

# Drag Force Flow Sensors



Lenterra's Drag Force Flow Sensors enable direct measurement of the drag force incurred by the flow on a thin pillar immersed into a fluid. When paired with an LOI Optical Interrogator or LOC-F Optical Controller, the sensor provides fast and continuous measurements for a wide range of applications: the sensor can be mounted inside a mixer, granulator, extruder, pipe or any other construction to provide in-line measurement with minimum disruption of process flow.

## Applications

- Scale up of granulator/mixer/extruder processes from the laboratory to the factory floor
- Continuous monitoring of mixing operations to prevent under/overprocessing
- Characterization of multiphase flows
- Flow rate, viscosity or granularity measurement



## Features

- In-line, continuous measurement with minimum disruption of process flow
- Directional sensitivity
- Chemically resistant construction
- Fiber optic connection for interface with compatible controller
- High measurement rate (up to 10 kHz with LOC-F controller)

## Ordering Information

Order with **P-f<sub>eff</sub>-l** where f<sub>eff</sub> = rated effective force, in millinewtons (ex. 300 for ± 0.3 N) and l = the pillar length, in mm.

Standard models are rated for up to 100°C operation.

Model Number	Eff. Force Measurement Range <sup>1</sup>	Resolution <sup>2</sup>	Resonance Frequency	Pillar Diameter	Pillar Length
P-15000-20	±15 N	15 mN	4,800 Hz	2.77 mm	20 mm
P-11000-40	±11 N	10 mN	1,800 Hz	4.19 mm	40 mm
P-8000-40	±8 N	8 mN	1,600 Hz	3.76 mm	40 mm
P-5000-40	±5 N	5 mN	1,500 Hz	3.4 mm	40 mm
P-4000-40	±4 N	4 mN	1,300 Hz	3.05 mm	40 mm
P-2500-40	±2.5 N	3 mN	1,200 Hz	2.77 mm	40 mm
P-1500-40	±1.5 N	2 mN	1,000 Hz	2.41 mm	40 mm
P1000-40	±1 N	1 mN	900 Hz	2.11 mm	40 mm
P-500-40	±0.5 N	0.5 mN	750 Hz	1.83 mm	40 mm
P-300-40	±0.3 N	0.3 mN	700 Hz	1.65 mm	40 mm
P-200-40	±0.2 N	0.25 mN	600 Hz	1.47 mm	40 mm
P-170-80	±0.17 N	0.2 mN	230 Hz	2.11 mm	80 mm
P-150-40	±0.15 N	0.2 mN	500 Hz	1.27 mm	40 mm
P-70-40	±0.07 N	0.1 mN	440 Hz	1.07 mm	40 mm
P-45-80	±0.045 N	0.1 mN	180 Hz	1.65 mm	80 mm

<sup>1</sup> Custom measurement ranges available.

<sup>2</sup> When used with a LOI interrogator.

## Specifications

Optical Connector: IP67 Sealed Duplex Single-Mode LC

Nominal Operating Wavelength: 1555 nm

Physical Dimensions: see below

Optical Cable Length: 2 meters

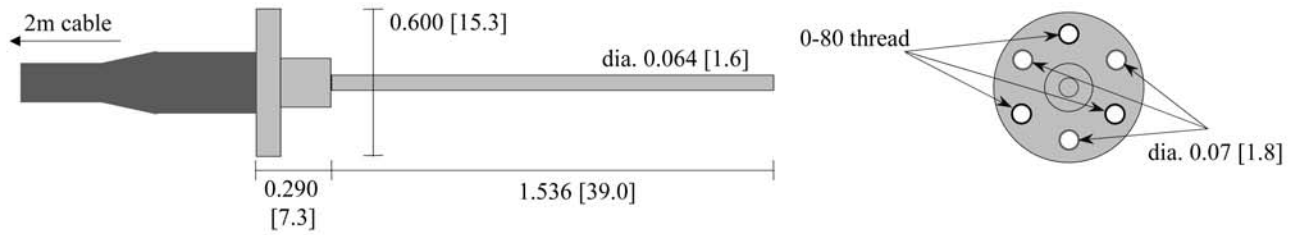
Operating/Storage Temp. (std.): -20 to 200°F (-30 to 100°C)

Operating/Storage Temp. (-HT): -20 to 400°F (-30 to 200°C)

Units are supplied with mounting hardware. Sensors have a directional response and should be aligned in the desired flow direction for maximum sensitivity.

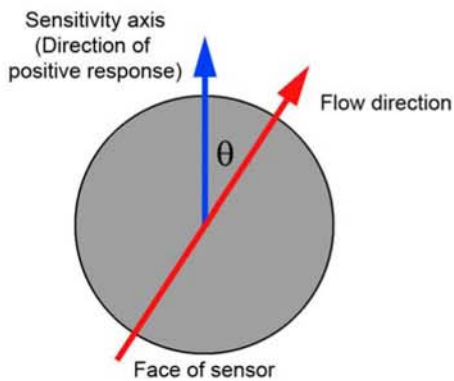
## Dimensions

(Model P-300-39)

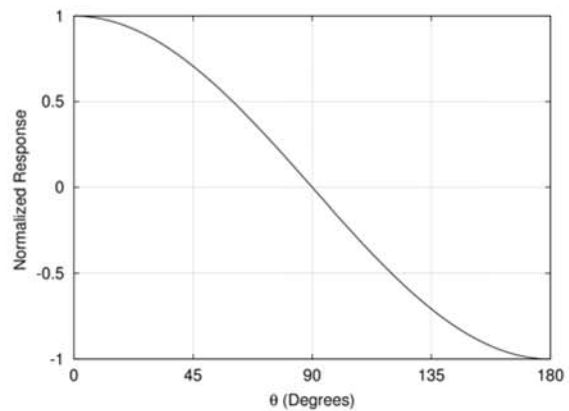


## Directional Response

DFF sensors have bidirectional response and should be aligned in the desired direction for maximum sensitivity.



## Sensitivity to Off-Axis Shear Stress



Sealed duplex LC optical connector and protective cap

**LENTERRA**

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