MATHYS
European Orthopaedics

For healthcare professional use only. This and the following illustrated images are not represent a connection between the use of the medical device described, nor its performance.

***Preservation** in motion*

aneXys

Modular, uncemented cup system

aneXys system

Today, implantation of artificial hip joints is one of the most successful standard procedures in surgery. [1] The aim of joint replacement is to eliminate pain, restore the function and reconstruct the physiological anatomy of the hip joint.

Due to the demographic development and the increasing importance of sports even in advanced age, the number of such operations can be expected to increase. [2]

The aneXys sytem provides advanced tribological options. vitamys, the vitamin E stabilised, highly crosslinked polyethylene (VEPE) is used as a soft bearing solution in combination with a ceramic or metal head. The ceramys ceramic-on-ceramic articulation completes the portfolio with a hard bearing option.

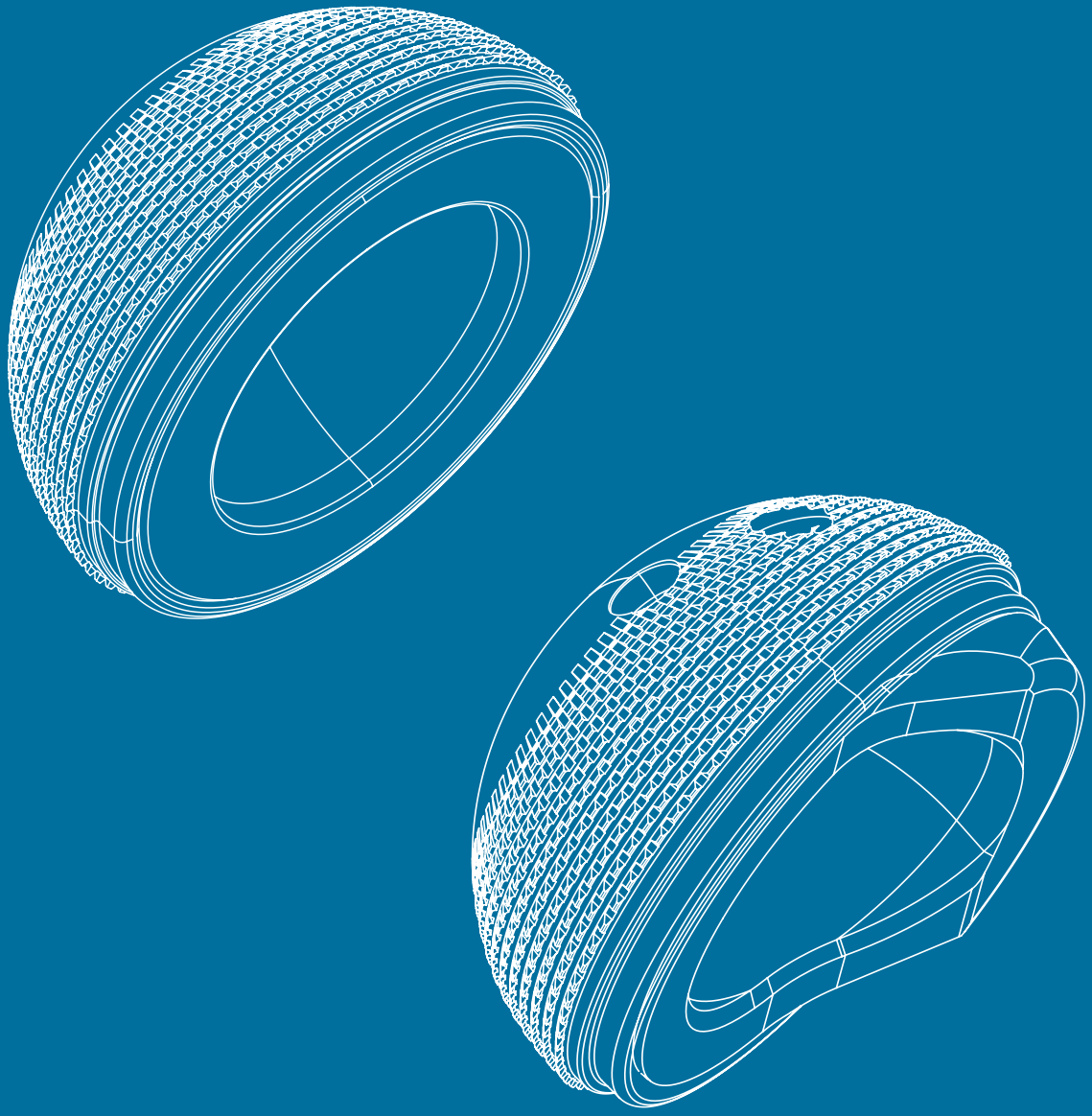
Implant design

By its design, the aneXys shell generates initial mechanical press-fit and promotes, by means of its surface, biological long-term stability.

