

Fluid Sealing Association

STANDARD

FSA-MG-503-06
SERRATED METAL GASKETS WITH COVERING
LAYERS (SMCL) STANDARD FOR RAISED
AND FLAT FACED FLANGES PER ASME B16.47



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**FLUID SEALING ASSOCIATION STANDARD
FSA-MG-503-06**

**SERRATED METAL GASKETS WITH COVERING LAYERS (SMCL) STANDARD
FOR RAISED AND FLAT FACED FLANGES PER ASME B16.47**

1. Scope

This standard covers size, class, construction, materials, markings and dimensions of Serrated Metal gaskets with Covering Layers (SMCL). The gaskets are dimensionally suitable for use with steel raised face and flat face flanges in accordance with ASME B 16.47 Series A (MSS SP-44) and Series B (API-605), for nominal pipe size (NPS) 26” through 60” and classes 150 through 900 for Series A and 75 through 900 for Series B.

2. Reference Documents

ASME B16.47 Pipe Flanges and Flanged Fittings, NPS 26 through NPS 60
ASME B16.20 Metallic Gaskets for pipe flanges: Ring Joint Spiral Wound and Jacketed
EN12560-6 Covered Serrated Metal Gaskets for Use with Steel Flanges

3. Construction

SMCL shall be constructed as a serrated metal ring with covering layers on both faces and shall be furnished with a centering ring. See Figure 1.

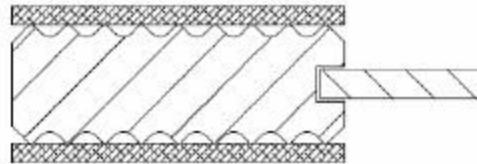


Figure 1

3.1. Dimensions and tolerances

Dimensions: see Tables 1 to 5 for Series A and Tables 5 to 10 for Series B.
Tolerances: see Figures 2 and 3.

3.2. Covering Layers

The covering layer serves as the sealing component of the gasket. It shall be applied to the serrated metal ring using a thin layer of adhesive.

3.3. Centering Ring

The centering ring is used to position the gasket in the flange. All SMCL gaskets shall be furnished with a centering ring. The centering ring may be as shown in Figure 1 or other construction as specified by the purchaser.

4. Materials

The serrated metal ring may be one of the metals listed on Table 12 or as directed by the purchaser.

Covering layers may be flexible graphite, PTFE, or as specified by the purchaser.

If the centering ring is made of carbon steel, it shall be painted, plated or otherwise coated as to inhibit atmospheric corrosion.

Selection of suitable materials for a given service is the responsibility of the user, subject to the requirements of the referenced standard and any applicable code or government regulation. The material selected shall be compatible with the fluid and suitable for the pressure-temperature conditions of the service.

5. Serrated Metal Ring Welding

If the serrated metal ring is of welded construction, the weld shall be of the full penetration type and the grooves shall be reestablished to match that of the remainder of the core. The maximum number of welds shall not exceed two.

6. Marking

The centering ring of each SMCL gasket shall be permanently marked. The character height shall be a minimum of 0.1 in (2.54mm).

The following information shall be included with the centering ring marking:

- Manufacturer's name or trademark
- Flange size (NPS)
- Pressure Class
- Abbreviation for serrated metal ring material
- Abbreviation for covering layer material
- Abbreviation for centering ring material (if different from the serrated metal ring)

Table 1
ASME B16.47 Series A (MSS SP-44) – Class 150

NPS	US Customary Dimensions (in)			Metric Dimensions (mm)		
	Groove Ring		(D3)	Grooved Ring		(D3)
	(D1)	(D2)	Centering Ring Outside Diameter	(D1)	(D2)	Centering Ring Outside Diameter
	Inside Diameter	Outside Diameter		Inside Diameter	Outside Diameter	
26	26.50	27.75	30.50	673.1	704.9	774.7
28	28.50	29.75	32.75	723.9	755.7	831.9
30	30.50	31.75	34.75	774.7	806.5	882.7
32	32.50	33.88	37.00	825.5	860.4	939.8
34	34.50	35.88	39.00	876.3	911.2	990.6
36	36.50	38.13	41.25	927.1	968.4	1047.8
38	38.50	40.13	43.75	977.9	1019.2	1111.3
40	40.50	42.13	45.75	1028.7	1070.0	1162.1
42	42.50	44.25	48.00	1079.5	1124.0	1219.2
44	44.50	46.38	50.25	1130.3	1177.9	1276.4
46	46.50	48.38	52.25	1181.1	1228.7	1327.2
48	48.50	50.38	54.50	1231.9	1279.5	1384.3
50	50.50	52.50	56.50	1282.7	1333.5	1435.1
52	52.50	54.50	58.75	1333.5	1384.3	1492.3
54	54.50	56.50	61.00	1384.3	1435.1	1549.4
56	56.50	58.50	63.25	1435.1	1485.9	1606.6
58	58.50	60.50	65.50	1485.9	1536.7	1663.7
60	60.50	62.50	67.50	1536.7	1587.5	1714.5

