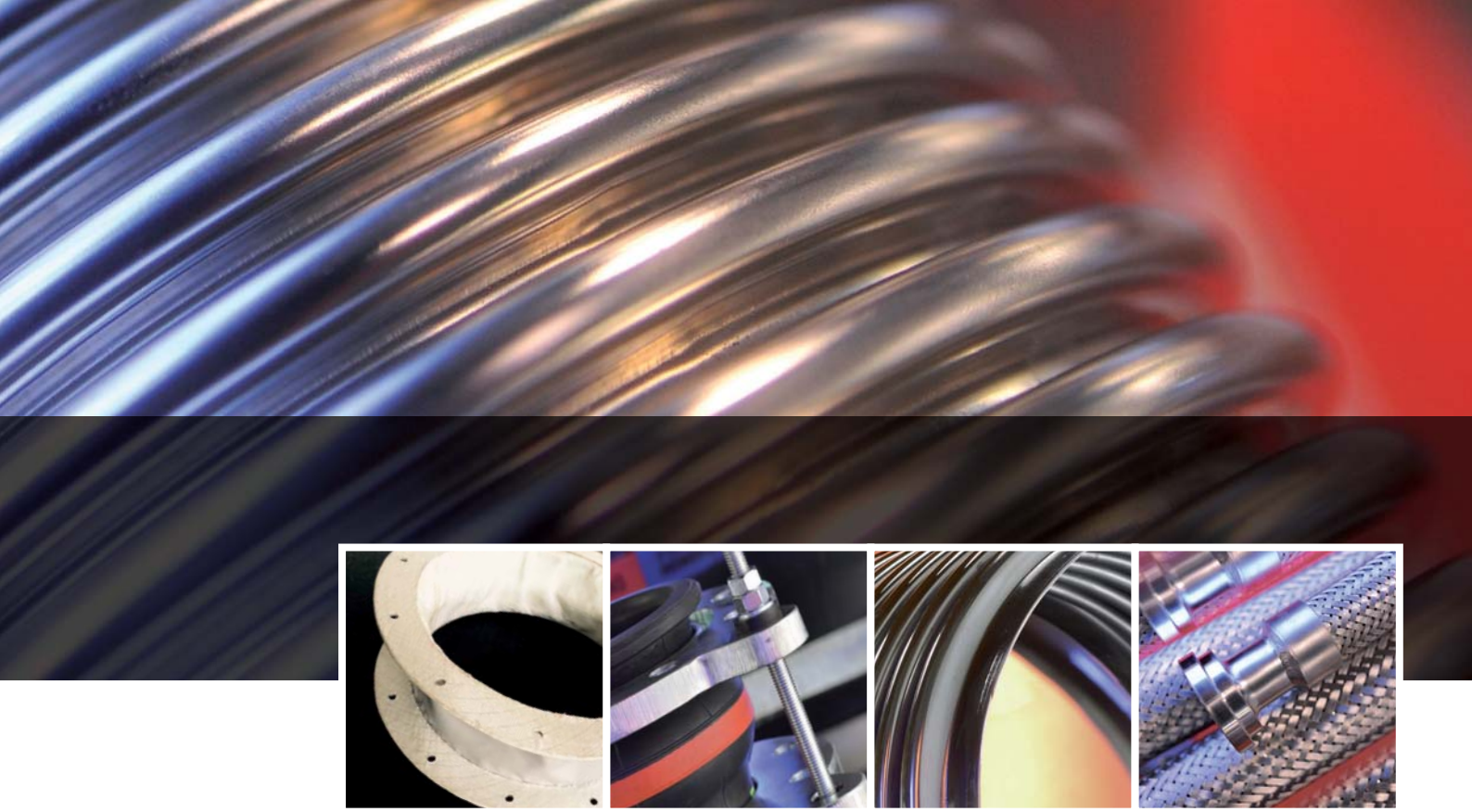

Appendix
materials and standards

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