

Hydrogen Fluoride Gas Cell for Gas Sensor and Calibrator O Band

Gas cells are precision filters whose absolute wavelengths depend on specific molecular energy level transitions. Hydrogen Fluoride (HF) exhibits strong molecular absorption in the bands 1255 - 1351nm, 865 - 895nm and 2.34 - 2.82 μ m.

Our HF gas cells can ship free space or fiber coupled and come in three styles: standard 50 Torr, low pressure and low concentration (see specifications below).

Our OFHC copper gas tube is compression-sealed for long life and features advanced optical design with wedged sapphire windows for very low level of interference artifacts. Cells may be ordered fully fiber-coupled (single mode fiber, with or without connectors), or with a built-in InGaAs photodetector on one end.

Specifications¹

50 Torr Standard:

Pressure	50 Torr +/- 20%
Line Depth ² (1312.6nm)	6 dB
Line Width (1312.6nm)	16 pm

Low Pressure Cell

Pressure	2 Torr +/- 50%
Line Depth ² (1312.6nm)	1.5 +/- 0.5
Line Width (1312.6nm)	4 pm

Low Concentration Cell

Concentration	50-150 ppm-meters
Backfill gas and pressure	N ₂ to 750 Torr
Line Depth ² (1312.6nm)	2.3 - 6.6 %
Line Width (1312.6nm)	27 pm

General

Wavelength Accuracy	+/- 0.1 pm
Temperature Dependence	< 0.01 pm/°C
Operating Temperature	+5 to +70 °C
Storage Temperature	-40 to +80 °C

Free Space

Wavelength Range	865nm to 2.8 μ m
Clear Aperture	4.5 mm

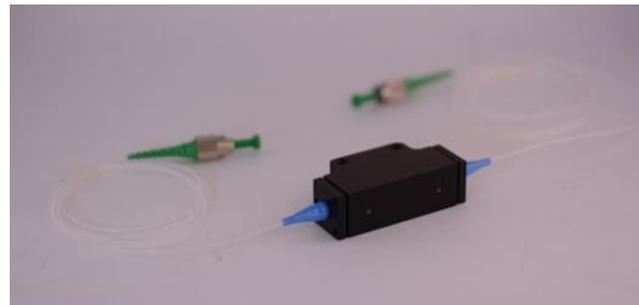
Fiber-Coupled

Wavelength Range	1255 to 1351 nm
Transmission	> 45%
Spectral Ripple near 1312nm	< 0.1 dB P-P any 2 nm span
Connector Style	FCAPC, SCAPC, FCPC, SCPC

Photodetector Output

Responsivity	> 0.4 A/W
Capacitance (0V)	4 pF typical
Shunt Resistance	> 5 M Ω

- 25 °C; Specifications subject to change without notice
- For instruments with resolution better than the linewidth. Using lower resolution could understate absorption depth.



