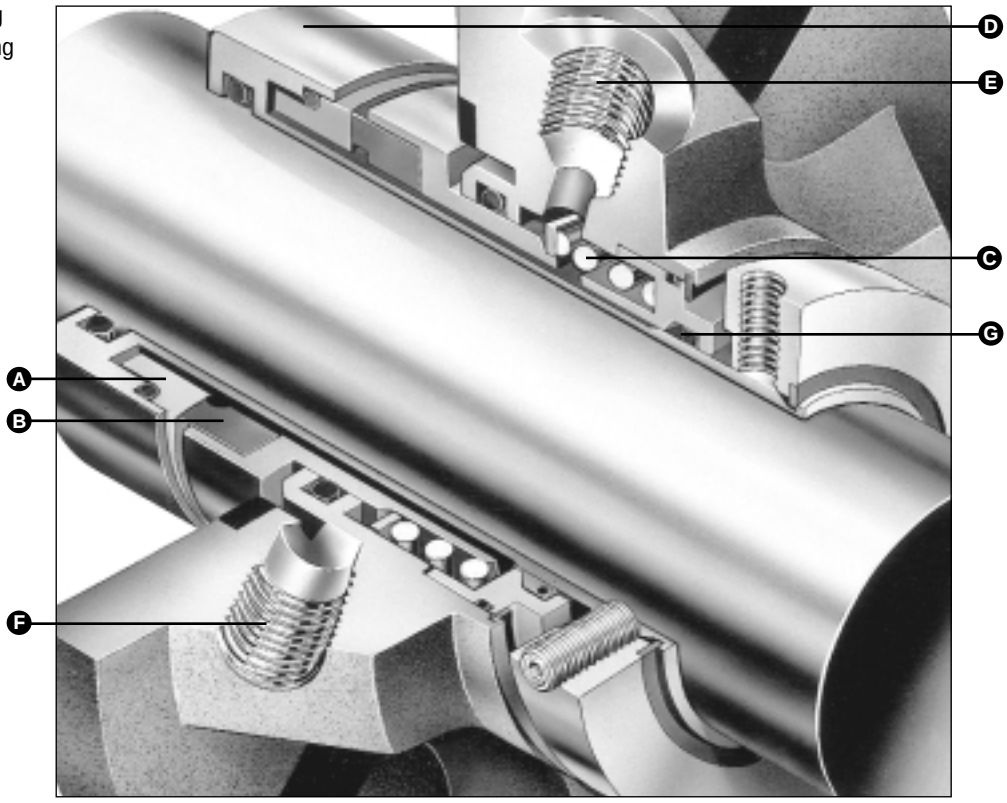
TYPE FFET

Single Cartridge O-Ring Seal

FFET

A – Seat/Mating Ring
B – Face/Primary Ring
C – Spring
D – Sleeve
E – Quench/Drain
F – Flush
G – Safety Bushing



Product Description

The FFET cartridge seal has been designed to reduce installation time and errors. The compactness of the cartridge ensures that the seal will fit all ANSI and DIN stuffing boxes and offers an ideal upgrade from packing.

- The FFET is a robust cartridge seal used for a variety of duties from chemicals to oil to water, and for many abrasive and crystallizing duties.
- The FFET is ideal for use on top-entry mixers where the liquid product may not provide continuous cooling and lubrication of the seal faces. The use of premium seal face materials ensures low heat generation and dry-running thermal stability.
- On top-entry agitators, a variation of the design is available for use on hygienic applications.

Design Features

- Heavy duty drive
- Stationary flexible unit permits high tolerance to solids.
- Stationary external spring improves tolerance to clogging.
- Indirect positive sleeve/shaft drive prevents shaft damage.
- Easy, fast, and reliable installation as a pressure-tested preset unit.
- Multifunctional gland plate.

Performance Capabilities

- Temperature:
  -40°C to 205°C/-40°F to 400°F
- Pressure:
  Dynamic: Up to 21 bar g/300 psig
  Hydrostatic: Up to 30 bar g/435 psig
- Speed:
  Up to 25 m/s/5000 fpm

Higher operating conditions are achievable.
Consult John Crane Engineering.

