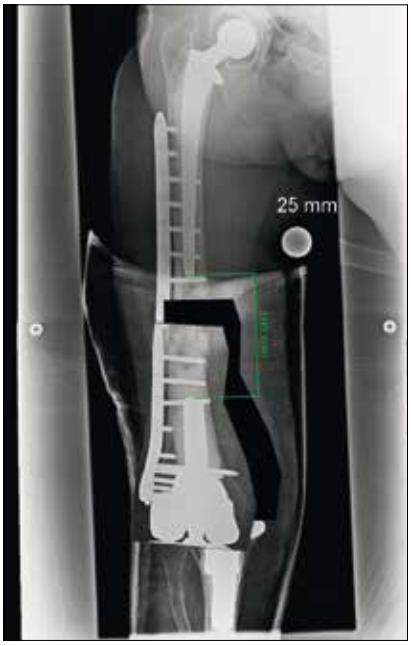


Pre-OP X-rays




Technical proposal




Pre-OP Planning

Trumpet-Type distal sleeve for optimal seating

The implant

Post-OP X-rays

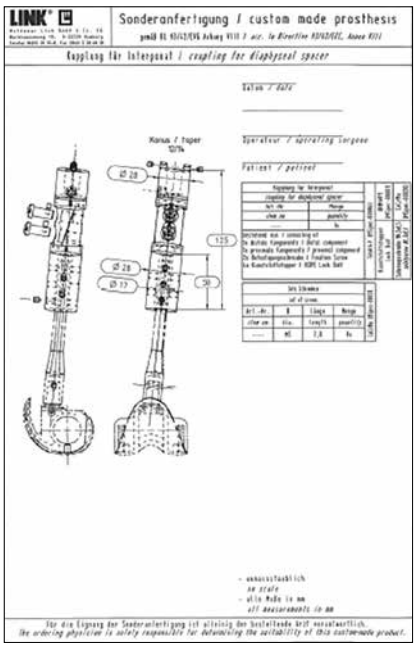
## Case 14

**Twin RescueSleeve® in case of repeated fracture of the femur after treatment with bone plate after three months.**

Pre-OP

Post-OP

Second fracture after 3 months




Technical proposal

LINK proposal

Intraoperative

The implant

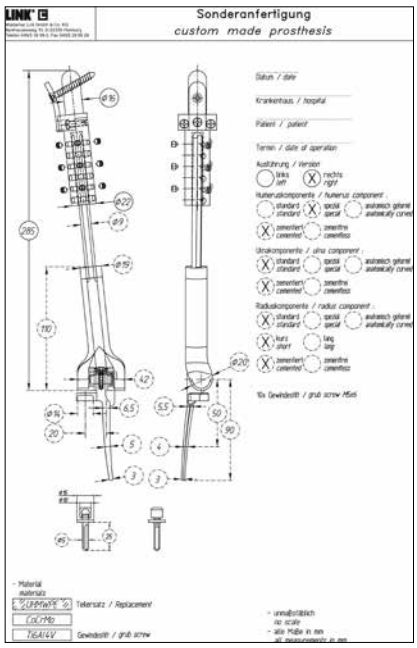
Post-OP X-ray

Proximal MEGA-C implant components

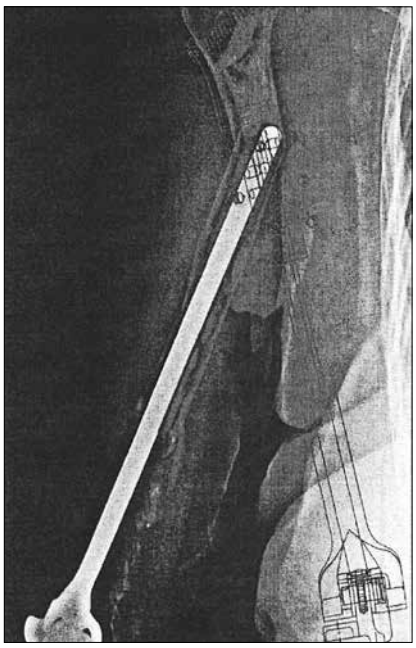
## Case 15

**Proximal modular one-sided RescueSleeve® for attachment to long stem distal humerus replacement with elbow joint. To be anchored in short proximal humerus fragment, additionally secured with modular flange.**

