Fluid Sealing Association

STANDARD

FSA-MG-502-05
SERRATED METAL GASKETS WITH COVERING LAYERS (SMCL) STANDARD FOR RAISED AND FLAT FACED FLANGES PER ASME B16.5

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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 16.5 for nominal pipe size (NPS) ½" through 24" in class 150 through 2500.

2. Referenced Documents

ASME B16.5 Pipe Flanges and Flanged Fittings, NPS 1/2 through NPS 24
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 Figures 1a, 1b, and 2.

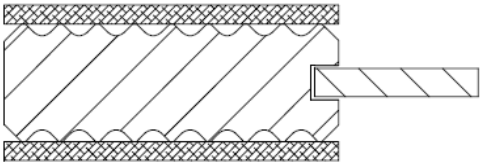

Figure 1a. Loose fit centering ring

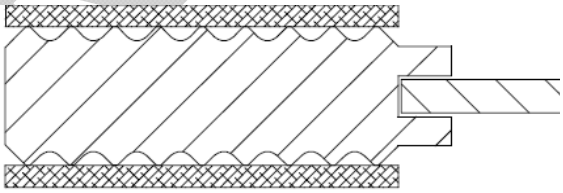

Figure 1b. Loose fitting centering ring with an extended core

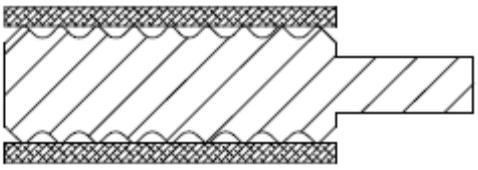

Figure 2. Integral centering ring

3.1. Dimensions

See Tables 1 and 2, Figures 3, 4, and 5 for dimensions and tolerances.

3.2. Serrated Metal Ring

Serrated metal ring dimensions per Table 1.

3.3. Covering Layers

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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.

3.4. 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 loose fit or integral to the gasket. The loose fit centering ring is recommended for applications where thermal and or pressure cycling can affect the integrity of the serrated metal ring.

4. Materials

The serrated ring may be one of the metals listed in Table 3 or as directed by the purchaser.

Covering layers may be flexible graphite, PTFE, or as specified by the purchaser. The centering ring may be one of the metals listed in Table 3. If the centering ring is 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 compatibile 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
US Customary Dimensions

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NPS	Serrated Metal Ring (in)		(D3) Centering Ring Outside Diameter (in)						
	(D1) Inside Diameter	(D2) Outside Diameter	Pressure Class						
			150	300	400	600	900	1500	2500
1/2	0.91	1.31	1.88	2.13	2.13	2.13	2.50	2.50	2.75
3/4	1.13	1.56	2.25	2.63	2.63	2.63	2.75	2.75	3.00
1	1.44	1.87	2.63	2.88	2.88	2.88	3.13	3.13	3.38
1 1/4	1.75	2.37	3.00	3.25	3.25	3.25	3.50	3.50	4.13
1 1/2	2.06	2.75	3.38	3.75	3.75	3.75	3.88	3.88	4.63
2	2.75	3.50	4.13	4.38	4.38	4.38	5.63	5.63	5.75
2 1/2	3.25	4.00	4.88	5.13	5.13	5.13	6.50	6.50	6.63
3	3.87	4.88	5.38	5.88	5.88	5.88	6.63	6.88	7.75
3 1/2	4.37	5.38	6.38	6.50	6.38	6.38	7.50	7.38	-----
4	4.87	6.06	6.88	7.13	7.00	7.63	8.13	8.25	9.25
5	5.94	7.19	7.75	8.50	8.38	9.50	9.75	10.00	11.00
6	7.00	8.37	8.75	9.88	9.75	10.50	11.38	11.13	12.50
8	9.00	10.50	11.00	12.13	12.00	12.63	14.13	13.88	15.25
10	11.13	12.63	13.38	14.25	14.13	15.75	17.13	17.13	18.75
12	13.37	14.87	16.13	16.63	16.50	18.00	19.63	20.50	21.63
14	14.63	16.13	17.75	19.13	19.00	19.38	20.50	22.75	-----
16	16.63	18.38	20.25	21.25	21.13	22.25	22.63	25.25	-----
18	18.87	20.87	21.63	23.50	23.38	24.13	25.13	27.75	-----
20	20.87	22.87	23.88	25.75	25.50	26.88	27.50	29.75	-----
24	24.88	26.87	28.25	30.50	30.25	31.13	33.00	35.50	-----