The system at a glance:

- Hemispheric external shape with equatorial excess and flattened pole
- Serrated macrostructure for high tilting and rotational stability [3]
- Microporous titanium coating to promote osseointegration [4]
- Different tribological options
- Reliable inlay anchoring via taper connection [5, 6]
- aneXys Flex provides residual elasticity of the outer shell*
- Possibility of additional screw fixation in aneXys Cluster and Multi shells

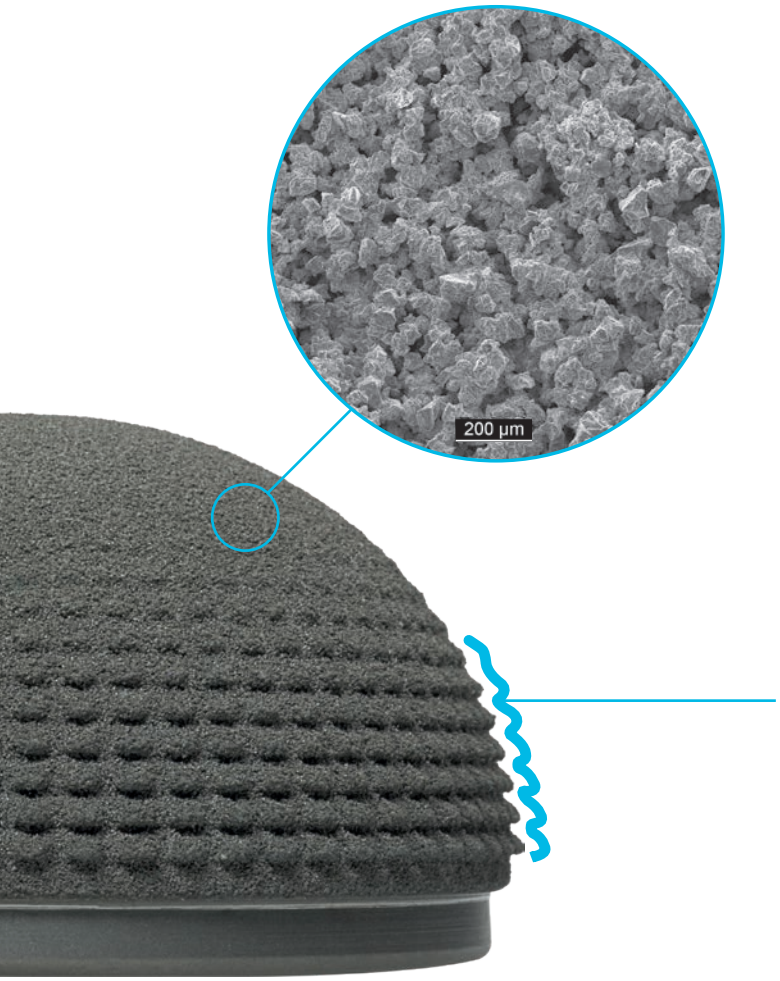
* Only in combination with vitamys inlays



Stability

Press-fit anchoring [7, 8]

- Equatorial excess for primarily stable implant fixation
- Polar flattening to direct load transmission to the equator of the acetabulum



Microstructure

- Microporous titanium coating
- Porosity up to 50 %
- Coating with many years of clinical use [4]
- Rough surface to support primary stability and stimulate osseointegration [4]

Macrostructure

- Serrated structure for primary rotational and tilting stability [3]

vitamys

vitamys is the solution: a polyethylene with high abrasion resistance, [9, 11 *] high oxidation resistance, [10, 11 *] and good mechanical strength. [9, 11 *]

vitamys is a highly cross-linked polyethylene enriched with vitamin E (VEPE), which belongs to the class of anti-oxidative highly cross-linked polyethylenes (AO-HXLPE). It is manufactured from GUR 1020-E, an ultra-high molecular weight polyethylene containing 0.1 % of alpha-tocopherol (vitamin E).

In contrast to the first generation of highly cross-linked polyethylenes, vitamys is manufactured with only a stress relieving heat treatment well below the melting point, in order to ensure the dimensional stability of the material. This leads to the good mechanical strength of vitamys. By the addition of the natural antioxidant vitamin E, vitamys achieves its high oxidation resistance. This ensures that the excellent mechanical and tribological properties are maintained even over long periods of use. [11 *]

* based on preclinical bench testing data

Advantages

The pros of vitamys are obvious: the good mechanical strength allows a material-saving design in the development of the prosthesis component. The high abrasion resistance reduces abrasion and thus the risk of osteolysis. The addition of vitamin E also ensures resistance to oxidation and thus a high resistance to ageing. [11]*

The advantage of vitamys is the beneficial combination of the three properties of mechanical strength, abrasion resistance, and oxidation resistance:

- Good mechanical strength for material-saving designs
- High abrasion resistance for reduced risk of osteolysis
- High oxidation stability for high ageing resistance

ceramys

ceramys is made of a homogeneous dispersion of 20 % alumina and 80 % yttriumoxide stabilized zirconia and contains no other additives.

