

# 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-3F1**.

## Gasket profiles

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

## Gasket limiting values

Profiles	W1A, W11A		W1A-3	
	1.4541 graphite	1.4541 PTFE	1.4571 graphite	1.4571 PTFE
Recommended max. roughness of the flange surfaces	$\mu\text{m}$	from to	25 50 50 100	25 50 50 100
Surface pressure limits for 20 °C	$\text{N}/\text{mm}^2$	$\sigma_v$ $\sigma_\theta$	15 15 180 180	15 15 200 200
Surface pressure limits for 300 °C	$\text{N}/\text{mm}^2$	$\sigma_v$ $\sigma_\theta$	20 - 150 -	20 - 150 -

You can find gasket characteristic values in accordance with EN13555 on our homepage at [www.klinger-kempchen.de](http://www.klinger-kempchen.de)

# CORRUGATED GASKETS

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

(Expired on 1st January 2013.)

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 TUV for compliance with TRD 401 and as a result of the tests have received the TUV approval mark. The approval mark was granted in compliance with the associated TUV 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.

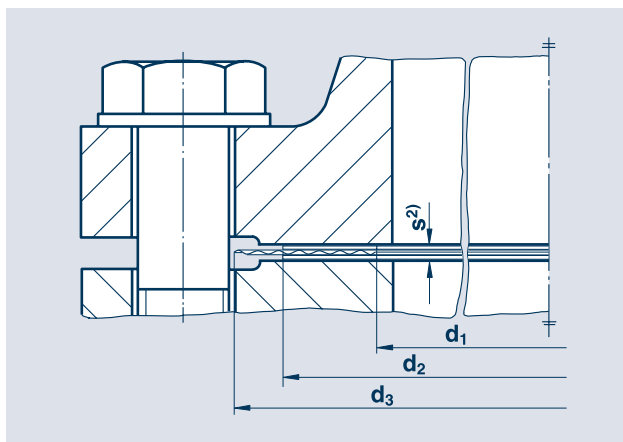
### Gasket limiting values

Description		20 °C	100 °C	200 °C	300 °C	400 °C	500 °C
W1A-RS2E2	$\sigma_v$ [N/mm <sup>2</sup> ]	15	16	17	20	22	25
1.4571/graphite	$\sigma_\theta$ [N/mm <sup>2</sup> ]	180	170	160	150	140	130

# CORRUGATED GASKETS

for flanges with raised face

04



Conforms to works standard 157 (PN 1 to PN 400)

Ordering example for a corrugated gasket with layers, Profile W11A, DN 100, PN 100, works standard 15L, made of ...<sup>1)</sup>:

**Corrugated gasket, W11A, DN 100, PN 100, WN 157, 1.4541 /g raphite**

For DIN flanges

DN	d <sub>1</sub>	d <sub>2</sub>	PN				d <sub>3</sub>								
			1 u. 2,5	6	10	16	25	40	63	100	160	250	320	400	
10	18	34	38	38	46	46	46	46	56	56	56	67	67	67	
15	22	39	43	43	51	51	51	51	61	61	61	72	72	78	
20	28	50	53	53	60	60	60	60	-	-	-	-	-	-	
25	35	57	63	63	70	70	70	70	82	82	82	83	92	104	
32	43	65	75	75	82	82	82	82	-	-	-	-	-	-	
40	49	75	85	85	92	92	92	92	103	103	103	109	119	135	
50	61	87	95	95	107	107	107	107	113	119	119	124	134	150	
65	77	109	115	115	127	127	127	127	137	143	143	153	170	192	
80	90	120	132	132	142	142	142	142	148	154	154	170	190	207	
100	115	149	152	152	162	162	168	168	174	180	180	202	229	256	
125	141	175	182	182	192	192	194	194	210	217	217	242	274	301	
150	169	203	207	207	218	218	224	224	247	257	257	284	311	348	
175	195	233	237	237	247	247	254	265	277	287	284	316	358	402	
200	220	259	262	262	272	272	284	290	309	324	324	358	398	442	
250	274	312	318	318	327	328	340	352	364	391	388	442	488	-	
300	325	363	373	373	377	383	400	417	424	458	458	536	-	-	
350	368	421	423	423	437	443	457	474	486	512	-	-	-	-	
400	420	473	473	473	489	495	514	546	543	572	-	-	-	-	
450	470	524	528	528	539	555	-	571	-	-	-	-	-	-	
500	520	575	578	578	594	617	624	628	657	704	-	-	-	-	
600	620	675	680	680	695	734	731	747	764	813	-	-	-	-	
700	720	777	785	785	810	804	833	852	879	950	-	-	-	-	
800	820	882	890	890	917	911	942	974	988	-	-	-	-	-	
900	920	987	990	990	1017	1011	1042	1084	1108	-	-	-	-	-	
1000	1020	1091	-	-	1124	1128	1154	1194	1220	-	-	-	-	-	
1200	1240	1320	-	-	1341	1342	1364	1398	1452	-	-	-	-	-	
1400	1440	1520	-	-	1548	1542	1578	1618	-	-	-	-	-	-	
1600	1640	1740	-	-	1772	1764	1798	1830	-	-	-	-	-	-	
1800	1840	1940	-	-	1972	1964	2000	-	-	-	-	-	-	-	
2000	2040	2140	-	-	2182	2168	2230	-	-	-	-	-	-	-	
2200	2240	2340	-	-	2384	2378	-	-	-	-	-	-	-	-	
2400	2440	2540	-	-	2594	-	-	-	-	-	-	-	-	-	
2600	2650	2750	-	-	2794	-	-	-	-	-	-	-	-	-	
2800	2870	2970	-	-	3014	-	-	-	-	-	-	-	-	-	
3000	3080	3180	-	-	3228	-	-	-	-	-	-	-	-	-	

