

Steel butt-welding pipe fittings

Elbows and bends with reduced pressure factor

DIN
2605
Part 1

Formstücke zum Einschweißen;
Rohrbogen; verminderter Ausnutzungsgrad

Supersedes DIN 2605,
September 1962 edition, and
DIN 2606, July 1965 edition.

In keeping with current practice in standards published by the International Organization for Standardization (ISO), a comma has been used throughout as the decimal marker.

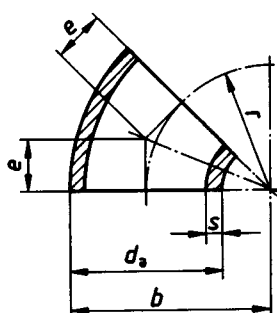
Dimensions in mm

1 Field of application

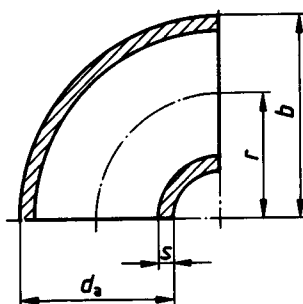
This standard specifies seamless and welded steel elbows and bends that are intended to be butt welded to pipes. Although the wall thicknesses specified correspond to those of the pipes, these fittings do not permit operation at the same internal pressure as the pipe welded on, i.e. they have a reduced pressure factor (cf. table 1 and clause 5).

2 Types and designation

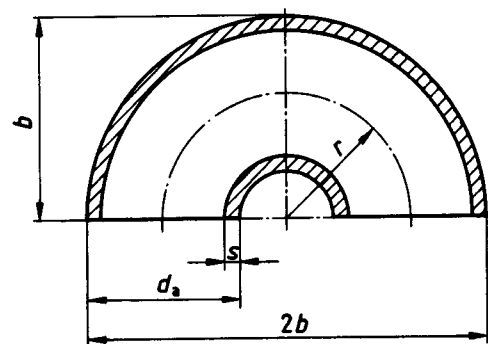
45° elbow



90° elbow



180° bend



r is to be calculated as follows: type 2: $r \approx 1,0 \cdot d_a$

type 3: $r \approx 1,5 \cdot d_a$

type 5: $r \approx 2,5 \cdot d_a$

type 10: $r \approx 5,0 \cdot d_a$

type 20: $r \approx 10,0 \cdot d_a$

Designation of a type 3 (3) seamless (S) 90° (90) elbow in accordance with this standard (1), where d_a is equal to 88,9 mm and s is equal to 2,3 mm, made from material belonging to material group G as in DIN 2609 (G):