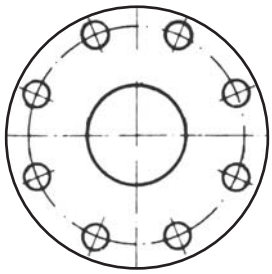
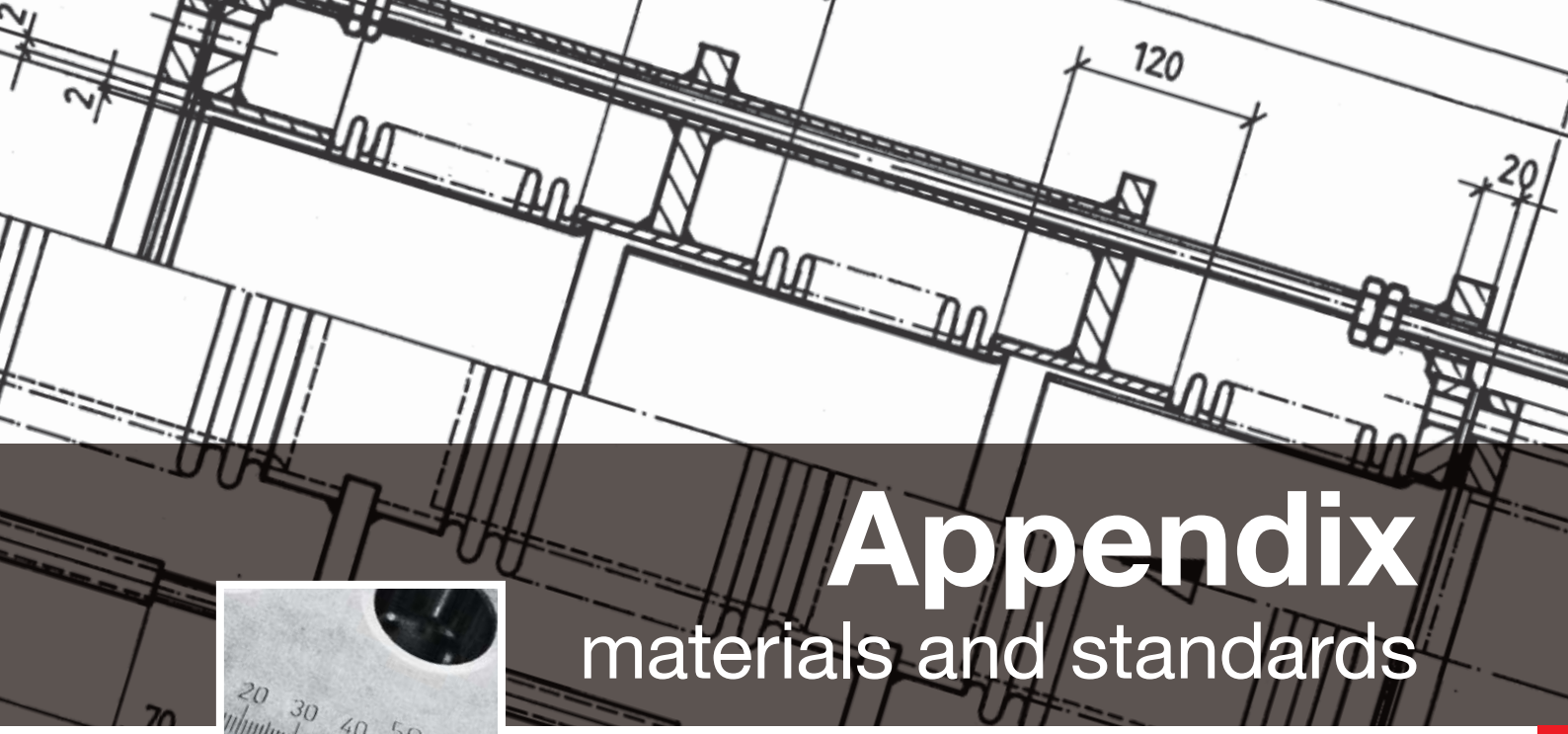