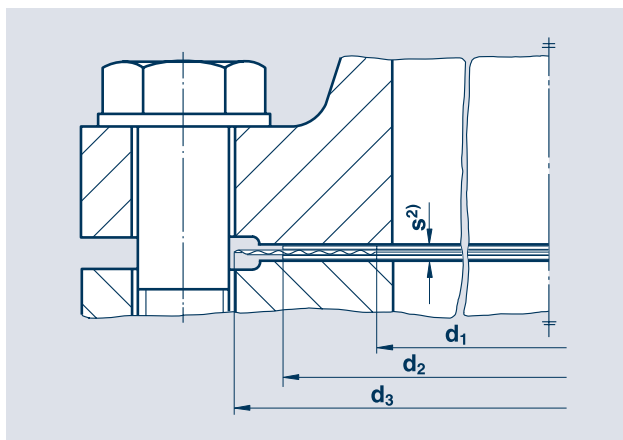
- Flanges compliant with the standard not available

Dimensions in mm

- Specify material when placing order
- The thickness of the metal ring is approx. 1.5 mm at d<sub>3</sub> < 150mm, otherwise approx. 1.2 mm

# CORRUGATED GASKETS

for flanges with raised face



Conforms to works standard 158 (Class 150 to Class 2500)

Ordering example for a corrugated gasket with layers, Profile W11A, NPS 5 for ANSI flanges, Class 600, works standard 158, made of ...<sup>1)</sup>:

**Corrugated gasket, W11A, NPS 5, Class 600, WN 158, 1.4541 / PTFE,**

04

For flanges in accordance with ANSI B16.5

NPS	d <sub>1</sub>	d <sub>2</sub>	Class		d <sub>3</sub>				
			150	300	400	600	900	1500	2500
½	21	35	44,4	50,8	50,8	50,8	60,3	60,3	66,7
¾	27	43	53,9	63,5	63,5	63,5	66,7	66,7	73,0
1	33	51	63,5	69,8	69,8	69,8	76,3	76,3	82,5
1¼	42	64	73,0	79,4	79,4	79,4	85,7	85,7	101,6
1½	48	73	82,5	92,1	92,1	92,1	95,2	95,2	114,3
2	60	92	101,6	108,0	108,0	108,0	139,7	139,7	142,8
2½	73	105	120,6	127,0	127,0	127,0	161,9	161,9	165,1
3	89	127	133,4	146,1	146,1	146,1	165,1	174,5	193,7
3½	102	140	158,8	161,9	158,7	158,7	-	-	-
4	114	157	171,5	177,8	174,6	190,5	203,2	206,4	231,7
5	141	186	193,7	212,7	209,5	238,1	244,5	250,8	276,2
6	168	216	219,1	247,7	244,5	263,5	285,8	297,4	314,3
8	219	270	276,2	304,8	301,6	317,5	355,6	349,3	384,1
10	273	324	336,5	358,8	355,6	396,9	431,8	431,8	473,0
12	324	381	406,4	419,1	415,9	454,0	495,3	517,5	546,1
14	356	413	447,7	482,6	479,4	488,9	517,5	574,7	-
16	406	470	511,2	536,6	533,4	561,9	571,5	638,1	-
18	457	535	546,1	593,7	590,5	609,6	636,0	701,7	-
20	510	585	603,2	650,9	644,5	679,5	695,3	752,4	-
22	559	641	657,2	701,7	698,5	730,3	-	-	-
24	610	690	714,4	771,5	765,2	787,4	835,0	898,5	-

