

Normative reference

- ISO 6474: Implants for surgery - Ceramic materials based on high purity alumina
- PA-1 (certified procedure): Wear test (Ring-on-Disc)
- DIN 50 324: Tribologie. Prüfung von Reibung und Verschleiß
- ASTM G99: Standard Test Method for Wear Testing with a Pin-on-Disk Apparatus

## MATERIAL TESTING

### WEAR TESTING

#### Ring-on-disc:

The ring-on-disc test according to ISO 6474 is designed as a 'screening test' for a first determination of tribologic behavior of a new material coupling for endoprostheses. The gained wear rates serve as standard values for the tribologic classification of new material couplings or coatings. This test is suitable for hard-soft and hard-hard couplings. The characteristics of the test are a steady and homogenous contact pressure, an alternating direction of the motion and an interruption of the lubricating film between ring and disc due to the reversing motion and different radial velocities in the wear track of the coupling (see fig. 2).

The specimens are examined with regard to the roughness and the profile of the wear track. At the disc the removed wear volume is determined, for ring and disc scanning electron microscope examinations can be advantageous.

The survey of the roughnesses is performed by a computer-controlled profil measuring device and the parameters  $R_t$ ,  $R_a$ ,  $R_{pk}$  and  $R_{vk}$  are determined. The measurement of the roughness according to DIN 4768, 4776, ISO 3274, ISO 4287-1 and ISO 4288 are performed on the same machine.

#### Pin-on-disc

In the pin-on-disc test the wear is determined using a pin which is pressed onto a rotating disc under a defined load (see fig. 2). The top of the pin is provided with a radius. At the beginning of the test this results in a point contact between pin and disk which turns into an increasing area during the test. The pin can also be replaced by a ball (ball-on-disc).

Unlike for the ring-on-disc, during the pin-on-disc test no reversing motion and no interruption of the lubricating film between the wear components occurs. Therefore ideally pure sliding friction between the friction components can be assumed.

The loading condition in the pin-on-disc test is defined by the normal load, the sliding velocity, the initial temperature of the test medium and the sliding distance between the wear coupling.

In the pin-on-disc test the wear volume can either be determined by the changed geometry of the specimen (shortening of the pin and determination of the wear track volume of the on the disc) or by the mass reduction of the specimens.



Fig. 1: Ring-on-disc testing device for the determination of tribologic properties.

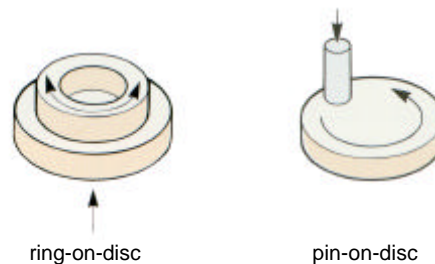


Fig. 2: Schematic representation of the different test

#### Data:

##### Ring-on-disc:

complexity:	medium
test medium:	Ringer's solution, aqua dest. at RT
number of spec.:	5 wear couplings each
test period:	100 h at 1 Hz oscillating motion
additional evaluation:	SEM, weight determination

#### Literature:

Please contact Endolab GmbH

#### Links:

[www.endolab.de](http://www.endolab.de)  
[www.astm.com](http://www.astm.com)  
[www.iso.ch](http://www.iso.ch)