Corrugated gaskets

Corrugated gaskets are universally applicable sealing elements. Due to the wide range of shapes that they can be produced in – including rings, ovals, elongated ovals or frames, with or without dividers, holes and retaining plates – they continue to be used in new areas. The gaskets can be fully or partially coated. Corrugated gaskets with torque support have proven excellent when used with inflexible flanges.

Even with unmachined flanges, a satisfactory seal can be achieved with the use of suitable soft-material layers. The gaskets can be produced in all the usual sizes up to 6000 mm.

The corrugation on the carrier hold the layers in place. The gaskets are also suitable for use with vacuums.

Gaskets of the Profile **W1A** consist of a carrier ring W1 with layers on both sides – PTFE for use at temperatures of up to 250°C, or graphite for temperatures of approx. 500 °C with atmospheric oxygen influx. When fitted, the soft plastic layers are pressed into the corrugation. This creates an extremely elastic sealing element with a low leakage rate.

In pieces with large diameters and sealing widths, or where there are bumps on the existing flange, it is particularly useful to have layers of RivaTherm Super on both sides. This provides the seal with better stability and evenness. RivaTherm Super layers are made from expanded graphite with a stainless steel sheet metal insert. The 1 mm product is designated RS1E1 and the 2 mm product is RS2E1. The layer width for RivaTherm Super should be at least 15 mm. The type of layer required should be specified in each case.

Gaskets with an unlined central edge are marked as Profile **W11A.** For large sealing diameters above DN 1200 we recommend that gaskets of either **Profile W2A** or **Profile W12A** be used. These gaskets are fitted with a stabilising ring as well as a W1A seal on both sides, making them very inherently stable with a greater ability to conform to the surface of the flange.

The gaskets can also be provided with an F1 external eyelet, such as in e.g. **Profile W1A-3·F1**.

Gasket profiles

Profile	Cross-section
W1A	
W1A-3	
W1A-3·F1	
W11A	
W2A	
W12A	

Gasket limiting values

Profiles			W1A, W11A		W1A-3	
Materials			1.4541 graphite	1.4541 PTFE	1.4571 graphite	1.4571 PTFE
Recommended max. roughness of the flange surfaces	µm	from	25	50	12,5	50
		to	50	100	25	100
Surface pressure limits for 20 °C	N/mm²	σ_v	15	15	15	15
		σ_θ	180	180	200	200
Surface pressure limits for 300 °C	N/mm²	σ_v	20	-	20	-
		σ_θ	150	-	150	-

You can find gasket characteristic values in accordance with EN13555 on our homepage at www.kempchen.de

Corrugated ring gasket W1A-RS 2E2 for manhole covers on steam boiler systems in accordance with TRD 401

Steam drums in energy producing and recycling plants use oval manhole covers with internal caps at pressures of up to 250 bar and temperatures of up to 450°C. For applications such as these we recommend the use of metal/soft-material gaskets. For manhole covers on steam boiler systems operating in accordance with **TRD 401** with pressure of up to **40 bar** and temperatures of up to **250°C**, and frequently in excess of that, the corrugated ring gaskets **W1A** with RivaTherm Super layers on both sides RS2E2 in the 2 mm size have proven to be extremely useful.

The **W1A** gaskets with layers of RS2E2 have been tested by the South German TÜV for compliance with TRD 401 and as a result of the tests have received the TÜV approval mark. The approval mark was granted in compliance with the associated TÜV technical specification sheet Gasket 100 and TRD 401 Appendix 1, and highest class "Test Class d" was awarded.

With appropriate dimensioning of the gasket with regard to measurements, it can withstand pressures of up to 400 bar and temperatures of up to 500°C.

The following table contains the surface pressure limits for the temperature range from 20°C to 500°C.

Gasket limiting values

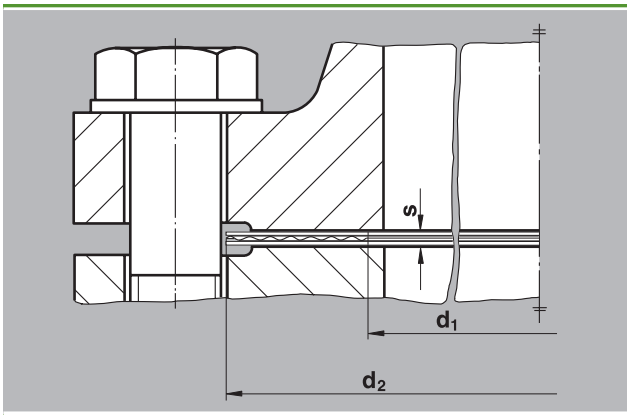
Description		20°C	100°C	200°C	300°C	400°C	500°C
W1A-RS2E2 1.4571/graphite	σ_v [N/mm^2]	15	16	17	20	22	25
	σ_ϑ [N/mm^2]	180	170	160	150	140	130

