

Intermediate S3F Sensor System

Surface Stress Sensitive Film (S3F) is an optical instrument for measurements of skin friction and pressure. The basis of this measurement is an elastic film that deforms under the action of the applied loads. The reaction of the film is monitored by imaging the surface. The film reaction is then modeled using finite element analysis resulting in a continuous distribution of skin friction and pressure over the filmed surface.

The Intermediate S3F Sensor system utilizes a high-resolution camera to image ISSI's Surface Stress Sensitive Film (S3F) layer, polymerized on a glass window. This serves as a sensor for smaller applications such as insect and reptile gait studies as well as human hands and small tire applications.

The S3F layer contains a probe material that enables changes in film thickness, produced primarily by pressure, to be visualized as changes in illumination level. The mathematical ratio of loaded and unloaded images quantifies the vertical displacement of the film.

A series of markers are applied to the film below the opaque upper layer. These markers are displaced laterally during contact, primarily by shear forces. Cross-correlation analysis quantifies the displacements produced by shear.

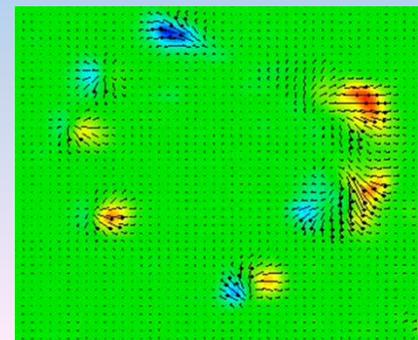
3-D displacement maps provide rapid visualization of the pressure and shear patterns produced by contact. Reconstruction of the pressure and shear force values is provided by offline analysis using a finite element model of the S3F with the measured displacements as inputs.



Why S3F?

S3F provides high spatial-resolution images of pressure and shear data at contact surface for a wide range of applications. The chemistry of an S3F layer can be altered or tuned to a specific application, making the S3F a versatile sensor for a wide range of applications from insect locomotion studies to hydrodynamics research to aircraft tire research.

Power	110-240 VAC, 50-60 Hz
Interface	USB 3.0
Linear Pressure Range	15-700 kPa. Unsaturated response over 2,000 kPa.
Linear Shear Range	3 to ± 100 kPa. Also not the saturation point.
Accuracy	$\pm 5\%$ of full scale for both pressure and shear
Data Capture Rate	60 fps
Spatial Resolution	1.2 mm
Crosstalk	Less than 3% between pressure and shear
Active Measurement Area	20.3 cm x 30.5 cm (8 in x 12 in)
Size	40.6 cm (L) by 40.6 cm (W) by 42 cm (H) (16 in by 16 in by 16.5 in)
Weight	34 kg (75 lb)
ECCN	EAR99



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