



# Material compatibility

Chlorine dioxide gas

# Chlorine Dioxide Gas Material Safety

## Our Generation Method

Not all chlorine dioxides are equal. Our CD Gas generators produce a pure chlorine dioxide gas, without the acidic byproducts typical of other chlorine dioxide products.

## Oxidation Potential

The oxidation potential is a scientific value to how corrosive a chemical is. The oxidation potential for chlorine dioxide is 47% lower than the oxidation potential of hydrogen peroxide.

## Low Temperature Sterilization

Our Chlorine Dioxide Gas is generated and introduced at room temperatures, meaning there is no concern over temperature sensitive materials or components being affected.

## Dry Sterilization

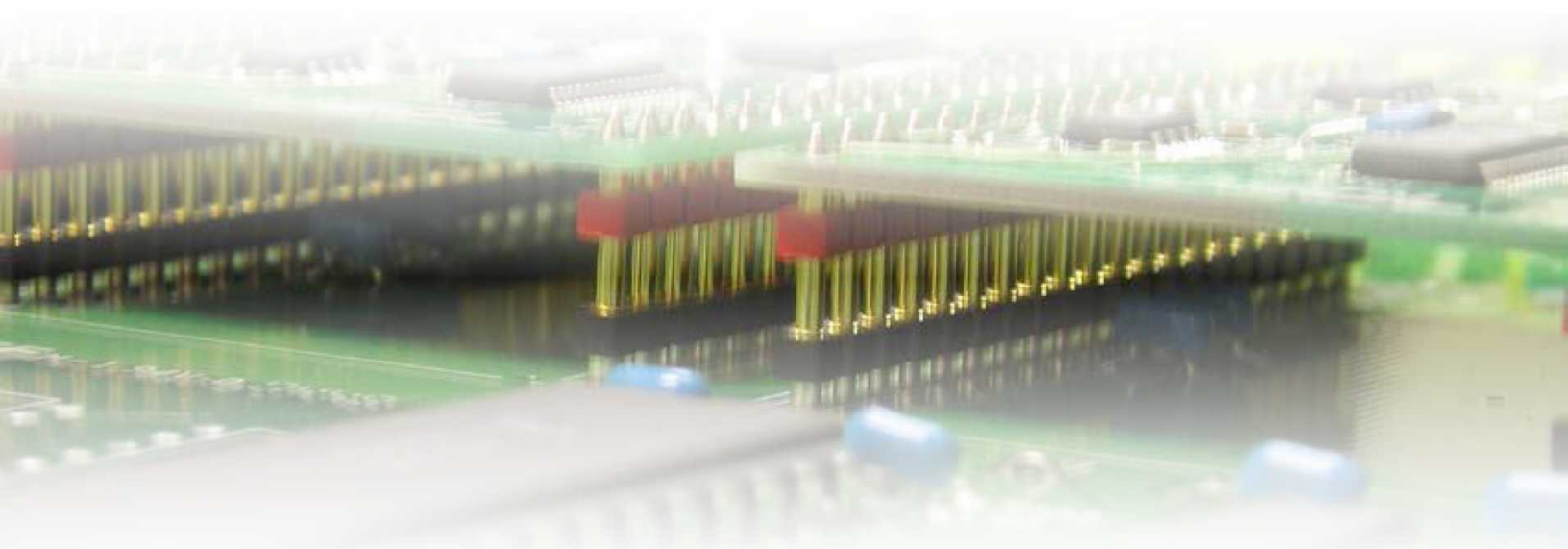
Our Chlorine Dioxide Gas is generated and introduced as a dry gas, meaning there is no concern over liquid sensitive materials or components being affected.

## Chlorine Dioxide Gas does not form hydrochloric acid in water

Chlorine dioxide gas does not react with water,

## Chlorine Dioxide Gas does not leave residues


Our CD Gas does not leave a residue on equipment and surfaces after a decontamination. Once the gas has been removed, the space is perfectly safe to enter and does not require additional cleanup.



# Oxidation Potential

## A Scientific Measure of Corrosivity

Oxidation potential is a chemical property that measures the chemical's tendency to oxidize. This can also be thought of as the corrosion potential. The higher the value, the greater stronger the chemical's oxidizing (or corrosion) power. The graph below shows common sterilants and their oxidation potential.

Decontaminating Agent	Oxidation / Corrosion Potential (V)	
Ozone	2.07	
Peracetic Acid	1.81	
Hydrogen Peroxide	1.78	
Bleach	1.49	
Chlorine Dioxide	0.95	

Chlorine dioxide is scientifically less corrosive than hydrogen peroxide

47% lower oxidation potential than hydrogen peroxide

## Mythbusting

### Corrosion of stainless steel

Chlorine dioxide gas is completely safe on stainless steel, unlike some widely used liquid chlorine dioxide solutions, whose acidic byproducts are corrosive against stainless steel.

### Chlorine dioxide is explosive

Not at use concentrations. Chlorine dioxide gas is potentially explosive at extremely high concentrations in a dry environment with an ignition source. ClorDiSys does not generate chlorine dioxide gas at these high concentrations, so there is no danger of explosion when using our process. The use concentration is 250 times less than the potentially explosive level.

### Chlorine dioxide leaves residues

Our pure CD gas does not leave a residue. Other chlorine dioxide products may leave residues. One of the first commercial uses of our CD gas was to sterilize implantable contact lenses. As such, it was proven that no residue was left after sterilization.



# Electron Microscopes

In 2009, we were approached by JEOL USA as they set forth to find a suitable decontamination method for their electron microscopes. They wanted a method to decontaminate the interior chambers of their microscopes to protect their service workers from the pathogens being studied within the microscopes. Identical sets of parts were sent for material testing against chlorine dioxide and hydrogen peroxide vapor. Our chlorine dioxide gas was selected due to its success in the material compatibility trials and is used with the \$3 million TEM.

"Our early attempts to use VHP with JEOL microscopes were not successful because of unacceptable level of corrosion of some parts inside the microscope column. Various parts were tested in a chamber filled with VHP and some showed visible discoloration and corrosion after the level of exposure necessary for a single decontamination cycle."

## Construction and Organization of a BSL-3 Cryo-Electron Microscopy Laboratory at UTMB

Authors: Michael B. Sherman, et. al.  
Journal of Structural Biology, Dec 2012



## Galvanized Ductwork

Hydrogen peroxide vapor has been shown to be incompatible with galvanized ductwork as the galvanization breaks down the hydrogen peroxide. Our chlorine dioxide gas has no such issue with galvanized metals.

"Tests with VHP in a medium-scale HVAC system indicated that galvanized steel reduced the hydrogen peroxide concentration, whereas PVC had less of an effect."

### Use of HVAC Systems in Building Decontamination.

Presentation by Tina Carlsen. for "Workshop on Decontamination, Cleanup, and Associated Issues for Sites Contaminated with Chemical, Biological, or Radiological Materials." February 24, 2005.

## Isolators

"A few of the unpainted mild steel components in the heat sealer suffered some oxidation... the cold rolled steel shafts in the sealer have remained unaffected by exposure to chlorine dioxide except where slots and flats have been milled in them. Basically uncoated ferrous metals required paint or another coating; Once we discovered what was going on, the affected parts were changed to more compatible materials (stainless steel and some plastics), or coated."

### Isolators Selection, Design, Decontamination, and Validation

Nick Barbu and Robert Zwick Aseptic Supplement to Pharmaceutical Engineering, August 2014

The isolator on the right has since undergone over 1000 CD gas decons with no material degradation.