Elbow DIN 2605-1-90-3-88,9 × 2,3 S-G

Continued on page 2 to 6

3 Dimensions

Table 1. Dimensions and pressure factor

Nominal size DN	Pipe outside diameter, d_a 1)	Type	Wall thickness, s , for series					Maximum pressure factor, as a percentage, for series					r	b	e
			1	2 ²⁾	3	4	5	1	2	3	4	5			
15	21,3	2	1,6	—	2,0	3,2	4,0	53	—	54	57	59	17,5	28	7
		3						74		75	75	76	28,0	38	12
		5						85		85	85	85	42,5	53	18
20	26,9	2	1,6	—	2,3	3,2	4,0	59	—	60	61	62	25,0	39	10
		3						67		68	68	69	29,0	43	12
		5						86		86	86	86	57,5	71	24
25	33,7	2	2,0	—	2,6	3,2	4,0	52	—	53	54	55	25,0	42	10
		3						70		70	70	71	38,0	56	16
		5						86		86	86	86	72,5	90	30
32	42,4	2	2,0	—	2,6	3,6	4,0	52	—	52	54	54	32,0	53	13
		3						70		70	71	71	48,0	69	20
		5						86		86	87	87	92,5	114	38
40	48,3	2	2,0	—	2,6	4,0	5,0	51	—	52	53	54	38,0	62	16
		3						72		72	73	73	57,0	82	24
		5						87		87	87	87	107,5	132	45
50	60,3	2	2,0	—	2,9	4,5	5,6	56	—	56	57	58	51	81	21
		3						74		74	75	75	76	106	32
		5						87		87	87	87	135	165	56
		10						92		93	93	93	254	284	105
		20						96		96	96	96	508	538	210
65	76,1	2	2,3	—	2,9	5,0	7,1	55	—	55	56	57	63	102	26
		3						74		74	75	75	95	133	39
		5						87		87	87	87	175	213	73
		10						92		92	92	93	318	356	132
		20						96		96	96	96	635	673	263
80	88,9	2	2,3	—	3,2	5,6	8,0	57	—	57	58	59	76	121	32
		3						75		75	75	76	114	159	47
		5						87		87	87	88	205	250	85
		10						93		93	93	93	381	425	158
		20						96		96	96	96	762	806	316
100	114,3	2	2,6	—	3,6	6,3	8,8	60	—	60	61	61	102	159	42
		3						76		76	76	77	152	210	63
		5						88		88	88	88	270	327	112
		10						93		93	93	93	508	565	210
		20						96		96	96	96	1016	1073	421
125	139,7	2	2,6	—	4,0	6,3	10,0	61	—	61	61	62	127	197	53
		3						77		77	77	77	190	260	79
		5						88		88	88	88	330	400	137
		10						93		93	93	93	635	705	263
		20						97		97	97	97	1270	1340	526
150	168,3	2	2,6	4,0	4,5	7,1	11,0	60	61	61	61	62	152	237	63
		3						77		77	77	77	229	313	95
		5						87		87	87	88	390	474	162
		10						93		93	93	93	762	846	316
		20						97		97	97	97	1524	1608	631

1) The pipe outside diameters given have been taken from series 1 in ISO 4200.

2) The wall thicknesses specified for series 2, for nominal sizes up to DN 1000, are in accordance with the normal wall thickness series given in DIN 2458.

A dash in a box indicates a size that has not been standardized.

Table 1 (continued).

Nominal size DN	Pipe outside diameter, d_a 1)	Type	Wall thickness, s , for series					Maximum pressure factor, as a percentage, for series					r	b	e
			1	2 ²⁾	3	4	5	1	2	3	4	5			
200	219,1	2						62	62	62	63	63	203	313	84
		3						77	78	78	78	78	305	414	126
		5	2,9	4,5	6,3	8,0	12,5	87	87	87	88	88	510	620	211
		10						93	93	93	93	93	1016	1126	421
		20						97	97	97	97	97	2032	2142	842
250	273	2						62	62	63	63		254	391	105
		3						78	78	78	78		381	518	158
		5	2,9	5,0	6,3	8,8	—	88	88	88	88	—	650	787	269
		10						93	93	93	93		1270	1407	526
		20						97	97	97	97		2540	2677	1052
300	323,9	2						63	63	63	63		305	467	126
		3						78	78	78	78		457	619	189
		5	2,9	5,6	7,1	10,0	—	88	88	88	88	—	775	937	321
		10						93	93	93	93		1524	1686	631
		20						97	97	97	97		3048	3210	1263
350	355,6	2						66	66	66	66		356	533	148
		3						79	79	79	80		533	711	221
		5	3,2	5,6	8,0	11,0	—	88	88	88	88	—	850	1028	352
		10						94	94	94	94		1778	1956	737
		20						97	97	97	97		3556	3734	1473
400	406,4	2						66	66	66	66		406	610	168
		3						79	79	80	80		610	813	253
		5	3,2	6,3	8,8	12,5	—	88	88	88	88	—	970	1173	402
		10						94	94	94	94		2032	2235	842
		20						97	97	97	97		4064	4267	1683
450	457	2						66	66	66			457	686	189
		3						79	79	80			686	914	284
		5	4,0	6,3	10	—	—	88	88	88	—	—	1122	1350	465
		10						94	94	94			2286	2515	947
		20						97	97	97			4572	4801	1894
500	508	2						66	66	66			508	762	210
		3						79	79	80			762	1016	316
		5	4,0	6,3	11	—	—	88	88	88	—	—	1245	1500	516
		10						94	94	94			2540	2794	1052
		20						97	97	97			5080	5334	2104
600	610	2						66	66	66			610	914	253
		3						79	79	80			914	1219	379
		5	5,0	6,3	12,5	—	—	88	88	88	—	—	1525	1830	632
		10						94	94	94			3050	3355	1263
		20						97	97	97			6100	6405	2527
700	711	2						62	61	60			711	1066	295
		3						75	73	72			1067	1422	442
		5	5,0	7,1	12,5	—	—	83	81	81	—	—	1778	2133	737
		10						88	86	85			3555	3911	1473
		20						91	89	88			7110	7466	2945
800	813	2						61	60	60			813	1220	337
		3						74	73	72			1219	1626	505
		5	5,6	8,0	12,5	—	—	82	81	81	—	—	2033	2439	842
		10						87	86	85			4065	4472	1684
		20						90	89	88			8130	8537	3368

