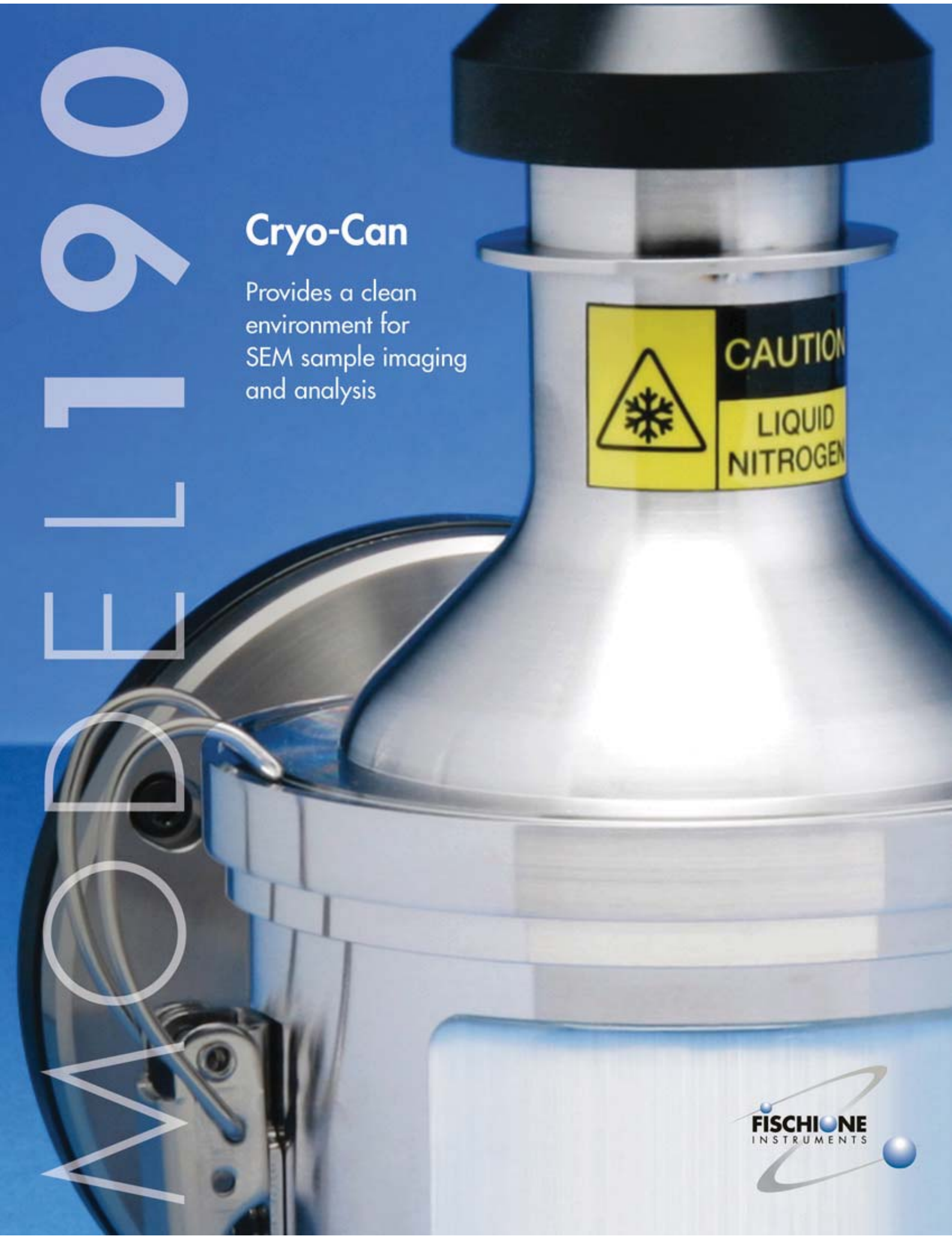
MODEL 1900

Cryo-Can

Provides a clean environment for SEM sample imaging and analysis



FISCHIONE INSTRUMENTS

MODEL **190**

Cryo-Can

Eliminates sample contamination during scanning electron microscope (SEM) operation.

- **Simple, economical, and reliable technique to remove organic contamination from the SEM**
- **The SEM can be used while the Cryo-Can is cooled, even on SEMs without airlocks**
- **Contaminants condense onto a removable, cold surface that can be regenerated and reused**
- **No separate vacuum or electrical interface required**
- **Noticeably improves resolution by reducing water vapor and hydrocarbons**
- **No internal cryo blade that restricts sample movement**

CLEAN ENVIRONMENT FOR SEM

The Model 190 Cryo-Can provides a clean environment for scanning electron microscopy (SEM) sample imaging and analysis. It helps eliminate chamber contamination resulting from sample outgassing and other sources. This contamination is polymerized (cracked) by the electron beam and is usually evidenced by the contamination beam marks that form on the sample surface. This surface contamination can compromise both image quality and the accuracy of analytical data.

Reduce contamination in SEM

The Model 190 Cryo-Can is used to reduce contamination in a SEM vacuum system and chamber. An outer container surrounds its inner nitrogen vessel. The volume between these two components is evacuated by the microscope's vacuum system.

