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implantcast

PRODUCT OVERVIEW HIP SYSTEMS

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HIP SYSTEMS

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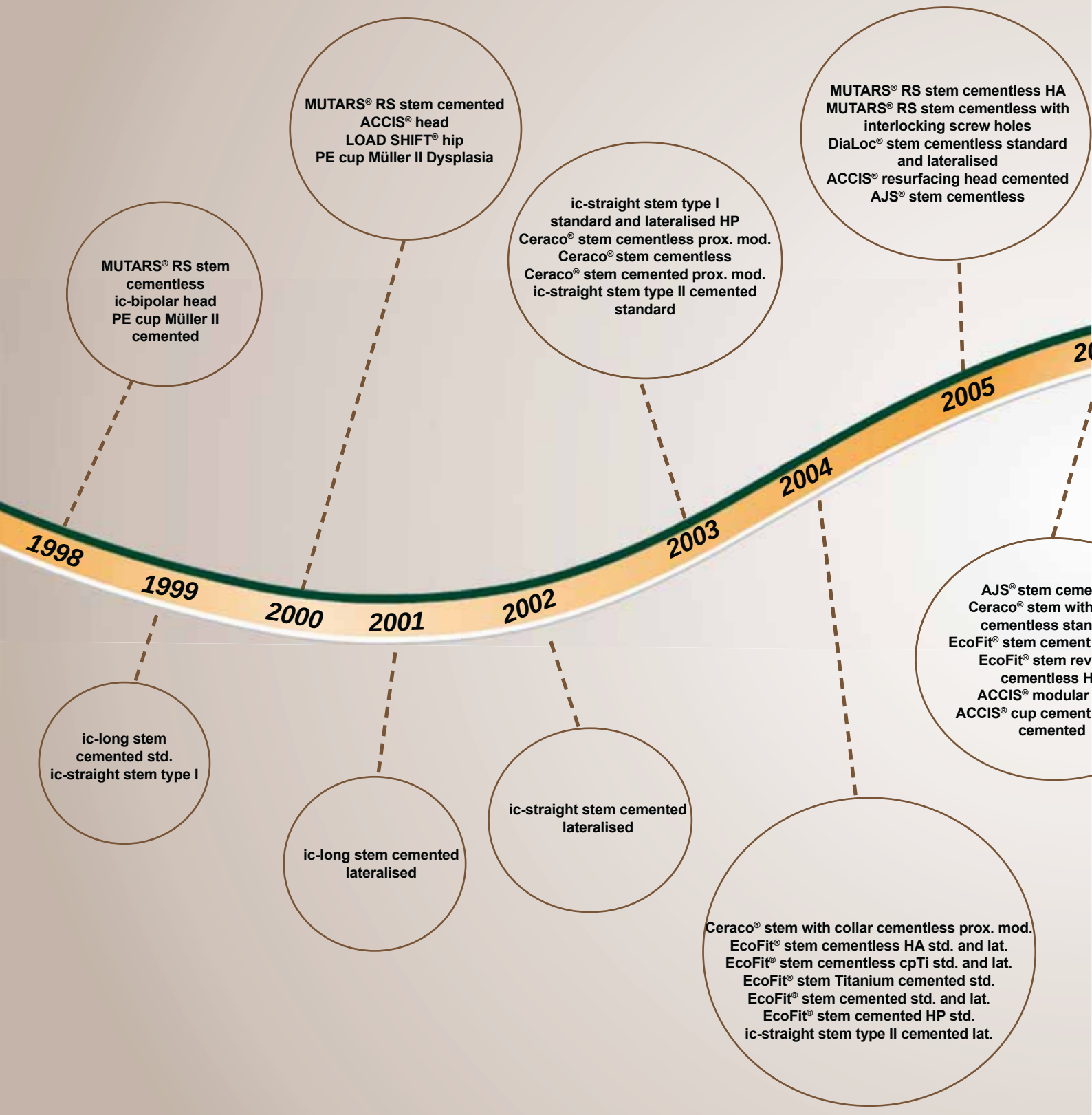
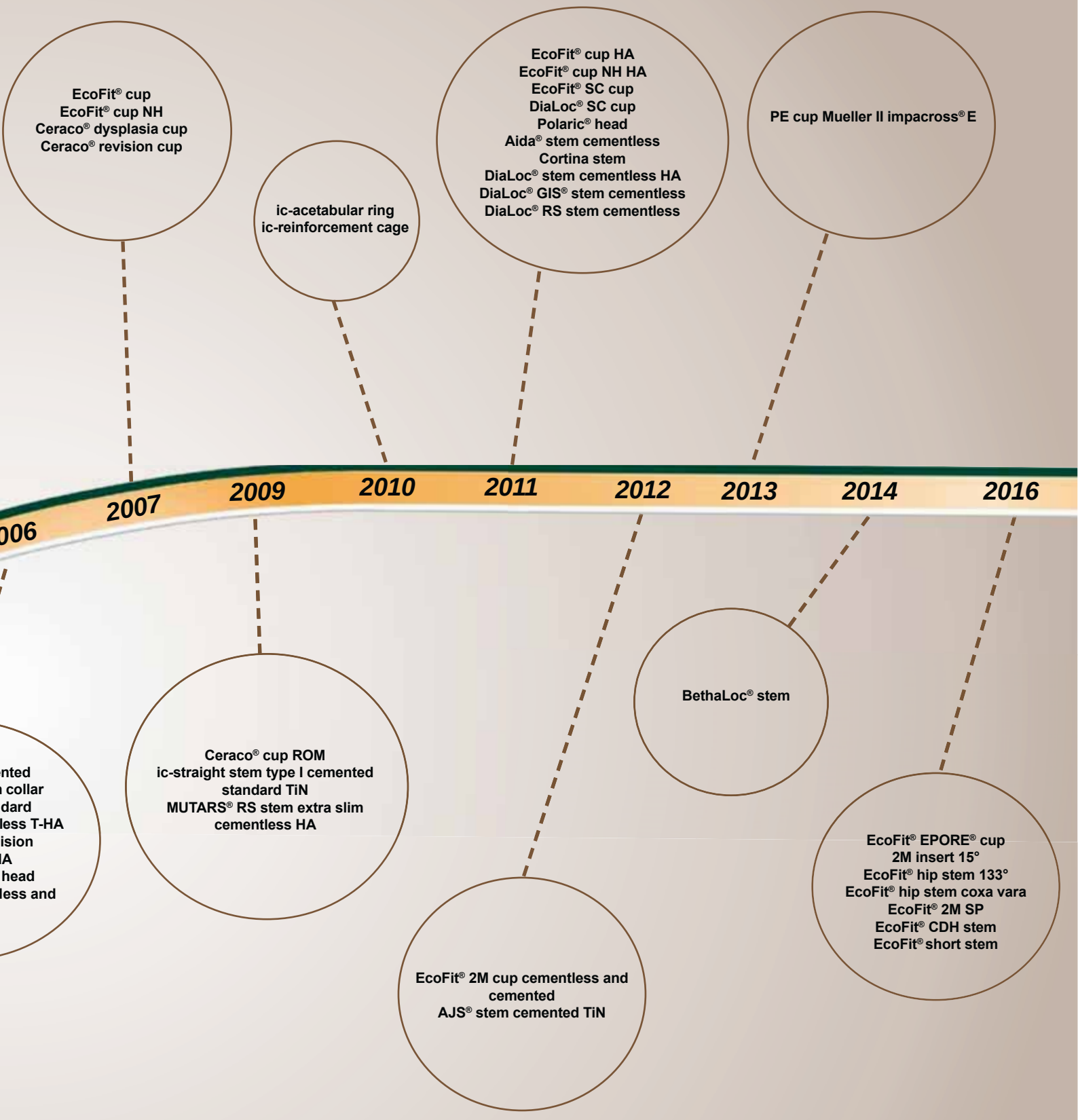
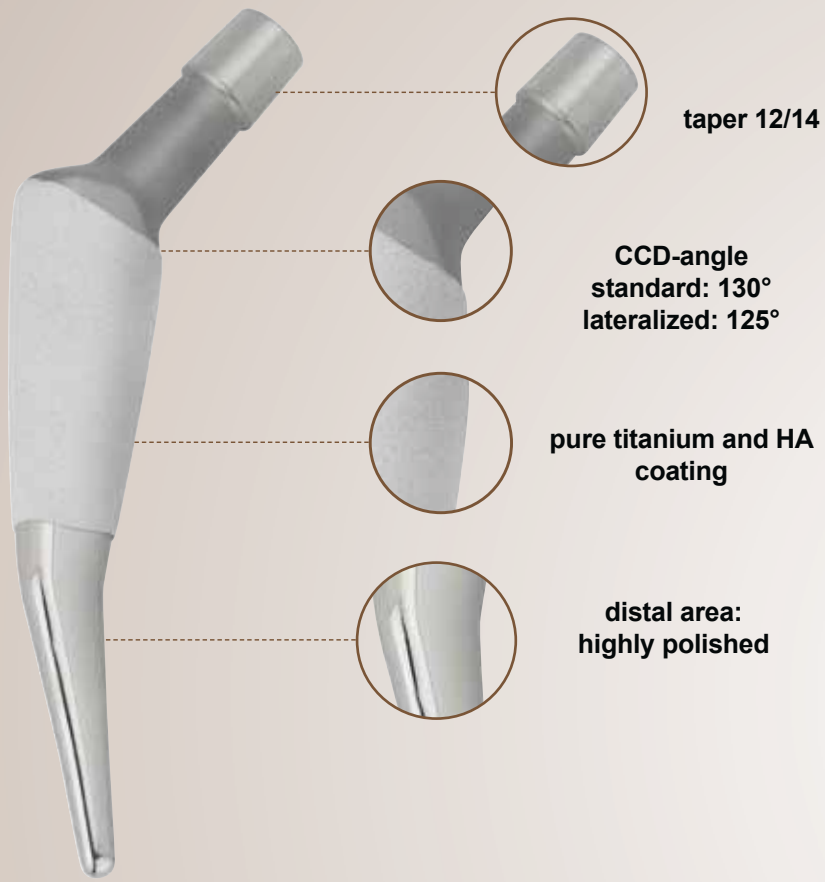
from short stem till revision...





von unipolar till tripolar...

Aida® short stem



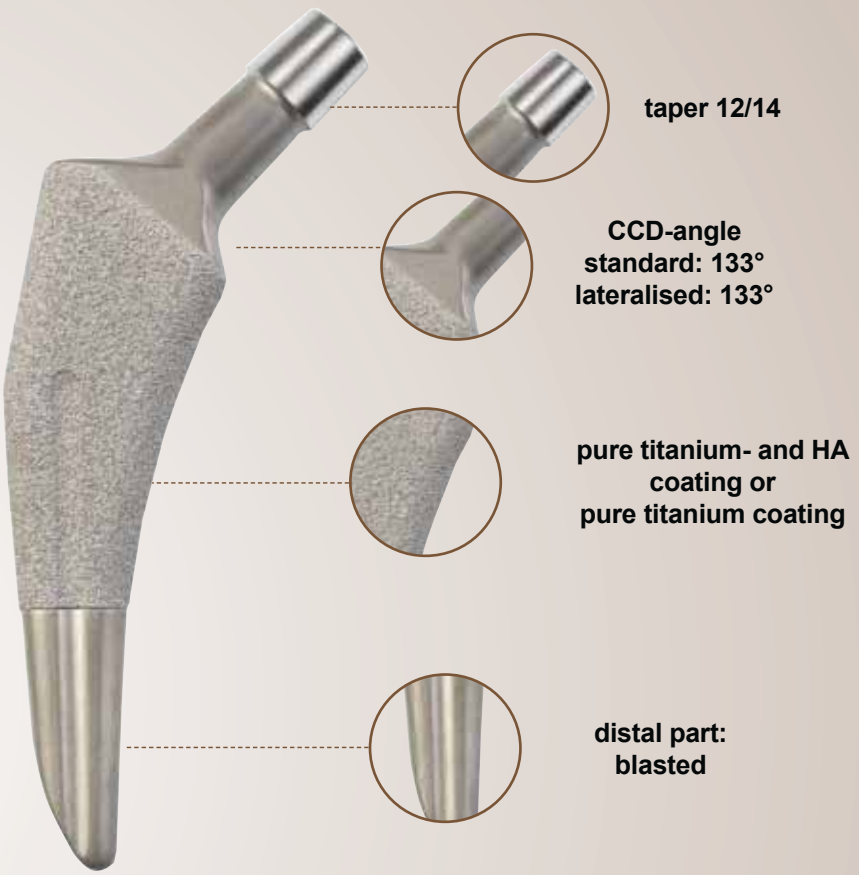
Description:

The Aida® short stem is designed to provide metaphyseal-only cementless anchorage within the spongiosa of the proximal femur. It is proximally supported at the calcar as well as laterally via the distal tip. Axial and rotational stability also arise from the tapered and trapezoidal cross-sectional geometries. The prosthesis has a circumferential proximal microporous coating, consisting of commercially pure titanium (cpTi) and hydroxyapatite (HA), for secondary osseointegration. The Aida® short stem is highly polished distally, hence load transmission can only occur in the proximal area as no fixation can occur distally.

	size range	material
standard	9 sizes	implatan®, $TiAl_6V_4$ acc. to ISO 5832-3
lateralised	9 sizes	implatan®, $TiAl_6V_4$ acc. to ISO 5832-3

	coating	usable with ic-heads
standard	implaFix® Duo, cpTi- and HA acc. to ISO 13779-2	neck length S-XXXL
lateralised	implaFix® Duo, cpTi- and HA acc. to ISO 13779-2	neck length S-XXXL