See Notes on Page 15

Table 2
ASME B16.47 Series A (MSS SP-44) – Class 300

NPS	US Customary Dimensions (in)			Metric Dimensions (mm)		
	Groove Ring		(D3) Centering Ring Outside Diameter	Grooved Ring		(D3) Centering Ring Outside Diameter
	(D1) Inside Diameter	(D2) Outside Diameter		(D1) Inside Diameter	(D2) Outside Diameter	
26	27.00	29.00	32.88	685.8	736.6	835.0
28	29.00	31.00	35.38	736.6	787.4	898.5
30	31.25	33.25	37.50	793.8	844.6	952.5
32	33.50	35.50	39.63	850.9	901.7	1006.5
34	35.50	37.50	41.63	901.7	952.5	1057.3
36	37.63	39.63	44.00	955.7	1006.5	1117.6
38	38.50	40.00	41.50	977.9	1016.0	1054.1
40	40.25	42.13	43.88	1022.4	1070.0	1114.4
42	42.25	44.13	45.88	1073.2	1120.8	1165.2
44	44.50	46.50	48.00	1130.3	1181.1	1219.2
46	46.38	48.38	50.13	1177.9	1228.7	1273.2
48	48.63	50.63	52.13	1235.1	1285.9	1324.0
50	51.00	53.00	54.25	1295.4	1346.2	1378.0
52	53.00	55.00	56.25	1346.2	1397.0	1428.8
54	55.25	57.25	58.75	1403.4	1454.2	1492.3
56	57.25	59.25	60.75	1454.2	1505.0	1543.1
58	59.50	61.50	62.75	1511.3	1562.1	1593.9
60	61.50	63.50	64.75	1562.1	1612.9	1644.7

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Table 3
ASME B16.47 Series A (MSS SP-44) – Class 400

NPS	US Customary Dimensions (in)			Metric Dimensions (mm)		
	Groove Ring		(D3)	Grooved Ring		(D3)
	(D1)	(D2)	Centering Ring Outside Diameter	(D1)	(D2)	Centering Ring Outside Diameter
	Inside Diameter	Outside Diameter		Inside Diameter	Outside Diameter	
26	27.00	29.00	32.75	685.8	736.6	831.9
28	29.00	31.00	35.13	736.6	787.4	892.2
30	31.25	33.25	37.25	793.8	844.6	946.2
32	33.50	35.50	39.50	850.9	901.7	1003.3
34	35.50	37.50	41.50	901.7	952.5	1054.1
36	37.63	39.63	44.00	955.7	1006.5	1117.6
38	38.25	40.25	42.25	971.55	1022.4	1073.2
40	40.38	42.38	44.38	1025.5	1076.3	1127.1
42	42.38	44.38	46.38	1076.3	1127.1	1177.9
44	44.50	46.50	48.50	1130.3	1181.1	1231.9
46	47.00	49.00	50.75	1193.8	1244.6	1289.1
48	49.00	51.00	53.00	1244.6	1295.4	1346.2
50	51.00	53.00	55.25	1295.4	1346.2	1403.4
52	53.00	55.00	57.25	1346.2	1397.0	1454.2
54	55.25	57.25	59.75	1403.4	1454.2	1517.7
56	57.25	59.25	61.75	1454.2	1505.0	1568.5
58	59.25	61.25	63.75	1505.0	1555.8	1619.3
60	61.75	63.75	66.25	1568.5	1619.3	1682.8

