

HMF FlatSeal™ for Chemical Transportation



High Performance Gasket Materials

HMF FlatSeal™ best-in-class flat gaskets engineered for the toughest chemical transportation applications

In the rail car industry, flat gaskets are the primary seal between the valve and tank car interface. They prevent leakage of liquids or gases, act as a barrier to contamination and are critical for the safe and efficient transportation of hazardous materials. Each rail car requires multiple gaskets in a variety of sizes with varying hardware conditions.

Trelleborg Sealing Solutions offers effective sealing with its best-in-class HMF FlatSeal™ gaskets designed to meet all flat gasket sealing needs. Our high performance material portfolio includes compressed non-asbestos fiber, flexible graphite, and polytetrafluoroethylene (PTFE) gaskets to meet the complete range of needs for the chemical transportation industry.

- FlatSeal™ HMF17 and FlatSeal™ HMF18 represent the latest technology in fiber-based flat gaskets, combining the flexibility and tight fit of an elastomer with the robust strength and mechanical stability of a fiber material. Their excellent adaptability to unevenness at minimum surface pressure levels means they provide a consistent leak-tight fit during tank car service.

- Made from high-quality expanded graphite, FlatSeal™ HMF31 effectively seals in the most extreme operating environments to meet fugitive emissions requirements.
- Demonstrating universal chemical compatibility, PTFE-based FlatSeal™ HMF41 and FlatSeal™ HMF45 offer outstanding sealing performance to ensure safety and optimize the efficiency of chemical processing and transportation applications.



Contact your Customer Solution Center

Does your application require resistance to aggressive chemicals? Or is the operating environment of your application especially challenging? Reach out to your local Customer Solution Center for support with FlatSeal™ selection to meet your specific requirements.



www.trelleborg.com/seals/csc

Minimizes
total cost of
ownership

Maximum
sealing
performance

Quick
turnaround

High level
of safety

HMF Material Types

FLATSEAL™ HMF17

Combining tight fit and robust strength

- Innovative mix of high-quality aramid fibers, special functional fillers and Nitrile Butadiene Rubber (NBR)
- Excellent adaptability to unevenness at minimum surface pressure levels
- Suitable for use with oils, lubricants, greases, fuels, cooling agents and other media
- Recommended temperature range: -148 °F to +300 °F / -100 °C to +150 °C
- Recommended pressure up to: 1450 psi / 100 bar



FLATSEAL™ HMF18

High performance fiber gasket for outstanding leak tightness

- Blend of high-quality aramid fibers, special functional fillers and Nitrile Butadiene Rubber (NBR)
- 3x higher adaptability to flange unevenness compared to classic fiber gaskets
- Suitable for use with water, steam, oils, lubricants, hydrocarbons, greases, fuels, cooling agents, chlorine and other media
- Recommended temperature range: -148 °F to +392 °F / -100 °C to +200 °C
- Recommended pressure up to: 1,800 psi / 125 bar



FLATSEAL™ HMF31

Optimized to meet fugitive emissions requirements

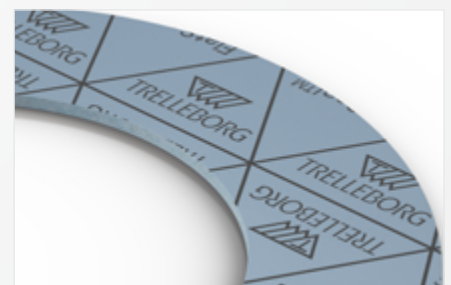
- High-purity graphite foil combined with an expanded metal layer
- Special impregnation minimizes leakage to meet fugitive emissions requirements
- Suitable for use in high-temp applications with steam, heat carrier oil, aggressive chemicals, exhaust gas and other media
- Recommended temperature range: -450 °F to +1000 °F / -267 °C to +537 °C
- Recommended pressure up to: 2,900 psi / 200 bar