This combination of zirconia and alumina is resistant to ageing [12] and results in a high fracture strength [13] and reduced risk of chipping and surface roughening in case of recurrent luxations. [14]

In comparison to alumina / alumina and metal / polyethylene pairings, ceramys has high resistance to fracture and good wear properties. [15, 16, 17]

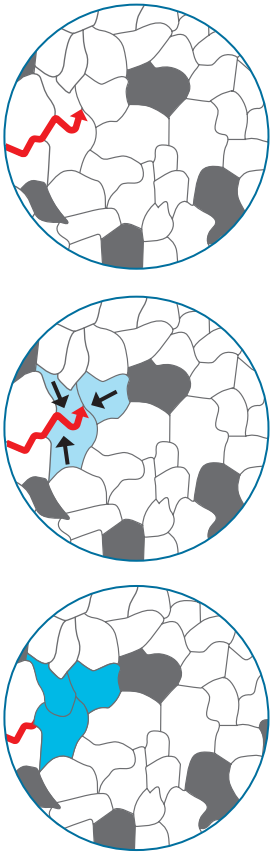
Reinforcement power of zirconia

If a micro crack crosses the ceramys matrix, some of the zirconia particles will transform from tetragonal into monoclinic crystalline structure. This leads to an increase in volume, resulting in a local compressive stress field surrounding the crack tip. Hence, the crack propagation will be inhibited, resulting in enhanced fracture toughness.

1.
Crack crossing ceramys matrix

2.
ZrO_2 transforms into monoclinic, high volume structure

3.
Crack is compressed and propagation stopped



Al_2O_3

Tetragonal ZrO_2

Crack

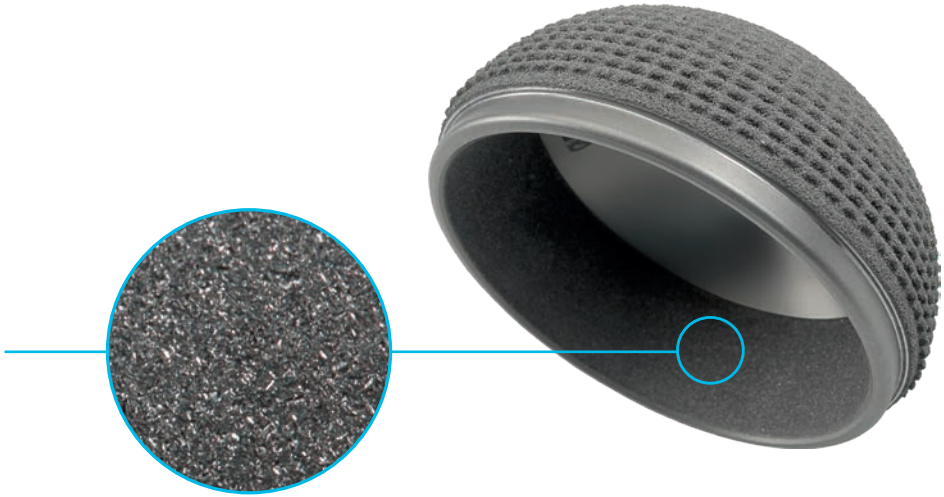
ZrO_2 during transformation into monoclinic crystalline phase

Monoclinic ZrO_2

Safety

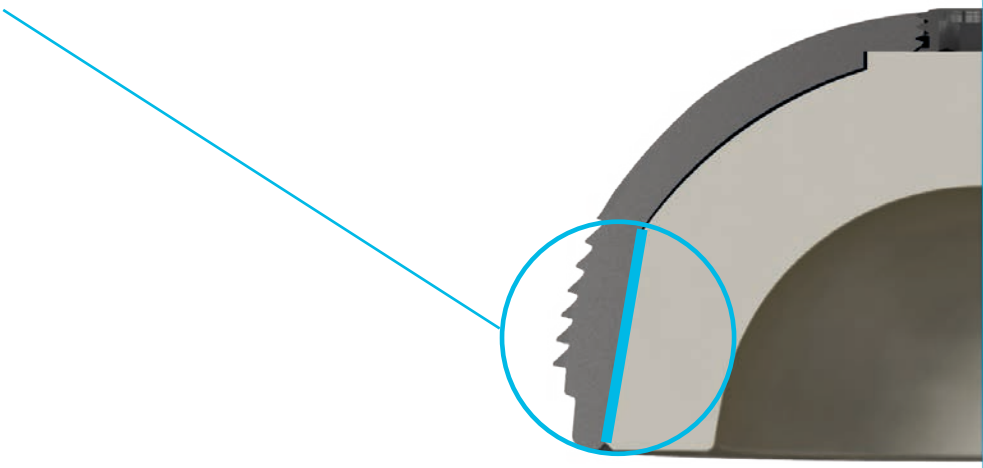
Rough surface [5, 6]