Appendix
materials and standards

Materials and Measuring Units

Materials acc. DIN EN 10088

W. Nr.	Short name DIN	AISI Nr.	C max.%	Cr %	Ni %	Mn max.%	Si max.%	S max.%	Mo %	Ti min. %
1.4301	X5CrNi18-10	304	0,07	17,0-19,0	8,5-10,5	2,0	1,0	0,03	–	–
1.4306	X2CrNi19-11	304L	0,03	18,0-20,0	10,0-12,0	2,0	1,0	0,03	–	–
1.4529	X2CrNiMoCuN25-20	B625	0,02	19,0-21,0	24,0-26,0	1,0	0,5	0,01	6,0-7,0	–
1.4539	X1CrNiMoCu25-20	904L	0,02	19,0-21,0	24,0-26,0	2,0	0,7	0,01	4,0-5,0	–
1.4541	X6CrNiTi18-10	321	0,08	17,0-19,0	9,0-12,0	2,0	1,0	0,03	–	5x%C
1.4571	X6CrNiMoTi17-12-2	316Ti	0,08	16,5-18,5	10,5-13,5	2,0	1,0	0,03	2,0-2,5	5x%C
1.4401	X5CrNiMo17-12-2	316	0,07	16,5-18,5	10,5-13,5	2,0	1,0	0,03	2,0-2,5	–
1.4404	X2CrNiMo17-12-2	316L	0,03	16,5-18,5	11,0-14,0	2,0	1,0	0,03	2,0-2,5	–
1.4435	X2CrNiMo18-14-3	316L	0,03	17,0-18,5	12,5-15,0	2,0	1,0	0,03	2,5-3,0	–
1.4436	X3CrNiMo17-13-3	316	0,07	16,5-18,5	11,0-14,0	2,0	1,0	0,03	2,5-3,0	–
2.4856	INCONEL625	B443	0,03	20,0-23,0	> 58	0,5	0,5	0,015	8,0-10,0	–

Units for Weights

Unit	g	kg	t	oz	lb
1 gram (g)	1	0,001	–	0,03527	0,0022
1 kilogram (kg)	1000	1	0,001	35,274	2,20462
1 tonne (t)	–	1000	1	35274	2204,62
1 ounce (oz)	28,3495	0,02835	–	1	0,0625
1 pound (lb)	453,592	0,45359	0,00045	16	1

Units for Pressure

Unit	Pa	Bar	mm H_2O	m H_2O	at
1 Pascal (Pa) = 1 N/m²	1	0,00001	0,10197	0,001	0,00001
1 Bar (bar)	100000	1	10197,2	10,1972	1,01972
1 water column millimeter ≤ kp/m²	9,80665	–	1	0,001	0.0001
1 water column meter (m H_2O)	9806,65	0,09807	1000	1	0,1
1 technical atmosphere (at) = kp/mm²	98066,5	0,98067	10000	10	1
1 physical atmosphere (atm)	101325	1,01325	10332,3	10,3323	1,03323
1 mm mercury column (mm Hg) = Torr	133,322	0,00133	13,5951	0,013595	0,00136
1 pound-force per sqare inch (lbf/in²)	6894,76	0,06895	703,07	0,70307	0,07031
1 pound-force per sqare foot (lbf/ft²)	47,8803	0,00048	4,88243	0,00488	0,00048
1 inch mercury column (in Hg)	3386,39	0,03386	345,316	0,34532	0,03453