FLATSEAL™ HMF41

Enhanced flexibility for stress sensitive flanges

- Innovative combination of modified PTFE and hollow glass microspheres
- Unique flexibility for ease of handling and installation
- Effective sealing performance on uneven or moderately damaged surfaces
- Near universal chemical compatibility
- Recommended temperature range: -450 °F to +527 °F / -267 °C to +275 °C
- Recommended pressure up to: 800 psi / 55 bar



FLATSEAL™ HMF45

Expanded PTFE offers unique properties

- High purity, multidirectional, expanded PTFE
- Robust material with high compression properties, which provide good adaptability to flange unevenness
- Near universal chemical compatibility
- Recommended temperature range: -450 °F to +527 °F / -267 °C to +275 °C
- Recommended pressure up to: 1,450 psi / 100 bar



Proven Performance

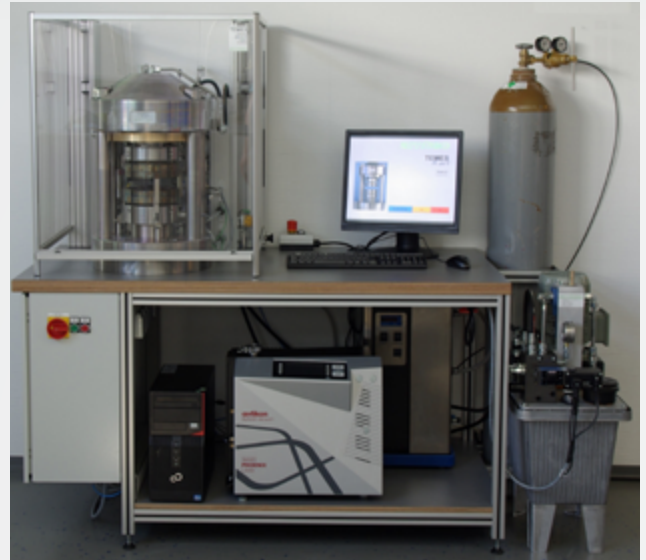
Competitive Benchmark Testing

LEAK TESTING

Performed in accordance with EN 13555, this test measures flat gasket sealing performance. Each gasket was compressed at varying surface pressures with a leak rate measured over time. HMF FlatSeal™ demonstrated outstanding sealing performance in leakage tests with comparable competitor products.

