Understanding IPX9 & IPX9K Testing

Ingress Protection Testing

General:

IPX9 and IPX9K testing are the highest ingress protection water ratings currently available in the IP Code family. This testing originated with the IPX9K added to the DIN standard for road vehicle parts and transportation equipment. Eventually many years later, IEC60529 was revised to add a similar IPX9 rating.

Standards:

The applicable standards for these tests are:

- **IPX9K:** DIN 40050-9 - *Road Vehicles; Degrees of Protection (IP Code); Protection against foreign objects, water and access electrical equipment*
- **IPX9:** IEC60529 - *Degrees of protection provided by enclosures (IP Code)*

Differences between Ratings:

Although the descriptions are not identical, the test equipment and testing method are very similar – the only difference being the calibration methods.

- **IPX9K:** protection against “high pressure/steam jet cleaning”
- **IPX9:** protection against “high pressure and temperature water jets”

Test Configuration:

IPX9 & IPX9K both require a blast of high pressure water, similar to that of a commercial pressure washer, which has been heated to a temperature of 80°C (176° F). The product is then rotated on a turntable at a speed of 5 RPM, as fan jets are focused at 4 positions (0°, 30°, 60°, 90°). In sequence, each fan blasts the product being tested with the heated, high pressure water for 30 seconds per position. Upon completion of all spray angles, the product must meet the acceptance criteria specified in the end-product standards.

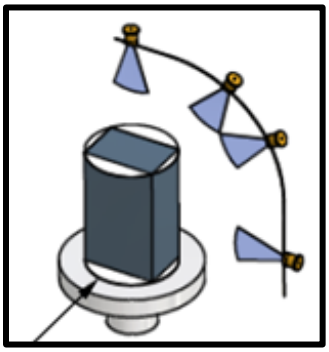

Figure 12 of IEC 60529

With the sample on a rotating turntable, each fan jets water for 30 seconds, for a combined test cycle of 2 minutes

Designing for Test Success:

IPX9 & IPX9K testing is extremely harsh. Rubber and plastic parts frequently melt and deform during testing. Selection of material type and retention of shape under load are extremely critical when it comes to designing the equipment enclosure, seals, and exposed components. At temperatures of almost 180° F and pressures of up to 1450 PSI, the product is subjected to a tremendous amount of stress for those two minutes.

Other IP Ratings:

While IPX9 & IPX9K are the highest water rating IP codes that can be achieved, please note that the rating does not correlate to an IPX7 or IPX8 immersion value. In other words, if you pass IPX9/IPX9K you do not automatically meet IPX7 or IPX8. You must still perform immersion tests.

Other IP Ratings:

This is not a test that should be taken casually. Serious design consideration must be made when seeking an IPX9 or IPX9K rating.