See Notes on Page 15

Table 4
ASME B16.47 Series A (MSS SP-44) – Class 600

NPS	US Customary Dimensions (in)			Metric Dimensions (mm)		
	Groove Ring		(D3)	Grooved Ring		(D3)
	(D1)	(D2)	Centering Ring Outside Diameter	(D1)	(D2)	Centering Ring Outside Diameter
	Inside Diameter	Outside Diameter		Inside Diameter	Outside Diameter	
26	27.00	29.00	34.13	685.8	736.6	866.8
28	29.00	31.00	36.00	736.6	787.4	914.4
30	31.25	33.25	38.25	793.8	844.6	971.6
32	33.50	35.50	40.25	850.9	901.7	1022.4
34	35.50	37.50	42.25	901.7	952.5	1073.2
36	37.63	39.63	44.50	955.7	1006.5	1130.3
38	39.00	41.00	43.50	990.6	1041.4	1104.9
40	41.25	43.25	45.50	1047.8	1098.6	1155.7
42	43.50	45.50	48.00	1104.9	1155.7	1219.2
44	45.75	47.75	50.00	1162.1	1212.9	1270.0
46	47.75	49.75	52.25	1212.9	1263.7	1327.2
48	50.00	52.00	54.75	1270.0	1320.8	1390.7
50	52.00	54.00	57.00	1320.8	1371.6	1447.8
52	54.00	56.00	59.00	1371.6	1422.4	1498.6
54	56.25	58.25	61.25	1428.8	1479.6	1555.8
56	58.25	60.25	63.50	1479.6	1530.4	1612.9
58	60.50	62.50	65.50	1536.7	1587.5	1663.7
60	62.75	64.75	68.25	1593.9	1644.7	1733.6

See Notes on Page 15

Table 5
ASME B16.47 Series A (MSS SP-44) – Class 900

NPS	US Customary Dimensions (in)			Metric Dimensions (mm)		
	Groove Ring		(D3)	Grooved Ring		(D3)
	(D1)	(D2)	Centering Ring Outside Diameter	(D1)	(D2)	Centering Ring Outside Diameter
	Inside Diameter	Outside Diameter		Inside Diameter	Outside Diameter	
26	27.00	29.00	34.75	685.8	736.6	882.7
28	29.00	31.00	37.25	736.6	787.4	946.2
30	31.25	33.25	39.75	793.8	844.6	1009.7
32	33.50	35.50	42.25	850.9	901.7	1073.2
34	35.50	37.50	44.75	901.7	952.5	1136.7
36	37.75	39.75	47.25	958.9	1009.7	1200.2
38	40.75	42.75	47.25	1035.1	1085.9	1200.2
40	43.25	45.25	49.25	1098.6	1149.4	1251.0
42	45.25	47.25	51.25	1149.4	1200.2	1301.8
44	47.50	49.50	53.88	1206.5	1257.3	1368.4
46	50.00	52.00	56.50	1270.0	1320.8	1435.1
48	52.00	54.00	58.50	1320.8	1371.6	1485.9

See Notes on Page 15

Table 6
ASME B16.47 Series B (API-605) – Class 150

NPS	US Customary Dimensions (in)			Metric Dimensions (mm)		
	Groove Ring		(D3)	Grooved Ring		(D3)
	(D1)	(D2)	Centering Ring Outside Diameter	(D1)	(D2)	Centering Ring Outside Diameter
	Inside Diameter	Outside Diameter		Inside Diameter	Outside Diameter	
26	26.50	27.50	28.56	673.1	698.5	725.5
28	28.50	29.50	30.56	723.9	749.3	776.3
30	30.50	31.50	32.56	774.7	800.1	827.1
32	32.50	33.50	34.69	825.5	850.9	881.1
34	34.50	35.75	36.81	876.3	908.1	935.0
36	36.50	37.75	38.88	927.1	958.9	987.4
38	38.37	39.75	41.13	974.6	1009.7	1044.6
40	40.25	41.88	43.13	1022.4	1063.6	1095.4
42	42.50	43.88	45.13	1079.5	1114.4	1146.2
44	44.25	45.88	47.13	1124.0	1165.2	1197.0
46	46.50	48.19	49.44	1181.1	1224.0	1255.7
48	48.50	50.00	51.44	1231.9	1270.0	1306.5
50	50.50	52.19	53.44	1282.7	1325.6	1357.3
52	52.50	54.19	55.44	1333.5	1376.4	1408.1
54	54.50	56.00	57.63	1384.3	1422.4	1463.7
56	56.88	58.18	59.63	1444.6	1477.8	1514.5
58	59.07	60.19	62.19	1500.2	1528.8	1579.6
60	61.31	62.44	64.19	1557.3	1585.9	1630.4