EcoFit® short stem



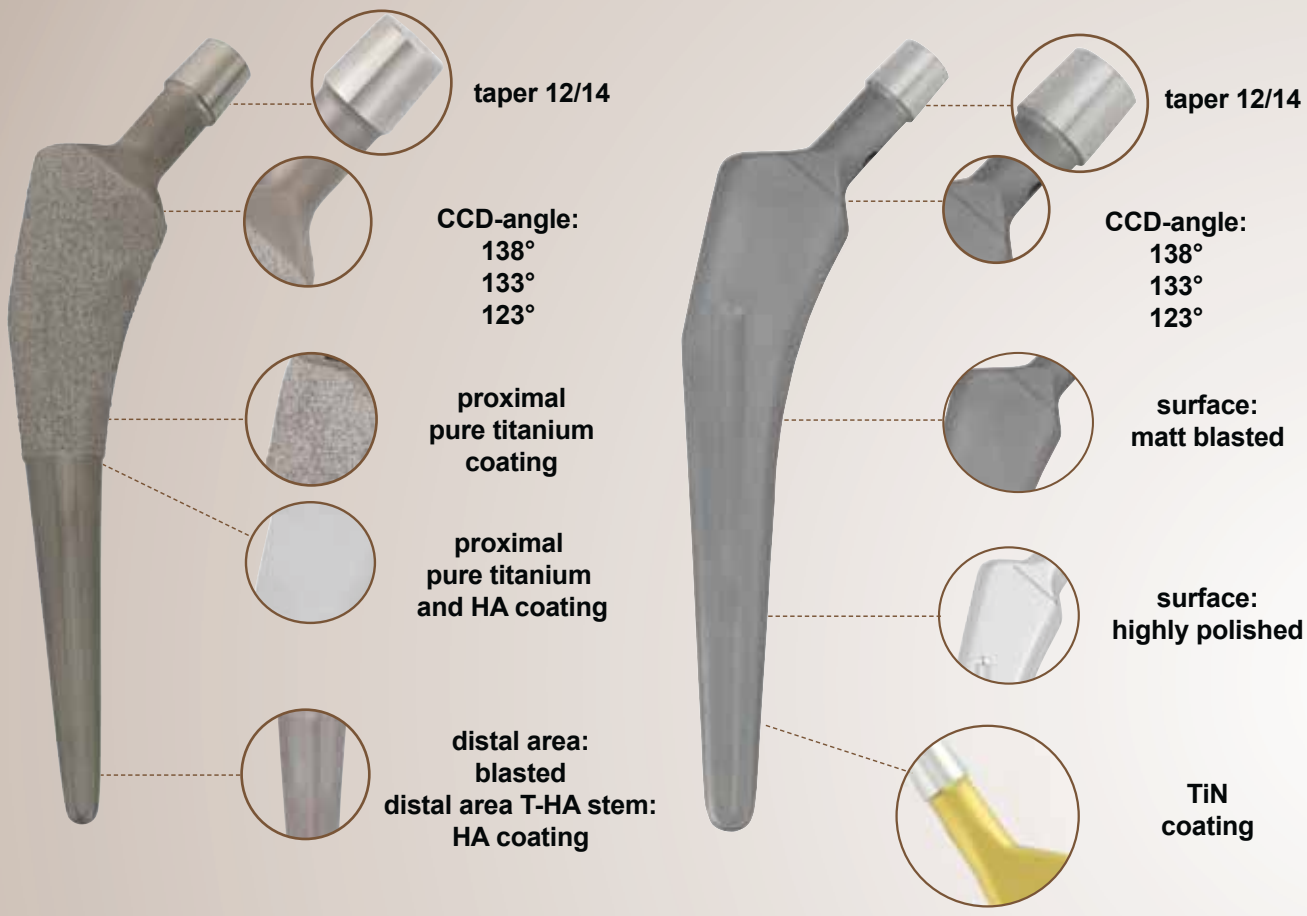
Description:

In addition to the primary hip stems the EcoFit® hip system also offers the option of a short stem system.
Both standard offset short stems and lateralised offset short stems are available as a cementless fixation option. The modular instrument platform provides the flexibility to intraoperatively adapt the surgery to meet the requirements of the individual patient. All 10 sizes of cementless EcoFit® short stems are available with a CCD-angle of 133°.

	size range	material
standard	10 sizes	implatan®, $TiAl_6V_4$ acc. to ISO 5832-3
lateralised	10 sizes	implatan®, $TiAl_6V_4$ acc. to ISO 5832-3

	coating	usable with ic-heads
standard/lateralised	implaFix® Duo, cpTi- and HA acc. to ISO 13779-2	neck length S-XL
standard/lateralised	implaFix®, cpTi	neck length S-XL

EcoFit® hip stem



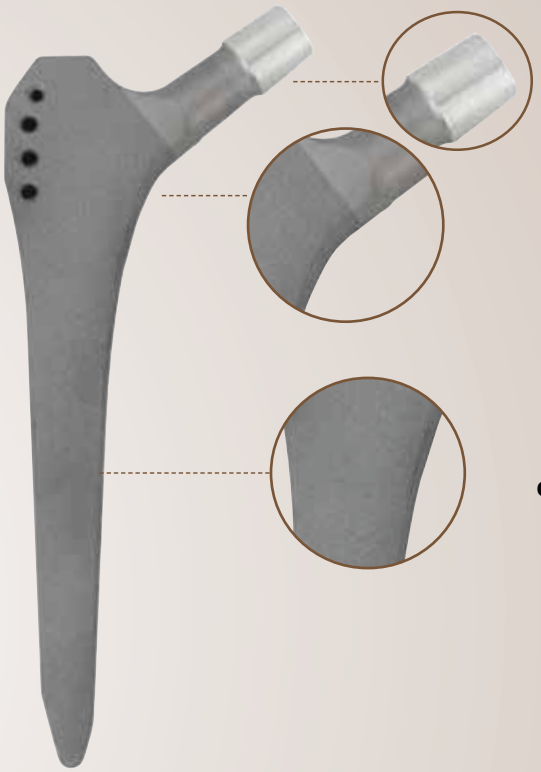
Description:

The EcoFit® total hip system includes a complete variety of cementless and cemented hip stems for the primary treatment of the hip joint. Aside from the standard stem lateralized stems are available. The modular instrumentation allows the adaptation to the patients' anatomy and enables the surgeon to customize the treatment to the patient needs. There are 10 respectively 12 sizes of the cementless and 6 sizes of the cemented EcoFit® stems available. All cementless EcoFit® stems are having a CCD angle of 138° (12 sizes, T-HA 10 sizes), 133° (12 sizes) or are existing as a coxa vara version with 123° (10 sizes).

	size range	material
cementless	depending on the variant	implatan®, $TiAl_6V_4$ acc. to ISO 5832-3
cemented	6 sizes	implavit®, CoCrMo acc. to ISO 5832-4

	coating	usable with ic-heads
cementless	implaFix®, cpTi; implaFix® Duo, cpTi- and HA acc. ISO 13779-2	neck length S-XXXL
cemented	TiN optional	neck length S-XL

DiaLoc® hip stem / DiaLoc® GIS®



taper 12/14

CCD-angle
standard: 131°
lateralized: 127°

surface:
corundum blasted

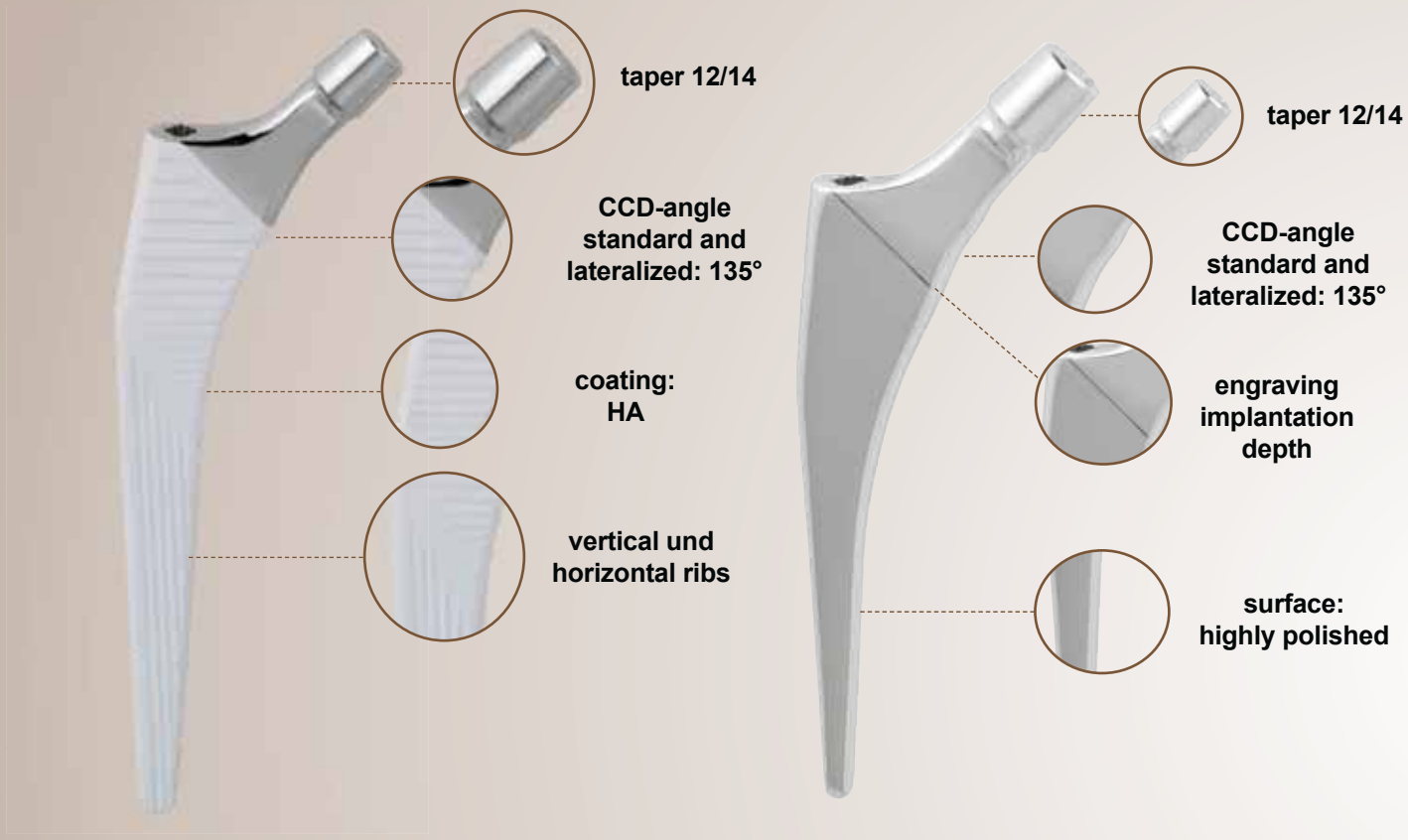
Description:

The DiaLoc® hip stem is a cementless hip stem. The conical, rectangular design of the DiaLoc® hip stem provides high rotational and primary stability. The cortical force transmission extends across the metaphyseal and diaphyseal region of the femur. The anatomical design of the inward curved region of the stems supports the PressFit anchorage in the proximal femur. The dimensions of the DiaLoc® implants have been chosen to reach optimal fit to the anatomical occurences of the patients. The very rough surface of the stems consisting of a $TiAl_6Nb_7$ casting alloy supports the secondary osseointegration. The proximal design of the DiaLoc® stem features a lateral fin (trochanter wing) with fenestrations for extra fixation in the trochanteric area. This can however be disadvantageous when using minimally invasive surgical techniques / approaches so our DiaLoc® GIS® hip stem is probably a better choice for such scenarios - optionally with cpTi and HA coating applied proximally.

	size range	material
standard	14 sizes / GIS® 12 sizes	implatan®, $TiAl_6Nb_7$ acc. to ISO 5832-11
lateralised	7 sizes	implatan®, $TiAl_6Nb_7$ acc. to ISO 5832-11

	coating	usable with ic-heads
standard / lateralised (GIS®)	implaFix® Duo, cpTi- and HA acc. to ISO 13779-2	neck length S-XXXL (except size -3 and -2)

Actinia® hip stem



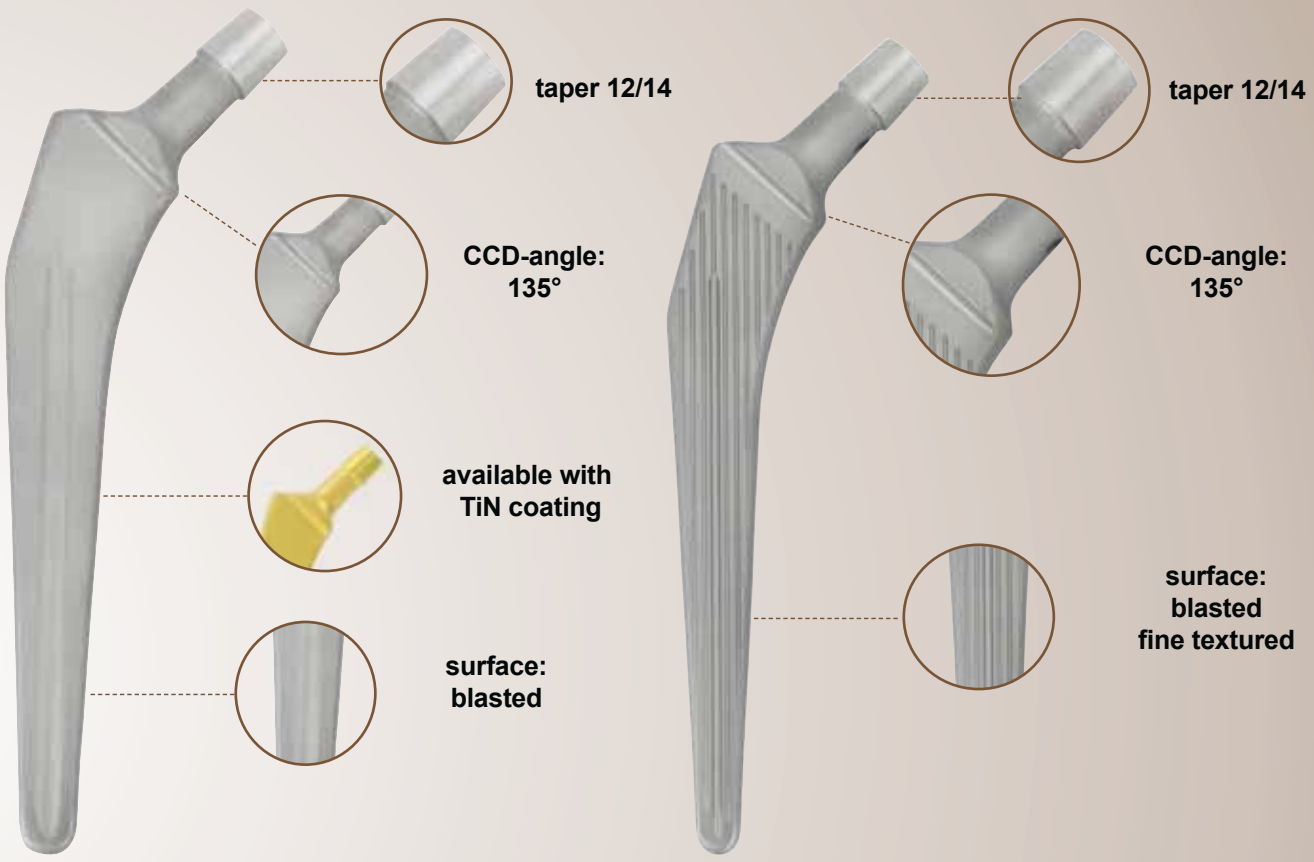
Description:

The Actinia® hip system includes a complete range of cementless and cemented hip stem implants for primary care. In addition to standard stems the system offers stems with lateralised neck geometry. Horizontal und vertical ribs are improving the rotational stability and increases the contact area between prosthesis and bone. The biconical stem shape provides a secure primary stability. An increased range of motion is created by a flattened neck geometry.

	size range	material
cementless	11 sizes std./10 sizes lat.	implatan®, $TiAl_6V_4$ acc. to ISO 5832-3
cemented	11 sizes std./10 sizes lat.	implavit®, CoCrMo acc. to ISO 5832-4

	coating	usable with ic-heads
cementless	implaFix® HA, acc. ISO 13779-2	neck length S-XL
cemented	-	neck length S-XL

ic-straight stem



Description:

The ic-straight stem hip system consists of cemented hip stems for the primary treatment. Aside from the standard stem lateralized stems (CCD-angle: 135°) are available. By the fine structure the surface of the implant is extended and the anchorage is optimized with bone cement. The ic-straight stem type I is also available as a highly polished version in 4 sizes and with TiN coating (standard: 9 sizes, lateralised: 5 sizes). The universal instrument enables a simple intra-operative change from the standard to the lateralized version.

	size range	material
cemented Type I	11 sizes (excl. TiN / HP)	implavit®, CoCrMo acc. to ISO 5832-4
cemented Type II	10 sizes	implavit®, CoCrMo acc. to ISO 5832-4

	coating	usable with ic-heads
cemented Type I	TiN optional	neck length S-XL
cemented Type II	-	neck length S-XXXL

EcoFit® CDH hip stem

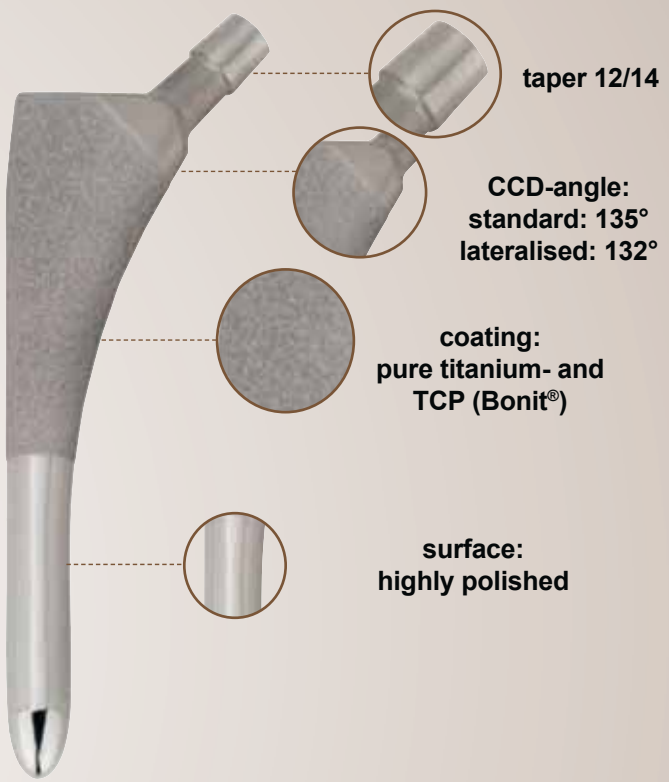
Description:

The EcoFit® CDH hip stem is available in both a cementless and a cemented version each with a CCD-angle of 145°. The stem, by necessity, is very slim and the neck and collar regions are highly polished. The CDH stands for congenital dysplasia hip and is used primarily in the indication dysplasia coxarthrosis.

	size range	material
cementless	3 sizes	implavit®, CoCrMo acc. to ISO 5832-4
cemented	3 sizes	implavit®, CoCrMo acc. to ISO 5832-4

	coating	usable with ic-heads
cementless	implaFix® Duo, cpTi - and HA,	neck length S-XL
	acc. to ISO 13379-2	not compatible with ceramic heads

Ceraco® hip stem



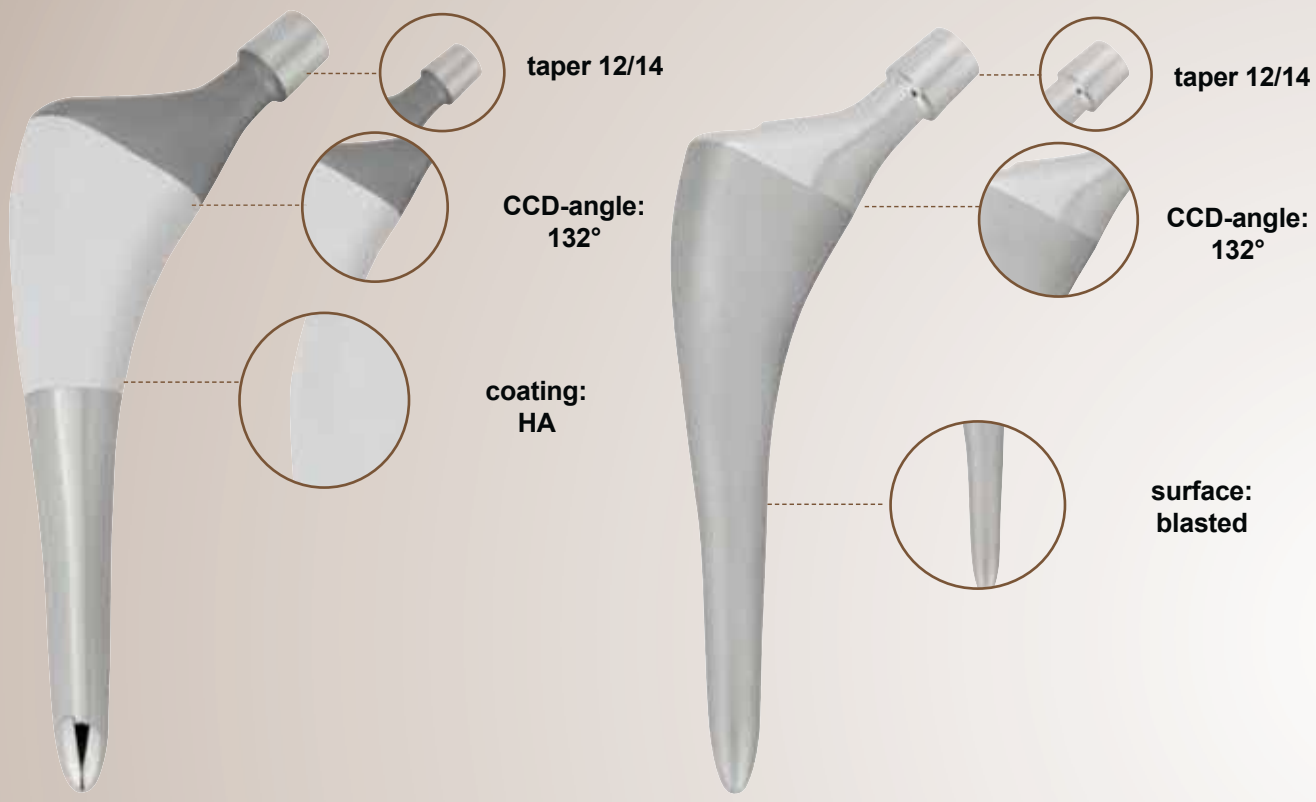
Description:

The Ceraco® stem system includes cementless stems in standard (10 sizes) and lateralised (6 sizes) models. Proximally the cementless version is coated with pure titanium and TCP (Bonit®) Both versions can be implanted with the same instrumentation. The portfolio of Ceraco® hip stems is complemented by modified cementless stems with a collar, in standard (12 sizes) or proximal modificated (11 sizes) version. Both variants can be implanted with the same instruments.

	size range	material
cementless	depending on the variant	implatan®, $TiAl_6V_4$ acc. to ISO 5832-3
with collar	std. 12 / prox. mod. 11 sizes	

	coating	usable with ic-heads
cementless	implaFix®, cpTi- and TCP (Bonit®)	neck length S-XL

AJS® hip stem



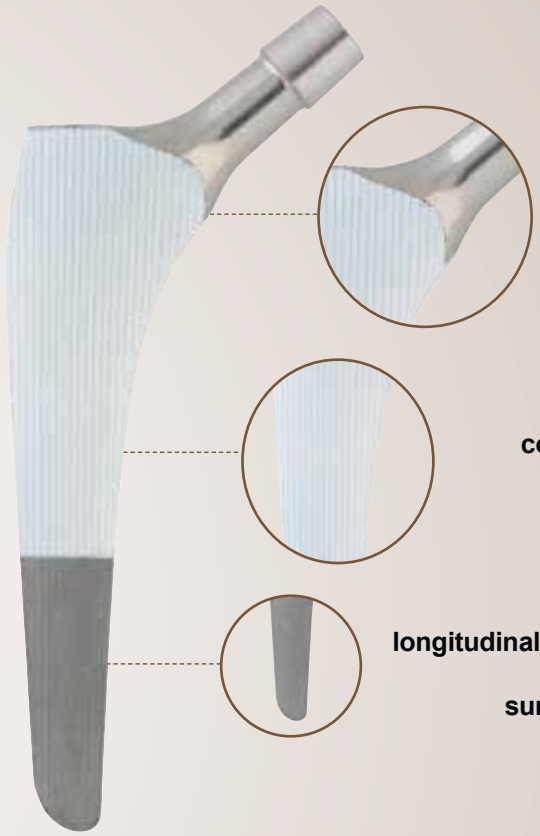
Description:

The AJS® hip system includes a complete variety of cementless and cemented hip stems for the primary treatment of the hip joint. The AJS® stem accommodates to the anatomy of the proximal femur of european patients in an optimal way. The design of the proximal stem ensures a brilliant primary stability with a solid, immediate fit. The tapered structure of the high polished distal part enables an optimal biomechanical settling of the prosthesis and reduces the risk of stress-shielding. The CCD-angle is 132°. The cemented options have a matt finish on the internal fixation areas which defines (and helps to control) the insertion depth during definitive implantation.

	size range	material
cementless	9 sizes	implatan®, $TiAl_6V_4$ acc. to ISO 5832-3
cemented	7 sizes	implavit®, CoCrMo acc. to ISO 5832-4

	coating	usable with ic-heads
cementless	implaFix® HA, acc.ISO 13779-2	neck length S-XXXL
cemented	TiN optional	neck length S-XL

BethaLoc® hip stem



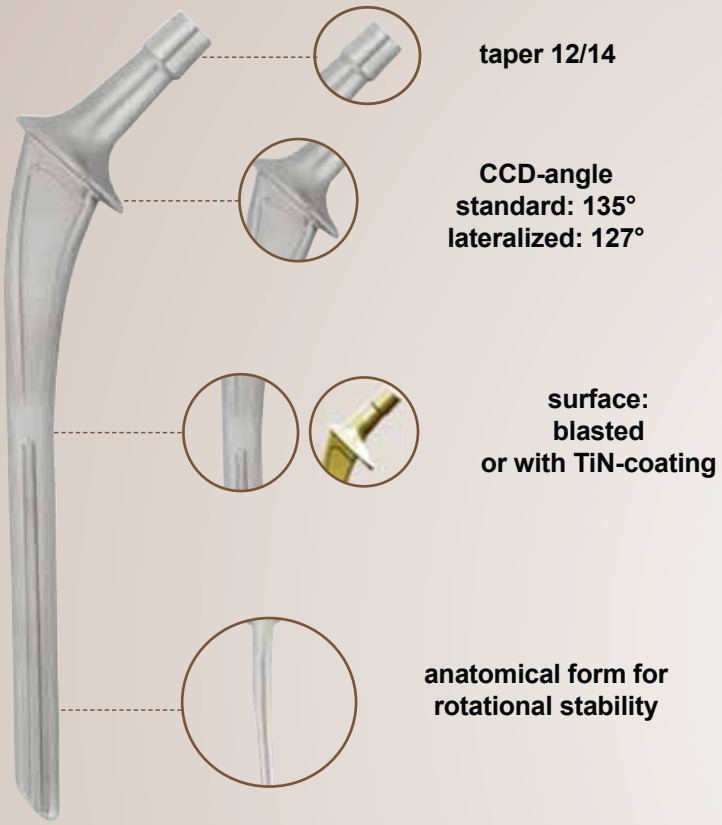
Description:

The BethaLoc® hip stem is available in standard and lateralized version. The rotational stability and osseointegration is improved by the longitudinal grooves on the entire stem. Two-third of the proximal region are coated with hydroxyapatite to boost the osseointegration.

	size range	material
cementless	10 sizes std./7 sizes lat.	implatan®, $TiAl_6V_4$ acc. to ISO 5832-3

	coating	usable with ic-heads
cementless	implaFix® HA, ISO 13779-2	neck length S-XL

Cortina hip stem



Description:

The Cortina hip system is a cemented hip system. The collar enables the physiological force transmission. The slight neck offers a higher Range of Motion. Additional rotational stability is ensured by the anatomical design. The Cortina hip stem is available in standard and lateralized version. Additionally all sizes are vailable in length 170mm. Furthermore revision stems in length 200mm, 250mm and 300mm are available. The system also includes stems with TiN-coating.

	size range	material
cemented	19 sizes (left/right)	implavit®, CoCrMo acc. to ISO 5832-4

	coating	usable with ic-heads
cemented	TiN optional	neck length S-XL

MUTARS® RS

Description:

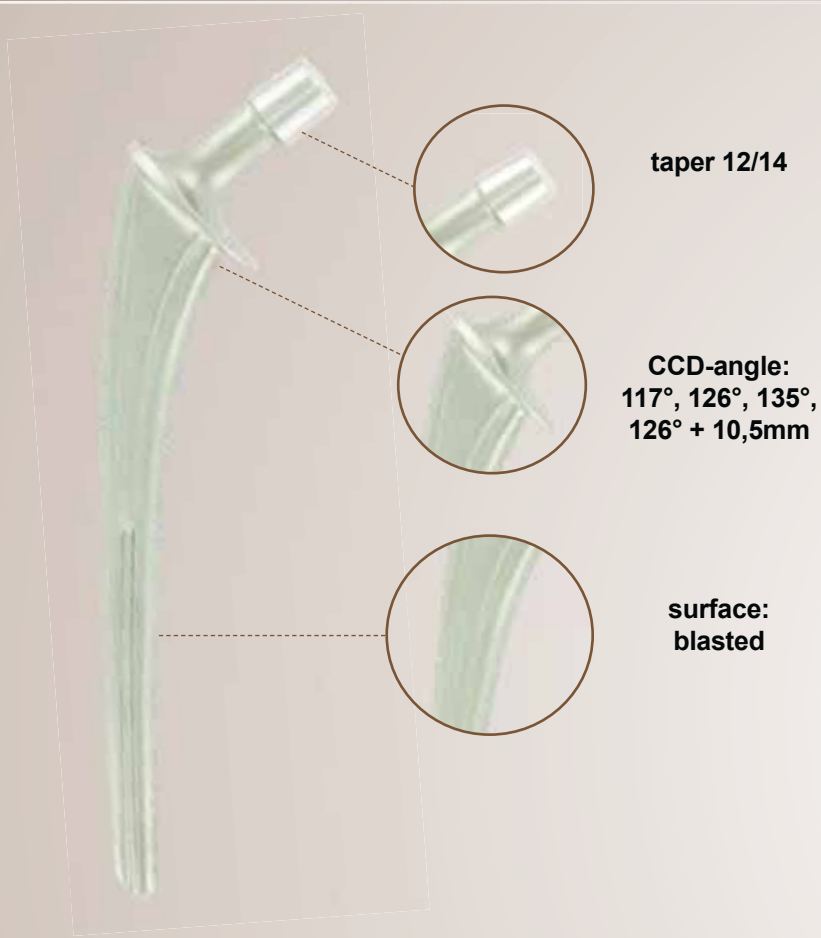
The proximal components of MUTARS® RS system are available in two lengths (32 and 42 mm with taper 12/14 mm) with two CCD angles of 127 ° and 135 ° each. Metaphyseal components are available in lengths of 40 mm and 50 mm. To build an extra long stem, up to three extension pieces, each of 25 mm length are on hand.

The RS system covers 31 cementless stems with HA coating in length 150, 200 and 250mm. Length 150 and 200mm are available in 1mm steps with diameter 12-22mm. Length 200mm (15-22mm) and 250mm (17-22mm) are having two interlocking screw holes. Additionally 12 cemented stems in length 120, 150 and 200mm in diameter 12, 14, 16, 18mm are available. The modularity of these components allows the optimal adaptation to the proximal femur without changing of the diaphyseal stem position.

	size range	material
cementless stems	31 sizes	implatan®, $TiAl_6V_4$ acc. to ISO 5832-3
cemented stems	12 sizes	implavit®, CoCrMo acc. to ISO 5832-4

	coating	usable with ic-heads
cementless stems	implaFix® HA, ISO 13779-2	neck length S-XXXL (only limited)
cemented stems	TiN optional	neck length S-XXXL (only limited)

Bicana®



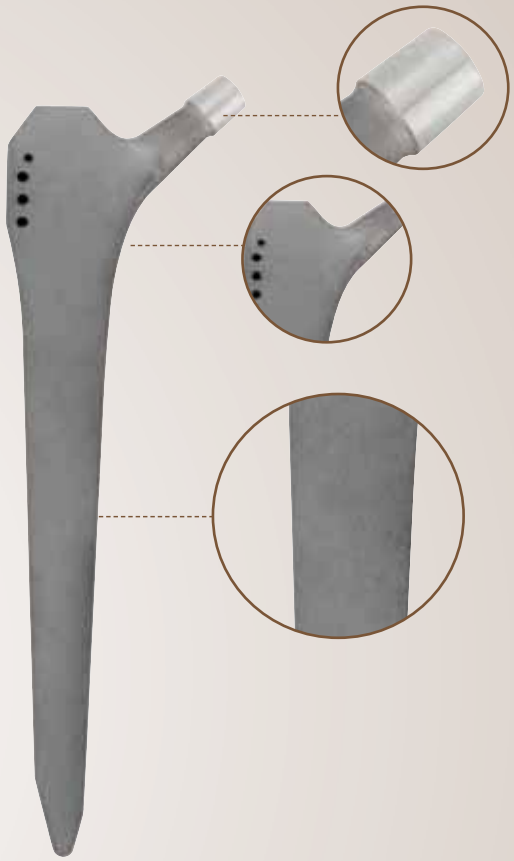
Description:

The Bicana® hip stem system is an anatomical, cemented system with an extensive collar (orientated at 45° to the femoral axis) which encourages physiological proximal load transmission. The anatomical s-shaped geometry ensures additional stability. A physiological / anatomical anteversion of 5° is built into the head-neck area of the stem.The primary Bicana® hip stem is available in three lengths (130mm, 150mm and 170mm) with four CCD-angles (117°, 126°, 126° [+10.5mm] and 135°).The revision Bicana® hip stem is available in lengths of 250mm and 300mm with CCD-angles of 126° and 135°. The Bicana stem 126° additionally commanded the length 200mm.

	size range	material
cemented primary	13 sizes resp. 14 sizes	implavit®, CoCrMo acc. to ISO 5832-4
cemented revision	126°: 9 sizes/135°: 6 sizes	implavit®, CoCrMo acc. to ISO 5832-4

	coating	usable with ic-heads
cemented primary	-	neck length S-XL
cemented revision	-	neck length S-XL

DiaLoc® revision stem



taper 12/14

CCD-angle:
131°

surface:
corundum blasted
(rough)

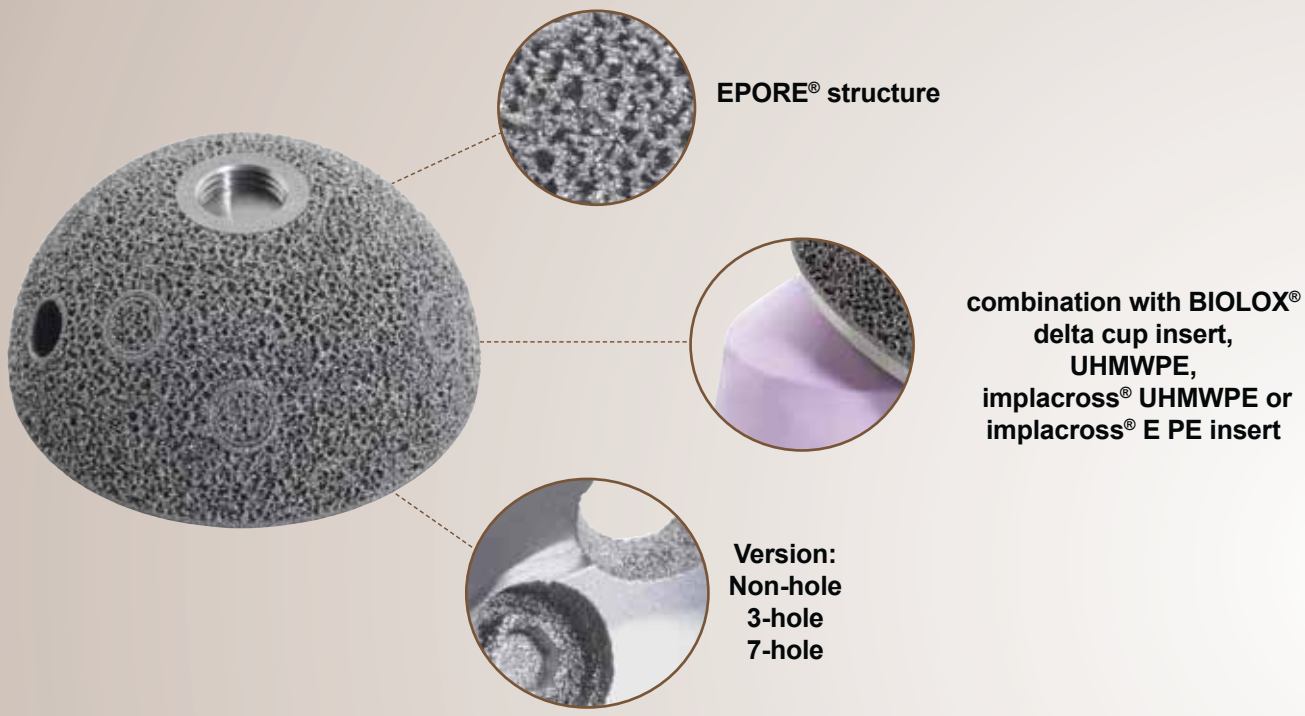
Description:

The DiaLoc® RS revision stem is a cementless hip stem for revision cases. The hip stems were extended distally by about 21-27% of the stem length. the proximal parts of the shaft remained unchanged. The conical, rectangular design of the DiaLoc® hip stem provides the high rotational and primary stability. The cortical force transmission extends across the metaphyseal and diaphyseal region of the femur.

	size range	material
cementless	8 sizes	$TiAl_6Nb_7$ acc .to ISO 5832-11

	coating	usable with ic-heads
cementless	-	neck length S-XXXL

EcoFit® cup EPORE®



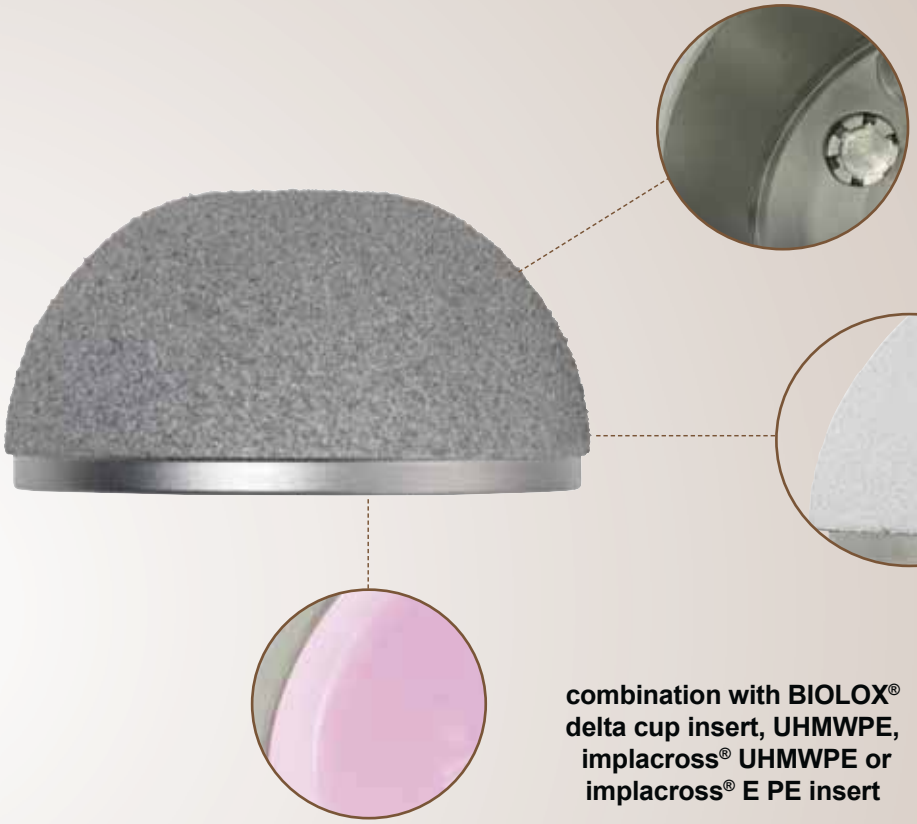
Description:

EPORE® is a highly porous structure made of titanium alloy ($TiAl_6V_4$) - an excellent material for use as a porous ingrowth structure as it is biological inert, ductile, corrosion resistant and also has a high fatigue strength. EcoFit® EPORE® cups have a central hole, in the acetabular base, for attaching the impactor which allows a secure and controlled implant impaction. Once the cup is seated, this central hole can be covered with a central screw plug. The EcoFit® EPORE® cup also has between three and seven pre-plugged holes which can be removed, even when the cup is in-situ, for the insertion of supplementary cancellous screws to enhance primary stability if required. These screws can be angled up to 15°. The cup is also available without additional holes (EcoFit® EPORE® NH) – only the impaction hole and with TCP-coating (Bonit®).

	size range	material
cementless	16 sizes (42-72mm)	implatan®, $TiAl_6V_4$

	coating	usable with ic-heads
cementless	optional TCP (Bonit®)	28mm, 32mm, 36mm
		40mm (only BIOLOX® delta)

EcoFit® cup



availabe with screw holes

available with pure titanium and HA coating

combination with BIOLOX® delta cup insert, UHMWPE, implacross® UHMWPE or implacross® E PE insert

