



Subject: Champion Aerospace Vs Tempest Filter Comparison

<u>Part Numbers:</u> Champion:	CH48108-1
	CH48109-1
	CH48110-1
Tempest:	AA48108-2
	AA48109
	AA48110-2

Purpose: To provide a comparison of Champion vs. Tempest filter performance under laboratory test conditions.

Champion Claim: Champion Aerospace provides a more robust filter with lower overall cost of ownership and improved performance over the competitive filter design. From the engine perspective, the use of one of Champion’s filter will provide:

- Improved filtration efficiencies at both 25 and 40 micron contaminant sizes
- Secondary filtration magnets are not necessary and do more harm than good
- Improved burst pressure resistance

Background: Champion Aerospace has long been recognized as the industry leader in spin-on oil filters for reciprocating aircraft engines. We introduced our first oil filter in 1974 and have continued to lead the industry ever since. In October 2002, we introduced improved filters (CH48103-1, CH48104-1, CH48108-1, CH48109-1, CH48110-1, CH48111-1 and CH48114-1) that overcame filtration limitations of our previous design and provided a more pressure resistant product.

Society of Automotive Engineering Aerospace Recommend Practice (ARP) 1400B is considered the “gold standard” for piston aircraft oil filtration. Champion’s current product is the only product on the market that meets these requirements in full. The following sections provide laboratory test results of the two competing products.

Filtration Efficiency: One Champion Aerospace Spin-on Lube Oil Filter, P/N CH48109-1, and one Tempest Spin-on Lube Oil Filter, P/N AA48109, were Multi-pass tested as specified in ARP1400. A summary of the Multi-pass test results are shown below in Table 1. The Tempest AA48109 filter does not meet the 25 micron ARP 1400 filtration requirement. It should be noted that Champion’s superior filter media has a slightly higher clean pressure drop, but this does not impact the engines lubrication system in any way. Graphical representation of the differential pressures of the two filters is shown in Figure 1.



Manufacturer	Part Number	Clean Pressure Drop (psid)	ISO Medium Test Dust Injected (grams)	Filtration Efficiency at 25µm	Filtration Efficiency at 40 µm
SAE ARP 1400 Requirement	-	N/A	20	75%	90%
Champion Aerospace	CH48109-1	1.6	35.66	91.23%	99.83%
Tempest	AA48109	1.1	46.22	69.70%	97.44%

