

Generating Purge Gas for FT-IR

Market Application Publication



Background:

Fourier Transform Infrared spectroscopy (FT-IR) is a powerful analytical technique for qualitative and quantitative analysis that is used in a broad range of applications. An FT-IR instrument uses a beam containing a broad range of wavelengths and measures the total absorbance of the sample. The instrument then makes a small change in the beam position and measures the total absorbance again. This process is repeated many times and the absorbance spectrum is then computer generated using a Fourier transform.

The successful collection of a spectrum via FT-IR requires that the sample and the air in the sample chamber be free of H₂O and CO₂, as these compounds absorb light and will obscure peaks that may be of interest in the spectrum.

In many laboratories, purge gas for FT-IR is provided by a high-pressure gas cylinder. While this can be a satisfactory approach, an in-house generator to provide purge gas is safer, more reliable convenient, and more economical than the use of cylinders. An in-house purge gas generator is completely automatic and requires a minimum of maintenance.



Features and benefits:

- CO₂ concentration of air is less than 1 ppm and the air Dew point is -100°F (-73°C)
- Improves signal to noise ratio of the IR spectrum, increases sample thru-put, maximizes up-time and laboratory efficiency
- Enhances laboratory safety, the system generates the required flow rate of purge air and is certified by CSA, UL, IEC1010 and CE
- Prevents running out of gas during instrument operation
- and eliminates the need for cylinders or nitrogen Dewar flasks
- Extremely low cost of operation, no hidden costs (demurrage, maintaining inventory). Payback period typically less than one year
- Compact system frees up laboratory floor space and is ideal for mobile laboratories
- Extremely reliable; operates on a 24h/day, 7day/week basis with minimum maintenance.

Purge Gas Generation:

Purge gas generators use a combination of coalescing filtration, regenerative pressure swing adsorption, and high efficiency particulate filtration to produce laboratory quality, dry, CO₂-free air from a standard compressed air supply. A number of generators are available to allow the user to configure the systems to meet the specific requirements of the facility; as an example, the Model 75 series includes systems that can up to 216 scfh (102 L/min) using an inlet air pressure of 125 psig from a compressed air. If laboratory supplied compressed air is not available, the Model 74-5401, which includes a state of the art oil-less compressor can be used.

Application:

Many industrial, academic and government laboratories use FT-IR spectrometers for the analysis of materials such as polymers, foods, pharmaceuticals, environmental samples. Since the performance of an FT-IR system is dramatically enhanced by purging with dry, CO₂ free gas, many spectrometer manufacturers recommend the use of purge gas with their system. As an example, Thermo Fisher, a major manufacturer of FT-IR systems sells Parker Hannifin purge gas systems with their spectrometer systems. Mike Bradley, Product Manager for Thermo Fisher reports that the Parker Hannifin systems are self contained systems that complement their spectrometers and greatly simplify the use of the FT-IR.

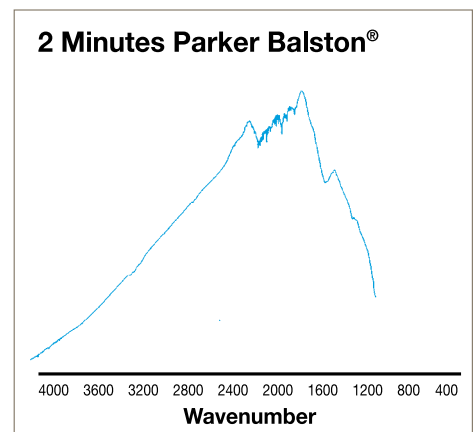
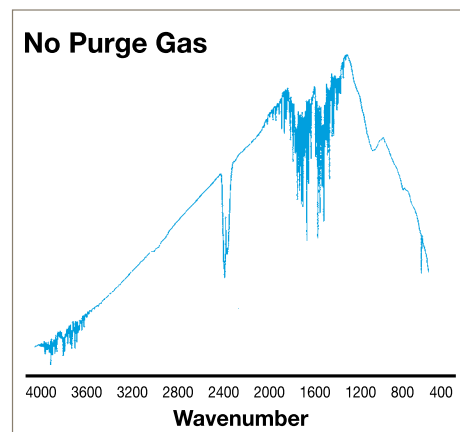
Parker Hannifin purge gas systems have been used in workshops where a large number of FT-IR systems are simultaneously used. As an example, Dr. James A. de Haseth and Dr. Peter R. Griffiths report that a Parker FT-IR Purge Gas Generator and Self Contained Lab Gas Generator were used in conjunction with a recent Society of Applied Spectroscopy Fourier Transform Infrared Spectrometry workshop held at the University

of Georgia. These organizers indicated that the generator provided excellent purge for six spectrometers and were so pleased with the performance of the generator that they requested the use of the generator for future workshops.

There are several benefits for using a purge gas generator instead of a compressed gas tank for FT-IR including safety, cost and convenience. A purge gas generator supplies the gas at the desired flow and pressure to the system. In contrast, when a compressed gas tank is used, a hazard exists when the tank is transported as a defective valve could cause the loss of control of the tank, which could cause significant damage. In addition, tanks need to be replaced on a periodic basis, which is time consuming. Once a purge gas generator is installed, gas can be provided on a 24 hour/7 day basis with minimum intervention. In addition, it should be noted that operating costs for a purge gas generator are very low, compared to the use of tank gas and the use of a purge gas generator reduces the environmental impact, since heavy gas tanks need not be transported from the source to the point of use.