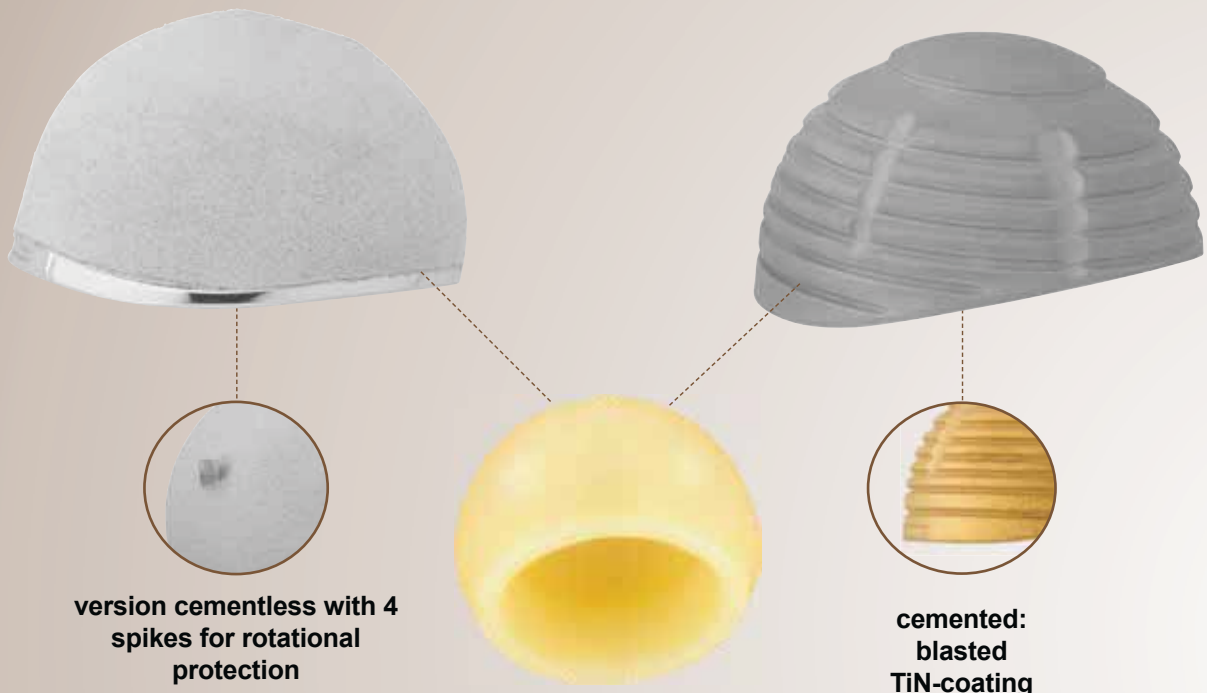
Description:

In order to minimize the micromotions and prevent PE abrasion in the contact area between metal cup and PE liner, a special locking mechanism has been developed. It allows the use of the identical acetabular cup implant for the use of various inserts. The PressFit Cup offers a triradial design to ensure a rigid seating of the cup in the acetabulum. To enhance the primary stability by using screws, the tapered covers may be removed (while the cup is already seated) and screws may be used. The cup is also available without three additional screw holes (EcoFit® NH).

	size range	material
cementless	12 sizes (46-68mm)	implatan®, $TiAl_6V_4$ acc .to ISO 5832-3

	coating	usable with ic-heads
cementless	implaFix®, cpTi	28mm, 32mm, 36mm
	implaFix® Duo, cpTi- and HA acc. to ISO 13779-2	40mm (only BIOLOX® delta)

EcoFit® 2M cup



version cementless with 4 spikes for rotational protection

2M implacross® E head

cemented: blasted TiN-coating

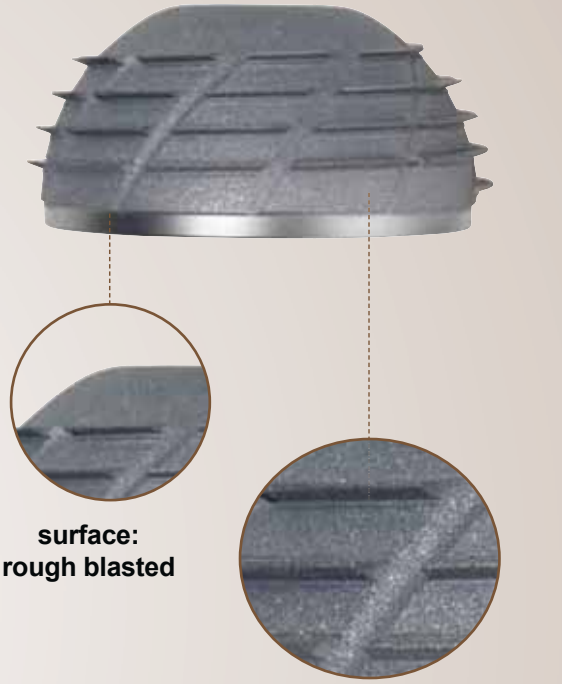
Description:

The EcoFit® 2M head made of implacross® E (crosslinked polyethylene with vitamin E) is snapped on the regular head. Through this combination the system allows the combined articulating of the two bearings; between the head and the EcoFit® 2M head and the outer surface of the EcoFit® 2M head and the EcoFit® 2M cup. This design reduces the risk of subluxations. The EcoFit® 2M hip cups are available in cementless and cemented version. To enhance the cement mantle the outer surface of the cemented cup has grooves and notches. The cementless cups are coated with implaFix® coating made of pure titanium and HA to allow pressfit fixation and bony ingrowth.

	size range	material
cementless	12 size (42-64mm)	implavit®, CoCrMo acc. to ISO 5832-4
cemented	11 size (44-64mm)	implavit®, CoCrMo acc. to ISO 5832-4

	coating	usable with ic-heads
cementless	implaFix® Duo, cpTi- and HA acc. to ISO 13779-2	22mm, 28mm, 32mm
cemented	TiN optional	22mm, 28mm, 32mm

EcoFit® SC cup



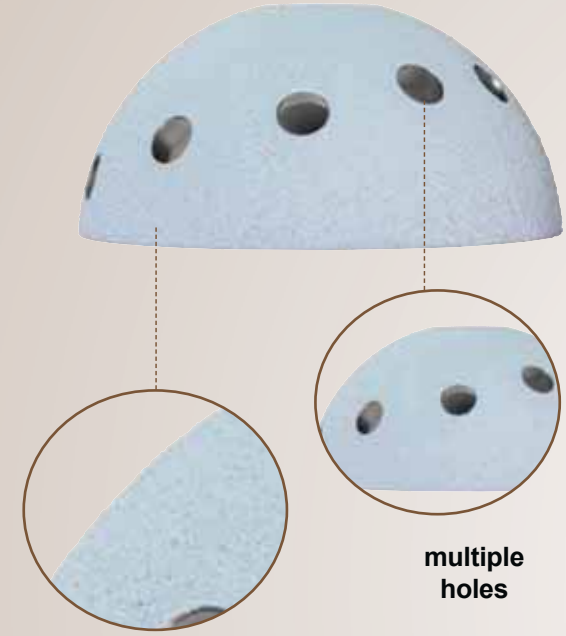
Description:

The EcoFit® SC represents a spherical screw cup. Besides the choice of material, beneficial for osseointegration, and the rough blastered surface, the system is characterized by its modularity. Various cup inserts can be used for the same cup.

	size range	material
cementless	12 sizes (46-68mm)	implatan®, $TiAl_6V_4$ acc. to ISO 5832-3

	coating	usable with ic-heads
cementless	-	28mm, 32mm, 36mm
		40mm (only BIOLOX® delta)

Ceraco® cup



Description:

The design of the Ceraco® hip cup system has been specially developed to supply dysplastic hips and revision cases. Multiple holes arranged at different azimuth angles allow optimal placement of additional spongiosa screws.

	size range	material
cementless dysplasia	4 sizes (40-46mm)	implatan®, $TiAl_6V_4$ acc. to ISO 5832-3
cementless revision	12 sizes (48-70mm)	implatan®, $TiAl_6V_4$ acc. to ISO 5832-3

	coating	usable with ic-heads
cementless	pure titanium- and TCP (Bonit®)	22mm, 28mm
		32mm size 60 - 70mm

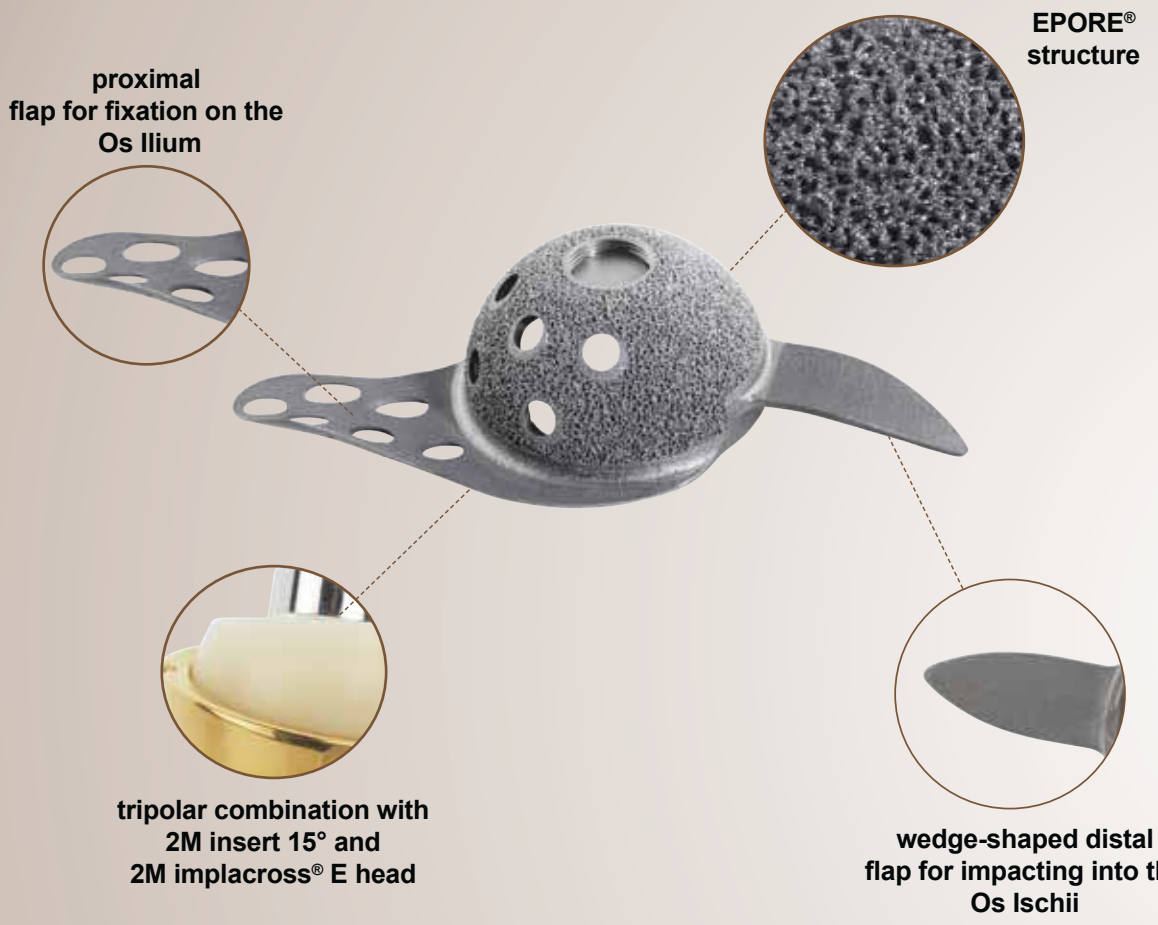
PE cup Mueller II

Description:

The Mueller PE cup II is a cemented acetabulum cup, depending on the version, for femoral heads of sizes 22, 28, 32 and 36mm. In addition to the standard PE cups (27 sizes, femoral heads 22, 28 and 32mm), cups with snap mechanism (11 sizes, femoral head 32mm) and dysplasia cups (21 sizes, femoral heads 28 and 32mm) with a cranial roof of 10° are also available. PE acetabular Müller II consisting of implacross® E (20 sizes) are available on request for heads 32mm and 36mm.

	size range	material
standard	27 sizes (40-64mm)	UHMWPE/optional implacross® E
dysplasia	21 sizes (44-64mm)	UHMWPE
x-ray wire		steel
usable with ic-heads	22mm, 28mm, 32mm, 36mm	

MUTARS® RS cup

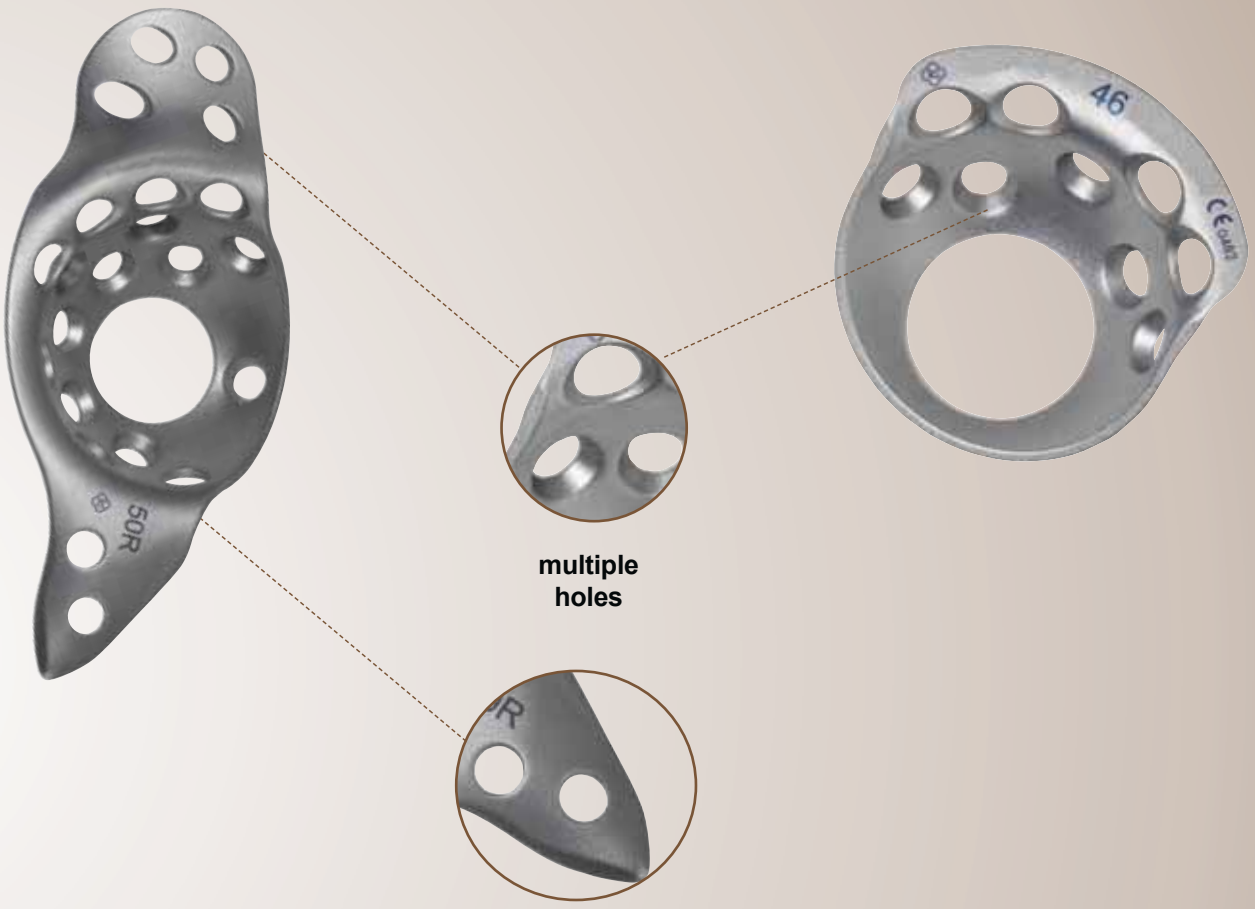


Description:

The MUTARS® RS cup is a modular, spherical, flattened at the pole revision cup made of implatan®, $TiAl_6V_4$. The back of the cup has a porous EPORE® structure which serves a better osseointegration. The fixation of the cup in the vital part of the os coxae is enabled by two anatomically shaped flaps. The distal flap is wedge-shaped and is fixed in the os ischii. In contrast the proximal flap is located on the outer surface of the os ilium and both can be connected with screws. The flaps can be adapted to the anatomical circumstances of the patient.

	size range	material
MUTARS® RS cup	5 sizes (46-62mm)	implatan®, $TiAl_6V_4$
2M insert 15°	4 sizes (22/28mm heads)	implavit®, CoCrMo with TiN-coating
PE insert	4 sizes (32/36mm heads)	implacross® PE

ic-reconstruction implants



Description:

The reinforcement cage and the acetabular ring can be used for the reconstruction of the acetabulum. The outer diameter of the implants is 6mm bigger than the nominal size. The Mueller PE cup and the EcoFit® 2M cup cemented are suitable for the cemented implantation into the reconstruction implants. The size of the cup should correlate to the nominal size of the reinforcement cage respectively the acetabular ring.

	size range	material
ic-reinforcement cage	4 sizes (right/left)	pure titanium acc. to ISO 5832-2 Grade 1
ic-acetabular ring	9 sizes	pure titanium acc. to ISO 5832-2 Grade 1

MUTARS® LUMiC®

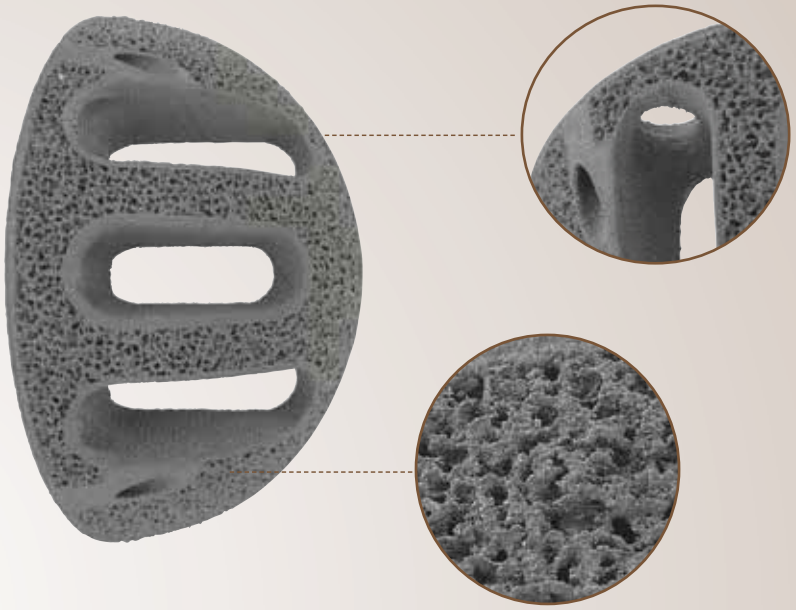
Description:

The MUTARS® LUMiC® cup as part of the pelvic replacement of the hip joint for complicated or multiple revisions or very large bone defects of the hip is a modular system, consisting of cup and stem. Both components can be connected via screws. The serration allows the positioning of the cup in 5° steps after stem implantation. The following articulation options are available: tripolar (2M insert 15° and 2M implacross® E head) and implacross® insert with different heads possibilities (ceramic or metal).

	size range	material
cup cementless	3 sizes (50, 54, 60mm)	implatan®, $TiAl_6V_4$ acc. to ISO 5832-3
stem cementless	6 sizes	implatan®, $TiAl_6V_4$ acc. to ISO 5832-3
stem cemented	3 sizes	implavit®, CoCrMo acc. to ISO 5832-4

	coating	usable with ic-heads
cup cementless	implaFix® HA, acc. ISO 13779-2	22mm, 28mm (2M insert 15°)
		32mm, 36mm with implacross® PE

EPORE® acetabular spacer



high porous structure

rods with a thickness of
360 ± 50 µm

Description:

EPORE® is a highly porous structure made of titanium alloy ($TiAl_6V_4$). Titanium alloy is an excellent material for use as a porous in-growth structure as it is biologically inert, ductile, corrosion resistant and has a high fatigue strength. implantcast GmbH has designed EPORE® to have a high porosity and a low modulus of elasticity so it can enhance biological in-growth. The structure is characterized by rods of 360 ± 50 µm thickness which are arrayed in a way that mimics cancellous bone structures.

	size range	material
acetabular spacer	4 sizes (54, 58, 62, 66mm)	implatan®, $TiAl_6V_4$
	3 heights (10, 15, 20mm)	

trochanter plate

Description:

The trochanter plate, composed of $TiAl_6V_4$ acc. to ISO 5832-3, is available in 4 lengths and offers an ideal supply of periprothetic fractures different types. The innovative form of the plates are featuring a multitude of fixation possibilities and thus improve the stability. The trochanter plates can be screwed distally. Lateral grooves are offering furthermore the possibility to combine the plates with cerclage tapes to enable an additional fixation.

	size range	material
trochanter plate	4 sizes	implatan®, $TiAl_6V_4$ acc. to ISO 5832-3
	120, 160, 200, 240mm	

Accessories

ic-intramedullary plug

description:

The ic-intramedullary plug is used for the obturation of the medullary cavity before inserting bone cement.

material:

UHMWPE acc. to ISO 5834-2

x-ray wire: $TiAl_6V_4$ acc. to ISO 5832-3

size range:

small (≥ Ø: 9 mm) and large (≥ Ø: 14 mm)

outer diameter small: 24mm

outer diameter large: 27mm

ic-cerclage

description:

The ic-cerclagefor the treatment of fractures is available in 8mm diameter. The instrumentation for fixation is available.

material:

pure titanium ISO 5832-2 Grade 1

size range:

8mm

ic-cement restrictor resorbable

description:

The biologically degredable cement restrictor is used for the obturation of the medullary cavity before inserting bone cement.

material:

gelatine (pig), glycerol, methylparahydroxybenzoate

size range:

6 sizes (8 - 18)

ic-titanium cerclage wire

description:

The ic-titanium cerclage wire for the treatment of fractures is available in two length.

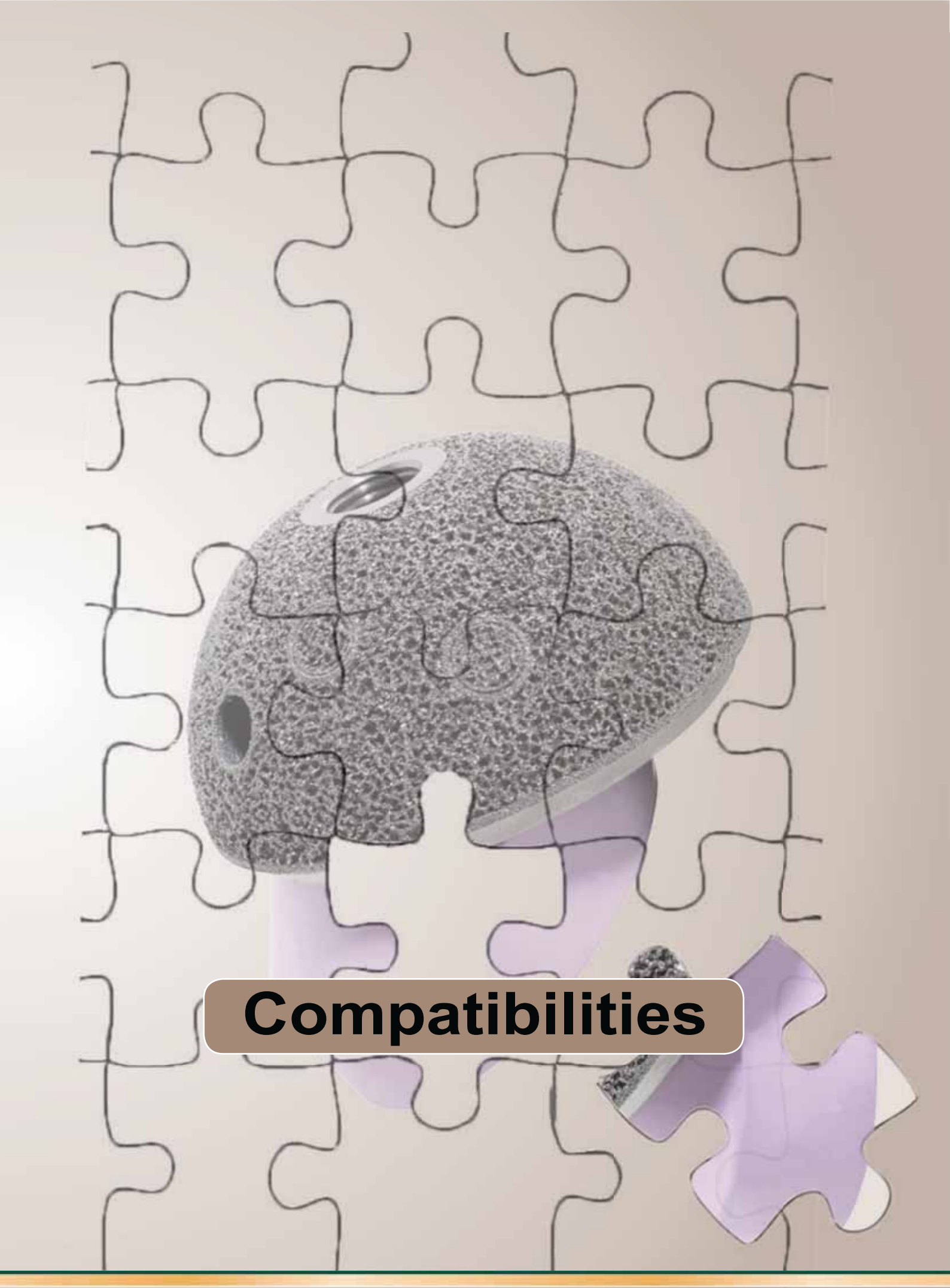
material:

pure titanium ISO 5832-2 Grade 1

size range:

length: 50cm

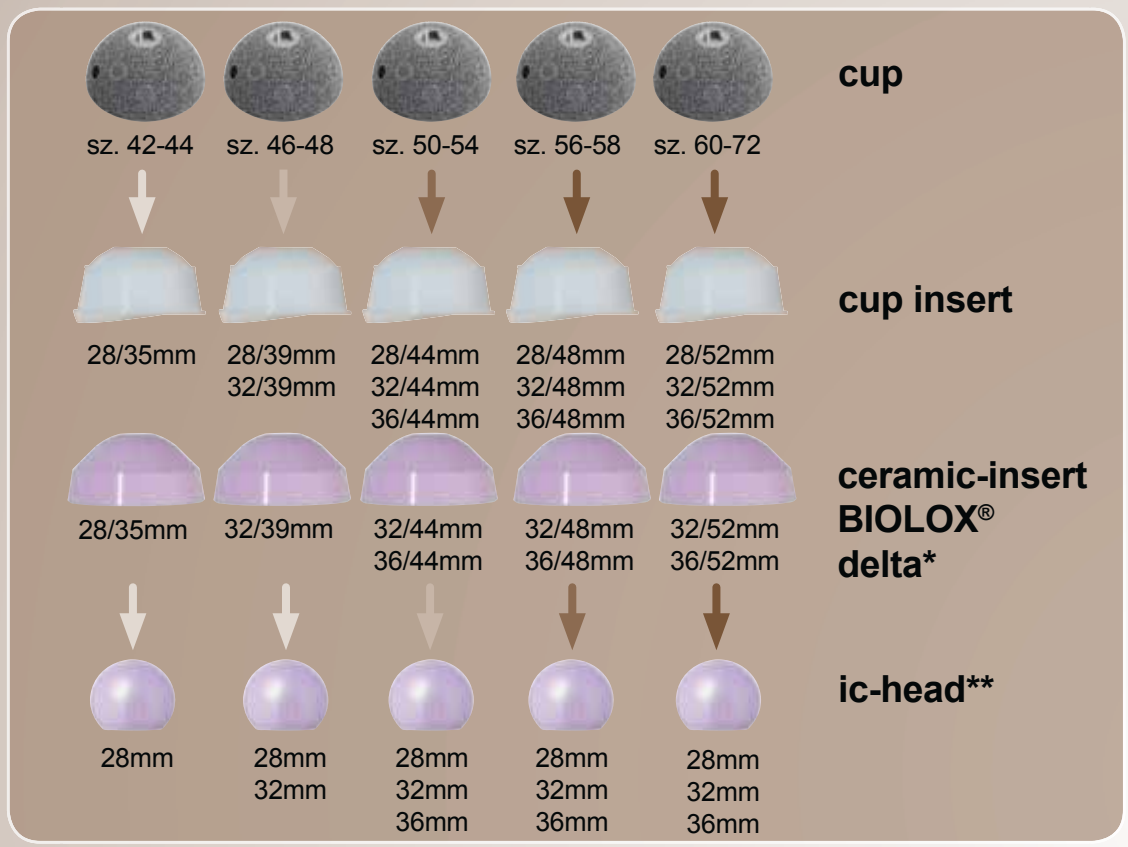
length: 5m



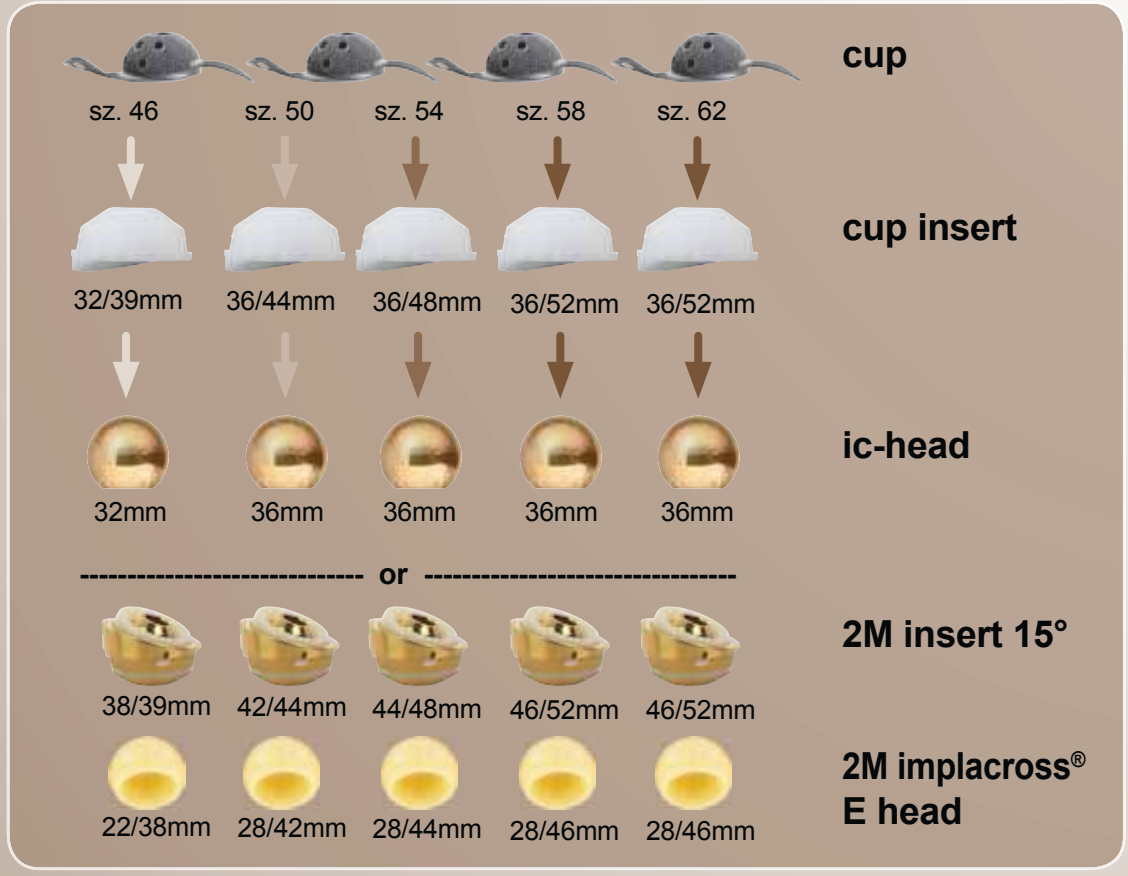
Compatibilities

Compatibility

EcoFit® EPORE® cup

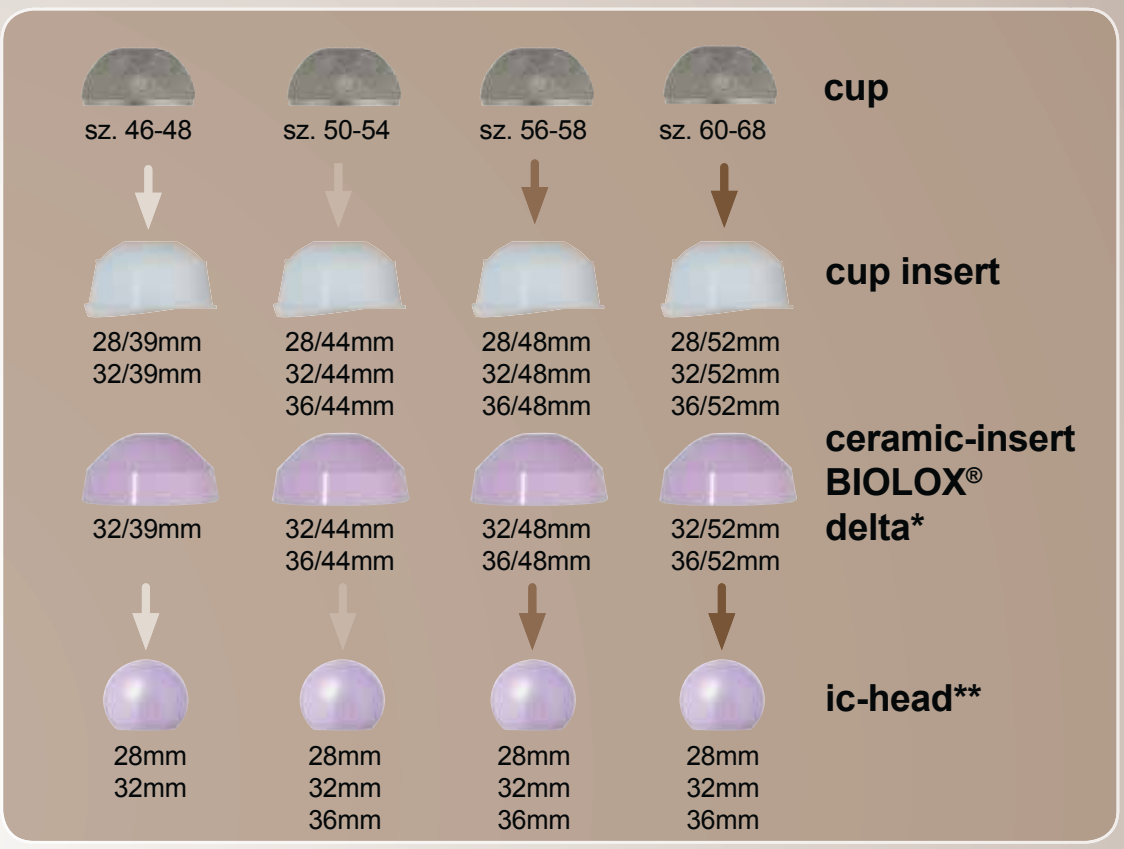


MUTARS® RS cup

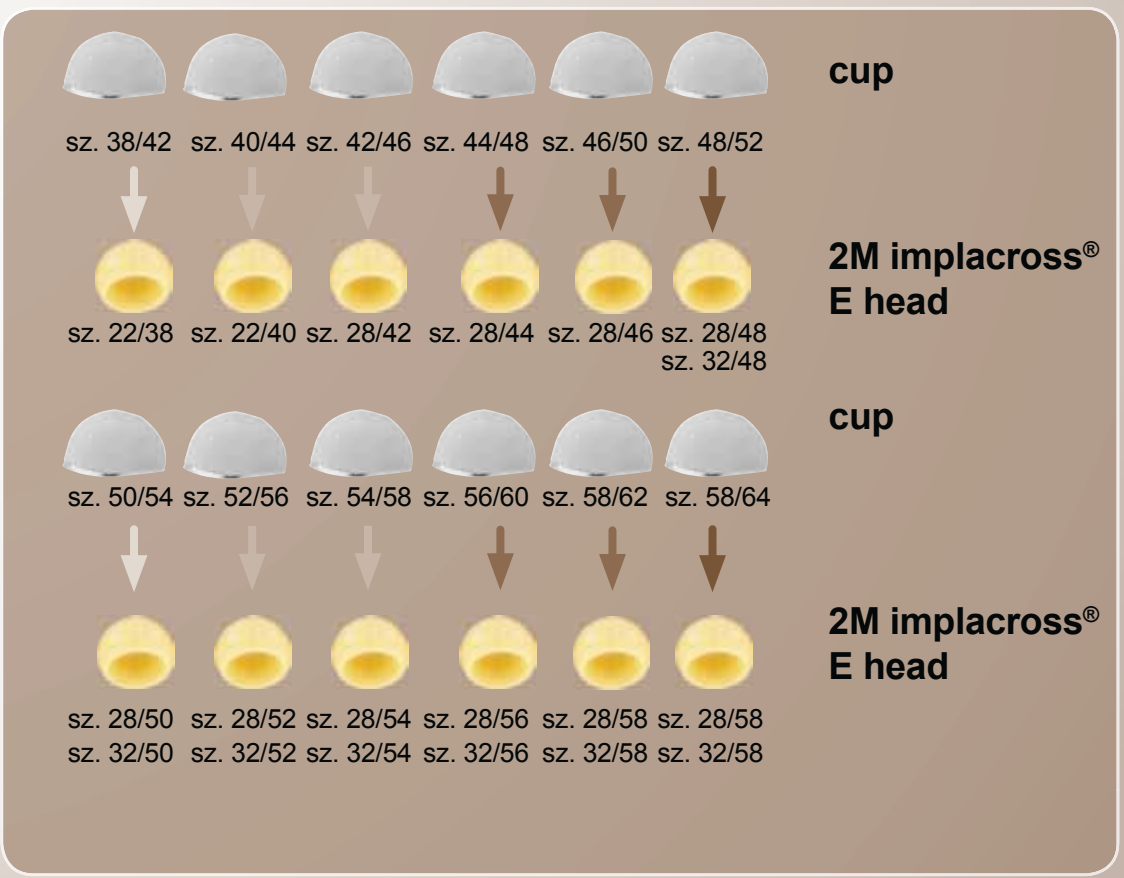


Compatibility

EcoFit® cup

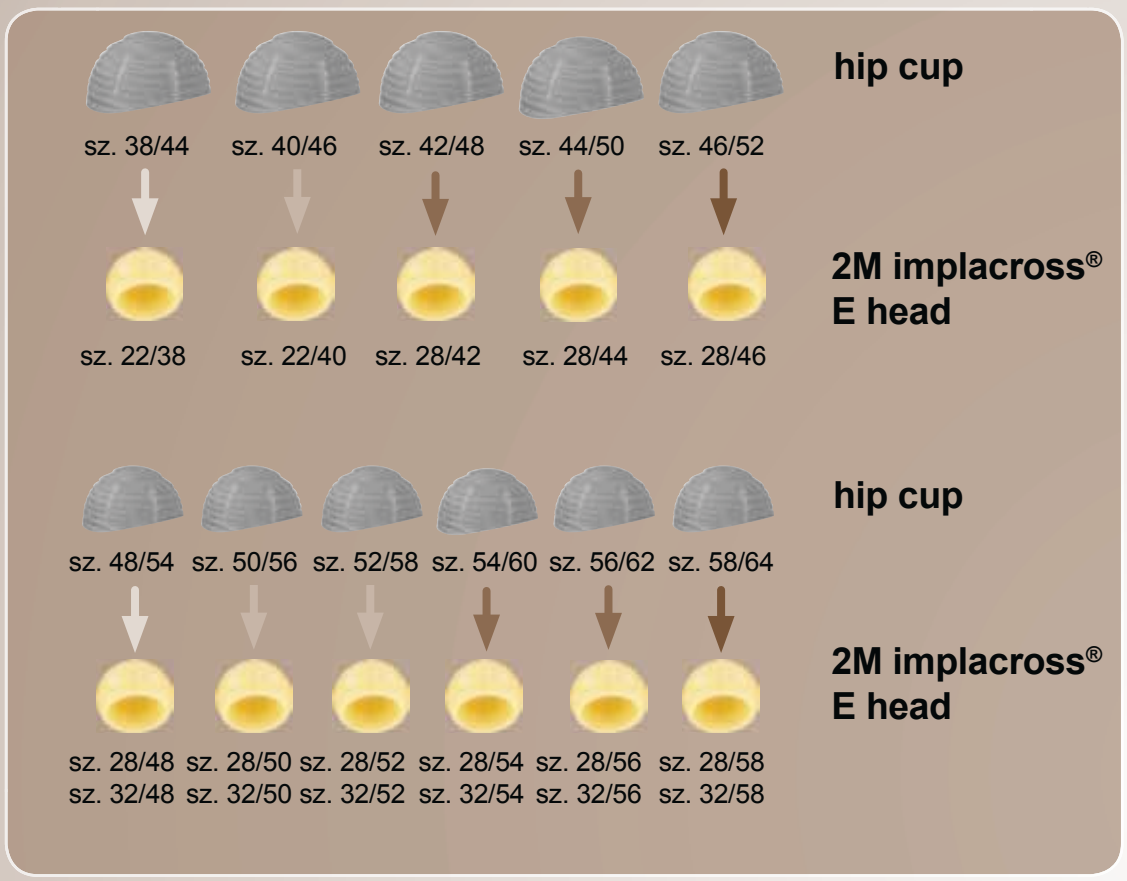


EcoFit® 2M cup cementless



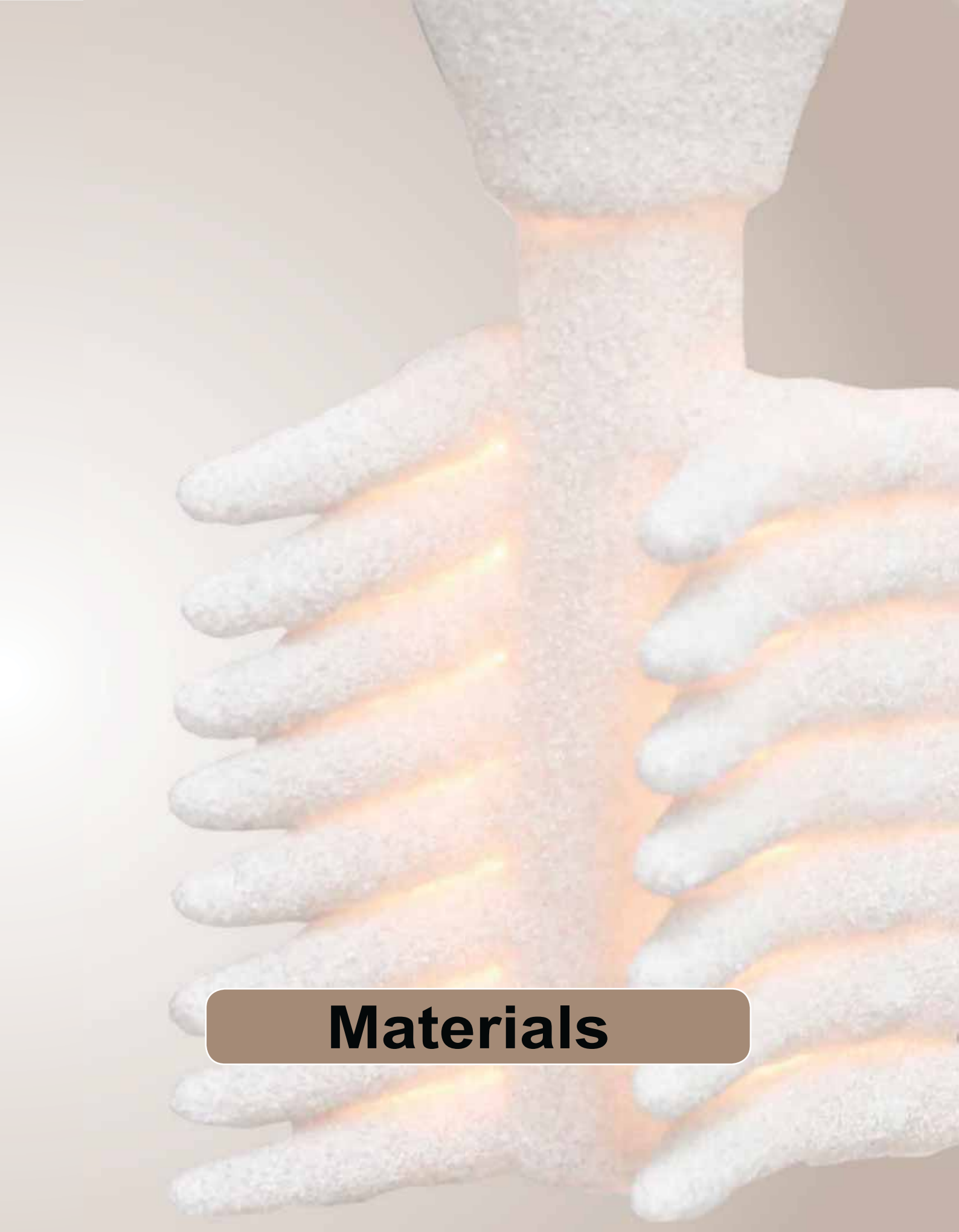
Compatibility

EcoFit® 2M cup cemented



***ceramic-inserts BIOLOX® delta are only compatible with ic-heads BIOLOX® delta.**

****For EcoFit® cup starting size 56mm ic-heads BIOLOX® delta 40mm are available.**



Materials

Materials Science
- EPORE® -

EPORE® porous osseointegrative surface structure

EPORE® implants are also made from titanium aluminium vanadium alloy - for the same reasons as those outlined on the previous page for implatan® components.

mechanical properties	
porosity	ca. 61 % ± 8%
rod thickness	ca. 360 ± 50 µm
rel. mod. of elasticity	3 ,1 ± 0,6 GPa*

However the implants in the EPORE® range are produced via an additive electron beam melting (EBM) manufacturing process. This essentially allows the printing, as it were, of a three-dimensional structure that can be highly complex (i.e. for customs and/or for defect filling) and porous (i.e. scaffold-like for osteointegration where desired) as well as solid, so to speak, (i.e. for attaching to instruments and connecting to other implants). Every item is digitally edited prior to the fully-automated EBM production process - which builds the implant layer-by-layer. A thin layer of powdered alloy is placed on the EBM building platform then a high energy electron beam moves along the powder fusing it locally to form an "implant slice". The platform is lowered, the next thin layer of powdered alloy is placed upon it and the electron beam fuses the next "implant slice" to the one made in the previous cycle. This is repeated until the component is completely built then the implant is finished by machining and inspected.

* tensile measurement

Materials Science
- metal components -

implavit® - CoCrMo acc. ISO 5832-4

The basic material for the manufacturing of cemented hip stems is cobalt chromium molybdenum alloy because of its excellent fatigue behaviour and favourable tribological properties.

The investment casting manufacturing process is used. This is where easily reproducible wax models are assembled to form a pattern clusters which are implant-shaped. The clusters are then coated with a ceramic material by dipping them multiple times in a ceramic fluid before applying ceramic sand to the exterior. The wax pattern clusters are then melted out of the ceramic outer construct. The molten alloy is then introduced and once it has solidified the ceramic exterior is removed so that the cast blank can be inspected for defects.

The final steps of the manufacturing: grinding, polishing and barrel finishing. Sometimes coating(s) might then applied but this depends on the specific implant that is being made.

implatan® - $TiAl_6V_4$ acc. ISO 5832-3

In the area of hip joint replacement all cementless metal implants, e.g. cementless stems and cups are manufactured of titanium aluminium vanadium alloy. This material is not only strong but it is also inert due to the formation of an extremely stable oxide outer layer which makes it corrosion resistant and extremely biocompatible. The implantan material also possesses favourable elastic and loading properties when in direct contact with bone.

The raw material is milled and drilled to for the basic implant shape before surface finishing via grinding, polishing and grit-blasting. Again, coating(s) might then applied depending on the specific implant being made.

Materials Science
- PE / ceramic components -

UHMWPE acc. ISO 5834-2

The Mueller II PE cup as well as PE cup inserts are manufactured from ultra high molecular weight polyethylene (UHMWPE) acc. to ISO 5834-2. The raw material is in powder form and is made into a puck via a compression moulding process which takes place at high temperature and high pressure. Subsequent heat-treatment reduces the stresses within the sintered puck which is then milled into the desired implant shape prior to wrapping and sterilising with ethylene oxide.

implacross®

In addition to conventional UHMWPE, cross-linked UHMWPE is available and corresponds to the chemical composition of the requirements of ISO 5834-1. To obtain the properties of the crosslinked UHMWPE, the UHMWPE slug material (GUR 1020) is irradiated with 75 ± 10% kGy under vacuum. This irradiation with gamma rays is carried out at room temperature. During the subsequent heat treatment, the rod material is heated to 150° C ± 3° C. The reached temperature is maintained over a period of 10 hours and then cooled down to room temperature.

implacross® E

Vitamin E occurs naturally in our food and is a collective term for all tocopherols and tocotrienols [2]. The blended material is sintered after compression molding method (CM) to sheet goods. The plates are then annealed at 110° C. Then, the cross-linking of the polyethylene is carried out by ionizing radiation. The vitamin E binds arising in networking free peroxide radicals, thus preventing the oxidative degradation of polyethylene. Finally, the material undergoes a re-annealing by the heat treatment at 150° C. The addition of vitamin E also increases the resistance to oxidation and long-term stability of the cross-linked UHMWPE [3], [4], [5].

