Pipes & Fittings

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Technical Specification of Ductile Iron Pipe Fittings

Permissible Deviation On Lengths of Fittings

Type of Fittings	DN (mm)	Deviation (mm)
Flange Socket, Flange Spigot, Collars, Tapers	80-1200	±25
	1400-2000	±35
Tees	80-1200	+50 -25
	1400-2000	+75 -35
90° (1/4) Bends	80-2000	±(15+0.03DN)
45° (1/8) Bends	80-2000	±(10+0.025DN)
22° 30' (1/16) Bends	80-1200 1400-2000	±(10+0.02DN) ±(10+0.025DN)
11° 15' (1/32) Bends		



Limit Deviations On Lengths

Type of Fittings	DN (mm)	Limit Deviations (mm)
Fittings fot Socketed Joints	80-1200	±25
Pipe & Fittings for Flanged Joints	80-2000	±10



Wall Thickness

The minimum wall thickness of fittings is 7mm, limit deviation is -2,3mm
The nominal wall thickness e=K(0,5+0,001DN), limit deviation is -(2,3+0,001DN)mm
The nominal wall thickness of different size fittings are listed in below table: in mm

DN	80	100	150	200	250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1400	1600	1800	2000
K9	6,0	6,1	6,3	6,4	6,8	7,2	7,7	8,1	8,6	9,0	9,9	10,8	11,7	12,6	13,5	14,4	15,3	17,1	18,9	20,7	22,5
K12	7,0	7,1	7,8	8,4	9,0	9,6	10,2	10,8	11,4	12,0	13,2	14,4	15,6	16,8	18,0	19,2	20,4	22,8	25,2	27,6	30,0
K14	8,1	8,2	9,1	9,8	10,5	11,2	11,9	12,6	13,3	14,0	15,4	16,8	18,2	19,6	21,0	22,4	23,8	26,6	29,4	32,2	35,0
Tolerance	-2,3	-2,4	-2,5	-2,5	-2,6	-2,6	-2,7	-2,7	-2,8	-2,8	-2,9	-3,0	-3,1	-3,2	-3,3	-3,4	-3,5	-3,7	-3,9	-4,1	-4,3

Note: The lower limit only is given, so as to ensure sufficient resistance to internal pressure

Pressure Test

The pressure test shall be carried out on all fittings before the application of their external and internal coatings, except for the metallic zinc coating of pipes which may be applied before the test. No leakage or sweating should be detected during test.

DN (mm)	Mininmum Works Test Pressure (bar)
80-300	25
350-600	16
700-1600	10

Not: The works hydrostatic test pressure is less for fittings than for pipes because the shape of the fittings makes it difficult to provide sufficient restraint to high internal pressure the test.

Lining

Fitting arre supplied with manually applied cement mortar lining, the mortar of the lining is composed of cement, sand and water. The mortar contains by mass minimum one part of cement to 3,5 parts of sand.

The nominal thickness of the lining and the minimum permissible values are given the table below.

DN (mm)	*Nominal Lining Thickness (mm)*	*Minimum at One Point (mm)*
≤300	*4*	*2,5*
350-600	*5*	*3*
700-1200	*6*	*3,5*
1400-2000	*9*	*6*

Note: The surface of the cement mortar lining shall be uniform and smooth. Trowel marks, protrusion of sand grains and surface etexture inherent to the method of manufacture are acceptale.
Stroge of fittings in hot, dry environment can cause metal expansion and mortar shirinkage which can result in dry lining developing areas of disbondment and shrinkage cracks exceeding the above given width. When the lining is re-exposed to water, it will swell by absorption of moisture and cracks qill close to conform to above table and will eventually heal by autogenous process.

Coating

A layer of zinc-rich coating+bitumen shall be uniformly covered the whole surface of the casting and have a smooth regular appearance.
The mean mass of zinc rich painting shall not be less than 200g/m², the mean thickness of the coating shall be not less than 70 µ m and the local minimum thickness shall be not less than 50 µ m.