- Reliable anchoring by clearance-free friction fit between inlay and shell
- Rotational stability of the inlay



Taper connection

- Centring of the inlay
- Aim to reduce risk of incorrect inlay positioning
- Low risk of interface complications



Instruments

- Straightforward workflow with clearly designed, modular instrument set
- Implantation via the most common surgical approaches with straight or offset instruments

Modularity

The modular aneXys cup offers a wide range of components with different tribological options.

aneXys – the modular Mathys solution for multiple bearings

aneXys Flex Shell*

aneXys Uno, Cluster, Multi Shells

Shell size	22.2 mm Inner D	28 mm Inner D	32 mm Inner D	36 mm Inner D	22.2 mm Inner D	28 mm Inner D	32 mm Inner D	36 mm Inner D
40 mm	X				X*			
42 mm	X	X			X*			
44 mm		X			X*	X		
46 mm		X	X			X		
48 mm		X	X			X*	X	
50 mm		X	X	X		X*	X	
52 mm		X	X	X		X*	X	X
54 mm		X	X	X		X*	X	X
56 mm			X	X		X*	X	X
58 mm			X	X			X	X
60 mm			X	X			X	X
62 mm			X	X			X	X
64 mm							X	X
66 mm							X	X
68 mm							X	X
70 mm							X	X

* Only for use with vitamys Inlays

References

1 Learmonth I.D., Young C., Rorabeck C. The operation of the century: total hip replacement. Lancet, 2007. 370(9597): p. 1508-19

2 Pivec R..J., Johnson A. J., Mears, S. C., Mont, M. A. Hip arthroplasty. Lancet, 2012. 380(9855): p. 1768-77.

3 Data on file at Mathys Ltd Bettlach

4 Data on file at Mathys Ltd Bettlach

5 Puente Reyna A.L., Jager M., Floerkemeier T., Frecher S., et al. Backside Wear Analysis of Retrieved Acetabular Liners with a Press-Fit Locking Mechanism in Comparison to Wear Simulation In Vitro. Biomed Res Int, 2016.

6 Puente Reyna A.L., Holderied M., Jäger M., Schilling C., et al. Articulation and Backside Wear Analysis after Long-Term in vitro Wear Simulation of Vitamin E Stabilized Polyethylene Acetabular Liners with a Press-Fit Locking Mechanism. Traumatology and Orthopedics of Russia, 2018. 24(2).

7 Morscher E. and Masar Z. Development and first experience with an uncemented press-fit cup. Clin Orthop Relat Res, 1988(232): p. 96-103.

8 Morscher E.W. Current status of acetabular fixation in primary total hip arthroplasty. Clin Orthop Relat Res, 1992(274): p. 172-93.

9 Oral E., Wannomae K.K., Hawkins N., Harris W.H., et al. Alpha-tocopherol-doped irradiated UHMWPE for high fatigue resistance and low wear. Biomaterials, 2004. 25(24): p. 5515-22.17.

10 Oral E., Rowell S.L., Muratoglu O.K. The effect of alpha-tocopherol on the oxidation and free radical decay in irradiated UHMWPE. Biomaterials, 2006. 27(32): p. 5580-7.

11 Data on file at Mathys Ltd Bettlach

12 Begand S., Oberbach T., Glien W. ATZ – A new material with a high potential in joint replacement Key Eng Mater, 2005. 284-286: p. 983-986.

13 Data on file at Mathys Ltd Bettlach

14 Oberbach T., Begand S., Glien W, Kaddick, C. Luxation Test of Different Ceramic on Ceramic Couplings. Key Eng Mater, 2007. 330-332: p. 1235-1238.

15 Data on file at Mathys Ltd Bettlach

16 Halma J.J., Senaris J., Delfosse D., Lerf R., et al. Edge loading does not increase wear rates of ceramic-on-ceramic and metal-on-polyethylene articulations. J Biomed Mater Res B Appl Biomater, 2014.

17 Al-Hajjar M., Jennings L.M., Begand S., Oberbach T., et al. Wear of novel ceramic-on-ceramic bearings under adverse and clinically relevant hip simulator conditions. J Biomed Mater Res B Appl Biomater, 2013.

***Preservation** in motion*

Item no. 336.010.135 02-0520-01 2020-05

Mathys Ltd Bettlach • Robert Mathys Strasse 5 • P.O. Box • 2544 Bettlach • Switzerland • Tel. +41 32 644 1 644 • Fax +41 32 644 1 161
www.mathysmedical.com