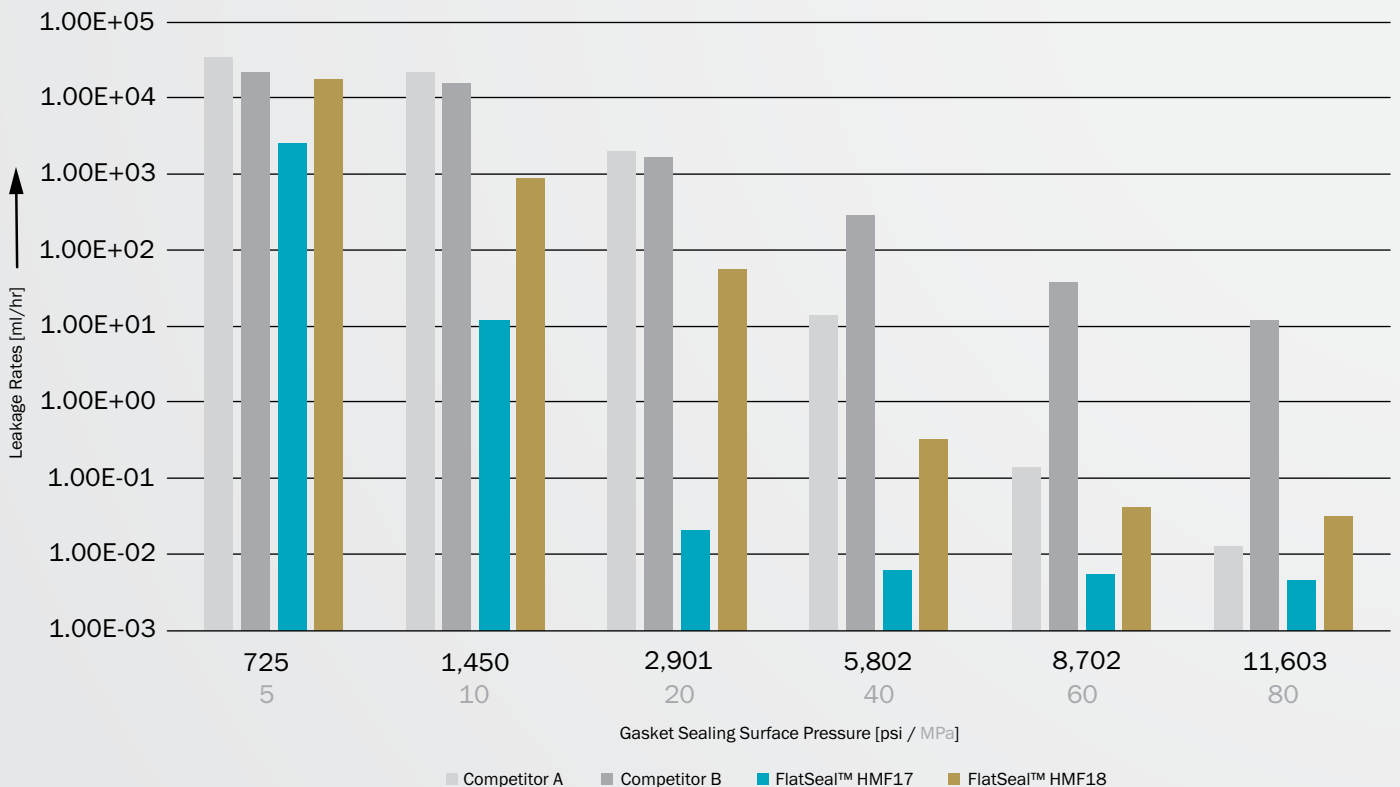
TEST PARAMETERS

- Gasket / flange size = 1.9 in x 3.5 in / 49 mm x 88 mm
- Thickness = 0.118 in / 3.0 mm (HMF), 0.125 in / 3.2 mm (Competitors)
- Media = Helium
- Internal Pressure = 580 psi / 4 MPa
- Temperature = +77 °F / +25 °C
- Surface pressure range = 725 - 11,603 psi / 5 - 80 MPa