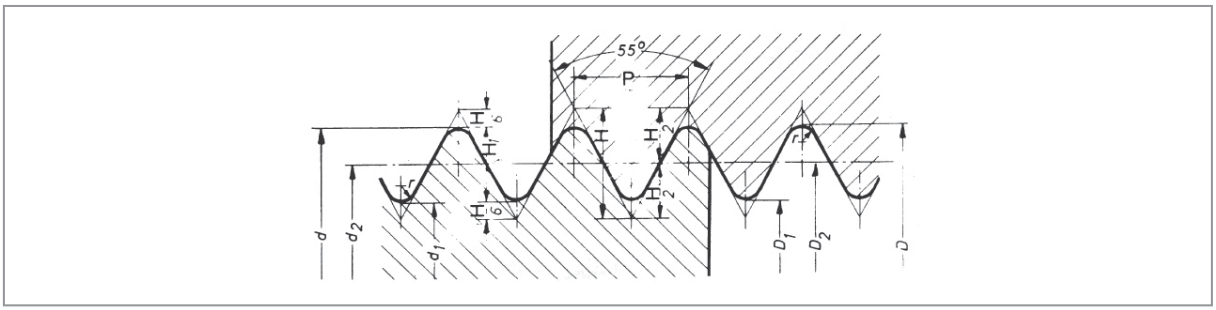
Unit	atm	mm Hg	lbf/in²	lbf/ft²	in Hg
1 Pascal (Pa) = 1 N/m²	–	0,0075	0,00014	0,02089	0,000295
1 Bar (bar)	0,98692	750,062	14,5037	2088,54	29,53
1 water column millimeter ≤ kp/m²	–	0,07356	0,00142	0,20482	0,0029
1 water column meter (m H_2O)	0,09678	73,5559	1,42233	204,816	2,8959
1 technical atmosphere (at) = kp/mm²	0,96784	735,559	14,2233	2048,16	28,959
1 physical atmosphere (atm)	1	760	14,696	2116,22	29,9213
1 mm mercury column (mm Hg) = Torr	0,00132	1	0,01934	2,78449	0,03937
1 pound-force per sqare inch (lbf/in²)	0,06805	51,7149	1	144	2,03602
1 pound-force per sqare foot (lbf/ft²)	0,00047	0,35913	0,00694	1	0,01414
1 inch mercury column (in Hg)	0,03342	25,4	0,49115	70,7262	1

Threads

Withworth Pipe Thread acc. to DIN 259 / DIN – ISO 228

British Standard Pipe Parallel Thread, with sealant compound, parallel or cylindrical.

Description	Sealing	Symbol	Detail
Pipe threads where pressure-tight joints are not made on the threads	not sealing on the thread	G	internal and external thread cylindrical



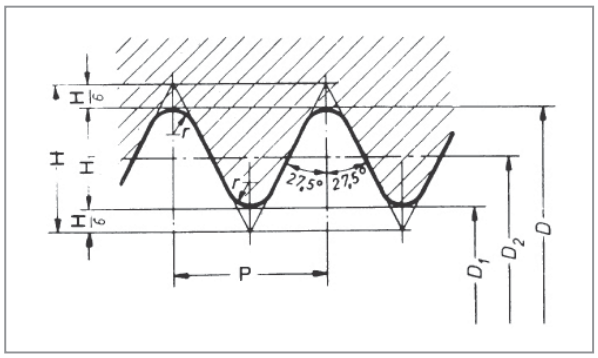
Size of thread	Nom. tube width	Thread dimensions						
		Outside diameter $d = D$	Flank diameter $d_2 = D_2$	Core diameter $d_1 = D_1$	Gradient P	No. of threads per 25,4 mm	Depth of thread H_1	Radius r ≈
R 1/8	6	9,728	9,147	8,566	0,907	28	0,581	0,125
R 1/4	8	13,157	12,301	11,445	1,337	19	0,856	0,184
R 3/8	10	16,662	15,806	14,950	1,337	19	0,856	0,184
R 1/2	15	20,955	19,793	18,631	1,814	14	1,162	0,249
R 3/4	20	26,441	25,279	24,117	1,814	14	1,162	0,249
R 1	25	33,249	31,770	30,291	2,309	11	1,479	0,317
R 1 ¼	32	41,910	40,431	38,952	2,309	11	1,479	0,317
R 1 ½	40	47,803	46,324	44,845	2,309	11	1,479	0,317
R 2	50	59,614	58,135	56,656	2,309	11	1,479	0,317
R 2 ½	65	75,184	73,705	72,226	2,309	11	1,479	0,317
R 3	80	87,884	86,405	84,926	2,309	11	1,479	0,317
R 4	100	113,030	111,551	110,072	2,309	11	1,479	0,317
R 5	125	138,430	136,951	135,472	2,309	11	1,479	0,317
R 6	150	163,830	162,351	160,872	2,309	11	1,479	0,317

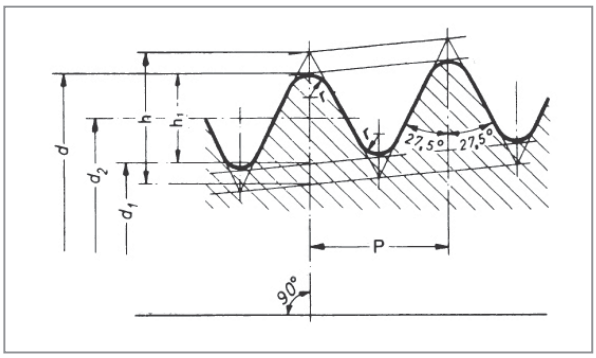
Measures in mm.