For 1) and 2), see page 2.

A dash in a box indicates a size that has not been standardized.

Table 1 (concluded).

Nominal size DN	Pipe outside diam-eter, d_a 1)	Type	Wall thickness, s , for series					Maximum pressure factor, as a percentage, for series					r	b	e
			1	2 ²⁾	3	4	5	1	2	3	4	5			
900	914	2						61	60	60			914	1371	379
		3						74	72	72			1372	1829	568
		5	6,3	10	12,5	—	—	82	80	81	—	—	2285	2742	947
		10						87	85	85			4570	5027	1893
		20						90	88	88			9140	9597	3786
1000	1016	2						61	60	60			1016	1524	421
		3						74	72	72			1524	2032	631
		5	6,3	10	12,5	—	—	82	80	81	—	—	2540	3048	1052
		10						87	85	85			5080	5588	2104
		20						90	88	88			10160	10668	4208
1200	1220	2						61	60				1220	1830	505
		3						74	72				1830	2440	758
		5	6,3	12,5	—	—	—	82	81	—	—	—	3050	3660	1263
		10						87	85				6100	6710	2527
		20						90	88				12200	12810	5053
1400	1420	2						61	60				1420	2130	588
		3						74	72				2130	2840	882
		5	6,3	12,5	—	—	—	82	81	—	—	—	3550	4260	1471
		10						87	85				7100	7810	2941
		20						90	88				14200	14910	5882
1600	1620	2						61	60				1620	2430	671
		3						74	72				2430	3240	1007
		5	6,3	12,5	—	—	—	82	81	—	—	—	4050	4860	1678
		10						87	85				8100	8910	3355
		20						90	88				16200	17010	6710

For 1) and 2), see page 2.
A dash in a box indicates a size that has not been standardized.

Table 2 below specifies outside diameters for DIN 2448 or DIN 2458 pipes which are still in use, but which deviate from those given in table 1. Elbows and bends for such pipes may still be ordered, provided they comply with all other relevant requirements specified here.

Fittings in accordance with table 2 should not be used for new designs.

Table 2. **Elbow and bend dimensions**
(not suitable for new designs)

Pipe outside diameter, d_a	Type	Wall thickness, s	r	b
25	3	2,0	27,5	40
	5		52,5	65
30	3	2,6	33,5	48
	5		62,5	77
31,8	3	2,6	35	51
	5		67,5	83
38	3	2,6	45	64
	5		82,5	101
44,5	3	2,6	51	73
	5		97,5	120
51	3	2,6	63,5	88
	5		115	140
57	3	2,9	72	100
	5		127,5	156
63,5	3	2,9	82,5	114
	5		142,5	174
70	2	2,9	65	100
	3		92	127
	5		160	195
82,5	2	3,2	77,5	119
	3		107,5	149
	5		190	231
101,6	2	3,6	95	146
	3		133,5	184
	5		237,5	288
108	2	3,6	100	154
	3		142,5	196
	5		252,5	306
127	2	4,0	117,5	181
	3		175	238
	5		300	364
133	2	4,0	125	192
	3		181	247
	5		312,5	379
152,4	2	4,5	142,5	219
	3		215	291
	5		357,5	434
159	2	4,5	150	230
	3		216	294
	5		375	454
177,8	2	5,0	170	259
	3		250	340
	5		430	519
193,7	2	5,6	180	277
	3		270	367
	5		455	552
244,5	2	6,3	235	375
	3		340	462
	5		580	702

4 Tolerances

The lower limit deviation for all sizes and wall thicknesses shall be $-12,5\%$.