Pre-OP X-rays




Technical proposal



Pre-OP with proposal

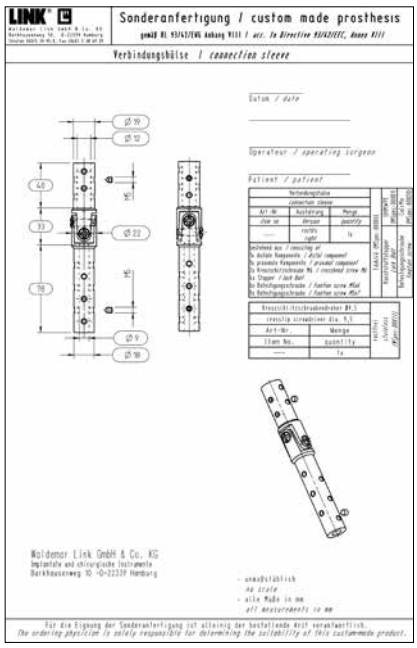
The implant

Post-OP X-ray

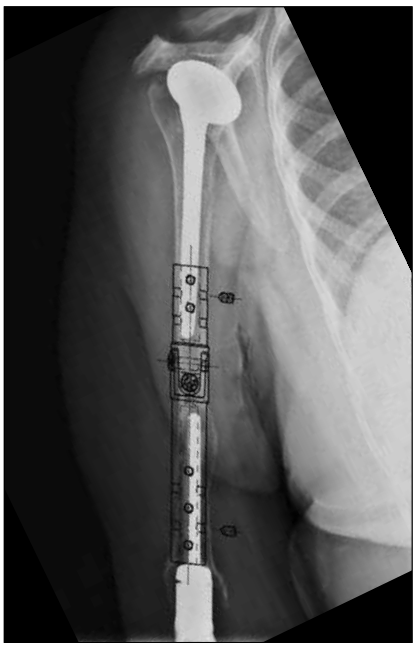
## Case 16

**Humeral twin RescueSleeve® at the right side uniting a shoulder and an elbow prosthesis.**

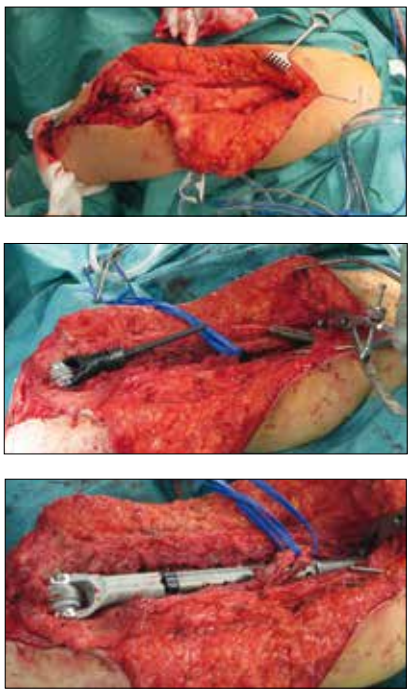
Pre-OP X-ray




Technical proposal

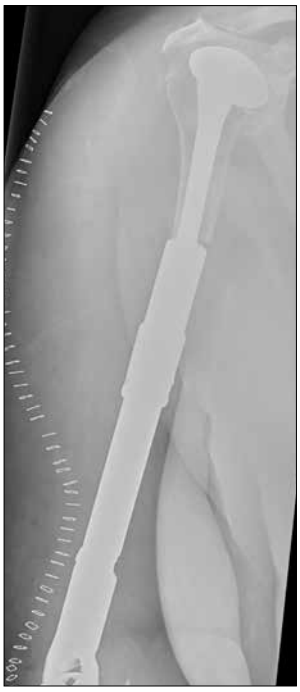


Pre-OP with proposal



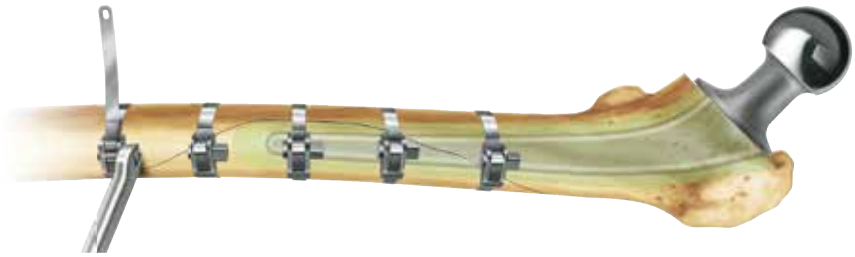
Intraoperative


The implant with CS (Cardan Short) coupling



Post-OP X-ray

## Thabe Titanium Cerclage Band



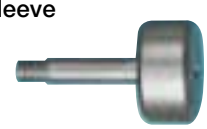
63-4300/02 Titanium Cerclage Band with Lock