Pipe Thread acc. to DIN 2999 (excerpt)

Whitworth pipe thread for pipes and fittings. Parallel female thread and tapered male thread (taper 1 : 16). An appropriate sealing compound can be used in the thread to ensure a leak-proof joint. The flank angle is 55°.

Description	Sealing	Symbol	Detail
Whitworth pipe threads for threaded pipes and fittings	sealing on the thread	**Rp**	internal thread cylindrical
		R	external thread taper





Size of thread	Nom. tube width	Distance of the measure. plane	Thread dimensions							
			Outside diameter d = D	Flank diameter $d_2 = D_2$	Core diameter $d_1 = D_1$	Gradient P	No. of thread per 25,4 mm	Depth of thread H_1	Radius r ≈	Effective length of thread
R 1/8	6	4,0	9,728	9,147	8,566	0,907	28	0,581	0,125	6,5
R 1/4	8	6,0	13,157	12,301	11,445	1,337	19	0,856	0,184	9,7
R 3/8	10	6,4	16,662	15,806	14,950	1,337	19	0,856	0,184	10,1
R 1/2	15	8,2	20,955	19,793	18,631	1,814	14	1,162	0,249	13,2
R 3/4	20	9,5	26,441	25,279	24,117	1,814	14	1,162	0,249	14,5
R 1	25	10,4	33,249	31,770	30,291	2,309	11	1,479	0,317	16,8
R 1 ¼	32	12,7	41,910	40,431	38,952	2,309	11	1,479	0,317	19,1
R 1 ½	40	12,7	47,803	46,324	44,845	2,309	11	1,479	0,317	19,1
R 2	50	15,9	59,614	58,135	56,656	2,309	11	1,479	0,317	23,4
R 2 ½	65	17,5	75,184	73,705	72,226	2,309	11	1,479	0,317	26,7
R 3	80	20,6	87,884	86,405	84,926	2,309	11	1,479	0,317	29,8
R 4	100	25,4	113,030	111,551	110,072	2,309	11	1,479	0,317	35,8
R 5	125	28,6	138,430	136,951	135,472	2,309	11	1,479	0,317	40,1
R 6	150	28,6	163,830	162,351	160,872	2,309	11	1,479	0,317	40,1

Measures in mm.

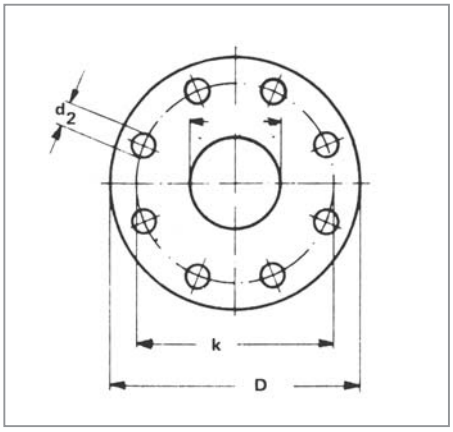
Flanges

Flange Dimensions acc. to DIN (PN 6 – PN 40)

Specific information about flanges according to DIN standards are described in the following tables.

The illustration on the right is only intended to show the arrangement of the bolt holes, not their quantity. Every flange shall be provided with a number of bolt holes divisible by 4.

The bolt holes shall in the case of piping and valve gear be arranged in such a way that they are symmetrical to the two main axes and that no holes come to be located in these axes. Other standards (like ANSI) or custom designed flanges can also be provided.