Standard

1. Mechanical Properties

Nominal Size DN	Minimum tensile strength, Rm Mpa	Minimum 0,2% proof stress, Rp0,2 Mpa	Minimum elongation after fracture, A%	Hardness HB
80-1000	≥420	≥300	≥10	≤230
«1100-2600			≥7	

Note:
1. By agreement between manufacture and purchaser, the 0,2% proof stress (Rp0,2) may be measred. It shall be not less than:
- 270 Mpa when A≥12% for DN 40 to DN 1000 or A≥10% for DN > 1000;
-300 Mpa in other cases.
2. DN 40 to DN 1000, the minimum elongation after fracture shall be 7% for thickness classes over K12.

2. Works Test Pressure

Nominal Size DN	Hydrostatic Works Test Pressure Bar
80-300	50
350-600	40
700-1000	32
1200-2000	25
2200-2600	18

3. Thickness of Cement Lining

DN	Nominal Value	Tolerance``	Maximum Crack Width and Radial Displacement
80-300	4	-1,5	0,4
350-600	5	-2	0,5
700-1200	6	-2,5	0,6
1400-2000	9	-3	0,8

1) A Negative tolerance only is given.
Note: Pipe end may have a chamfer of maximum length 50 mm.

4. Metallik Zinc Coating

When metallic cinc spray is applied, the mean mass of the zinc per unit area shall be not less than 130 g/m^3 with a local minimum of 110 g/m^3. The mass of the zinc according to customer`s request is also available.

5. Bitumen Coating

The mean thickness of bitumen coating shall be not les than 70 µm and local minimum thickness shall be not less than 50 µm. The thickness of bitumen coating according to the customer`s request is also available.

The ductile iron pipes are manufactured according to ISO 2531(Ductile iron pipes, fittings and accessories for pressure pipelines); EN545 (Ductile iron pipes, fittings and accessories and their joints for sewerage applications);

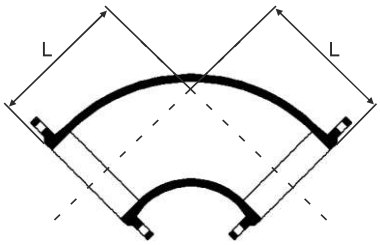
Cement mortar lining are applied according to ISO 4179 (Ductile iron pipes for presure and non-pressure pipelines Centrifugal cement mortar lining General requirements); Zinc coating are applied according to ISO 8179-1 (Ductile iron pipes-External coating-Part 1: Metallic zinc with finishing layer).

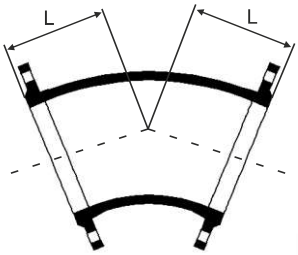
6. Alternative Coating

a) External coatings:
- Metallic zinc with finishing layer, in accordance with ISO 8179-1;
- Zinc rich paint with finishing layer, in accordance with ISO 8179-2;
- Epoxy coating, in accordance with EN 14901;
- Polyethylene sleeve, in accordance with ISO 8180;
- Alloy of zinc and aluminum with or without other metals, having a minimum mass of 400 g/m2, with finising layer;
- Extruded polyethylene coating in accordance with EN 14628;
- Polyurethane coating in accordance with EN 15189;
- Cement mortar coating in accordance with EN 15542;
- Adhesive tape;

b) Internal coating (linings):
- Portland/Blast furnace slag/sluphate/high aluminum cement mortar, in accordance with ISO 4179;
- Cement mortar lining with seal coat, in accordance with ISO 16132;
- Epoxy coating, in accordance with EN 14901;
- Polyurethane lining in accordance eith EN 15655;

c) Coating of the joint area:
- Epoxy coating;
- Polyurethane coating.