See DIN 2609 for upper limit deviations.

Table 3. **Limit deviations for dimensions b and $2b$** ^{3), 4)}

Nominal size DN	Limit deviations for dimension		
	b 45° elbow	b 90° elbow	$2b$ 180° bend
15 to 65	$\pm 6,0$	$\pm 2,5$	$\pm 8,0$
80 to 100	$\pm 7,0$	$\pm 3,0$	$\pm 9,0$
125 to 200	$\pm 8,5$	$\pm 3,5$	$\pm 10,0$
250	$\pm 9,5$	$\pm 4,0$	$\pm 14,0$
300 to 450	$\pm 12,0$	$\pm 5,0$	$\pm 14,0$
500 to 600	$\pm 14,5$	$\pm 6,0$	$\pm 16,0$
700			To be agreed.
800 or more	$\pm 19,0$	$\pm 8,0$	

3) The limit deviations specified for b relate to types 2, 3 and 5, these for types 10 and 20 being subject to agreement.
4) Dimension b to be measured at the fitting end edges.

5 Pressure factor and design assumptions

The pressure factor is defined as the ratio of permissible working pressure of the elbow or bend to that of the connecting pipe (the former being lower than the latter), and is expressed as a percentage. The wall thicknesses of fittings have been designed so that the fittings can accommodate the same pressure as the connecting pipe, in accordance with *Technische Regel für Dampfkessel* (Code of practice for steam boilers) TRD 301, the following assumptions also having been made:

- lower limit deviations for pipe wall thickness as follows:
for d_a up to 610 mm: $-12,5\%$;
for d_a greater than 610 mm and s up to 10 mm: $-0,35$ mm;
 s exceeding 10 mm: $-0,5$ mm;
- lower limit deviations for fitting wall thickness, as given in table 3;
- identical material;
- identical welding factor for longitudinal welds;
- identical outside diameters;
- no allowance for corrosion.

6 Other wall thicknesses

Elbows and bends with wall thicknesses other than those specified in table 1 may also be ordered in accordance with this standard.

7 Welding end preparation

Where required, the inside of welding ends may be bevelled to an angle of 15° to 18° , or the outside to an angle of 27° to 30° , relative to the fitting axis.

8 Technical delivery conditions

See DIN 2609 for technical delivery conditions for elbows and bends as covered here.

Standards and other documents referred to

DIN 2448 Seamless steel pipes and tubes; dimensions and mass per unit length
DIN 2458 Welded steel pipes and tubes; dimensions and mass
DIN 2609 Steel butt-welding pipe fittings; technical delivery conditions
ISO 4200 Plain end steel tubes, welded and seamless; general tables of dimensions and masses per unit length
TRD 301*) *Zylinderschalen unter innerem Überdruck* (Cylindrical shells subject to internal pressure)

Other relevant standard

DIN 2605 Part 2 Steel butt-welding pipe fittings; elbows and bends for use at full service pressure

Previous editions

DIN 2605: 11.53, 09.62; DIN 2606: 07.65.

Amendments

The following amendments have been made to the September 1962 edition of DIN 2605 and the July 1965 edition of DIN 2606.

- a) DIN 2605 and DIN 2606 have been combined to form a single standard.
- b) The scope of the standard has been extended to cover fittings up to size DN 1600.
- c) Fitting types 2, 10 and 20 and 45° bends are now included.

International Patent Classification

B 23 K

F 16 L 43/00

*) Obtainable from *Beuth Verlag GmbH*, Burggrafenstraße 6, D-1000 Berlin 30.