



## OZPEN™ CO<sub>2</sub> FIBER OPTICS CLEANING UNIT FOR HIGH POWER COMPONENTS

### Features:

- Superior removal of any residue on fiber optics and other components especially for high power applications.
- Quick dry and solvent free cleaning process.
- Designed to clean small surface areas.
- Superior to solvent cleaning wiping techniques.
- More economical and versatile than snow guns with enclosures.
- Cleans a variety of substrates such as glass, metal, etc.
- Removes dust particles, polishing compounds, fingerprints, surface films, and other surface residues.
- CO<sub>2</sub> composite spray

### Applications:

- Effective cleaning of various high power fiber optic connectors and other components
- Optical element cleaning, optical coating preparation/cleaning
- Electro-optic sensors and medical devices cleaning
- Semiconductor and biomedical components surface cleaning

### Product Description:

The **OZPEN** is a versatile, precision, small surface area cleaning system for critical fiber optics and other manufacturing operations. The **OZPEN** generates and propels an adjustable spray of clean dry air or nitrogen containing small CO<sub>2</sub> particles to efficiently remove foreign matter from a surface.

The **OZPEN** replaces or augments conventional solvent-aided wiping cleaning techniques which can spread, smear or shed, or redeposit trace residues and particles over critical surfaces.

The composite spray cleaning technique is a patented process where one can deliver controlled shear stress on surface contaminants using chemically active, dry CO<sub>2</sub> spray for efficient and effective removal of inorganic and organic surface contamination from critical substrate surfaces.

The cleaning unit delivers a precisely controlled accelerated stream of solid carbon dioxide particles (i.e. snow) at high velocity. The snow is created from the conversion of liquid CO<sub>2</sub> to solid CO<sub>2</sub> particles and CO<sub>2</sub> gas at the spray nozzle. The nozzle, propellant pressure, and temperature are adjusted for optimal cleaning process.

The main method for removal of particulate and other loosely bound contaminants is momentum transfer. In this process, an incoming CO<sub>2</sub> particle strikes a particle on the surface. The resulting force overcomes the force holding the particle to the surface, and the CO<sub>2</sub> gas spray/propellant plume then carries the particle away. This unique dry process can remove very small particles (< 100 nm in size) without the need for using other wet cleaning techniques.

Thin film organic contamination may also be removed by CO<sub>2</sub> composite snow cleaning. To remove organic species they must be soluble in liquid CO<sub>2</sub>. Typical light oils are good candidates for CO<sub>2</sub> cleaning.

Solid CO<sub>2</sub> spray within the spray plume exists at temperature of approx. -78 °C. The cooling properties of CO<sub>2</sub> can be used to remove contaminant with high water content, first by freezing then by fracturing it from the underlying substrate.

Each **OZPEN** is equipped with a flexible coaxial tube, spray pen applicator, and foot switch. The basic system provides precision cleaning capability right out of the box and includes all components for precision cleaning apart from the process gases.



OZPEN, Front Snow and Propellant Controls



CO<sub>2</sub> Cleaning of The Connector



Dirty Fiber Before Cleaning



Same Fiber After CO<sub>2</sub> Cleaning



AR Coated Air Gap High Power Connector, (Example How To Clean Hard To Reach Places)

### Ordering Information For Standard Parts:

Bar Code	Part Number	Description
45702	OZ-PEN-110 V	Compact tabletop, composite CO <sub>2</sub> spray cleaning pen for precision cleaning. Equipped with power switch, propellant thrust controller (0-125 psi), nitrogen gas gauge, CO <sub>2</sub> flow controller and propellant temperature control, spray pen applicator with 1 m long hose, standard nozzle and pen holder. 110 V version.
45703	OZ-PEN-230 V	Compact tabletop, composite CO <sub>2</sub> spray cleaning pen for precision cleaning. Equipped with power switch, propellant thrust controller (0-125 psi), nitrogen gas gauge, CO <sub>2</sub> flow controller and propellant temperature control, spray pen applicator with 1 m long hose, standard nozzle and pen holder. 230 V version CE Certified.

### Basic plug-n-spray cleaning system includes:

1. CO<sub>2</sub> Composite Spray Generator: a compact table top chassis equipped with power switch, clean dry air (CDA) or N<sub>2</sub> propellant thrust controller (0-125 psi) and gauge, propellant gas temperature controller and precision CO<sub>2</sub> injection flow controller. Spray applicator: Pencil style, 1 m long cabled to generator, and pen holder.  
Internal: Particle capillary: Size 20 (fine, installed)

2. Connection Kit: Cylinder, adaptor, hose, for liquid CO<sub>2</sub> cylinder. Pressure regulator for N<sub>2</sub> supply and hose.