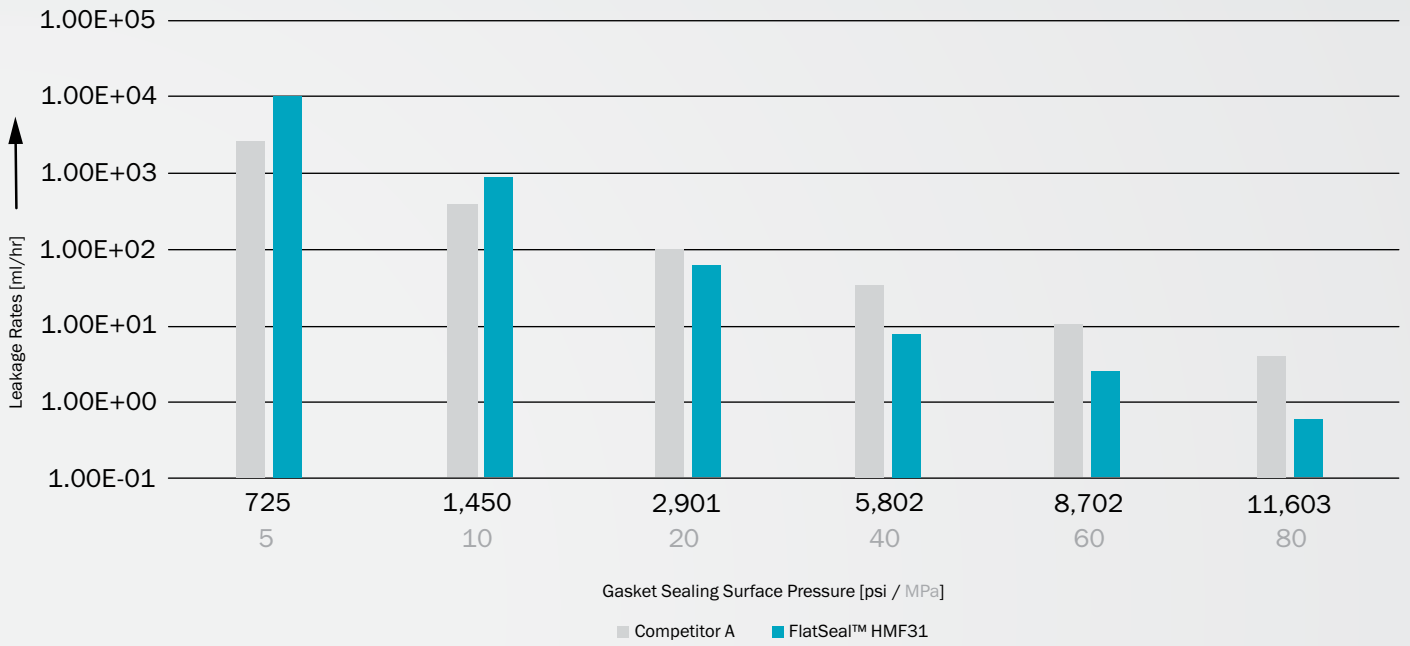


Multifunctional test rig used to perform compression, leakage and creep/relaxation testing.