Comparative Spectral Analysis in Purging an FT-IR Sample Chamber

The spectrum collected without purge gas is extremely noisy in several regions. When the sample is purged with nitrogen for two minutes, water vapor and CO₂ are removed and the noise in the spectrum is removed so that important features in the spectrum can be observed.



Self-Contained FT-IR Purge Gas Generator

The Parker Balston Model 74-5041NA FT-IR Purge Gas Generator is specifically designed for use with FT-IR spectrometers to provide a purified purge and air bearing gas supply from compressed air. The Parker Balston model 74-5041NA provides instruments with CO₂-free compressed air at less than -100°F (-73°C) dew point with no suspended impurities larger than 0.01 micron 24 hours/day, 7 days/week. The Parker Balston Self-Contained FT-IR Purge Gas Generator completely eliminates the inconvenience and the high costs

of nitrogen cylinders and Dewars, and significantly reduces the costs of operating FT-IR instruments.

The Parker Balston unit generates cleaner background spectra in a shorter period of time and more accurate analysis by improving the signal-to-noise ratio. The typical payback period is less than one year.

The generator is quiet, very reliable, and easy to install - simply attach the outlet air line, plug the electrical cord into a wall outlet, and the unit is ready for trouble-free operation.



Model 74-5041NA

Features and Benefits

- Less expensive and more convenient than nitrogen cylinders and dewars
- Includes state-of-the-art, oil-less compressor
- Compact, portable design is ideal for mobile labs
- Improves signal-to-noise ratio even on non-purge systems
- Increases FT-IR sample thru-put and maximizes up-time
- Special sound insulation design ensures quiet operation



Principal Specifications:

Model Number	75-45NA	75-52NA	75-62NA	74-5041NA
Purge Air Purity	CO ₂ Concentration <1ppm			
Dew Point	-100°F (-73°C)			
Flow Rate (Inlet Pressure) for Specified Dew Point	36 scfh (17 l/min) at 125 psig	72 scfh (34 l/min) at 125 psig	216 scfh (102 l/min) at 125 psig	60 scfh (28 lpm) at Max. rate 80 psig
	18 scfh (9 l/min) at 60 psig	36 scfh (17 l/min) at 60 psig	120 scfh (57 l/min) at 60 psig	---
Max. Inlet Pressure	60 psig/125 psig	60 psig/125 psig	60 psig/125 psig	Internal Compressor
Max. Inlet Air Temp. Range	78°F (25°C) [1]	78°F (25°C) [1]	78°F (25°C) [1]	---
Ambient Temp. Range	---	---	---	30°F-90°F (-1°C - 32°C)
Air consumption for Regeneration [2]	30 scfh (14 lpm)	60 scfh (28 lpm)	120 scfh (57 lpm)	---
Compressor	None Required	None Required	None Required	¾ hp
Inlet Port Size	¼" NPT (Female)			
Outlet Port Size	¼" NPT (Female)			
Dimensions (18cm x 33cm x 15cm)	7"W x 13"H x 6"D (32cm x 71cm x 23cm)	13"W x 28"H x 9"D (32cm x 102cm x 23cm)	13"W x 42"H x 9"D (46cm x 76cm x 81cm)	18"W x 31"H x 32"D
Electrical Requirements[3]	120VAC/60Hz/10W	120VAC/60Hz/10W	120VAC/60Hz/10W	120VAC/60Hz/20 Amps
Shipping Weight	26 lb (12 kg)	60 lb (27 kg)	88 lb (40 kg)	250 lb (114 kg)

NOTES:

- 1 Outlet dew point will increase at higher inlet compressed air temperatures.
- 2 Total air consumption = regeneration flow + flow demand.
- 3 Electrical requirements are for North America, see product catalog for electrical and plug configurations for other locations.

Ordering Information - 75-xx Systems*:

Description	Model Number
FT-IR Purge Gas Generator	75-45NA, 75-52NA, 75-62NA
Annual Maintenance Kit	IK7572
Installation Kit	MKH2PEM-6M (6 Month Service Kit) MKH2PEM-24M (24 Month Service Kit)
Preventative Maintenance Plan	75-45NA: 75-45PM 75-52NA: 75-45PM 75-62NA: 75-62PM
Extended Support with 24 Month Warranty	75-45NA: 75-45-DN2 75-52NA: 75-45-DN2 75-62NA: 75-62-DN2

*Part Numbers are for North America, see product catalog for electrical and plug configurations for other locations.

Ordering Information - 74-5041 System*:

Description	Model Number
FT-IR Purge Gas Generator	74-5041NA
Annual Maintenance Kit	74065
Replacement Compressor	74156
Preventative Maintenance Plan	74-5041-PM
Installation Kit	IK7532
Extended Support with 24 Month Warranty	74-5041-DN2

*Part Numbers are for North America, see product catalog for electrical and plug configurations for other locations.

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