- Flanges compliant with the standard not available

Dimensions in mm

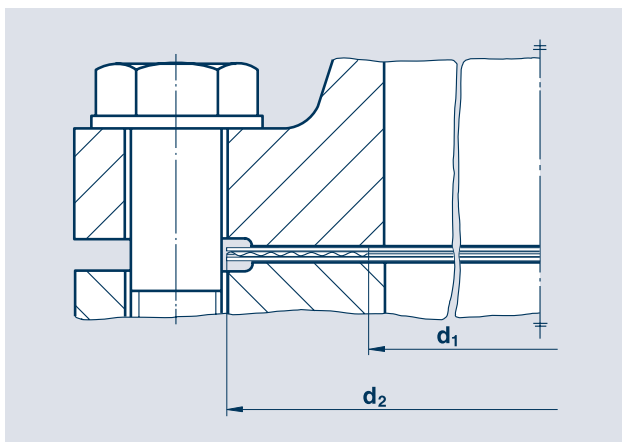
<sup>1)</sup> Specify material when placing order

<sup>2)</sup> The thickness of the metal ring is approx. 1.5 mm at d<sub>3</sub> < 150mm, otherwise approx. 1.2 mm

# CORRUGATED GASKETS

for flanges with raised face

04



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 ...<sup>1)</sup>:

**Corrugated gasket, W1A, DN 100, PN 100, EN 1514-4, 1.4571 / graphite**

Conforms to EN 1514-4 for DIN flanges

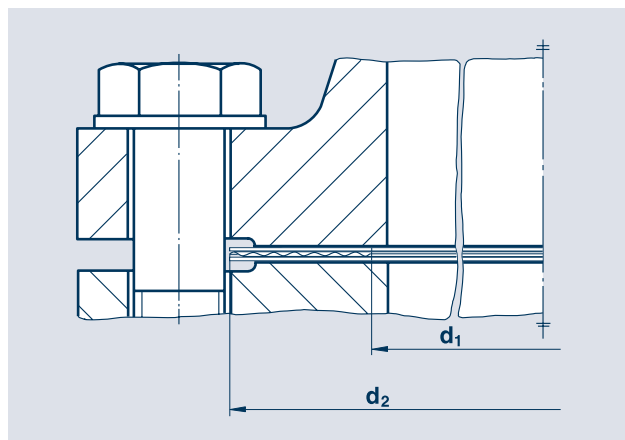
DN	d <sub>1</sub>	PN					
		10	16	25	40	63	100
10	18	48	48	48	48	58	58
15	22	53	53	53	53	63	63
20	27	63	63	63	63	74	74
25	34	73	73	73	73	84	84
32	43	84	84	84	84	90	90
40	49	94	94	94	94	105	105
50	61	109	109	109	109	115	121
65	77	129	129	129	129	140	146
80	89	144	144	144	144	150	156
100	115	164	164	170	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

<sup>1)</sup> Specify material when placing order

# CORRUGATED GASKETS



**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 ...<sup>1)</sup>:

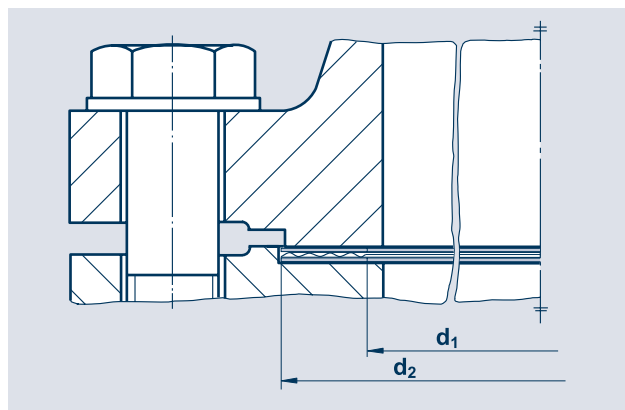
**Corrugated gasket, W1A, NPS 5, Class 600, EN 12560-4, 1.4541 / PTFE**