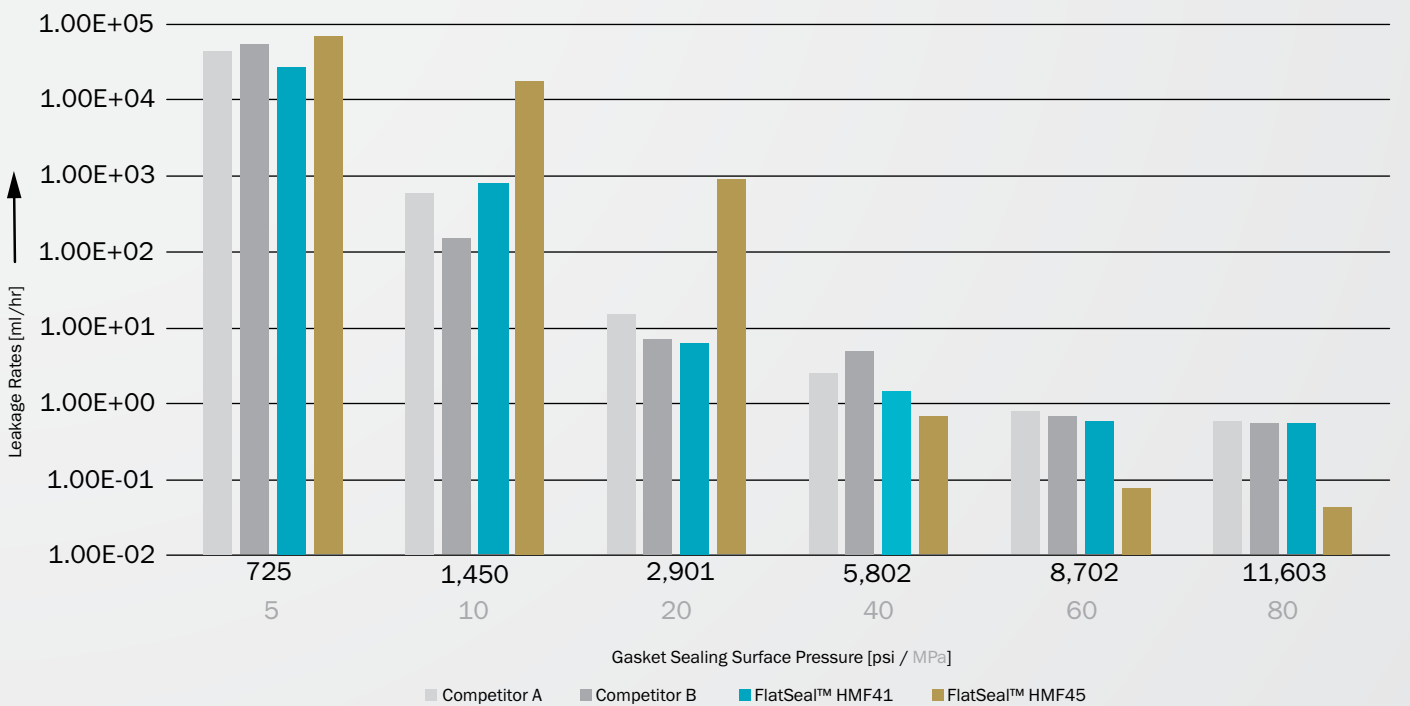
ELASTOMER-BONDED FIBER GASKETS



EXPANDED GRAPHITE GASKETS



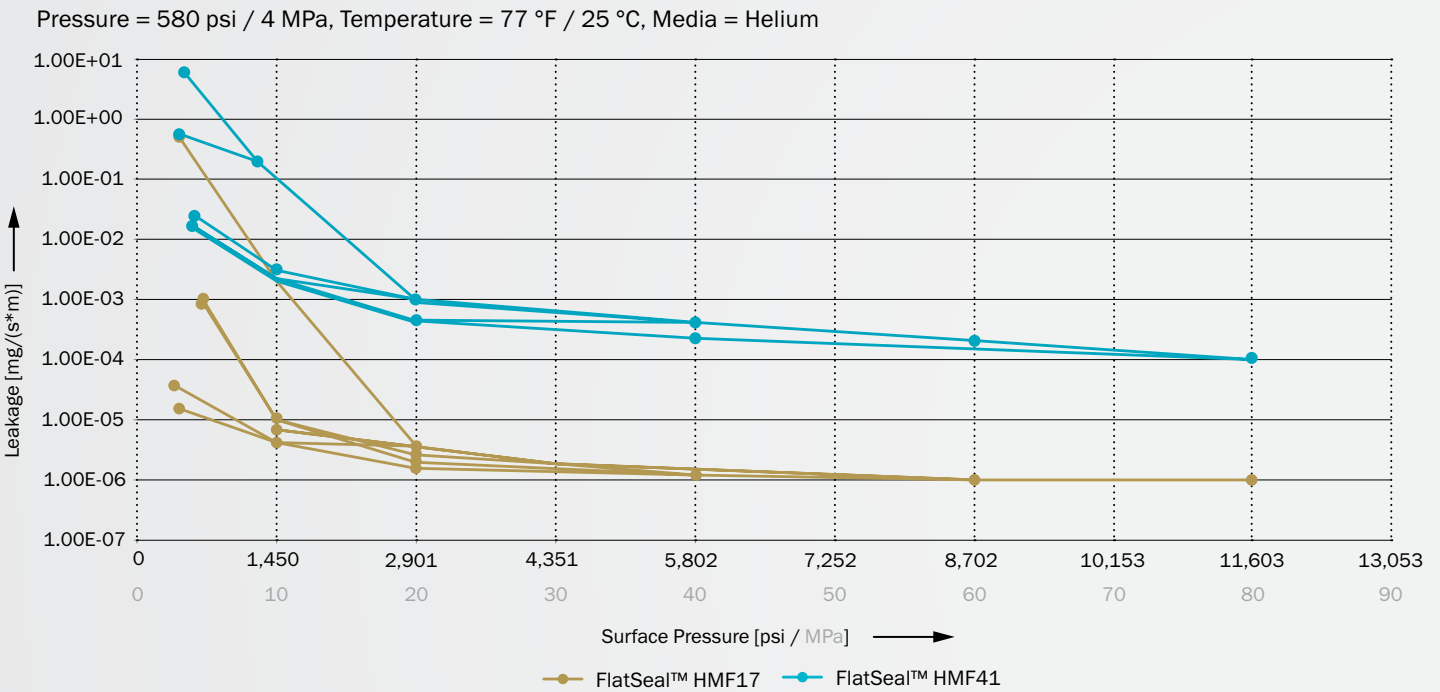
PTFE-BASED GASKETS



LOADING/UNLOADING CURVES (NO RETORQUE REQUIRED)

Repair facilities in the rail car industry are tasked with requalifying tank cars and replacing gaskets to get the car back in service as quickly and safely as possible. Some gasket materials require retorquing of the bolts after 24 hours to minimize leakage due to relaxation of the material. Test results shown in the graph below demonstrate that HMF FlatSeal™ gaskets do not require retorque after 24 hours.