3. Operation manual.

### Standard Product Specifications

Property	Value	Comment
Voltage requirements	110 V, 230 V	230 V CE Certified
Cleaning agent supply	Liquid CO <sub>2</sub> , 650-950 psi, 50-75° F	Not Included
Propellant supply	N <sub>2</sub> , CDA gas, 70-150 psi	Not Included
Spray Control	Foot switch	
Maximum Environmental operating temperature	80° F	
Workspace (spray generator)	12.5" W x 10" D x 5.5" H	
Fluid filtration	0.5 micron (standard)	
Particle capillary	Size 20 (fine) installed (0.02")	

### Gas connections:

CO <sub>2</sub> connection	Country	Connector type	Connector description	
	USA/Canada	CGA 320	0.825"-14 NGO	No pressure regulator used
	UK	BS341-No 8	W 0.860" x 14 TPI	
	Germany	DIN-477-No 6	W 21.8 X 1/14"	
	Italy	UNI 4406	W 21.7 X 1/14"	
	Netherlands	RU 1	W 21.8 X 1/14"	
Propellant gas/ nitrogen	USA/Canada	CGA 580	0.965"-14 NGO INT	Pressure regulator supplied
	UK	BS 341-No3	G 5/8" INT	
	Germany	DIN 477-No10	W 24.32 x 1/14" RH	
	Italy	UNI 4409	W 21.7 X 1/14"	
	Netherlands	RU 3	W 24.32 X 1/14"	

### Typical gas cylinder specifications

	CO <sub>2</sub> cylinder (liquid/dip tube)	Nitrogen cylinder
Cylinder type	K	T
Gas purity	99.99%	99.99-99.999
Total weight	88 kg	75 kg
Liquid gas content	27.2 kg	8.4 m3
Pressure	830 psig/57.2 bar	2640 psig/183 bar
Dimensions approx. height, OD	150 cm x 23 cm	145 cm x 21 cm
Gas suppliers	Linde, Praxair, others	Linde, Praxair, others

Note: Gas connections:

1. For other countries please enquire
2. Gas Connection Source:

[http://hiq.linde-gas.com/international/web/lg/spg/like35lgspg.nsf/docbyalias/tool\\_sg\\_cylinder\\_outlet#a5](http://hiq.linde-gas.com/international/web/lg/spg/like35lgspg.nsf/docbyalias/tool_sg_cylinder_outlet#a5)

### Gas consumption and cost of the cleaning

In the table below typical gas consumption is specified for the OZPEN. The cost of cleaning depends very much of the initial cleanliness of the component that needs to be cleaned.

You can use the CO<sub>2</sub> cleaning method only. It depends on the type of the part that you wish to clean.

For fiber optic components we typically use some other pre-cleaning method, either solvent wiping or ultrasonic cleaning, before we use the CO<sub>2</sub> method.

With a little experimenting you can determine which approach works best for a specific application.

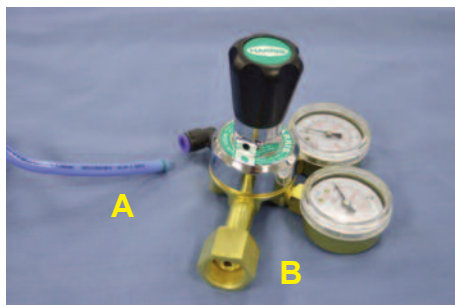
Property	Value	Comment
CO <sub>2</sub> (liquid) usage	2.5-3.5 kg/hour	
N <sub>2</sub> usage	10-15 SCFM	Typically 4 T size cylinders per one CO <sub>2</sub> cylinder

The cost of the cleaning depends mainly on gas cost and how long one cleans each part.

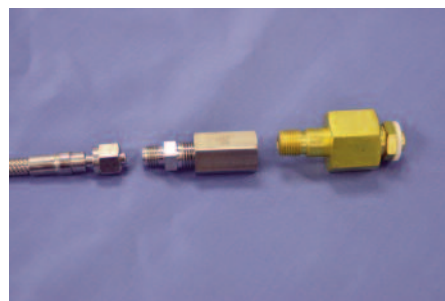
Typically CO<sub>2</sub> and N<sub>2</sub> cost approximately \$100 and \$50 per cylinder respectively. If a clean supply of compressed air is used as the propellant gas instead of nitrogen then the cost is substantially lower.

Cleaning per piece can typically cost approximately from \$0.07 - \$0.35 per piece. This is only a guideline, and the cost will vary based on parts being cleaned.

### OZPEN connection and typical setup.



Propellant gas line connection.  
A: Nitrogen supply  
B: European DIN connection.



CO<sub>2</sub> Liquid connection to cylinder DIN 8 standard connection



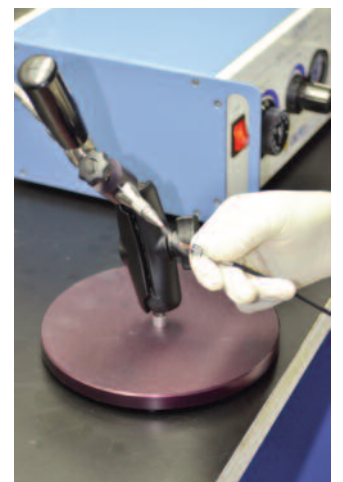
CO<sub>2</sub> & N<sub>2</sub> Cylinders, typical gas supply (USA) connection shown.



Back of the unit connections  
A: CO<sub>2</sub> connection (use 9/16" wrench).  
B: Foot pedal connection.  
C: Power connection.  
D: Propellant gas, Nitrogen.



OZPEN cleaning high power patchcord.



Fiber optic connector cleaning - close up.