Once evacuated, liquid nitrogen is introduced into the nitrogen vessel. The cold, outer surface of the nitrogen vessel traps contamination from the SEM chamber. The nitrogen vessel is easily removed and replaced with a sealing vacuum vessel lid. The SEM chamber can be subsequently evacuated, allowing imaging and analysis to occur with a significantly-reduced contamination level. Contamination is driven off the nitrogen vessel by either a heat gun or an infrared lamp.

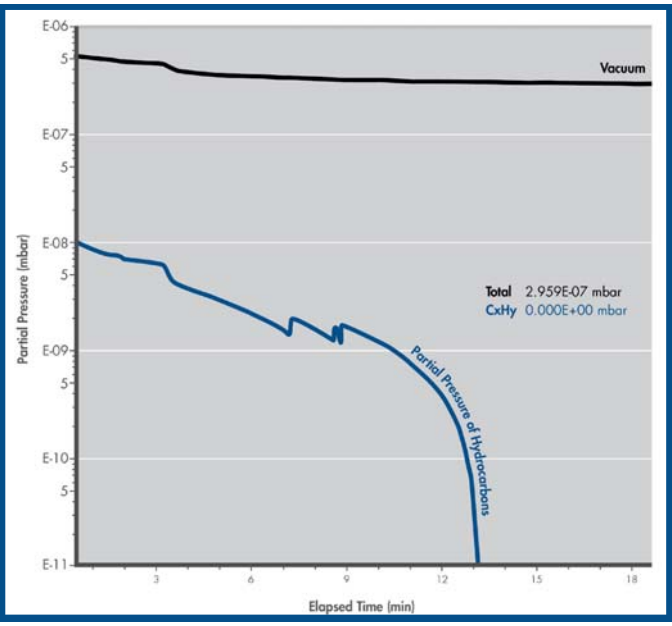
The Cryo-Can can work either before or while the SEM is in operation, maximizing data collection. Activating the Cryo-Can improves both imaging and analytical data quality.

- Ideal for high beam current applications including field emission scanning electron microscopy (FESEM), energy dispersive X-ray spectroscopy (EDS), wavelength dispersive spectroscopy (WDS), and electron backscattered diffraction (EBSD).
- Ideal for highly contaminated samples.
- Cold removal of the liquid nitrogen vessel physically eliminates contamination from the SEM.
- Contamination-free SEM examination when the sample is cleaned with the Fischione Model 1020 Plasma Cleaner.
- Noticeably improves resolution by reducing water vapor and hydrocarbons.
- Uses no internal cryo blade that restricts sample movement.

Uses SEM vacuum system

The Cryo-Can vacuum container is readily connected to one of the SEM chamber ports and does not need an independent vacuum system.

A removable liquid nitrogen vessel within the vacuum container is secured by two locking clips for fast and easy installation and removal. The space between these two components is pumped by SEM vacuum.



Mass spectrum showing the effect of the Model 190 Cryo-Can on the partial pressure of hydrocarbons (blue line). Cooling down the Cryo-Can for less than 15 minutes dramatically decreases hydrocarbons to below the detectable level. The SEM chamber vacuum is also improved (black line).

Data courtesy of Ingo Gestmann, FEI Company, The Netherlands.

Once the SEM chamber and Cryo-Can are evacuated, liquid nitrogen is introduced into the vessel of the Cryo-Can. The cold surface of the vessel traps contaminants outside the SEM chamber. As a result, SEM vacuum rapidly improves and sample contamination is reduced.

Sample exchange during use

Sample exchange can be made while the Cryo-Can is in operation by using a dry nitrogen gas backfill during venting. This eliminates ice from forming on the cold vessel surface.

Removing condensed contamination

The liquid nitrogen vessel is typically removed after 30 minutes to 5 hours of operation. The time depends on the level of SEM chamber contamination. To remove the liquid nitrogen vessel, the SEM chamber is first vented with dry nitrogen gas and then the two clips are unlocked. Removing the vessel while it is cold eliminates the condensed contamination from the SEM.

Placing a lid on the vacuum container seals the SEM chamber when the Cryo-Can is not in use. When the SEM vacuum system is activated, the Cryo-Can is evacuated along with the SEM chamber. The SEM vacuum remains clean and further sample contamination is reduced.

The SEM can be operated continuously with either the liquid nitrogen vessel or the lid installed.

Removing contaminants from the vessel

Once the liquid nitrogen vessel is emptied of residual liquid nitrogen and is placed onto the stand, both the vessel and the stand can be baked in an oven or by an infrared lamp. Baking regenerates the surface of the liquid nitrogen vessel, allowing it to be replaced in the vacuum container and reused without reintroducing contamination into the SEM.

Maintenance-free operation

Other than maintaining the integrity and cleanliness of the O-ring seals, no maintenance of the Cryo-Can is required.

Cryo-Can connected to the SEM chamber port

Vacuum-sealed Cryo-Can without liquid nitrogen vessel

Liquid nitrogen vessel and support stand

PLASMA CLEANING

For optimal SEM performance, Fischione highly recommends that you plasma clean the sample and holder with the Fischione Model 1020 Plasma Cleaner. During imaging and analysis, organic contamination may build up on the sample. A cleaning time of 10 seconds to 2 minutes in the plasma cleaner removes the contamination without altering the sample's structure or composition. Longer cleaning times can remove contamination spots caused by previous SEM viewing of non-plasma cleaned samples.

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