In this test, pressure is placed on the gasket (loading curve) and then incrementally reduced (unloading curve) over a short period of time. According to these tests, FlatSeal™ HMF17 and FlatSeal™ HMF41 show no significant increase in leakage rate, meaning no retorque is required, which saves time for rail car maintenance teams.



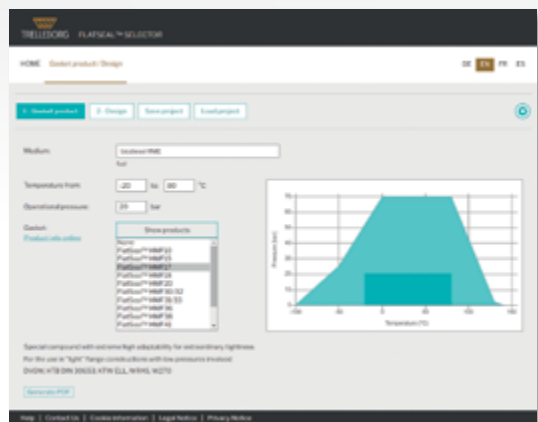
FlatSeal™ Selector

Trelleborg Sealing Solutions offers a wide variety of FlatSeal™ options in materials engineered for specific operating conditions.

Need help specifying a FlatSeal™ for your application?

The new FlatSeal™ Selector helps you select a material based on operating conditions and calculate important data for your sealing system.

www.trelleborg.com/seals/tools



RESIDUAL STRESS TESTING

Residual stress testing was completed in accordance with DIN 52913. This test is designed to simulate stress loss in materials due to relaxation over a 16 hour period at elevated temperatures. All HMF FlatSeal™ gasket materials have proven outstanding performance in these tests, demonstrating the reliability and safety of these materials.

FLUID TESTING

Fluid testing was completed in accordance with ASTM F146. This test is designed to measure the material response to two different types of media: IRM 903 and Fuel B. The gaskets were immersed in the two fluids for a period of five hours. Following this, measurements were made to determine changes in weight and thickness.

Elastomer-bonded Fiber Gaskets

Property	Standard	Unit	Competitor A	Competitor B	FlatSeal™ HMF17	FlatSeal™ HMF18
Thickness		mm	3.2	3.2	3.0	3.0
Residual stress: 50 MPa, +175 °C	DIN 52913	N/mm ²	23.1	21.7	20	24
IRM 903 (5h/+150 °C)						
Weight change	ASTM F146	%	9.8	8.0	8	6
Thickness change		%	1.2	2.6	2	2
Fuel B (5h/RT)						
Weight change	ASTM F146	%	9.0	9.7	12	7
Thickness change		%	9.0	9.7	9	6

Expanded Graphite Gaskets

Property	Standard	Unit	Competitor A	FlatSeal™ HMF31
Thickness		mm	3.2	3.0
Residual stress: 50 MPa, +300 °C	DIN 52913	N/mm ²	46.5	45
Oxidation resistance	EN 14772	%/h	≤ 4	≤ 4

PTFE-based Gaskets

Property	Standard	Unit	Competitor A	Competitor B	FlatSeal™ HMF41	FlatSeal™ HMF45
Thickness		mm	3.2	3.2	3.0	3.0
Residual stress: 30 Mpa, +150 °C	DIN 52913	N/mm ²	10.9	10.7	11.2	14.0

Trelleborg is a world leader in engineered polymer solutions that seal, damp and protect critical applications in demanding environments. Its innovative solutions accelerate performance for customers in a sustainable way.

Trelleborg Sealing Solutions is a leading developer, manufacturer and supplier of precision seals, bearings and custom-molded polymer components. It focuses on meeting the most demanding needs of aerospace, automotive and general industrial customers with innovative solutions.

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