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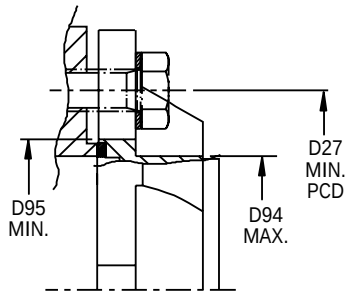
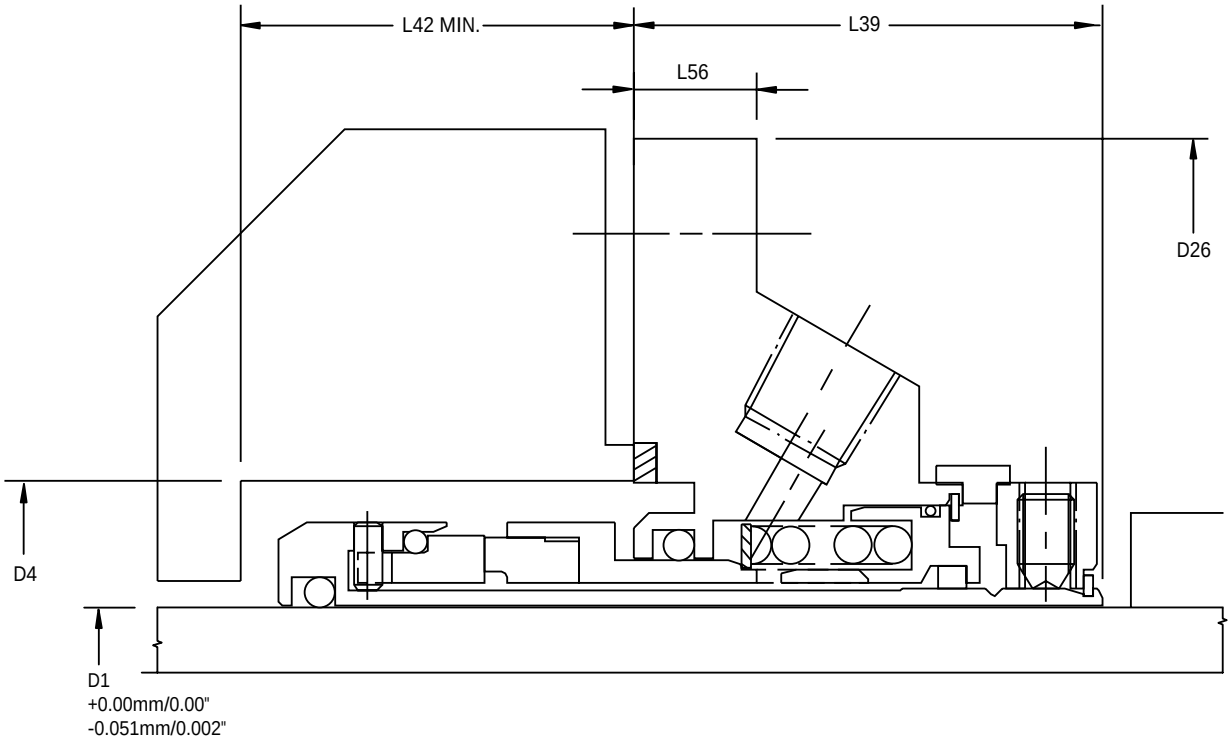
Type FFET Typical Arrangement/Dimensional Data





Seal Size*	Max. Stud/Bolt Diameter
25mm to 38mm/1" to 1-1/2"	M10 - 3/8"
40mm to 60mm/1-5/8" to 2-3/8"	M12 - 1/2"
65mm to 85mm/2-1/2" to 3-1/2"	M16 - 5/8"
90mm to 100mm/3-5/8" to 4"	M20 - 3/4"

*Above 100mm/4" to suit client specification.

The gland plate is provided with four equispaced slots to the dimensions shown. Minimum PCD D27 and slot width D28 are sized to suit stud or bolt diameters according to the seal size. (See chart on left)

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Type FFET Dimensional Data (mm)