US Customary Tolerances

1. The groove pitch **(P)** shall range from 0.03 to 0.06 in. with a tolerance of + 10% - 0.
2. The typical serrated metal ring with a loose fit centering ring (Figure 1a) shall have a thickness **(T)** of 0.115 to 0.131 in. Metal rings of other thickness may be specified by the purchaser. The typical serrated metal ring thickness for an extended core (Figure 1b) shall be 0.141" to 0.157".
3. The groove angle shall be approximately 90 degrees (Figure 5).
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 tolerance for NPS ½ through NPS 8 is +/- 0.03 in.; for NPS 10 through NPS 24 is +/- 0.06 in.
6. Serrated metal ring inside diameter tolerance for NPS ½ through NPS 8 is +/- 0.03 in.; for NPS 10 through NPS 24 is +/- 0.06 in.
7. The centering ring outside diameter tolerance for all sizes is +/- 0.03 in.
8. The covering layer shall have a thickness from 0.015 in. to 0.030 in.
9. The thickness for a typical loose fit centering ring (Figure 1a) shall be from 0.024 to 0.035 in. Rings of other thickness may be specified by the purchaser. The typical thickness of loose fit centering ring with an extended core (Figure 1b) shall be 0.055 to 0.062 in.
10. The integral centering ring thickness shall be from 0.059 to 0.067 in. or as specified by the purchaser.

Table 2
Metric Dimensions

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NPS	Serrated Metal Ring (mm)		(D3) Centering Ring Outside Diameter (mm)						
	(D1) Inside Diameter	(D2) Outside Diameter	Pressure Class						
			150	300	400	600	900	1500	2500
1/2	23.1	33.3	47.6	54.0	54.0	54.0	63.5	63.5	69.9
3/4	28.6	39.7	57.2	66.7	66.7	66.7	69.9	69.9	76.2
1	36.5	47.5	66.7	73.0	73.0	73.0	79.4	79.4	85.7
1 1/4	44.5	60.2	76.2	82.6	82.6	82.6	88.9	88.9	104.8
1 1/2	52.4	69.9	85.7	95.3	95.3	95.3	98.4	98.4	117.5
2	69.9	88.9	104.8	111.1	111.1	111.1	142.9	142.9	146.1
2 1/2	82.6	101.6	123.8	130.2	130.2	130.2	165.1	165.1	168.3
3	98.3	123.8	136.5	149.2	149.2	149.2	168.3	174.8	196.9
3 1/2	111.0	136.5	161.9	165.1	161.9	161.9	190.5	187.5	-----
4	123.7	154.0	174.6	181.0	177.8	193.7	206.4	209.6	235.0
5	150.8	182.6	196.9	215.9	212.7	241.3	247.7	254.0	279.4
6	177.8	212.6	222.3	250.8	247.7	266.7	288.9	282.7	317.5
8	228.6	266.7	279.4	308.0	304.8	320.7	358.8	352.6	387.4
10	282.6	320.7	339.7	362.0	358.8	400.1	435.0	435.0	476.3
12	339.6	377.7	409.6	422.3	419.1	457.2	498.5	520.7	549.3
14	371.5	409.6	450.9	485.8	482.6	492.3	520.7	577.9	-----
16	422.3	466.7	514.4	539.8	536.6	565.2	574.7	641.4	-----
18	479.3	530.1	549.3	596.9	593.7	612.8	638.2	704.9	-----
20	530.1	580.9	606.4	654.1	647.7	682.6	698.5	755.7	-----
24	631.8	682.5	717.6	774.7	768.4	790.6	838.2	901.7	-----