Conforms to EN 1514-4 (PN 10 to PN 100)

Ordering example for a corrugated gasket with layers, Profile W1A, DN 100, PN 100, EN 1514-4, made of…[1]:

Corrugated gasket, W1A, DN 100, PN 100, EN 1514-4, 1.4541/graphite

1) Specify material when placing order



Conforms to EN 1514-4 for DIN flanges

DN	d_1	PN 10	PN 16	PN 25	d_2 PN 40	PN 63	PN 100
10	18	48	48	48	48	58	58
15	22	53	53	53	53	63	63
20	27	63	63	63	63	74	74
25	34	73	73	73	73	84	84
32	43	84	84	84	84	90	90
40	49	94	94	94	94	105	105
50	61	109	109	109	109	115	121
65	77	129	129	129	129	140	146
80	89	144	144	144	144	150	156
100	115	164	164	170	170	176	183
125	141	194	194	196	196	213	220
150	169	220	220	226	226	250	260
200	220	275	275	286	293	312	327
250	273	330	331	343	355	367	394
300	324	380	386	403	420	427	461
350	356	440	446	460	477	489	515
400	407	491	498	517	549	546	575
450	458	541	558	567	574	-	-
500	508	596	620	627	631	660	708
600	610	698	737	734	750	768	819
700	712	813	807	836	-	883	956
800	813	920	914	945	-	994	-
900	915	1020	1014	1045	-	1114	-

- Flanges compliant with the standard not available

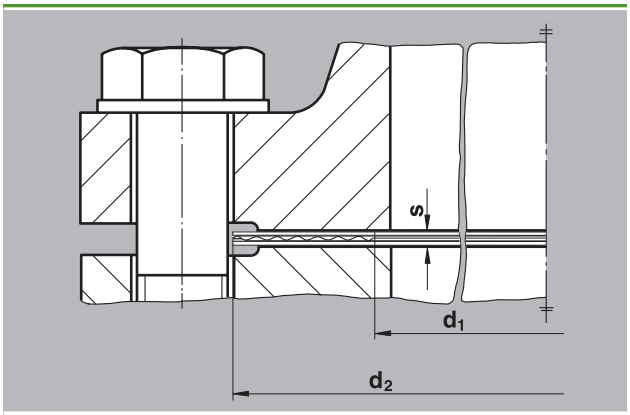
Dimensions in mm

Conforms EN 12560-4 (Class 150 to Class 2500)

Ordering example for a corrugated gasket with layers, Profile W1A, NPS 5, for ANSI flanges, Class 600, EN 12560-4, made of…[1]:

Corrugated gasket, W1A, NPS 5, Class 600, EN 12560-4, 1.4541 / PTFE

1) Specify material when placing order



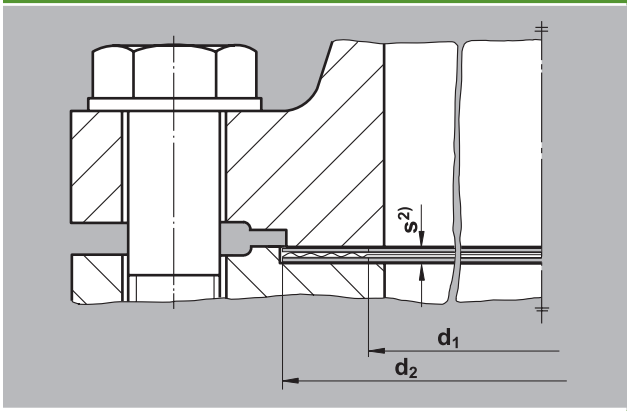
Conforms to EN 12560-4 for flanges in accordance with ANSI B 16.5