Seal Size/D1 (mm)	D4 Min.	D4 Max.	D26	D27	D28	D94	D95	L39	L42	L56
25	41.0	47.5	112	70.0	12.0	47.5	58.0	48.0	38	12
28	44.0	50.5	116	73.0	12.0	50.5	61.0	48.0	38	12
30	46.0	52.5	117	75.0	12.0	52.0	63.0	48.0	38	12
32	48.0	54.5	119	77.0	12.0	54.0	65.0	48.0	38	12
33	51.0	57.5	122	80.0	12.0	57.5	68.0	48.0	38	12
35	51.0	57.5	122	80.0	12.0	57.5	68.0	48.0	38	12
38	57.0	63.5	128	86.0	12.0	62.0	74.0	48.0	40	12
40	60.0	66.5	136	90.5	14.0	66.0	76.5	48.0	40	12
43	63.5	70.0	140	95.0	14.0	69.5	81.0	48.0	40	12
45	63.5	70.0	140	95.0	14.0	69.5	81.0	48.0	40	12
48	66.8	73.0	145	98.0	14.0	73.0	84.0	50.0	40	13
50	70.0	76.5	150	101.0	14.0	77.0	87.0	50.0	40	13
53	73.0	79.5	155	105.0	14.0	80.0	91.0	50.0	40	13
55	73.0	79.5	155	105.0	14.0	80.0	91.0	50.0	40	13
60	79.4	85.5	165	112.5	14.0	87.5	98.5	50.0	40	13
65	90.0	96.5	190	129.5	17.5	98.0	111.5	57.0	46	13
70	95.0	101.4	200	136.5	17.5	105.5	118.5	57.0	46	13
75	101.6	108.0	205	143.0	17.5	112.5	125.0	57.0	46	13
80	108.0	114.5	210	149.5	17.5	118.5	131.5	57.0	46	13
85	111.0	124.0	240	156.0	17.5	126.0	138.0	60.5	48	13
90	117.5	131.0	275	168.0	22.0	131.0	146.0	62.5	48	16
95	120.5	131.0	275	168.0	22.0	131.0	146.0	62.5	48	16
100	127.0	136.5	280	174.0	22.0	137.0	152.0	62.5	48	16
105	140.0	152.0	*	*	*	*	*	66.0	60	*
110	146.0	158.0	*	*	*	*	*	66.0	60	*
115	146.0	158.0	*	*	*	*	*	66.0	60	*
120	152.5	164.0	*	*	*	*	*	66.0	60	*
125	159.0	171.0	*	*	*	*	*	66.0	60	*
130	170.0	182.0	*	*	*	*	*	76.0	68	*
135	178.0	187.0	*	*	*	*	*	76.0	68	*
140	178.0	187.0	*	*	*	*	*	76.0	68	*
145	184.0	194.0	*	*	*	*	*	76.0	68	*
150	190.0	200.0	*	*	*	*	*	76.0	68	*

*Seal plate dimensions to suit client specifications.

Type FFET Dimensional Data (inches)

Seal Size/D1 (inches)	D4 Min.	D4 Max.	D26	D27	D28	D94	D95	L39	L42	L56
1.000	1.625	1.875	4.400	2.749	0.469	1.87	2.28	1.89	1.50	0.47
1.125	1.750	2.000	4.600	2.869	0.469	2.00	2.40	1.89	1.50	0.47
1.250	1.875	2.125	4.700	3.029	0.469	2.12	2.56	1.89	1.50	0.47
1.375	2.000	2.250	4.800	3.149	0.469	2.25	2.68	1.89	1.50	0.47
1.500	2.250	2.500	5.000	3.379	0.469	2.44	2.91	1.89	1.57	0.47
1.625	2.375	2.625	5.400	3.563	0.563	2.60	3.00	1.89	1.57	0.47
1.750	2.500	2.750	5.500	3.753	0.563	2.74	3.19	1.89	1.57	0.47
1.875	2.625	2.875	5.700	3.863	0.563	2.87	3.30	1.97	1.57	0.51
1.937	2.750	3.000	5.906	3.993	0.563	3.03	3.43	1.97	1.57	0.51
2.000	2.750	3.000	5.906	3.993	0.563	3.03	3.43	1.97	1.57	0.51
2.125	2.875	3.125	6.094	4.143	0.563	3.15	3.58	1.97	1.57	0.51
2.250	3.000	3.250	6.312	4.323	0.563	3.29	3.76	1.97	1.57	0.51
2.375	3.125	3.375	6.500	4.443	0.563	3.44	3.88	1.97	1.57	0.51
2.500	3.250	3.500	6.687	4.707	0.687	3.56	4.02	1.97	1.57	0.51
2.625	3.563	3.812	7.469	5.077	0.687	3.86	4.39	2.24	1.81	0.51
2.750	3.750	4.000	7.875	5.357	0.687	4.15	4.67	2.24	1.81	0.51
2.937	4.000	4.250	8.063	5.607	0.687	4.43	4.92	2.24	1.81	0.51
3.000	4.000	4.250	8.063	5.607	0.687	4.43	4.92	2.24	1.81	0.51
3.250	4.250	4.500	8.281	5.867	0.687	4.66	5.18	2.24	1.81	0.51
3.375	4.375	4.875	9.437	6.117	0.687	4.96	5.43	2.38	1.89	0.51
3.500	4.500	4.875	9.437	6.117	0.687	4.96	5.43	2.38	1.89	0.51
3.625	4.625	5.125	10.812	6.625	0.875	5.16	5.75	2.46	1.89	0.63
3.750	4.750	5.125	10.812	6.625	0.875	5.16	5.75	2.46	1.89	0.63
3.875	4.875	5.375	11.000	6.855	0.875	5.39	5.98	2.46	1.89	0.63
4.000	5.000	5.375	11.000	6.855	0.875	5.39	5.98	2.46	1.89	0.63