Table 1: Champion Aerospace and Tempest Multi-pass Performance Comparison

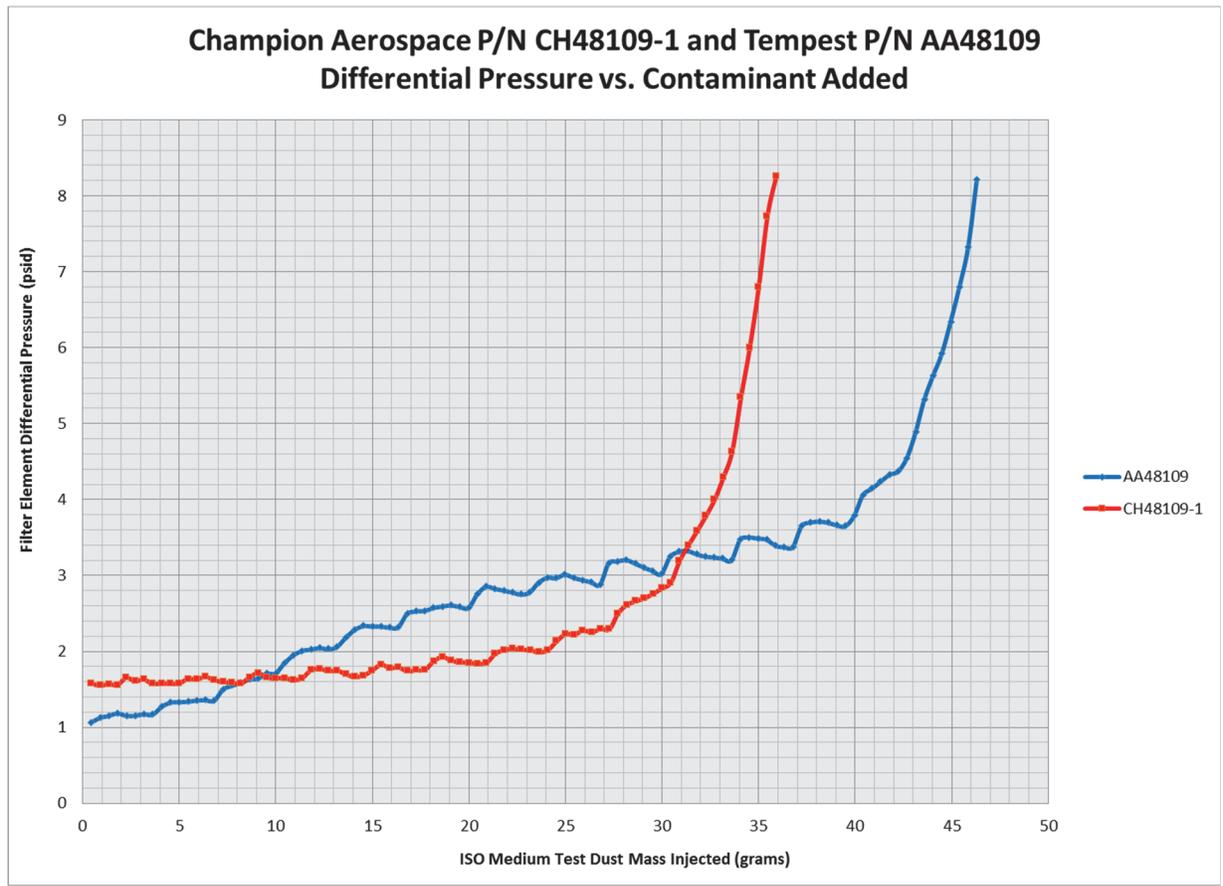


Figure 1 – Champion Aerospace and Tempest Differential Pressure vs. Contaminant Added



Magnet: Tempest advertises that it has a “magnetic secondary filtration system (that) attracts steel particles too small to be caught in the filter media”. Champion has not added a magnet over the years due to technical concerns that the magnet could also permit metal fillings being released downstream of the filter. A magnet naturally accumulates metal particles during normal, non-bypass, operation at the bypass valve entrance. Due to the physical contact of, the leaf spring, and the valve seat to the magnet, these internal components are themselves magnetized. During a cold start, the valve suddenly opens and flushes the accumulated metal particles downstream. Bypass flows produce high velocities that release metal particles loosely held to the magnetized valve seat and Leaf-spring. Magnetized metal particles conglomerate and travel downstream to vulnerable engine components, such as bearings. Champion relies on a superior filtration media to protect our customer’s engines. We have a proven history of leading the industry in oil filtration.

Burst Pressure Performance: One Champion Aerospace Spin-on Lube Oil Filter, P/N CH48108-1, and one Tempest Spin-on Lube Oil Filter, P/N AA48108-2, were burst pressure tested in accordance with ARP 1400. The outlet port of the test fixture was capped and static pressure was applied to the fixture inlet port beginning at 250 psig and increased in increments of approximately 25 psig until leakage or burst of the filter or the minimum burst pressure of 500 psig was achieved. The ARP 1400 burst pressure requirement of 500 psig was achieved on both test units and maintained for a period of two minutes without any signs of leakage, however, permanent deformation of the Tempest Spin-on Lube Oil Filter, was observed at an inlet pressure of 496 psig.

The test units were then burst tested to leakage failure. Static pressure was applied to the fixture inlet port until leakage greater than 1 drop or catastrophic failure was observed. The burst pressure test results are shown below in Table 2. It should be noted that the Tempest filter had noticeable filter deformation at the burst pressure requirement of 500 psig. The Champion filter has an approximate 25% greater burst pressure, which confirms that the Champion filter is mechanically more robust. The burst pressure traces are shown in Figure 2.