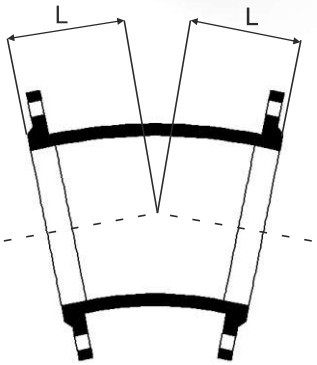


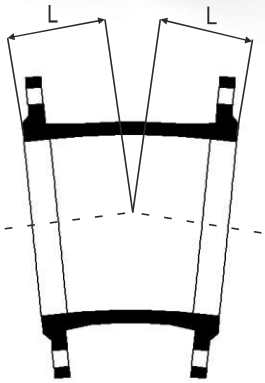
Double Flange Bend 90°

DN	L	Mass (kg)		
		PN10	PN16	PN25
80	165	9,6	9,6	9,6
100	180	11,9	11,9	12,9
150	220	20	20	22
200	260	31	30,5	34,5
250	30	50	49,5	57
300	400	70	70	81
350	450	90	96	113
400	500	116	127	149
450	550	143	160	190
500	600	191	211	235
600	700	272	325	353
700	800	386	416	473
800	900	533	572	653
900	1000	698	745	841
1000	1400	907	990	1163
1200	1300	1490	1619	1728
1400	1350	2193	2335	2640
1600	1450	2663	2481	2778
1800	1550	3348	3572	3980
2000	1650	1307	4613	5065

Double Flange Bend 45°

DN	L	Mass (kg)		
		PN10	PN16	PN25
80	130	9,3	9,3	9,3
100	140	11,3	11,3	12,4
150	160	18,5	18,5	20,5
200	180	27,5	27	31
250	350	55	54	62
300	400	78	77	88
350	298	76	83	89
400	324	96	107	129
450	349	116	132	158
500	375	14	175	198
600	426	212	266	294
700	478	296	326	388
800	529	403	442	528
900	581	519	567	669
1000	632	668	751	881
1200	750	1050	1170	1345
1400	775	1388	1524	1852
1600	845	1915	2119	2416
1800	910	2465	2417	3125
2000	980	3149	3455	3907





BS4772 Long Bend

Double Flange Bend 22,5°

DN	L	Mass (kg)		
		PN10	PN16	PN25
80	130	9,2	9,2	9,2
100	140	11,5	11,5	12,5
15	160	18,6	18,6	20,6
200	180	27,4	27	31,2
250	350	55,3	54,5	58,4
300	400	78,3	77,5	88,7
350	298	76,8	83	100
400	324	96	107	130
450	349	118	135	166
500	375	146	176	200
600	426	214	267	296
700	478	252	342	/
800	529	288	448	/
900	581	361	588	/
1000	632	459	773	/
1200	735	717	1213	/
1400	835	1021	1635	/
1600	940	1190	2325	/
1800	/	1640	1864	/
2000	/	2081	2357	/

Double Flange Bend 11,25°

DN	L	Mass (kg)		
		PN10	PN16	PN25
80	130	9,2	9,2	9,2
100	140	11,5	11,5	12,5
150	160	18,6	18,6	20,6
200	180	27,9	27,5	31,7
250	350	55,8	55	58,9
300	400	78,8	78	89,2
350	298	77,3	83,5	100
400	324	96,8	108	131
450	349	118	135	166
500	375	147	177	201
600	426	215	268	297
700	478	240	343	/
800	529	270	451	/
900	581	303	592	/
1000	682	382	778	/
1200	735	590	1220	/
1400	835	827	1643	/
1600	940	1203	2338	/
1800	/	1342	1566	/
2000	/	1694	1970	/