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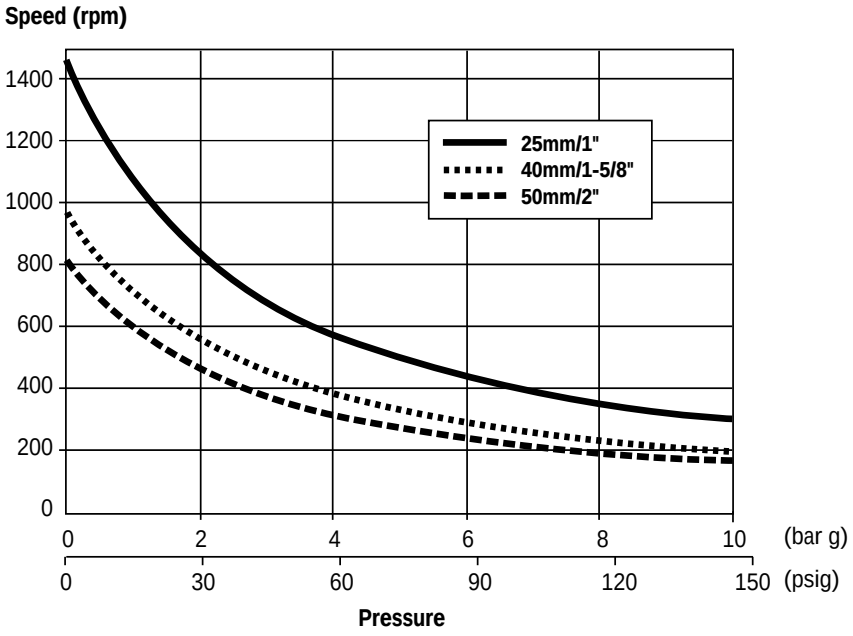
Type FFET Dimensional Data (inches) (cont'd)

Seal Size/D1 (inches)	D4 Min.	D4 Max.	D26	D27	D28	D94	D95	L39	L42	L56
4.125	5.500	6.000	*	*	*	*	*	2.60	2.36	*
4.250	5.500	6.000	*	*	*	*	*	2.60	2.36	*
4.375	5.750	6.250	*	*	*	*	*	2.60	2.36	*
4.500	5.750	6.250	*	*	*	*	*	2.60	2.36	*
4.625	6.000	6.500	*	*	*	*	*	2.60	2.36	*
4.750	6.000	6.500	*	*	*	*	*	2.60	2.36	*
4.875	6.250	6.750	*	*	*	*	*	2.60	2.36	*
5.000	6.250	6.750	*	*	*	*	*	2.60	2.36	*
5.125	6.750	7.188	*	*	*	*	*	3.00	2.68	*
5.250	6.750	7.188	*	*	*	*	*	3.00	2.68	*
5.375	7.000	7.375	*	*	*	*	*	3.00	2.68	*
5.500	7.000	7.375	*	*	*	*	*	3.00	2.68	*
5.625	7.250	7.688	*	*	*	*	*	3.00	2.68	*
5.750	7.250	7.688	*	*	*	*	*	3.00	2.68	*
5.875	7.500	7.875	*	*	*	*	*	3.00	2.68	*
6.000	7.500	7.875	*	*	*	*	*	3.00	2.68	*

*Seal plate dimensions to suit client specifications.

Dry-Running Limits



NOTES:

Standard face combination for dry-running is silicon carbide/carbon.

Maximum dry-running operating pressure = 10 bar g/147 psig.

Maximum temperature = 120°C/248°F (180°C/356°F using constant level lubricator).

For sizes above 50mm/2", consult John Crane Engineering.