See Notes on Page 15

Table 7
ASME B16.47 Series B (API-605) – Class 300

NPS	US Customary Dimensions (in)			Metric Dimensions (mm)		
	Groove Ring		(D3) Centering Ring Outside Diameter	Grooved Ring		(D3) Centering Ring Outside Diameter
	(D1) Inside Diameter	(D2) Outside Diameter		(D1) Inside Diameter	(D2) Outside Diameter	
26	26.50	28.00	30.38	673.1	711.2	771.5
28	28.50	30.00	32.50	723.9	762.0	825.5
30	30.50	32.00	34.88	774.7	812.8	885.8
32	32.50	34.00	37.00	825.5	863.6	939.8
34	34.50	36.00	39.13	876.3	914.4	993.8
36	36.50	38.00	41.25	927.1	965.2	1047.8
38	39.75	41.25	43.25	1009.7	1047.8	1098.6
40	41.75	43.25	45.25	1060.5	1098.6	1149.4
42	43.75	45.25	47.25	1111.3	1149.4	1200.2
44	45.75	47.25	49.25	1162.1	1200.2	1251.0
46	47.88	49.38	51.88	1216.0	1254.1	1317.6
48	49.75	51.63	53.88	1263.7	1311.3	1368.4
50	51.88	53.38	55.88	1317.6	1355.7	1419.2
52	53.88	55.38	57.88	1368.4	1406.5	1470.0
54	55.25	57.25	60.25	1403.4	1454.2	1530.4
56	58.25	60.00	62.75	1479.6	1524.0	1593.9
58	60.44	61.94	65.19	1535.1	1573.2	1655.8
60	62.56	64.19	67.19	1589.1	1630.4	1706.6

See Notes on Page 15

Table 8
ASME B16.47 Series B (API-605) – Class 400

NPS	US Customary Dimensions (in)			Metric Dimensions (mm)		
	Groove Ring		(D3)	Grooved Ring		(D3)
	(D1)	(D2)	Centering Ring Outside Diameter	(D1)	(D2)	Centering Ring Outside Diameter
	Inside Diameter	Outside Diameter		Inside Diameter	Outside Diameter	
26	26.25	27.50	29.38	666.8	698.5	746.1
28	28.13	29.50	31.50	714.4	749.3	800.1
30	30.13	31.75	33.75	765.2	806.5	857.3
32	32.00	33.88	35.88	812.8	860.4	911.2
34	34.13	35.88	37.88	866.8	911.2	962.0
36	36.13	38.00	40.25	917.6	965.2	1022.4
38	38.25	40.25	42.25	971.6	1022.4	1073.2
40	40.38	42.38	44.38	1025.5	1076.3	1127.1
42	42.38	44.38	46.38	1076.3	1127.1	1177.9
44	44.50	46.50	48.50	1130.3	1181.1	1231.9
46	47.00	49.00	50.75	1193.8	1244.6	1289.1
48	49.00	51.00	53.00	1244.6	1295.4	1346.2
50	51.00	53.00	55.25	1295.4	1346.2	1403.4
52	53.00	55.00	57.25	1346.2	1397.0	1454.2
54	55.25	57.25	59.75	1403.4	1454.2	1517.7
56	57.25	59.25	61.75	1454.2	1505.0	1568.5
58	59.25	61.25	63.75	1505.0	1555.8	1619.3
60	61.75	63.75	66.25	1568.5	1619.3	1682.8

See Notes on Page 15

Table 9
ASME B16.47 Series B (API-605) – Class 600

NPS	US Customary Dimensions (in)			Metric Dimensions (mm)		
	Groove Ring		(D3)	Grooved Ring		(D3)
	(D1)	(D2)	Centering Ring Outside Diameter	(D1)	(D2)	Centering Ring Outside Diameter
	Inside Diameter	Outside Diameter		Inside Diameter	Outside Diameter	
26	26.13	28.13	30.13	663.6	714.4	765.2
28	27.75	29.75	32.25	704.9	755.7	819.2
30	30.63	32.63	34.63	777.9	828.7	879.5
32	32.75	34.75	36.75	831.9	882.7	933.5
34	35.00	37.00	39.25	889.0	939.8	997.0
36	37.00	39.00	41.25	939.8	990.6	1047.8
38	39.00	41.00	43.50	990.6	1041.4	1104.9
40	41.25	43.25	45.50	1047.8	1098.6	1155.7
42	43.50	45.50	48.00	1104.9	1155.7	1219.2
44	45.75	47.75	50.00	1162.1	1212.9	1270.0
46	47.75	49.75	52.25	1212.9	1263.7	1327.2
48	50.00	52.00	54.75	1270.0	1320.8	1390.7
50	52.00	54.00	57.00	1320.8	1371.6	1447.8
52	54.00	56.00	59.00	1371.6	1422.4	1498.6
54	56.25	58.25	61.25	1428.8	1479.6	1555.8
56	58.25	60.25	63.50	1479.6	1530.4	1612.9
58	60.50	62.50	65.50	1536.7	1587.5	1663.7
60	62.75	64.75	68.25	1593.9	1644.7	1733.6

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Table 10
ASME B16.47 Series B (API-605) – Class 900