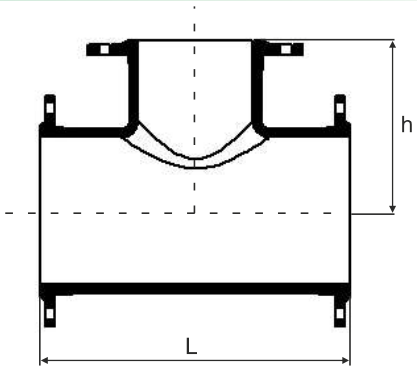
EN545 Series A Bend

Double Flange Bend 22,5°

DN	L	Mass (kg)		
		PN10	PN16	PN25
80	80	9,2	9,2	9,2
100	85	11,5	11,5	12,6
150	100	18,6	18,6	20,8
200	110	27	27	31
250	125	37,9	37,1	46
300	140	51	50,3	63
350	155	61,1	67,9	87,2
400	165	74,8	90,7	113,1
450	180	87,3	110	135,4
500	190	107,8	142,9	168,3
600	220	154,7	215,7	246
700	300	216,5	250,9	330,2
800	330	294,9	330,3	422,3
900	360	373	416,2	528,2
1000	390	477,2	552,6	697,8
1200	450	736,6	853,2	1035
1400	460	1021	1157	1388
1600	470	1284	1468	1789
1800	480	1640	1864	2229
2000	520	2081	2357	2914

Double Flange Bend 11,25°

DN	L	Mass (kg)		
		PN10	PN16	PN25
80	70	9,2	9,2	9,2
100	75	11,5	11,5	12,5
150	85	17,2	17,2	19,5
200	90	24,3	24,4	28,8
250	100	34,7	33,8	42,8
300	110	46,4	45,7	58,4
350	120	54,9	61,8	81
400	130	66,8	82,7	105,1
450	135	76,6	99,3	124,7
500	140	93,6	128,7	164,1
600	169	134,7	195,7	225,9
700	205	206,6	241	320,3
800	230	270	308	367,3
900	245	303	351	450,2
1000	265	382	465	607
1200	360	639,2	755,8	937,2
1400	380	873,8	995,4	1275
1600	400	1203	1382	1664
1800	410	1415	1641	2075
2000	415	1711	1985	2629



All Flange Tee

Body	Branch	L	h	Mass (kg)		
DN	dn			PN10	PN16	PN25
80	80	330	165	15,6	15,6	15,6
100	80	360	175	18,4	18,4	19,5
	100	360	180	19,4	19,4	21
150	80	440	205	28,5	28,5	31
	100	440	210	29,5	29,5	32
	150	440	220	32,5	32,5	36
200	80	520	235	42	41,5	46
	100	520	240	43	42	47,5
	150	520	250	46	46	51
	200	520	260	49,5	49	56
250	80	700	265	49,7	49,3	56,7
	100	700	275	68	67	75
	150	700	300	72	71	81
	200	700	325	76	75	85
	250	700	350	82	81	93
300	100	800	300	94	93	105
	150	800	325	98	97	109
	200	800	350	102	101	114
	250	800	375	109	108	121
	300	800	400	116	115	131
350	100	850	325	116	122	139
	150	850	325	119	125	142
	200	850	325	121	128	146
	250	850	325	128	134	154
	300	850	425	132	138	160
	350	850	425	142	151	176
400	100	900	350	143	154	177
	150	900	350	144	156	181
	200	900	350	148	159	184
	250	900	350	151	161	198
	300	900	450	160	184	213
	350	900	450	170	183	215
	400	900	450	174	191	225