NPS	d_1	Class d_2 150	300	600	900	1500	2500
½	22	47,6	54,0	54,0	63,5	63,5	69,9
¾	27	57,2	66,7	66,7	69,9	69,9	76,2
1	34	66,7	73,0	73,0	79,4	79,4	85,7
1¼	43	76,2	82,6	82,6	88,9	88,9	104,8
1½	49	85,7	95,3	95,3	98,4	98,4	117,5
2	61	104,8	111,1	111,1	142,9	142,9	146,1
2½	73	123,8	130,2	130,2	165,1	165,1	168,3
3	89	136,5	149,2	149,2	168,3	174,6	196,9
4	115	174,6	181,0	193,7	206,4	209,6	235,0
5	141	196,9	215,9	241,3	247,7	254,0	279,4
6	169	222,3	250,8	266,7	288,9	282,6	317,5
8	220	279,4	308,0	320,7	358,8	352,4	387,4
10	273	339,7	362,0	400,1	435,0	435,0	476,3
12	324	409,6	422,3	457,2	498,5	520,7	549,2
14	356	450,9	485,8	492,1	520,7	577,9	-
16	407	514,4	539,8	565,2	574,7	641,4	-
18	458	549,3	596,9	612,8	638,2	704,9	-
20	508	606,4	654,1	682,6	698,5	755,7	-
24	610	717,6	774,7	790,6	838,2	901,7	-

- Flanges compliant with the standard not available

Dimensions in mm

For flanges with male and female faces



Conforms to DIN 2692 (PN 10 to PN 100)

For dimensions, see the section “General dimension tables”. Ordering example for a corrugated gasket with layers, Profile W1A, DN 100, made of ...[1]:

Corrugated gasket, W1A, DN 100, DIN 2692, 1.4541/PTFE

In accordance with ANSI B 16.21 (Class 150 to 1500)

For dimensions, see the section “General dimension tables”. Ordering example for a corrugated gasket with layers, Profile W1A, DN 5, NPS 5, wide finish, made of ...[1]:

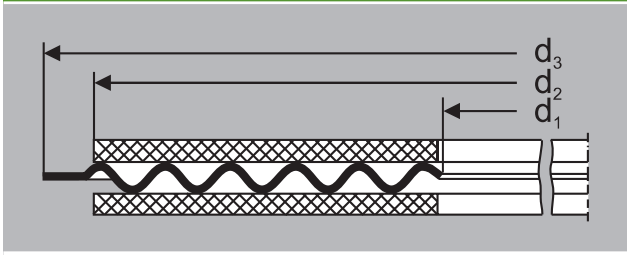
Corrugated gasket, W1A, NPS 5, ANSI B 16.21 wide, male and female face, 1.4541/graphite

1) Specify material when placing order

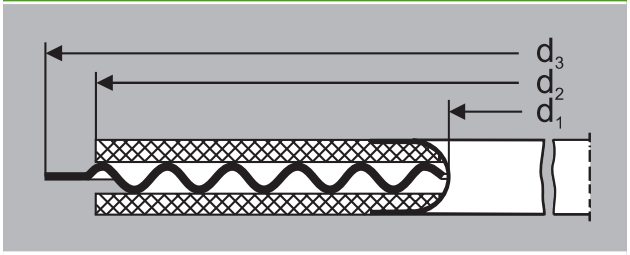
Corrugated TA-Luft gasket Profile W1A-3

with layers of soft material on both sides and an optimised corrugated ring carrier.

Profile: W1A-3



Profile: W1A-3•F1



TA Luft gaskets such as Profile W1A-3 consist of an optimised corrugated ring carrier W1-3 made of 1.4571 with graphite layers on both sides. The 0.8 mm thick layers have a purity of C >= 99%, a density of ρ = 1.0g/cm^3 and a chloride content of <= 25 ppm. The graphite layers do not contain filler or adhesives.

The total thickness of a gasket with graphite layers as delivered is approx. 2.9 mm, made up of the 1.3 mm thick corrugated ring carrier and both 0.8 mm graphite layers.

0.5 mm layers of unsintered PTFE are also used.

The total thickness of a gasket with PTFE layers as delivered is approx. 2.3 mm, made up of the 1.3 mm thick corrugated ring carrier and both 0.5 mm PTFE layers.

When a surface pressure of 30 MPa is applied, the gasket thickness is reduced by approximately 50%.

This means that in a pressurised condition, the gasket has the same thickness as a soft-material flat gasket with a starting thickness of 2 mm. The W1A-3 gasket can also be used with flanges conforming to DIN 2526 Form C.

In order to avoid contact between the medium and the graphite layers, the corrugated ring gasket is also available with an eyelet ring made of 1.4571, Profile W1A-3•F1.

Gaskets that conform to works standard 188 and/or works standard 189 in accordance with DIN 2690 have an external parallel centre ring onto which the corrugated ring material, the nominal width, the nominal pressure and the manufacturer's mark are impressed.

As the external diameter of the layers is approx. 8 mm smaller than the corrugated carrier, this identification area is always visible.