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

NPS	d <sub>1</sub>	Class		d <sub>2</sub>			
		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	-

Dimensions in mm

**For flanges with male and female faces**



**Conforms to DIN 2692 (PN 10 to PN 100)**

For dimensions, see the section 3 "flat gaskets".  
Ordering example for a corrugated gasket with layers, Profile W1A, DN100, made of ...<sup>1)</sup>:

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

**In accordance with ANSI B16.21 (Class 150 to 1500)**

For dimensions, see the section 3 "flat gaskets".  
Ordering example for a corrugated gasket with layers, Profile W1 A, DN 5, NPS 5, wide finish, made of ...<sup>1)</sup>:

**Corrugated gasket, W1A, NPS 5, ANSI B16.21 wide, male and female face, 1.4541/graphite**

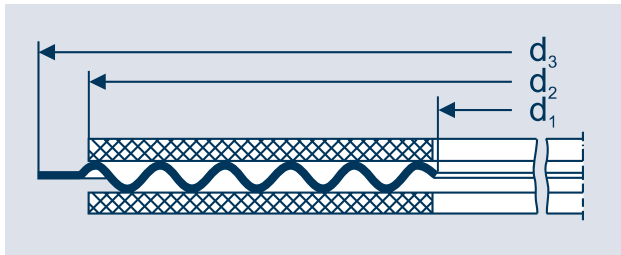
<sup>1)</sup> Specify material when placing order

# CORRUGATED GASKETS

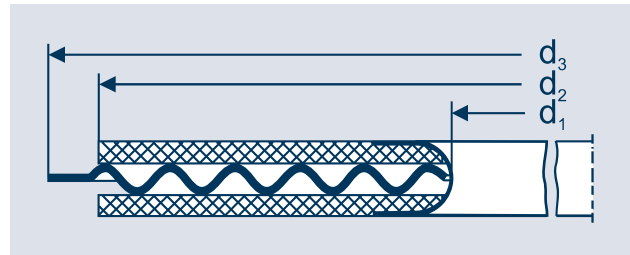
## Corrugated TA-Luft gasket Profile W1A-3

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  $C \geq 99\%$ , a density of  $\rho = 1.0 \text{ g/cm}^3$  and a chloride content of  $\leq 25 \text{ ppm}$ . 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 "Tire Safe" requirements of ISO 10497 has been demonstrated by tests in accordance with API 607 and is confirmed with the relevant certificate.

# CORRUGATED GASKETS

## Gasket limiting values

Layer	Graphite	PTFE
Min. surface pressure N/mm <sup>2</sup> at 20 °C: $\sigma_v$	15	15
Max. surface pressure N/mm <sup>2</sup> at 20 °C: $\sigma_y$	200	200
Min. temperature: °C	-200	-200
Max. temperature:* °C	+550	+250

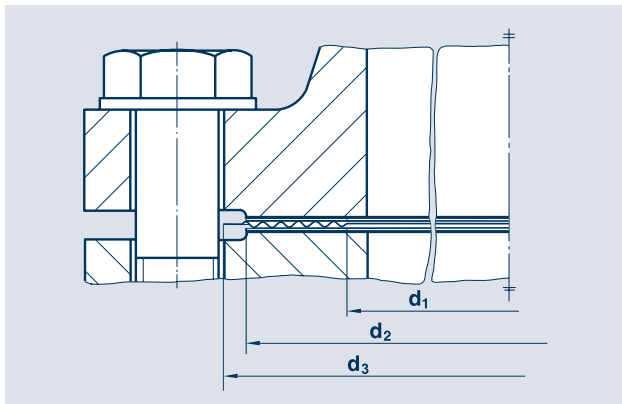
\* From a continuous temperature of 450 °C our technical department must be consulted.