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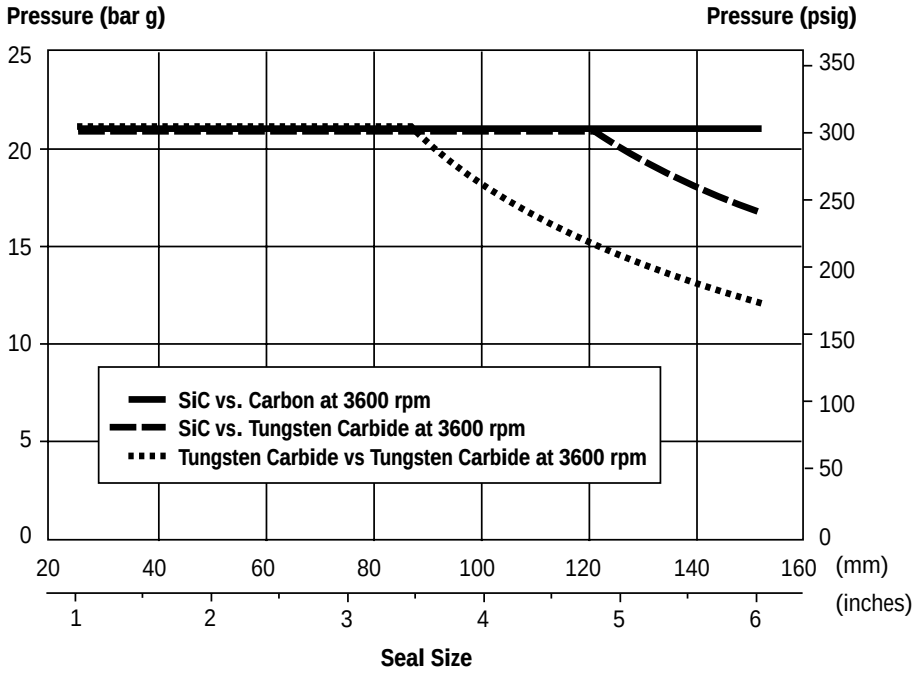
Basic Pressure Ratings



NOTE:
For silicon carbide vs. silicon carbide limits, consult John Crane Engineering.

Multiplier Factors

	Selection Considerations	Multiplier Factor
Sealed Fluid Lubricity	Petrol/Gasoline, Kerosene, or Better	x 1.00
	Water and Aqueous Solutions (<80°C/175°F)	x 0.75
Sealed Fluid Temperature (for carbon only)	Up to 80°C/175°F	x 1.00
	From 80°C to 120°C/175°F to 250°F	x 0.90
	From 120°C to 180°C/250°F to 355°F	x 0.80
	From 180°C to 230°C/355°F to 445°F	x 0.65

Example for Determining Pressure Rating Limits:

Seal: 127mm/5" Diameter Type FFET

Product: Aqueous Solution

Face Materials: Silicon Carbide vs. Tungsten Carbide

Operating Temperature: 80°C/175°F

Operating Speed: 3600 rpm

Velocity $= \pi^* \times \frac{127\text{mm}}{1000} \times \frac{3600}{60\text{ sec}} =$ 23.9 m/sec (4712 ft/min)

(*π = 3.14)

Therefore, velocity is within limits.

Using the Basic Pressure Rating graph, the maximum pressure would be 20 bar g/290 psig.

From the Multiplier Factors chart, apply the multiplier factors for the specific service requirements to determine the maximum operating pressure for the application:

20 bar g/290 psig x 0.75 = 15 bar g/217 psig

The maximum operating pressure of this 127mm/5" Type FFET seal is 15 bar g/217 psig.

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Single Cartridge O-Ring Seal

Materials of Construction

SEAL COMPONENTS	MATERIALS	
Description	**Standard**	**Options**
Face/Primary Ring	Resin-Impregnated Carbon Graphite	Nickel Binder Tungsten Carbide Reaction Bonded Silicon Carbide Sintered Silicon Carbide
Seat/Mating Ring	Reaction-Bonded Silicon Carbide	Sintered Silicon Carbide Nickel Binder Tungsten Carbide
Retaining Clips Drive Collar Gland Plate Sleeve	Stainless Steel	Super Duplex (UNS S32760)
Stationary Seal Ring Body	Duplex Stainless Steel (UNS S31803)	Super Duplex Stainless Steel (UNS S32760) Alloy C-276 (UNS N10276)
Spring	Stainless Steel	Alloy C-276 (UNS N10276)
O-Rings	Fluorocarbon	Ethylene Propylene Perfluoroelastomer

Application Criteria

The FFET cartridge seal can be customized for specific installations after review and evaluation by John Crane Engineering. The following data is needed to evaluate the proposed service.

- Make and Model of Equipment
- Shaft or Sleeve OD
- Direction of Shaft Rotation Viewed from Drive End
- Seal Cavity Dimensions
- Speed
- Process Fluid
  - Specific Gravity
  - Box Pressure
  - Vapor Pressure
  - Temperature
  - Viscosity

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