▷ Nominal Pressure 6

Nom. diameter	Flange			Bolts			Flange thickness		
	D diameter	d_1 diameter seal	k hole circle	Quantity	Thread	d_2 hole diam.	DIN old	DIN EN 1092 Flange type	
								02	11
10	75	35	50	4	M10	11	10	12	12
15	80	40	55	4	M10	11	10	12	12
20	90	50	65	4	M10	11	10	14	14
25	100	60	75	4	M10	11	12	14	14
32	120	70	90	4	M12	14	12	16	14
40	130	80	100	4	M12	14	12	16	14
50	140	90	110	4	M12	14	12	16	14
65	160	110	130	4	M12	14	12	16	14
80	190	128	150	4	M16	18	14	18	16
100	210	148	170	4	M16	18	14	18	16
125	240	178	200	8	M16	18	14	20	18
150	265	202	225	8	M16	18	14	20	18
200	320	258	280	8	M16	18	16	22	20
250	375	312	335	12	M16	18	20	24	22
300	440	365	395	12	M20	22	24	24	22
350	490	415	445	12	M20	22	26	26	22
400	540	465	495	16	M20	22	28	28	22

Measures in mm.

▷ Nominal Pressure 10

Nom. diameter	Flange			Bolts			Flange thickness		
	D diameter	d_1 diameter seal	k hole circle	Quantity	Thread	d_2 hole diam.	DIN old	DIN EN 1092 Flange type	
								02, 04	11
DN 10 - 150	**For size 10 - 150 use flanges of nom. pressure PN 16**								
200	340	268	295	8	M 20	22	20	24	24
250	395	320	350	12	M 20	22	22	26	26
300	445	370	400	12	M 20	22	26	26	26
350	505	430	460	16	M 20	22	28	28	26
400	565	482	515	16	M 24	26	32	32	26

Measures in mm

▷ Nominal Pressure 16

Nom. diameter	Flange			Bolts				Flange thickness	
	D diameter	d_1 diameter seal	k hole circle	Quantity (old)	Thread	d_2 hole diam.	DIN old	DIN EN 1092 Flange type	
								02, 04	11
10	90	40	60	4	M 12	14	14	14	16
15	95	45	65	4	M 12	14	14	14	16
20	105	58	75	4	M 12	14	14	16	18
25	115	68	85	4	M 12	14	16	16	18
32	140	78	100	4	M 16	18	16	18	18
40	150	88	110	4	M 16	18	16	18	18
50	165	102	125	4	M 16	18	16	19	18
65	185	122	145	*(4) 8	M 16	18	16	20	18
80	200	138	160	8	M 16	18	18	20	20
100	220	158	180	8	M 16	18	18	22	20
125	250	188	210	8	M 16	18	18	22	22
150	285	212	240	8	M 20	22	18	24	22
200	340	268	295	12	M 20	22	20	26	24
250	405	320	355	12	M 24	26	24	29	26
300	460	378	410	12	M 24	26	28	32	28
350	520	438	470	16	M 24	26	32	35	30
400	580	490	525	16	M 27	30	36	38	32

* Also available / Measures in mm.

▷ Nominal Pressure 25

Nom. diameter	Flange			Bolts			Flange thickness		
	D diameter	d_1 diameter seal	k hole circle	Quantity	Thread	d_2 hole diam.	DIN old	DIN EN 1092 Flange type	
								02, 04	11
DN 10-150	**For size10-150 use flanges of nom. pressure PN 40**								
200	360	278	310	12	M 24	26	26	32	30
250	425	335	370	12	M 27	30	30	35	32
300	485	395	430	16	M 27	30	34	38	34
350	555	450	490	16	M 30	33	38	42	38
400	620	505	550	16	M 33	36	42	46	40