Due to their soft plastic layers, these gaskets conform easily to flange sealing surfaces.

Once fitted, the layers are pressed into the corrugation and are chambered there, resulting in the creation of an extremely elastic sealing element due to the pressure, with a leak rate that is significantly lower than with traditional graphite flat gaskets.

Profile W1A-3 has been tested in accordance with VDI 2440 and fulfils the criteria of the TA Luft type test.

The blow out security of Profile W1A-3 was tested, demonstrated and documented by the Amtec Institute on specimens at a temperature of 400°C. The geometry of the corrugated ring gasket ensures high stability in the seal, making it particularly easy to handle.

Fulfilment of the "Fire Safe" requirements of ISO 10497 has been demonstrated by tests in accordance with API 607 and is confirmed with the relevant certificate.

With these certifications, the gasket fulfils all the current regulatory requirements, particularly

- **TRB** - Technical Regulations for Pressure Vessels TRB 600(1998)
- **TRD** - Technical Regulations for Boilers TRD 001 (1997), TRD 401 (1999), TRD 451 (1996), TRD 452 (1996)
- **TRbF** - Technical Regulations for Flammable Liquids TRbF 50 (2002)
- **TRFL** - Technical Regulations for Pipelines - TRFL (2003)
- **TRwS** - Technical Regulations on Substances Hazardous to Water TRwS AK 780 (2001)
- **BG Chemie** - Safety and Operation of Thermal Transfer Systems with Organic Heat Carriers
- **UVV Technical Gas** - Accident Prevention Regulations UVV gases (1999)
- **Cooling agent in accordance with DIN 8975**

Gasket limiting values

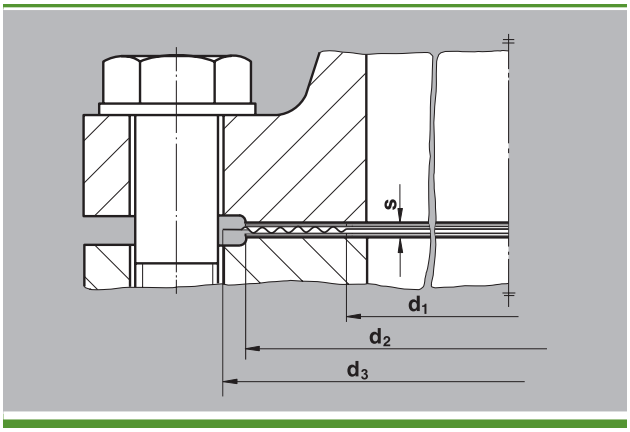
Layer		Graphite	PTFE
Min. surface pressure N/mm² at 20 °C:	σ_V	15	15
Min. surface pressure N/mm² at 20 °C:	σ_ϑ	200	200
Min. temperature	°C	-200	-200
Max. temperature	°C	+500	+250

You can find gasket characteristic values in accordance with EN13555 on our homepage at www.kempchen.de

Corrugated gaskets

Ordering example for a corrugated ring gasket, Profile W1A-3, DN 100, PN 16, works standard 188, with a corrugated ring carrier made of 1.4571 steel with a graphite layer.

Corrugated ring gasket, W1A-3, DN 100, PN 16, works standard 188, 1.4571/graphite



Works standard 188
For smooth flanges and flanges with raised face as per DIN and/or EN

		PN 10		PN 16		PN 25		PN 40		PN 63		PN 100	
DN	d_1	d_2	d_3	d_2	d_3	d_2	d_3	d_2	d_3	d_2	d_3	d_2	d_3
10	18	39	45	39	45	39	45	39	45	52	58	52	58
15	22	44	50	44	50	44	50	44	50	57	63	57	63
20	28	54	60	54	60	54	60	54	60	68	74	68	74
25	35	64	70	64	70	64	70	64	70	78	84	78	84
32	43	76	82	76	82	76	82	76	82	84	90	84	90
40	49	86	92	86	92	86	92	86	92	99	105	99	105
50	61	101	107	101	107	101	107	101	107	109	115	115	121
65	77	121	127	121	127	121	127	121	127	134	140	140	146
80	90	136	142	136	142	136	142	136	142	144	150	150	156
100	115	156	162	156	162	162	168	162	168	170	176	177	183
125	141	186	192	186	192	189	195	189	195	207	213	**214**	**220**
150	169	212	218	212	218	219	225	219	225	244	250	**254**	**260**
200	220	267	273	267	273	279	285	286	292	306	312	**321**	**327**
250	274	322	328	324	330	336	342	347	353	**361**	**367**	**388**	**394**
300	324	374	380	380	386	397	403	414	420	**421**	**427**	**455**	**461**
350	356	434	440	440	446	454	460	471	477	483	489	**509**	**515**
400	407	485	491	492	498	511	517	543	549	540	546	**569**	**575**
450	458	535	541	552	558	561	567	568	574				
500	508	590	596	614	620	621	627	**625**	**631**	**654**	**660**	**702**	**708**
600	610	692	698	731	737	728	734	**744**	**750**	**762**	**768**	-	-
700	712	807	813	**801**	**807**	**830**	**836**	**844**	**850**	**877**	**883**	-	-
800	813	914	920	**908**	**914**	**939**	**945**	**964**	**970**	**988**	**994**	-	-
900	915	1014	1020	**1008**	**1014**	**1039**	**1045**	**1074**	**1080**	**1108**	**1114**	-	-
1000	1020	1114	1120	**1119**	**1125**	**1144**	**1150**	**1184**	**1190**	-	-	-	-

