



### Friction of Contact Lenses in Saline Solution

Friction is a measure of a surface's resistance to motion. When two surfaces are rubbing against each other, friction acts as the force to prevent the two surfaces from moving in a given direction. Continued relative motion leads to material loss or wear of the surface and its friction counterpart. Over time, a surface will degrade to a point that renders the surface unusable for its designed application. Altering the surface chemistry can change the friction properties to better suit the application needs and help to prolong the material's useful life.

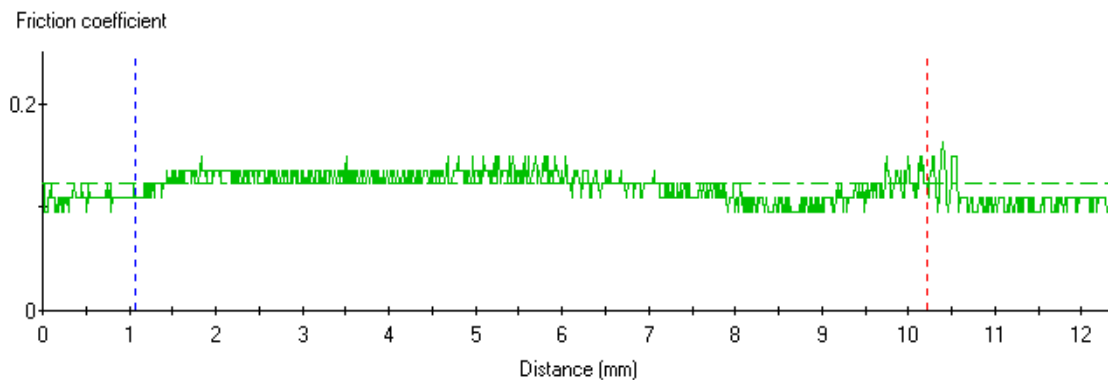


Figure 1. Friction coefficient as a function of sliding distance for the 1-Day Acuvue TruEye contact lens against glass slide in saline contact lens solution.

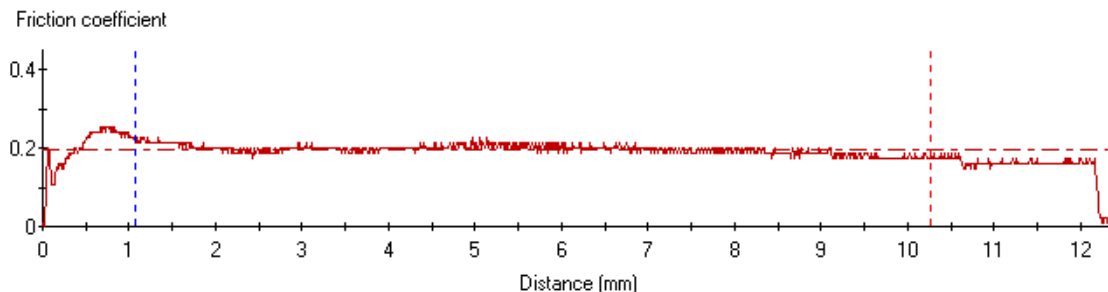


Figure 2. Friction coefficient as a function of sliding distance for the Acuvue Oaysis with Hydraclear Plus contact lens against glass slide in saline contact lens solution.

The TS-501 Triboster, manufactured by Kyowa Interface Science Co., Ltd., is capable of measuring both the static and kinetic friction coefficients of a material surface in a single pass or multiple passes under dry or lubricated conditions with temperature control from room



temperature to 180°C. The high sensitivity friction transducer and low loads employed by the TS-501 allow for softer materials like polymers, fabrics and thin films to be tested with ease and accuracy. The velocity of the stage is automatically controlled by user input values from 0.02mm/s to 100mm/s.

Table 1 Static and Kinetic Friction Coefficients of Contact Lens Sliding against Glass Slide in Saline Contact Lens Solutions

Friction Coefficient	1-Day Acuvue TruEye	Acuvue Oaysis with Hydraclear Plus
$\mu_s$	0.123	0.255
$\mu_k$	0.123	0.195

Most of the disposable contact lenses are made of extremely soft hydrogels with significant amount of water content. Wearing contact lenses is becoming trendy for people whether it is for cosmetic, corrective or therapeutic reasons. In addition to many designed functionalities of the contact lenses wearing comfort is a key factor to be well controlled by the contact lens designer. One of the aspects of the wearing comfort is the friction between eyelid and the contact lens.

As shown in Figures 1 and 2, and Table 1, two different kinds of commercially available contact lenses from Johnson & Johnson Vision Care, Inc. were tested for friction using the TS-501. The first kind of contact lens tested was 1-Day Acuvue TruEye disposable contact lens. The second kind of contact lens was Acuvue Oaysis Hydraclear Plus disposable contact lens. Both kinds of contact lenses were tested under the same conditions and parameters sliding against glass slide in saline contact lens solution. From the results it is obvious that the static and kinetic friction coefficients for the two kinds of contact lenses are different. The different friction coefficients would result in different wearing comfort for people.