Measures in mm

▷ Nominal Pressure 40

Nom. diameter	Flange			Bolts			Flange thickness		
	D diameter	d_1 diameter seal	k hole circle	Quantity	Thread	d_2 hole diam.	DIN old	DIN EN 1092 Flange type	
								02, 04	11
10	90	40	60	4	M 12	14	16	14	16
15	95	45	65	4	M 12	14	16	14	16
20	105	58	75	4	M 12	14	16	16	18
25	115	68	85	4	M 12	14	18	16	18
32	140	78	100	4	M 16	18	18	18	18
40	150	88	110	4	M 16	18	18	18	18
50	165	102	125	4	M 16	18	20	20	20
65	185	122	145	8	M 16	18	20	22	22
80	200	138	160	8	M 16	18	22	24	24
100	235	162	190	8	M 20	22	22	26	24
125	270	188	220	8	M 24	26	24	28	26
150	300	218	250	8	M 24	26	24	30	28
200	375	285	320	12	M 27	30	30	36	34
250	450	345	385	12	M 30	33	36	42	38
300	515	410	450	16	M 30	33	40	42	42
350	580	535	510	16	M 33	36	46	54	46
400	660	615	585	16	M 36	39	50	60	50

Measures in mm.

Comparison of DIN Standards and DIN EN 1092-1

Application

The new DIN EN 1092-1 combines the previous flange norms in one single norm. Please find the comparison of old and new norms and flange types, applications and sizes of the most common flanges in the table below.

DIN	Flange type acc. to DIN EN	Application	Size acc. to previous standard DIN	Size acc. to DIN EN 1092-1
2566	13	Thread flange with shoulder PN 10 – PN 16	DN 6 – DN 100	DN 10 – DN 600
2573	01	Flange, even for brazing or welding PN 6	DN 10 – DN 500	DN 10 – DN 600
2576	01	Flange, even for brazing or welding PN 10	DN 10 – DN 500	DN 10 – DN 600
2630	11	Weld-on flange PN 1 – PN 2,5	DN 10 – DN 4000	DN 10 – DN 4000
2631	11	Weld-on flange PN 6	DN 10 – DN 3600	DN 10 – DN 3600
2632	11	Weld-on flange PN 10	DN 10 – DN 3000	DN 10 – DN 3000
2633	11	Weld-on flange PN 16	DN 10 – DN 2000	DN 10 – DN 2000
2634	11	Weld-on flange PN 25	DN 10 – DN 1000	DN 10 – DN 1000
2635	11	Weld-on flange PN 40	DN 10 – DN 500	DN 10 – DN 600
2636	11	Weld-on flange PN 63 (64)	DN 10 – DN 400	DN 10 – DN 400
2637	11	Weld-on flange PN 100	DN 10 – DN 350	DN 10 – DN 350
2641	02, 33, 32	Swivel flange; collar PN 6	DN 10 – DN 1200	DN 10 – DN 600
2642	02, 33, 32	Swivel flange; collar PN 10	DN 10 – DN 800	DN 10 – DN 600
2655	02, 33, 32	Swivel flange; collar PN 25	DN 10 – DN 500	DN 10 – DN 600
2656	02, 33, 32	Swivel flange; collar PN 40	DN 10 – DN 400	DN 10 – DN 600
2673	04, 34	Swivel flange; weld-on shoulder PN 25	DN 10 – DN 1200	DN 10 – DN 600

Flange Types and Corresponding Parts

Please find the new flange types and corresponding parts acc. to DIN EN 1092-1 in the following table.

Type no.	Denomination	Type no.	Denomination
01	Weld-on even flange	13	Thread flange with shoulder
02	Swivel flange for weld-on collar	32	Even collar
04	Swivel flange for weld-on collar	33	Weld-on collar
11	Weld-on flange	34	Weld-on shoulder

▷ Sealing Surface Denomination

Please find the new sealing surface denomination acc. to DIN EN 1092-1 in the table below.

Old denomination acc. to DIN	New denomination acc. to DIN EN 1092-1
Form A	Form A
Form B	Form A
Form C	Form B 1
Form D	Form B 1
Form E	Form B 2
Form F	Form C
Form N	Form D
Form V 13	Form E
Form R 13	Form F
Form V 14	Form H
Form R 14	Form G

▷ Example

Denomination of flanges and parts acc. to DIN EN 1092-1.

Denomination	Flange no.	Sealing surface form	DN	PN	Material
Flange EN 1092-1	02	A	DN 200	PN 10	1.0038
Bund EN 1092-1	32	A	DN 200	PN 10	1.4571
V-Flange EN 1092-1	11	B1	DN 100	PN 6	1.0402