PRODUCT BULLETIN

Garlock

Fire Safe Gasketing

Fire safety is a common requirement for gaskets used in various systems and operating conditions. While the most common fluids requiring fire safe gaskets are flammable liquids, such as gasoline, diesel fuel, and kerosene, amongst others associated with hydrocarbon processing, there are many more industries and applications with similar stipulations. For instance, flammable liquids such as alcohols found in food and pharmaceutical manufacturing, may also require fire safe gaskets that are safe for food contact. Occasionally, systems will contain strong chemicals (such as acids or caustics) that are not flammable, but fire safe gaskets are needed as a safety precaution. Let's not forget one of the most important systems where the fluid is not hazardous or flammable yet keeping the fluid in the pipe is critical; water lines used for fire protection and sprinkler systems. If a fire breaks out in a building with multiple floors, it's crucial that the gaskets in the entire system remain intact and keep water moving to where it is needed to put out the fire!

What qualifications does a gasket need to be considered "fire safe"?

The answer can vary depending on the customer. In the industrial sector, the test methods recognized as the gold standard for fire testing are typically published by the American Petroleum Institute (API). Historically the API 589 and API 607 were used to qualify both compression packing for valves, as well as gaskets for the flange connections. It's worth noting that the API 589 was developed specifically for qualifying valve stem packing, and the API 607 was developed specifically for qualifying soft-seated quarter turn valves. However, both were used for testing and qualifying gaskets as there was no gasket-specific procedure available at the time. Eventually, the decision was made to develop a standard around the flanged connection, or "end connection" as it is referred to in the API 6FB, which is recognized as the gasket fire test method today.

Does that mean that API 589 and API 607 tests previously run are no longer valid?

Absolutely not. The API 6FB is very similar to the other API valve tests, except flanged spools are used instead of valves. The test temperatures, burn times, and pressures are all very similar, which makes sense. Why would the API organization develop a test for flange connections that was not as stringent as the test for the valves that have flange connections?

Let's take a closer look at the API 6FB fire test. Typically, ASME 6"-300# raised face flanges are used, and it is run at a pressure of 555 psig or 38 bar (75% of the flange rating per the test method). The burn and cool down duration for the test is 60 minutes. When started, the flange connection must be completely enveloped in flames (to simulate what would happen if a fire really did occur near the flange connection). Thermocouples in calorimeter blocks placed around the flange assembly are used to ensure that a temperature of at least 1200°F (649°C) is reached within 15 minutes of the fire being started. A minimum average temperature of 1200°F (649°C) with no reading less than 1050°F (566°C) must be maintained for the remainder of the burn portion of the test. Leakage is measured throughout, and if it exceeds 23.8 ml/min (calculated allowable leakage from a 6"-300# flange connection) the test is terminated and considered a failure.

Who performs fire testing?

Typically, these tests are performed by independent laboratories that are set up with special facilities and equipment designed to achieve the required conditions safely. This provides an added bonus as most customers prefer 3rd party test results, eliminating any possible bias. Garlock offers many products that we consider to be "fire safe" based on actual testing. While many reports are based on the historic API 589 and API 607 methods, testing performed since the early 2000s has been run at a third-party independent lab following the API 6FB method.

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Are all claims of products being "fire safe" valid?

In recent years we began hearing troubling talk of competitors claiming their PTFE sheet products are "fire safe". We have always refuted these claims since it's not physically possible for PTFE, which melts at 621°F (327°C), to survive for 30 minutes at 1200°F (649°C). Making such a claim can be considered irresponsible, misleading, and potentially dangerous.

Recently Garlock made the decision to evaluate one of these claims. A well-known independent third-party test laboratory was hired by Garlock to perform the API 6FB fire test on a competitor's silicon carbide-filled PTFE that is advertised as being "fire safe". The results showed that the product not only failed the test, but it failed catastrophically. The PTFE product could not make it past the 20-minute mark due to gross leakage. Below are images from the test report:

Competitor's gasket prior to test

Flange assembly prior to test

Flange assembly during test

Test terminated due to gross leakage

Competitor's gasket post test
(NOTE: portions of the gasket were stuck to the other flange face as well)

How did the competitor get this PTFE product to "pass"?

Past reports have shown that some competitors have modified test methods and/or equipment to make the product pass. The result is a claim that can give customers a false sense of security and may result in catastrophic damage if a fire occurs near flange connections with these materials.

Conclusion:

A gasket must be constructed mainly of materials designed to survive exposure to fire to pass an API fire test. Polymers, such as PTFE, are unable to survive these conditions.

Garlock offers a complete line of products suitable for various service conditions, such as the new **CMG XC**, that have successfully passed an **API fire test**. Below is a quick reference chart that provides a broad service list and possible sealing solutions.

To discuss your service further, please contact the Applications Engineering team at 800-448-6688, 315-597-7350, or email the team at GasketApps@Garlock.com.

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		Aliphatic Hydrocarbons (Fuels, Petroleum oil)	Aromatic Hydrocarbons (Toluene, Benzene, Xylene)	Strong Acids	Strong Caustics	Food & Pharmaceutical	Fire Protection Water
Compressed Fiber Gasketing	**Style 5500** Inorganic Fiber	•					•
	Style 9900 Graphite Fiber	•					•
Corrugated Metal Gaskets	**GRAPHONIC®** Graphite Facing	•	•				•
	CMG XC THERMa-PUR® & GYLON® 3545 Facing	•	•	•	•	•	•
	G.E.T.™ Graphite & ePTFE Facing	•	•	•	•		•
Spiral Wound Gaskets	**FLEXSEAL® RW/RWI** Graphite Filler	•	•				•
	FLEXSEAL® XC (INPHERNO™) Graphite & ePTFE Fillers	•	•	•	•	•	•
	FLEXSEAL® XC-2 (TANDEM™) Graphite Filler with ePTFE Envelope	•	•	•	•	•	•
Kammprofile Metal Gaskets	**Kammprofile** Graphite Facing	•	•				•
	KAMM XC *(TAN-KAMM™)* Graphite & ePTFE Facing	•	•	•	•	•	•

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