Body	Branch	L	h	Mass (kg)		
DN	dn			PN10	PN16	PN25
450	100	950	375	176	193	225
	150	950	375	182	199	231
	200	950	375	190	207	240
	250	950	375	199	216	250
	300	950	475	210	227	263
	350	950	475	219	240	279
	400	950	475	231	254	296
	450	950	475	243	269	315
500	100	1000	400	210	241	265
	150	1000	400	214	243	269
	200	1000	400	215	245	271
	250	1000	400	218	258	280
	300	1000	500	227	255	287
	350	1000	500	239	276	298
	400	1000	500	242	276	311
	450	1000	500	249	298	327
	500	1000	500	252	297	332
600	100	1100	450	268	329	352
	150	1100	450	283	340	370
	200	1100	450	305	358	388
	250	1100	450	307	360	392
	300	1100	550	312	374	398
	350	1100	550	328	380	413
	400	1100	550	329	387	427
	450	1100	550	338	417	448
	500	1100	550	349	420	464
	600	1100	550	355	434	477
700	100	540	510	253	295	/
	150	595	515	255	296	/
	200	650	525	258	298	/
	250	705	530	310	335	/
	300	760	540	319	342	/
	350	815	545	340	375	/

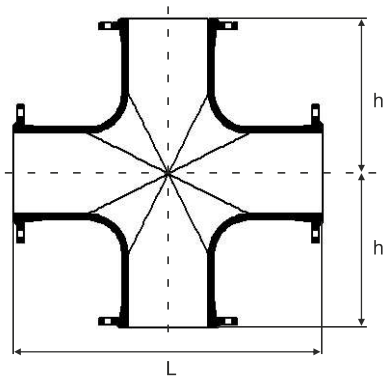
All Flange Tee

Body	Branch	L	h	Mass (kg)		
DN	dn			PN10	PN16	PN25
700	400	870	555	543	379	/
	450	925	560	429	436	/
	500	980	570	442	481	/
	600	1090	585	476	523	/
	700	1200	600	477	523	/
800	100	980	570	345	383	/
	150	635	575	349	387	/
	200	690	585	352	390	/
	250	745	590	672	410	/
	300	800	600	423	427	/
	350	855	605	443	471	/
	400	910	615	441	484	/
	450	965	620	519	563	/
	500	1020	630	561	599	/
	600	1350	645	618	678	/
	700	1350	660	663	711	/
	800	1350	675	657	715	/
900	100	620	630	428	476	/
	150	675	635	432	480	/
	200	730	645	436	484	/
	250	785	650	499	533	/
	300	840	660	523	569	/
	350	895	665	538	588	/
	400	950	675	544	594	/
	450	1005	680	673	729	/
	500	1060	690	726	784	/
	600	1500	705	767	860	/
	700	1500	720	843	901	/
	800	1500	735	860	913	/
	900	1500	750	853	924	/
1000	100	660	690	524	572	/
	150	715	695	534	582	/
	200	770	705	546	629	/

Body	Branch	L	h	Mass (kg)		
DN	dn			PN10	PN16	PN25
1000	250	825	710	631	703	/
	300	880	720	651	739	/
	350	935	725	660	753	/
	400	990	735	668	755	/
	450	1045	740	850	911	/
	500	1100	750	955	1007	/
	600	1650	765	1007	1116	/
	700	1650	780	1067	1152	/
	800	1650	795	1085	1168	/
	900	1650	810	1095	1219	/
	1000	1650	825	1105	1229	/
1200	100	660	810	996	1082	/
	150	715	815	998	1084	/
	200	775	825	1000	1086	/
	250	830	830	1002	1094	/
	300	890	840	1004	1106	/
	350	950	845	1006	1113	/
	400	1005	855	1008	1122	/
	500	1120	870	1109	1255	/
	600	1240	885	1101	1256	/
	700	1355	900	1279	1423	/
	800	1470	915	1291	1439	/
	900	1585	930	1427	1662	/
	1000	1700	945	1494	1664	/
	1200	1935	975	2201	2321	/
1400	100	970	905	1227	1363	/
	200	1085	920	1231	1367	/
	400	1320	950	1514	1656	/
	600	1550	980	1655	1818	/
	800	1780	1010	1886	2041	/
	1000	2015	1040	2131	2309	/