NPS	US Customary Dimensions (in)			Metric Dimensions (mm)		
	Groove Ring		(D3)	Grooved Ring		(D3)
	(D1)	(D2)	Centering Ring Outside Diameter	(D1)	(D2)	Centering Ring Outside Diameter
	Inside Diameter	Outside Diameter		Inside Diameter	Outside Diameter	
26	27.25	29.50	33.00	692.2	749.3	838.2
28	29.25	31.50	35.50	743.0	800.1	901.7
30	31.75	33.75	37.75	806.45	857.3	958.9
32	34.00	36.00	40.00	863.6	914.4	1016.0
34	36.25	38.25	42.25	920.8	971.6	1073.2
36	37.25	39.25	44.25	946.2	997.0	1124.0
38	40.75	42.75	47.25	1035.1	1085.9	1200.2
40	43.25	45.25	49.25	1098.6	1149.4	1251.0
42	45.25	47.25	51.25	1149.4	1200.2	1301.8
44	47.50	49.50	53.88	1206.5	1257.3	1368.4
46	50.00	52.00	56.50	1270.0	1320.8	1435.1
48	52.00	54.00	58.50	1320.8	1371.6	1485.9

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Tolerances:

1. The groove pitch (**P**) shall range from 0.03 to 0.062 in (0.8 to 1.6 mm).
2. Up to and including NPS 48 the serrated metal ring shall have a thickness (**T**) of 0.141 to 0.157 in (3.6 to 4.0 mm). For sizes over NPS 48 the serrated metal ring shall have a thickness (**T**) of 0.181 to 0.200 in (4.6 to 5.0 mm). Metal rings of other thickness may be specified by the purchaser.
3. The groove angle shall be approximately 90 degrees.
4. Flat (**F**) on peak of serrations and Radius (**R**) at base of the serrations are a function of the pitch, depth and angle of groove.
5. Serrated metal ring outside diameter (**D2**) tolerance for all sizes is +/- 0.062 in (+/- 1.6 mm).
6. Serrated metal ring inside diameter tolerance for all sizes is +/- 0.03 in (+/- 0.8 mm).
7. The centering ring outside diameter (**D3**) tolerance for all sizes is + 0.00 / -0.062 in (+0.00 / -1.6 mm).
8. The covering layer shall have a thickness from 0.015 to 0.030 in (0.4 to 0.8 mm).
9. The typical centering ring (Figure 2) thickness shall be from 0.053 to 0.065 in (1.3 to 1.7 mm). Rings of other thickness may be specified by the purchaser.

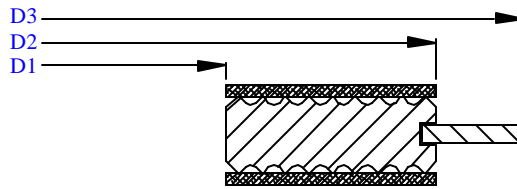


Figure 2 – Gasket Dimensions

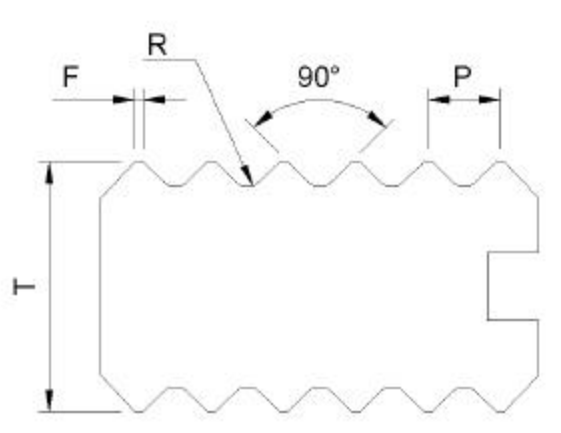


Figure 3 – Serrated Metal Dimensions

Table 11
Materials of Construction

Abbreviations for SMCL gasket materials	
Material	Abbreviation
Carbon Steel	CRS
304 SS	304
304 L SS	304 L
309 SS	309
310 SS	310
316 L SS	316 L
317 L SS	317 L
347 SS	347
321 SS	321
430 SS	430
Monel® 400	MON
Nickel 200	NI
Titanium	TI
20Cb-3 alloy	A-20
Hastelloy®B	HAST B
Hastelloy® C	HAST C
Inconel® 600	INC 600
Inconel® 625	INC 625
Inconel®X-750	INX
Incoloy®800	IN 800
Incoloy® 825	IN 825
Zirconium	ZIRC
Flexible-Graphite	FG
Polytetrafluoroethylene	PTFE