SOLUTION SHEET

DANTEC DYNAMICS

DirectShear Optical System

Wall shear stress sensors for harsh environments, including high-temperature applications



System with optical sensor and Optical Sensor Unit

Measure Mean and Fluctuating Wall Shear Stress

The DirectShear®-Optical system provides the ability to measure mean and fluctuating wall shear stress in high speed, high temperature (0-400°C) test facilities, using a flush-mounted purely optical sensor.

The Optical Sensor Unit (OSU) provides a modulation signal to the sensor head and outputs analog voltage over BNC. This modulation signal enables the simultaneous measurement of both the mean and fluctuating wall shear stress.

Each sensor is specifically paired and tuned to its control unit. These pairings are documented in the calibration sheet provided with each sensor.

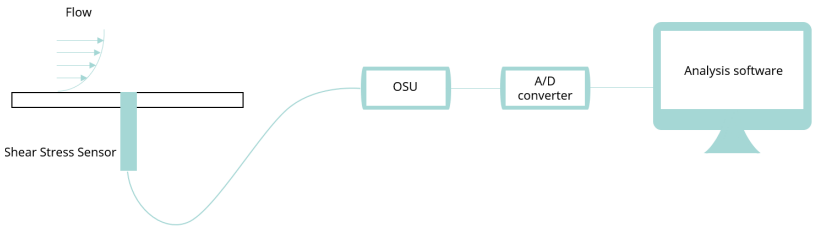
Key benefits

- Direct measurement of shear stress
- High temperature capable – 0 to 400°C
- Harsh environment capable
- Non-intrusive - minimal flow disturbance
- High resolution, dynamic range and bandwidth
- Immune to EMI

NOVA INSTRUMENTS

The DirectShear Optical Solution

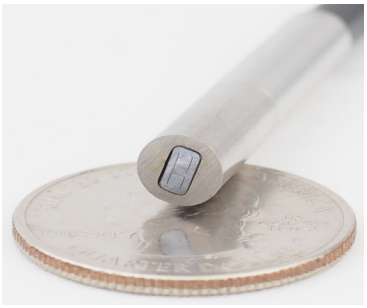
The complete measurement chain comprises a flush-mounted sensor connected to an OSU. The analog output from the OSU is connection to a data acquisition system which comprises analog to digital conversion and data storage.



Overview of the DirectShear-Optical System

The DirectShear-Optical system comprises the following elements:

- A DirectShear sensor
- An Optical Sensor Unit (OSU)
- An A/D converter
- Analysis software



DirectShear-Optical sensor head

DirectShear-Optical sensor

- Optical micromachined floating element sensor that enables time-resolved, one-dimensional, direct shear stress measurements in harsh environments
- Suite of sensor models for different applications, from 50 Pa to 5000 Pa
- Non-intrusive - backside contacts for minimal flow disturbance

Optical Sensor Unit, stand alone

- Optimized control unit enables high dynamic range and bandwidth
- Selectable low-noise AC or rechargeable Li-ion battery power source

A/D Converter

The output of the CSU should be connected to a data acquisition system via a BNC connection. The recommended minimum resolution is 100 nV. Typical AC-coupled signal outputs will not exceed 1 V in magnitude; however, mean output voltages can reach up to 6 V at full scale output without the Zero Offset engaged (see DC Offset Measurement below for Zero Offset operation). The minimum bandwidth of the data acquisition system should be at least twice the measurement bandwidth of interest to avoid temporally aliasing the sensor signal. For fluctuating shear stress or pressure measurements, the input to the data acquisition system should be AC coupled.

DC Offset Measurement

Before and after data acquisition, the DC offset from the output of the circuit should be recorded. The DC offset provides information on whether sensor drift has occurred during operation. The DC offset of the sensor can be monitored at the CSU output by introducing a BNC tee to split off the signal. A digital multimeter with at least 6.5 digits should be set to maximize dynamic range for determining the DC offset of the sensor.

The Zero Offset correction brings the DC offset to nominally 0V. To engage the Zero Offset, press and hold the Zero Offset Button for 3-5 seconds. When the Zero Offset LED comes on, the DC offset will drop. To disengage the Zero Offset, press the Zero Offset Button for less than 3 seconds. The Zero Offset LED will turn off and the DC offset voltage will return to normal.

NOTE *Output drift can occur due to temperature and humidity fluctuations during the course of a test. Consult the sensor data sheet to determine the effect of changes in environmental conditions during testing.*

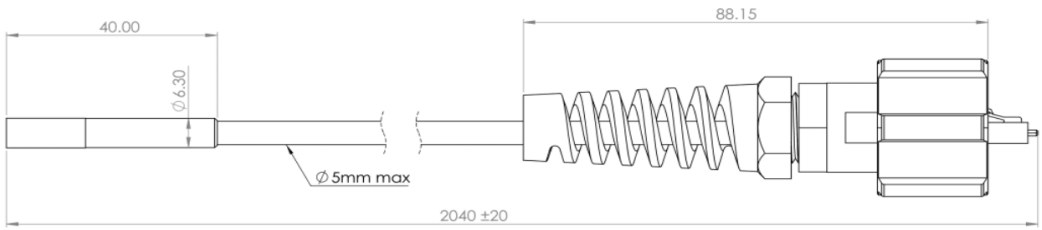
Technical specifications

Sensor Model	Shear Stress (Pa)	Bandwidth (kHz)	Sensitivity (mV/Pa)	Resolution (mPa)	Element Size
0022-A-00	50	1.8	40	0.5	1mm x 0.7mm
0022-F-00	100	2.5	20	1	1mm x 1mm
0022-B-00	300	5	5	2	0.4mm x 0.4mm
0022-C-00	1000	10	1.3	50	0.3mm x 0.3mm
0022-D-00	5000	20	0.3	50	0.3mm x 0.3mm

Cylindrical package dimensions

- Length – 40 mm (1.57″)
- Diameter – 6.30 mm (0.25″)
- Sensor Flushness – <25 um (<0.001″)

Dimensional drawing in mm



DANTEC DYNAMICS Turn Measurements into Knowledge

Data Sheet SS_0866_v2. Subject to change without notice. Copyright © 2026.
Dantec Dynamics. All Rights Reserved. www.dantecdynamics.com
DirectShear® is a registered trademark of IC2. Used with permission.

NOVA INSTRUMENTS