All Flange Tee

Body	Branch	L	h	Mass (kg)		
DN	dn			PN10	PN16	PN25
1400	1200	2245	1070	2567	2767	/
	1400	2480	1100	2781	2985	/
1600	100	1020	1015	1874	2078	/
	200	1140	1030	1880	2084	/
	400	1370	1060	2000	2210	/
	600	1600	1090	2167	2398	/
	800	1835	1120	2452	2675	/
	1000	2065	1150	2740	2986	/
	1200	2300	1180	3058	3327	/
	1400	2530	1210	3498	3770	/
	1600	2760	1240	3886	4192	/
1800	100	1075	1125	2346	2598	/
	200	1190	1140	2350	2602	/
	400	1420	1170	2574	2835	/
	600	1655	1200	2694	2972	/
	800	1885	1230	3023	3299	/
	1000	2120	1260	3375	3669	/
	1200	2350	1290	3740	4056	/
	1400	2580	1320	4254	4574	/
	1600	2815	1350	4691	5147	/
	1800	3045	1380	5123	5501	/
2000	100	1125	1235	2836	3142	/
	200	1240	1250	2840	3146	/
	400	1475	1280	3002	3314	/
	600	1705	1310	3300	3642	/
	800	1940	1340	3844	4459	/
	1000	2170	1370	4112	4459	/
	1400	2635	1430	4966	5340	/
	1600	2865	1460	5625	6033	/
	1800	3100	1490	6115	6547	/
	2000	3330	1520	6648	7107	/



All Flange Cross

Body	Branch	L	h	Mass (kg)		
DN	dn			PN10	PN16	PN25
80	80	330	165	20,1	20,1	20,1
100	80	360	175	23	23	24,2
	100	360	180	25	25	2701
150	80	440	205	33,1	33,1	36,1
	100	440	210	35,1	35,1	38,1
	150	440	220	41,1	41,1	46,1
200	80	520	235	46,5	45,9	50,7
	100	520	240	48,5	46,9	53,7
	150	520	250	45,5	53,9	60,7
	200	520	260	61,5	60,9	70,7
250	80	700	265	37,5	37,5	44,5
	100	700	275	74,1	72,9	81,1
	150	700	300	82,1	80,9	93,1
	200	700	325	90,1	88,9	101
	250	700	350	102	101	117
300	100	800	300	100	98,8	112
	150	800	325	108	107	120
	200	800	350	116	115	130
	250	800	375	130	129	144
	300	800	400	144	143	164
350	100	850	325	122	128	145
	150	850	325	128	134	151
	200	850	325	132	140	159
	250	850	352	146	151	176
	300	850	425	154	160	187
	350	850	425	174	186	219
400	100	900	350	149	160	183
	150	900	350	151	164	191
	200	900	350	159	170	197
	250	900	350	160	174	225

Body	Branch	L	h	Mass (kg)		
DN	dn			PN10	PN16	PN25
400	300	900	450	182	220	236
	350	900	450	202	228	249
	400	900	450	211	234	259
450	100	950	375	186	203	235
	150	950	375	198	215	248
	200	950	375	213	230	265
	250	950	375	231	248	286
	300	950	475	253	270	312
	350	950	475	272	296	343
	400	950	475	296	324	378
	450	950	475	320	354	416
500	100	1000	400	215	247	272
	150	1000	400	223	251	280
	200	1000	400	225	255	284
	250	1000	400	231	281	301
	300	1000	500	249	275	316
	350	1000	500	273	290	338
	400	1000	500	279	317	364
	450	1000	500	293	361	396
	500	1000	500	299	359	406
600	100	1100	450	242	311	329
	150	1100	450	272	333	365
	200	1100	450	316	369	401
	250	1100	450	321	373	409
	300	1100	550	330	400	420
	350	1100	550	358	413	451
	400	1100	550	364	427	479
	450	1100	550	382	487	521
	500	1100	550	403	494	553
	600	1100	550	416	521	579