72-1077 Swivel-Jaw Bone Holding Clamp

10-5373/01 Hex screwdriver

16-3290/00 Cross slot screwdriver

15-8006/03 Drill sleeve



10-5373/02 Hex screwdriver

1 - Soenen, Marc et al „Stemmed TKA in a Femur with a Total Hip Arthroplasty. Is there a safe distance between the stem tips?“, Journ. of Arth., 28 (2013) 1437-1445

2 - Weiser, L. et al „The role of interprosthetic fractures of the femur“, JBJS Vol 96-B, No 10, Oct 2014, PP 1378-1384

3 - Citak, Mustafa et al „Treatment of interprosthetic femoral fractures with an interposition prosthesis“, Acta Orthpedica 2013, 84 (3): 326-327

4 - Weiser, L. (UKE), Morlock M. (TUHH) et al „Biomechanische Untersuchung zum Einfluss des Abstandes zwischen zwei intramedullären Implantaten sowie der Knochendichte und Knochendicke bei interprothetischen Femurfrakturen“, UKE und TUHH Hamburg, 2013

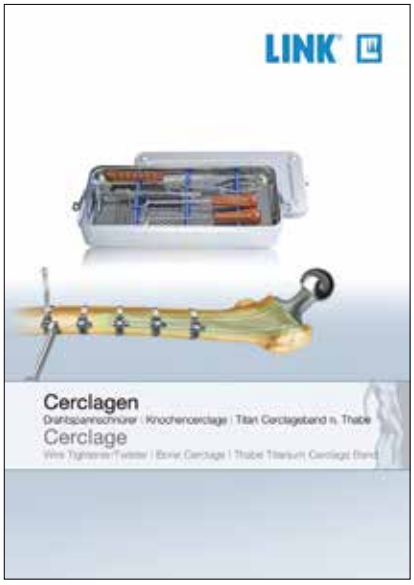
5 - Patel, Nirav K. et al „Custom-made Cement-Linked Mega Prostheses: A Salvage Solution for Complex Periprosthetic Femoral Fractures“, The Journ. of Arth. 29 (2014) 204-209

6 - Duda, Georg et al „Dynamic Examination of an Arthrodesis Nail’s Taper Connection“, TU Hamburg/Harburg, Dept. of Biomechanics, Prof. Dr. E. Schneider, 02/94

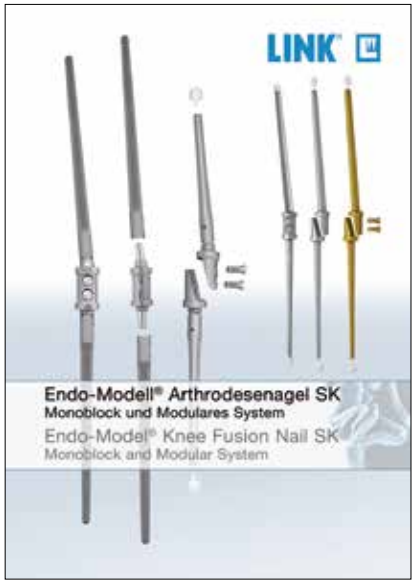
7 - Weiser, L. et al „Interposition sleeve as treatment option for interprosthetic fractures of the femur; a biomechanical in vitro assessment“, Intern. Orthop (SICOT), DOI 10.1007/s00264-015-2788-5

## Additional Information

Catalogs on request: E-mail customer@linkhh.de




255_Cerclagen




746_Endo-Model® Knee Fusion Nail SK

customLINK®

Waldemar Link GmbH & Co. KG

Barkhausenweg 10 · 22339 Hamburg, Germany
Phone +49 40 53995-0 · info@linkhh.de
www.linkorthopaedics.com

LINK®