Metric Tolerances

1. The groove pitch **(P)** shall range from 0.8 to 1.5 mm with a tolerance of + 10% - 0.
2. The typical serrated metal ring with a loose fit centering ring (Figure 1a) shall have a thickness **(T)** of 2.9 to 3.3 mm. Metal rings of other thickness may be specified by the purchaser. Typical serrated metal ring thickness for an extended core (Figure 1b) shall be 3.6mm to 4mm.
3. The groove angle shall be approximately 90 degrees (Figure 5) .
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 tolerance for NPS ½ through NPS 8 is +/- 0.8 mm; for NPS 10 through NPS 24 is +/- 1.5mm.
6. Serrated metal ring inside diameter tolerance for NPS ½ through NPS 8 is +/- 0.8mm; for NPS 10 through NPS 24 is +/- 1.5mm.
7. The centering ring outside diameter tolerance for all sizes is +/- 0.8mm.
8. The covering layer shall have a thickness from 0.4 to 0.8 mm.
9. Thickness for the typical loose fit centering ring (Figure 1a) shall be from 0.6 to 0.9mm. Rings of other thickness may be specified by the purchaser. The typical thickness of a loose fit centering ring with an extended core (Figure 1b) shall be 1.4mm to 1.6mm.
10. The integral centering ring thickness shall be from 1.5 to 1.7 mm or as specified by the purchaser.

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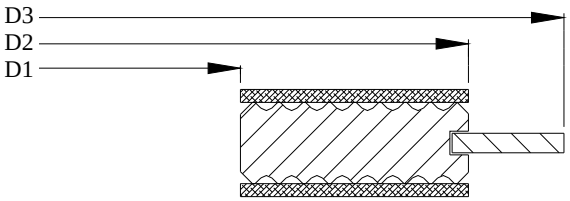

Figure 3 - Loose fit centering ring

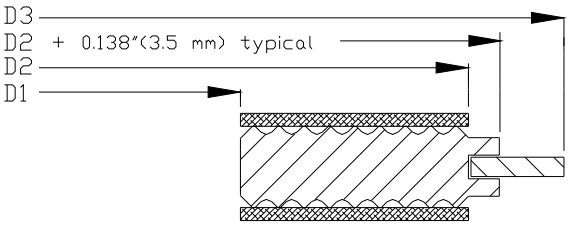

Figure 3a - Loose fit centering ring with extended core

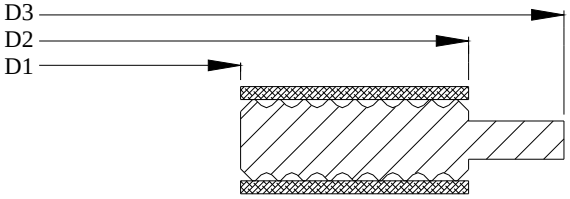

Figure 4 - Integral centering ring

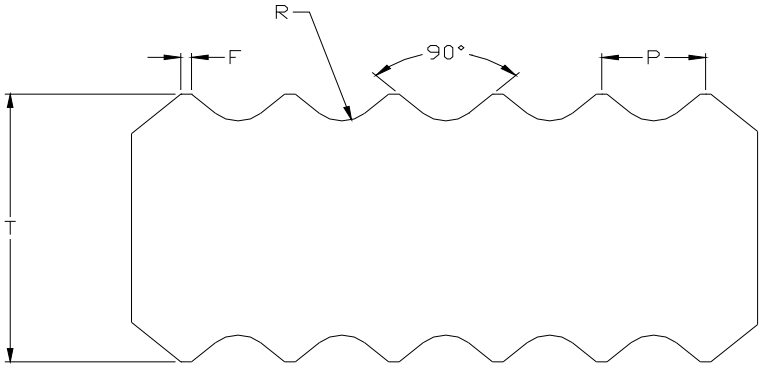

Figure 5 - Serrated metal dimensions

Table 3
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

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