- Flanges compliant with the standard not available

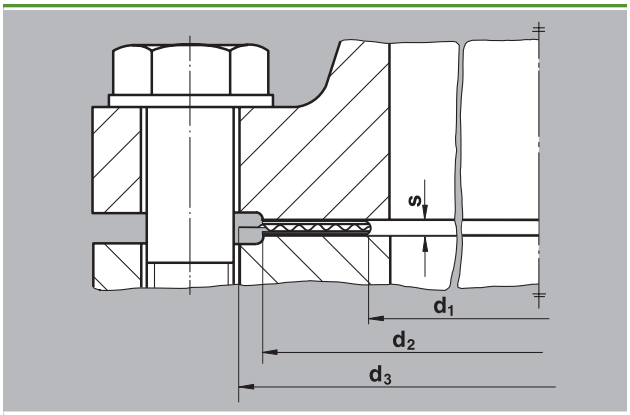
Dimensions in mm

Figures in bold:
For flanges with raised face, the surface pressure must be recalculated and if necessary re-evaluated. In some cases the gasket will not bear the installation tightening torque required by the internal pressure.

Corrugated gaskets

Ordering example for a corrugated ring gasket, Profile W1A-3 • F1, NPS 4, Class 15, works standard 189, with a corrugated ring carrier and a eyelet made of 1.4571 steel with a graphite layer.

Corrugated ring gasket, W1A-3 • F1, NPS 4, Class 150, works standard 189, 1.4571/graphite



Works standard 189
For smooth flanges and flanges with raised face as per ANSI / ASME B16.5 and EN 1759

			Class 150		Class 300		Class 600		Class 900	
DN	NPS	d_1	d_2	d_3	d_2	d_3	d_2	d_3	d_2	d_3
15	½	22	40	47,5	46	54,0	46	54,0	56	63,5
20	¾	27	49	57,0	59	66,5	59	66,5	62	70,0
25	1	34	59	66,5	65	73,0	65	73,0	72	79,5
32	1 ¼	43	68	76,0	75	82,5	75	82,5	81	89,0
40	1 ½	49	78	85,5	88	95,5	88	95,5	91	98,5
50	2	61	97	105,0	103	111,0	103	111,0	135	143,0
65	2 ½	73	116	124,0	122	130,0	122	130,0	157	165,0
80	3	89	129	136,5	141	149,0	141	149,0	161	168,5
100	4	115	167	174,5	173	181,0	186	193,5	199	206,5
125	5	141	189	197,0	208	216,0	234	241,5	240	247,5
150	6	169	215	222,5	243	251,0	259	266,5	**281**	**289,0**
200	8	220	272	279,5	300	308,0	313	320,5	**351**	**359,0**
250	10	273	332	339,5	354	362,0	**392**	**400,0**	**427**	**435,0**
300	12	324	402	409,5	415	422,5	**449**	**457,0**	**491**	**498,5**
350	14	356	443	451,0	478	486,0	**484**	**492,0**	**513**	**520,5**
400	16	407	507	514,5	532	540,0	**557**	**565,0**	**567**	**574,5**
450	18	458	542	549,5	589	597,0	**605**	**613,0**	**630**	**638,0**
500	20	508	599	606,5	646	654,0	**675**	**682,5**	**691**	**698,5**
600	24	610	710	717,5	767	774,5	**783**	**790,5**	**830**	**838,0**

Dimensions in mm

Figures in bold:
For flanges with nubbins, the surface pressure must be recalculated and if necessary re-evaluated. In some cases the gasket will not bear the installation tightening torque required by the internal pressure.