You can find gasket characteristic values in accordance with EN13555 on our homepage at [www.klinger-kempchen.de](http://www.klinger-kempchen.de)



# CORRUGATED GASKETS

04



Ordering example for a corrugated ring gasket, Profile W1A-3, DN 100, PN 16, works standard 210, 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 210, 1.4571 / graphite**

## Works standard 210

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

DN	d <sub>1</sub>	PN 10		PN 16		PN 25		PN 40		PN 63*		PN 100*	
		d <sub>2</sub>	d <sub>3</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>2</sub>	d <sub>3</sub>
10	18	38	46	38	46	38	46	38	46				
15	22	43	51	43	51	43	51	43	51				
20	27	53	61	53	61	53	61	53	61				
25	34	63	71	63	71	63	71	63	71				
32	43	74	82	74	82	74	82	74	82				
40	49	84	92	84	92	84	92	84	92				
50	61	99	107	99	107	99	107	99	107				
65	77	119	127	119	127	119	127	119	127				
80	89	134	142	134	142	134	142	134	142				
100	115	154	162	154	162	160	168	160	168				
125	141	184	192	184	192	186	194	186	194				
150	169	210	218	210	218	216	224	216	224				
200	220	265	273	265	273	276	284	282	290				
250	273	320	328	321	329	332	340	344	352				
300	324	370	378	376	384	392	400	409	417				
350	356	430	438	436	444	449	457	466	474				
400	407	481	489	487	495	506	514	538	546				
450	458	531	539	547	555	556	564	563	571				
500	508	586	594	609	617	616	624	<b>620</b>	<b>628</b>				
600	610	678	695	726	734	723	731	<b>739</b>	<b>747</b>			-	-
700	712	802	810	<b>796</b>	<b>804</b>	<b>825</b>	<b>833</b>					-	-
800	813	909	917	<b>903</b>	<b>911</b>	<b>934</b>	<b>942</b>					-	-
900	915	1009	1017									-	-

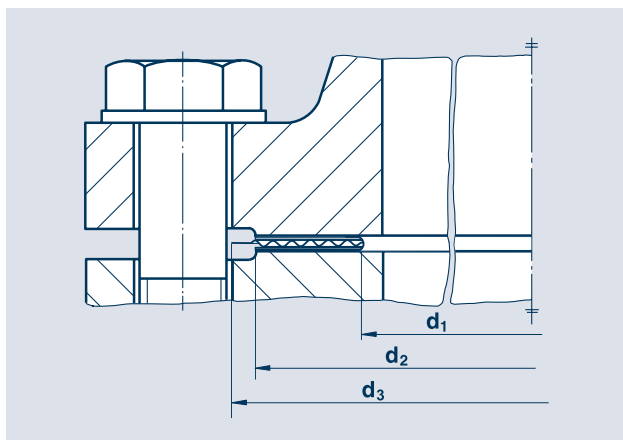
- Flanges compliant with the standard not available. \*Sizes available on request.

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**

04

## Works standard 189

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

DN	NPS	d <sub>1</sub>	Class 150		Class 300		Class 600		Class 900	
			d <sub>2</sub>	d <sub>3</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>2</sub>	d <sub>3</sub>	d <sub>2</sub>	d <sub>3</sub>
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	1¼	43	68	76,0	75	82,5	75	82,5	81	89,0
40	1½	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	2½	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	<b>281</b>	<b>289,0</b>
200	8	220	272	279,5	300	308,0	313	320,5	<b>351</b>	<b>359,0</b>
250	10	273	332	339,5	354	362,0	<b>392</b>	<b>400,0</b>	<b>427</b>	<b>435,0</b>
300	12	324	402	409,5	415	422,5	<b>449</b>	<b>457,0</b>	<b>491</b>	<b>498,5</b>
350	14	356	443	451,0	478	486,0	<b>484</b>	<b>492,0</b>	<b>513</b>	<b>520,5</b>
400	16	407	507	514,5	532	540,0	<b>557</b>	<b>565,0</b>	<b>567</b>	<b>574,5</b>
450	18	458	542	549,5	589	597,0	<b>605</b>	<b>613,0</b>	<b>630</b>	<b>638,0</b>
500	20	508	599	606,5	646	654,0	<b>675</b>	<b>682,5</b>	<b>691</b>	<b>698,5</b>
600	24	610	710	717,5	767	774,5	<b>783</b>	<b>790,5</b>	<b>830</b>	<b>838,0</b>

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.