BIOLOX®

The BIOLOX® delta cup inserts are made of a mixed oxide ceramic and form the articulation partner for the ic-heads BIOLOX® forte and ic-femoral heads BIOLOX® delta. BIOLOX® delta consists essentially of alumina with embedded nanoparticles of tetragonal zirconia (Y-TZP) and has in comparison to BIOLOX® forte a higher strength and hardness. The BIOLOX® delta inserts have to be connected to the compatible ic-acetabular via taper deadlock. This provides a safe anchorage and a sufficient backup rotation of the socket insert in the cup. The BIOLOX® delta cup inserts are manufactured by the company CeramTec with the specified taper connection of implantcast GmbH.

Coatings
- pure titanium (cpTi) -

implaFix® cpTi

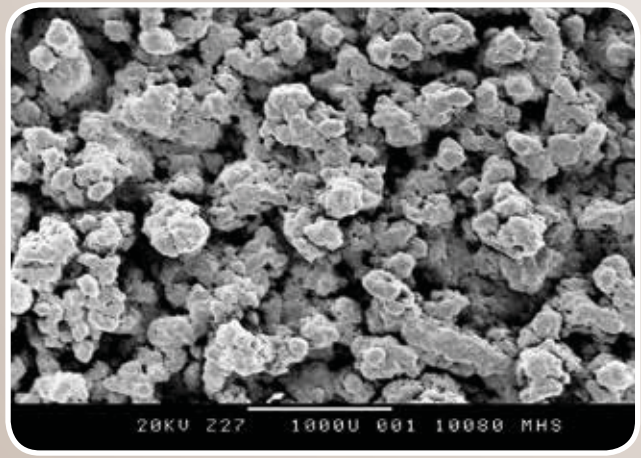
Uncemented joint replacements have steadily increased since the 1970s. This is because the bone loss is lower when compared to cemented prostheses. Cementless implants are particularly advantageous in younger patients where increased life expectancy increases the chance of revision surgery being required.

The key to the success of this procedure is a stable oseointegration; this is mainly determined by surface structure, surface chemistry as well as good primary implant stability. It has been shown that when provided with a structured surface with a favourable pore size, bone cells will grow directly onto biocompatible materials such as Titanium and its alloys.

Different processes for the structuring of bone growth on compatible implant surfaces have failed to provide the desired fatigue strength. These processes include sintered Titanium beads whereby the thermal effect can reduce the fatigue resistance of Titanium alloy implants by about one third. Corund-blasted implants, where micro-cracks can reduce fatigue resistance by up to two thirds. [1]
Unlike sintering or corund blasting, the process of producing porous structures using the Titanium Plasma Spray (TPS) process reduces the fatigue resistance to acceptable limits. In this procedure, a pure Titanium coating is bonded to the implant, thus providing the bone with a surface that promotes osseointegration and bone growth.

TPS was first developed in the U.S. in the 1980s and has become particularly important because of the superior osseointegration provided by this type of thermal spray coating.

TPS coatings are produced on implants in a vacuum chamber. An inert gas mixture (argon) is ionised in an ultra high temperature plasma flame. The gas heats up and expands rapidly being expelled at high speed through a nozzle shaped anode. At the same time Titanium powder is injected into the plasma flame and this begins to melt. Flying at high speed, the molten Titanium particles strike the substrate surface, cool quickly and fuse to the implant surface. The resultant porous layer is built up by multiple layers of particles. For HA coatings the TPS process is also transacted with hydroxyapatite.



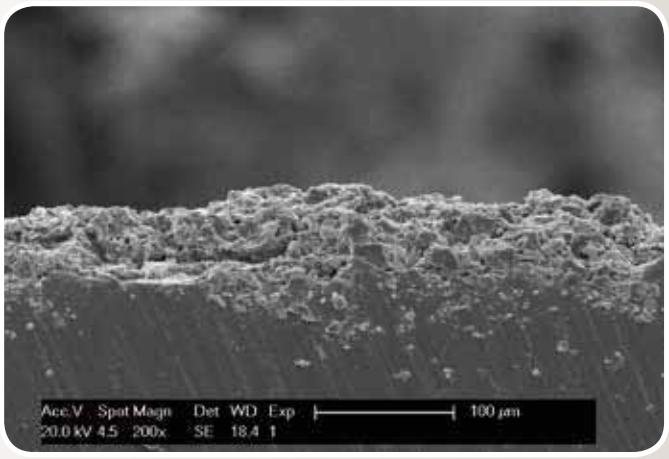
detailed view of the implaFix® cpTi coating

Coatings
- hydroxyapatite -

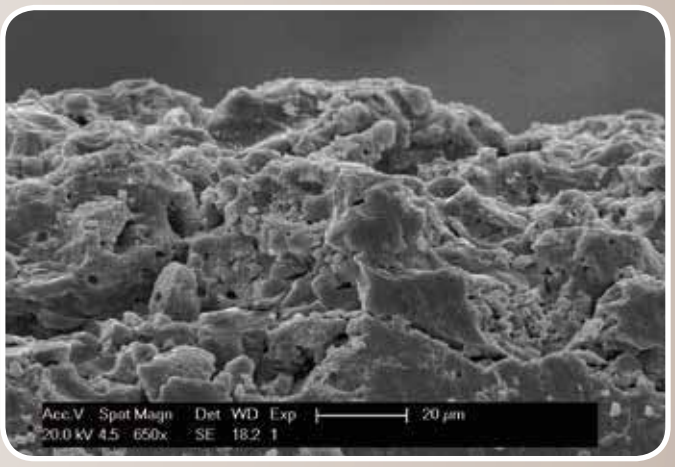
implaFix® HA acc. ISO 13779-2

The implaFix® HA coating is a bioactive material. It finds application in the coating of i.e. cementless stems. By creating chemical bonds between the implant and the bone tissue is achieved a quick integration of the prosthesis in the bone. The goal is to reach biological fixation of the implant into the cortical and spongiosa bones.

For the coating process, the implant surface is cleaned and roughened by grit-blasted. The rough surface increases the adhesive strength of the coating. Subsequently, the implant is passed through Plasma spraying coated with hydroxyapatite. The final treatment and the control ensures the quality. The coating process ends with the final cleaning and inspection.



detailed view implaFix® HA coating
(650x magnification)



detailed view implaFix® HA coating
(200x magnification)

Literature

[1] DOT GmbH: Feste Verankerung durch poröse Titan-Plasma-Beschichtungen

[2] A.Domke, R.Großklaus, B.Niemann, H.Przyrembel, K.Richter, E.Schmidt, et al. (2004). Verwendung von Vitaminen in Lebensmitteln - Toxikologische und ernährungsphysiologische Aspekte. Dahlem: Bundesinstitut für Risikobewertung.

[3] E.Oral, A.S.Malhi, K.K.Wannomae, & O.K.Muratoglu. (2008). Highly Cross-Linked Ultrahigh Molecular Weight Polyethylene With Improved Fatigue Resistance for Total Joint Arthroplasty. The Journal of Arthroplasty , S. 1037-1044.

[4] P.Bracco, V.Brunella, M.Zanetti, M.P.Luda, & L.Costa. (2007). Stabilisation of ultra-high molecular weight polyethylene with Vitamin E. Polymer Degradation and Stability , S. 2155-2162.

[5] P.Gijsman, H.J.Smelt, & D.Schumann. (2010). Hindered amine light stabilizers: An alternative for radiation cross-linked UHMWPE implants. Biomaterials , S. 6685-6691.

Notes

Notes

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