Manufacturer	Part Number	Burst Pressure Test (500 psig for 2 minutes)	Burst Pressure To Leakage Test	Burst Pressure to Leakage Failure Mode
Champion Aerospace	CH48108-1	Pass	748 psig	Shell Ruptured
Tempest	AA48108-2	Pass* <i>*Permanent deformation observed at 495.93 psig</i>	585 psig	Shell Ruptured

Table 2: Champion Aerospace P/N CH48108-1 and Tempest P/N AA48108-2 Burst Pressure Results



AEROSPACE™

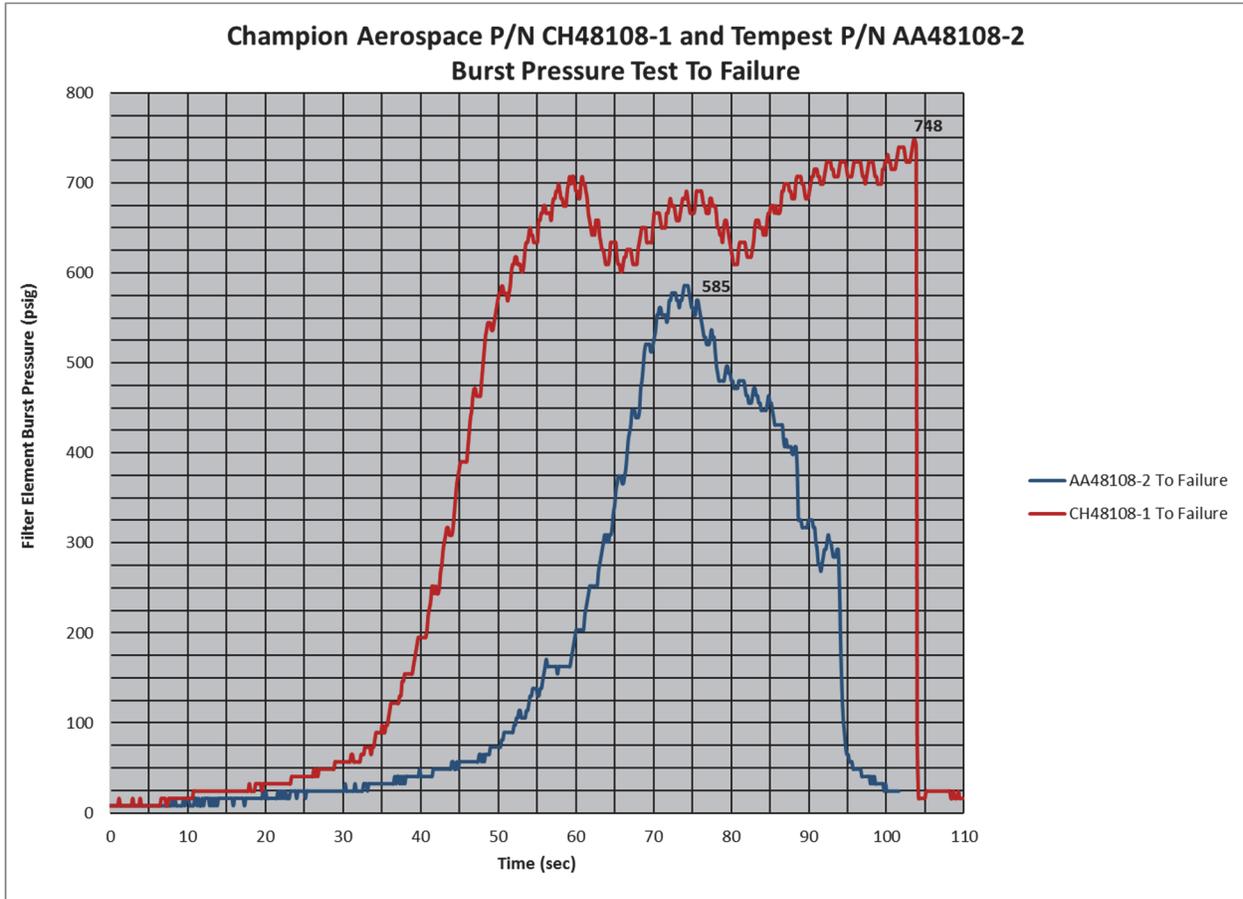


Figure 2: Champion Aerospace and Tempest Burst Pressure To Failure Trace