

Drag Force Flow (DFF) Sensor

Lenterra's DFF sensor is an immersion probe that provides continuous real-time measurement of flow force and temperature in liquids and powders. This novel Process Analytical Technology (PAT) tool enables process monitoring and control in pharmaceutical, food, biotech and other industries.

Probe features

- Stainless steel construction, sterilizable and chemically resistant
- Fiber optic sensing – no electromagnetic interference and no ignition hazard
- High measurement rate (500 measurements per second)
- Simultaneous measurements of force and temperature
- Force measurement is self-calibrated for temperature variations
- Directional measurements
- Turn-key operation when coupled with Lenterra Optical Interrogator (LOI)
- Wide range of sensitivities (model dependent)

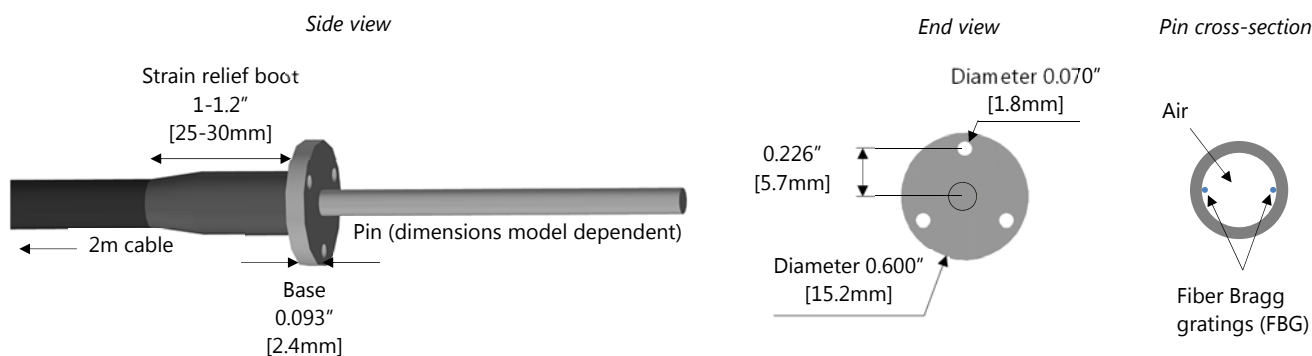
Models

Model number	Measurement range ¹ , mN	Resolution ² , mN	Pin diameter, mm	Pin length, mm
P-15000-30	±15,000	15	3.2	30
P-11000-40	±11,000	10	4.19	40
P-8000-40	±8,000	8	3.2	40
P-5000-40	±5,000	5	3.0	40
P-4000-40	±4,000	4	2.8	40
P-2500-40	±2,500	3	2.77	40
P-1500-40	±1,500	2	2.41	40
P-1000-40	±1,000	1	2.11	40
P-500-40	±500	0.5	1.83	40
P-300-40	±300	0.3	1.27	40
P-170-80	±170	0.17	2.11	80
P-70-40	±70	0.1	1.07	40
P-45-80	±45	0.1	1.65	80

¹ Custom measurement ranges available.

² When used with a Lenterra LOI interrogator.

Probe construction



Optical wavelength

Operating temperature^{3,4}

Storage temperature

1556.5 nm

-10°C to 120°C (14°F to 248°F)

-10°C to 60°C (-14°F to 140°F)

³ Custom-made probes may operate down to -30°C and up to 180°C

⁴ Operating temperature is for pin thermally insulated from cable

Specifications

Pin

Cylindrical hollow stainless steel tube sealed with a stainless steel cap, Fiber Bragg gratings adhered to inner surface
Materials: SS 303, 316 or 316L, Silica glass, Epoxy (Cotronics 4525)
Fastening: pin to base – welding, cap to pin and FBGs to pin – epoxy

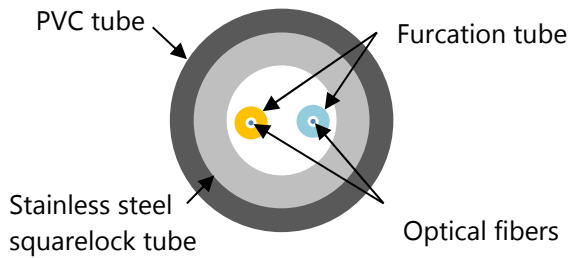
Base

Material: SS 303, 316 or 316L

Strain relief boot

Material: Polyolefin Plastic

Instrument cable



Material: SS squarelock tube covered with PVC tube
Outside diameter: 0.24" (6.1mm)
Length: 6.5 ft (2m)
Operating temperature: -10°C to 60°C (14°F to 140°F)

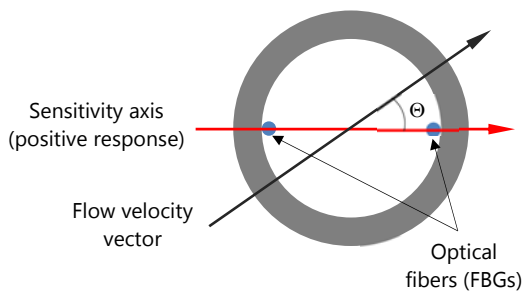
Fiber optic connector



Type: Duplex LC/PC fiber connector
Ingress Protection: IP67 - Dust Tight, Waterproof
Operating temperature: -40°C to 85°C (-40°F to 180°F)

Directional response

Cross-section of the pin



Sensitivity vs. flow direction

