

Sealed and Pressurized Cameras

What is a sealed and pressurized camera?

The idea of pressurizing and sealing camera enclosures comes from the need to protect sensitive optics and electronics while providing the clearest image possible under a wide range of environmental conditions. This paper explores the industry protection standards and the unique solution that CohuHD™ provides for protection of camera optics and electronics.

What are the standards for protection from environmental contaminants?

Agencies such as IEC (International Electrotechnical Commission), NEMA (National Electrical Manufacturer Association), and the US Military create technical standards that are in the best interest of the industry and users. IP67 is specified by IEC and recognized internationally, while NEMA4X, NEMA6P, and MIL-E-5400T have been particularly noticeable in the US.

One of the most important specifications for the video surveillance and traffic industries is the IP67 standard. It covers only a brief portion of the environmental specification – contaminant intrusion. As defined in IEC 60529, the IP Code (Ingress Protection Rating, sometimes also interpreted as International Protection Rating) classifies and rates the degrees of protection provided against the intrusion of solid objects, accidental contact, dust, and water in mechanical casings and with electrical enclosures. The first digit designates the level of protection against dust intrusion, and the second against water intrusion.

IP67 standard states - Enclosures are totally protected against dust, and against the effect of water immersion between 15 cm and 1 m, no ingress permitted.

Why do cameras need to be pressurized and how does pressurization help?

Pressurization is an important step in assuring protection of the camera. Extreme environments, such as rain, snow, salty air, strong winds, high humidity, and dust are hard on camera hardware, and increase the likelihood of affecting inner mechanisms. Pressurization reduces the ability of foreign matter to enter the camera housing. Sealing to the IP67 standard allows for pressurizing the enclosure resulting in increased camera protection.

The process of pressurization consists of two parts: purging the unit and pressurizing it. The camera module is mounted inside a sealed enclosure. Then the enclosure is purged. The purging process removes any moist air from inside the camera enclosure and provides an internal relative humidity of five percent or less. After the humidity is removed, the enclosure is pressurized with a dry, inert gas. As long as the positive pressure relative to the surrounding atmosphere of at least 0.5 psig is maintained inside the enclosure, no contaminants such as dust or moisture will be able to enter. Gas used for pressurization should not react with any components installed inside the enclosure. Hence, an inert gas such as dry nitrogen is generally used for pressurization.

Note: Psig refers to pound-force per square inch gauge – which designates pressure relative to the local atmospheric pressure. For more information on psig, please refer to <http://www.convertunits.com/info/psig>.

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What are the advantages of having a camera sealed and pressurized?

- Reliability of performance. Sealing and pressurization ensure that electrical, mechanical, and optical components remain free from contaminants.
- Less frequent and easier maintenance. Pressurized enclosures provide much better protection for the camera and lens.
- Cost savings in the future. Sealed and pressurized enclosures generally cost more than non-pressurized housings, but the savings from reduced maintenance costs and longer camera life more than make up for the additional price.
- Controlled environment for optics and lens. A sealed and pressurized enclosure prevents condensation on the lens and interior of the housing faceplate.
- No interior corrosion of circuit boards, solder joints, wiring, or metal parts. With all the oxygen purged and replaced by nitrogen, the oxidation process is halted. This extends the life of the circuit boards and their components significantly.
- No lubricant contamination. Lubricant covers mechanical workings of the lens zoom, focus, and iris functions. Pressurization keeps the lubricant clean.

Which applications will benefit from using a pressurized camera?

- Industrial
- Marine
- Heavy transportation/Traffic
- Mining
- Oil/Gas
- Harsh environments
- Outdoor video security

CohuHD's solution for protection – environmental sealing to the IP67 standard and pressurization with dry nitrogen

CohuHD pioneered sealed and pressurized technology and is the world leader in producing high quality camera enclosures capable of withstanding dusty environments, extreme cold and heat, humidity and rain. CohuHD positioning systems consist of sealed, pressurized camera modules mounted together with high performance pan/tilt units that are environmentally sealed from rain, dust, dirt, and other undesirable contaminants. Powder coated aluminum enclosures provide additional protection in harsh environments.



Figure 1
CohuHD 4830 camera with the enclosure removed. Notice corrosion on the outside of the rear plate. However, the optics and electronics inside are pristine.

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CohuHD camera enclosures containing optics are sealed to the IP67 standard. Furthermore, for years CohuHD cameras have been built to surpass the IP67 level. Exceeding the IP 67 standard is the key feature of CohuHD cameras that enables them to typically last 10-20 years in outdoor environments. CohuHD cameras are pressurized with dry nitrogen. A pressure sensor is installed in the enclosures. The message from the sensor is sent to the operator display and allows the pressure in the camera to be monitored remotely. In addition to pressurization, desiccant bags are installed to further ensure that no residual humidity is retained in the enclosure atmosphere. Figure 1 illustrates the reliability of the CohuHD products. The CohuHD 4830 camera was installed in a marine application for 10 years. The barrel was cut because of corrosion on the outside of the rear plate. However, the optics and electronics inside were pristine since they were protected by a housing sealed to IP67 and then pressurized with dry nitrogen.



Figure 2.
CohuHD 4830 camera. Close up

CohuHD applications

CohuHD's pressurized and sealed camera systems are used around the world. They withstand the severe cold of Alaska, the heat of the deserts in Saudi Arabia, and the humidity of Florida and Brazil. CohuHD camera systems are installed worldwide in applications ranging from freeways and ports, aircraft in-flight safety and entertainment, ships, surveillance systems for high-risk facilities, explosives detection, military targeting, border control, and hazardous material handling. Sealing and pressurization ensure reliable operation over many years in these harsh environments.

Conclusion

Businesses face a decision whether to invest in a higher quality product that will withstand extreme conditions, or go with a lower cost camera system. The wisest decision would be to choose the most effective total ownership cost solution - especially for applications in harsh environments. The important distinction that sets CohuHD enclosures apart is their long-term reliability. CohuHD enclosures are specifically designed to overcome these harsh environments. Sealing to the IP67 standard and then pressurizing with dry nitrogen makes CohuHD products insusceptible to water damage, and prevents failure of electrical, mechanical, and optical components. This typically assures 10-20 years of reliable operation in extreme environments. For more information on CohuHD products, please visit www.CohuHD.com.

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About CohuHD Costar™

[CohuHD Costar™](#) is a leading manufacturer of high-definition video surveillance camera systems designed for the performance requirements associated with critical infrastructure applications and is now part of [Costar Technologies, Inc.](#)

CohuHD Costar solutions integrate the latest high-definition video imaging and compression technologies into our ruggedized camera products. CohuHD Costar is a high-value, solutions provider for monitoring in the most critical, sensitive environments. We focus on providing the most reliable, rugged, outdoor PTZ cameras in the market.

For more than 50 years, we have manufactured in the U.S. the most reliable, rugged video cameras available.