

Harsh Environment Connector Selection

Steven Cooper, Vice President of Engineering, Switchcraft



Is it a Harsh Environment or a “Harsh Harsh” Environment?

Most connectors designed for conditions such as water spray and intermittent water submission (IP67) are considered Harsh Environment Connectors. “Harsh Harsh” environment connectors are designed for extended temperatures like -55 to +150 degrees centigrade and/or deep submersion (>5000 feet). Often people specify a connector that is rated for a higher level of protection than is required for the application, for typical applications a harsh environment connector that is properly specified will meet or exceed the application needs. Level of sealing protection, temperature ranges and environmental specifications vary from application to application and it is important to design at the level appropriate for the application.

Most harsh environment connectors today refer to some specified length of time for sealing, possibly extended temperature ranges with the addition of UV (ultra-violet) resistance for plastic. The following are typical environmental concerns:

- Dust proof
- Moisture and Spray resistant
- Water submersion and depth
- Temperature Range
- Fluids
- Gas environments
- Pressure
- Shielding
- UV
- Radiation
- Extended Life

Harsh Environment Connector Selection

Published on Electronic Component News (<http://www.ecnmag.com>)



Figure 1. A sealed DC Power Jack typically used on portable equipment may be exposed to the elements. Typically 12 volts DC at 5 amps sealed to IP67, IP68 and NEMA 250 6P. The cap seals the jack when not mated.

Choosing the correct combination of protective features for a harsh environment connector requires careful examination of the application that the connector is being designed into. The typical sealed connector is rated for IP67 and has a temperature range of -40 to +85 degrees centigrade. Industry standards are influencing the ratings of many plastic connectors pushing them to achieve a rating of IP68 (NEMA 250 6P) for sealing, with a temperature range of -40 to +105 degrees centigrade. Additionally requirements for UV inhibitors in the plastic components and extended life requirements are becoming normal. Connectors are being used on roof-tops and buried in the ground. They are exposed to temperature cycles for many years with the typical goal of 20 years of service life.

These conditions require selecting the right plastic materials which provide the connector with a combination of strength and flexibility. Depending on the connector design, the plastic materials are typically glass filled for strength or no glass (neat) because of needed flexibility for cable clamp fingers or coupling rings. In addition the plastic materials need to be impervious to moisture pick-up in order to diminish the reduction in insulation resistance caused by moisture ingress in plastics. Plastics exposed to sunlight usually need to have UV inhibitors to reduce the plastic degradation over time. The plastic material is typically degraded by the destruction of polymer bonds, which can result in brittleness and cracking.

Once the housing materials are selected the design continues with the selection of the elastomer materials for sealing. They are reviewed for temperature and set characteristics of the elastomer. The design continues, adding features which allow proper functioning in the connector assembly including the proper amount of elastomer squeeze on sealing interfaces.

Harsh Environment Connector Selection

Published on Electronic Component News (<http://www.ecnmag.com>)

The design is analyzed with FEA (finite element analysis) to help validate the design and prototypes may be made for further validation or for customer feedback. Then MOLDFLOW (or other tooling creation analysis tool) is utilized to ensure feasibility and optimization of the design in the tooling creation process. Once we have all these items addressed we will tool the product. After the pilot run we will do validation testing and finally release the product after successful completion of the testing.

There are many types of harsh environment connectors ranging from plastic to metal, round and rectangular, single through multiple conductors, and covering a variety of special environments. Making a selection that meets the application requirements is important when comparing connector options. If you do not find what you are looking for please contact the connector source for possible modification as they may have additional options to meet your needs.

Source URL (retrieved on 04/20/2015 - 11:36pm):

http://www.ecnmag.com/articles/2011/11/harsh-environment-connector-selection?qt-recent_content=0