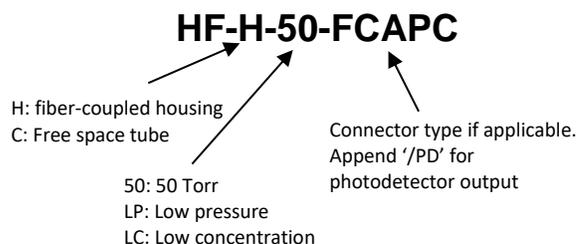
Features

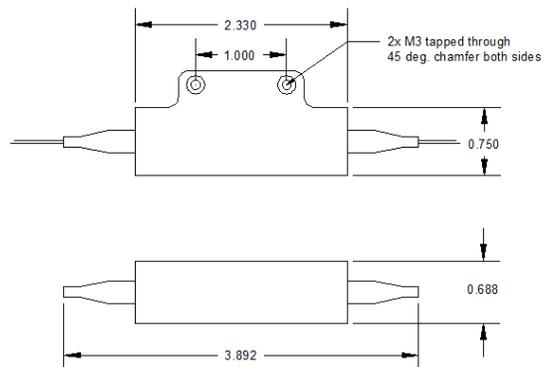
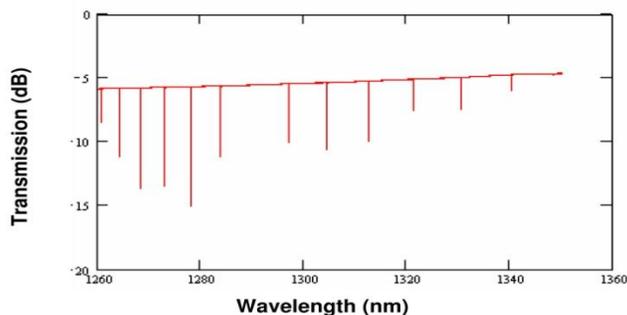
- **Compression seal (sapphire to copper)**
- **AR-coated and wedged windows for low level of spectral artifacts at 1312nm**
- **Rugged miniaturized package**
- **Fiber-coupled and photodetector output options**
- **Wide spectral range for free space cells**

Applications

- **Remote optical gas sensing systems**
- **Bump testing gas detectors**
- **Embedded calibrator for tunable laser or OSA**
- **Wavelength locker**
- **Laboratory calibration source**

Ordering Information (example)





HF fiber coupled gas cell

Dimensions in inches. For free space absorption tube please inquire

Line	Wavelength (nm) ^{1,2}	Pressure Shift ³ (pm/Torr)
R(8)	1253.3845	-0.010
R(7)	1255.3002	-0.010
R(6)	1257.7520	-0.008
R(5)	1260.7417	-0.006
R(4)	1264.2721	-0.003
R(3)	1268.3469	-0.001
R(2)	1272.9705	0.004
R(1)	1278.1480	0.004
R(0)	1283.8857	0.009
P(1)	1297.0703	0.003
P(2)	1304.5339	0.004
P(3)	1312.5910	0.002
P(4)	1321.2525	-0.002
P(5)	1330.5301	-0.003
P(6)	1340.4365	-0.006
P(7)	1350.9858	-0.009
P(8)	1362.1931	-0.010

1. Data from most recent HITRAN 2012 database. Significant updates were made from the previous 2008 database.
2. HITRAN line uncertainty given in terms of wavenumber: $<0.0001\text{cm}^{-1}$ and $\geq 0.00001\text{cm}^{-1}$.
3. Air-broadened pressure shift data at 296K from HITRAN 2012.

Note: HITRAN is a spectroscopic database involving research and standards bodies worldwide. It is headquartered at the Harvard Smithsonian Center for Astrophysics and contains the most accurate spectroscopic data in the world.

A Note on Dimers: The dimer H_2F_2 is generally present to varying concentrations depending on gas pressure and temperature. For room temperature (25 °C) at 100 Torr pressure the dimer concentration will be in the neighborhood of 25%. For pressures below 25 Torr the dimer concentration is generally negligible at room temperature and above. The presence of the dimer effectively reduces the concentration of the monomer but does not change the wavelength of the absorption lines except through the weak dependence on pressure shift. The most evident effect will be the absorption width getting larger at higher temperatures due to the increase in monomer concentration.

Traceability

The resulting absorption spectra exhibited by Wavelength References HF Cells are determined by fundamental molecular energy level transitions that have been well characterized by standards bodies and stored in spectroscopic databases such as HITRAN. As such, the presence of HF at a specified pressure and temperature guarantees repeatable absorption spectra characteristics.

Material Handling

Safety is always an appropriate concern. Occupational Safety & Health Administration (OSHA) lists a Permissible Exposure Limit (PEL) for HF of 3ppm over an 8-hour period (time-weighted average). This would correspond to inhaling a total of approximately 10mg of substance (assuming 0.5L tidal volume and 16 breaths/minute). Our 50 Torr cells contain approximately 0.02mg to 0.4mg of HF, depending on tube size. Because exposure amounts are far below any quantity deemed hazardous by OSHA, no special provisions are necessary for the handling of these cells, and they may be shipped by any customary means.