

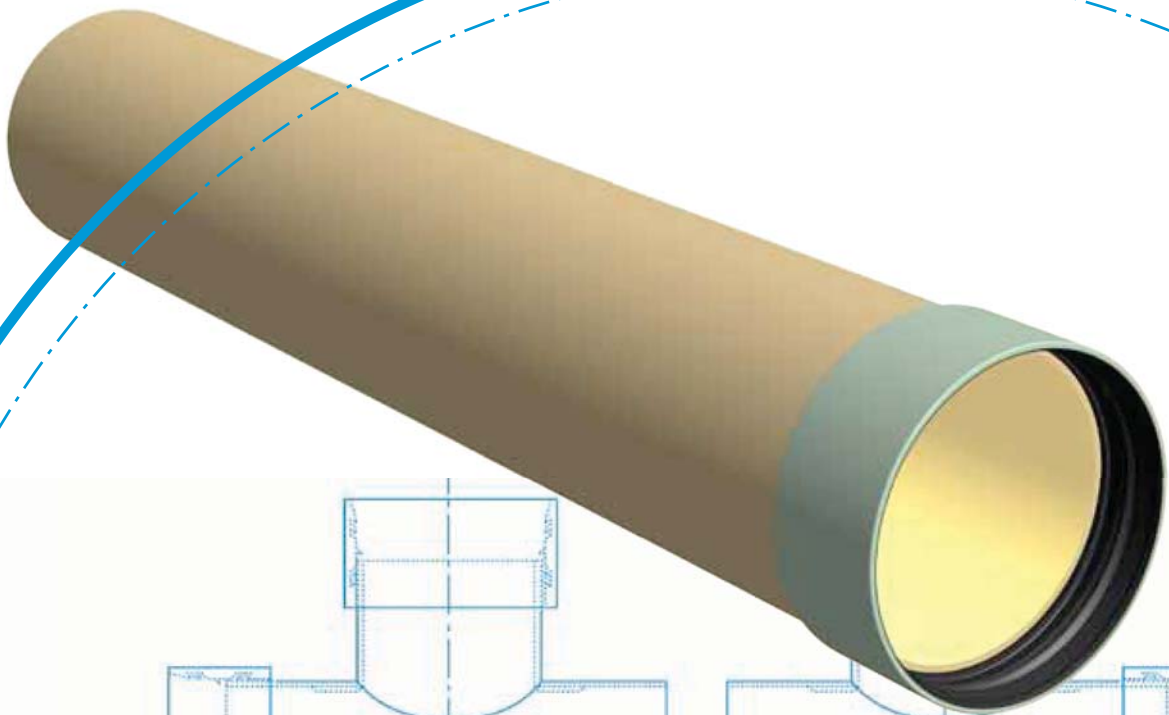


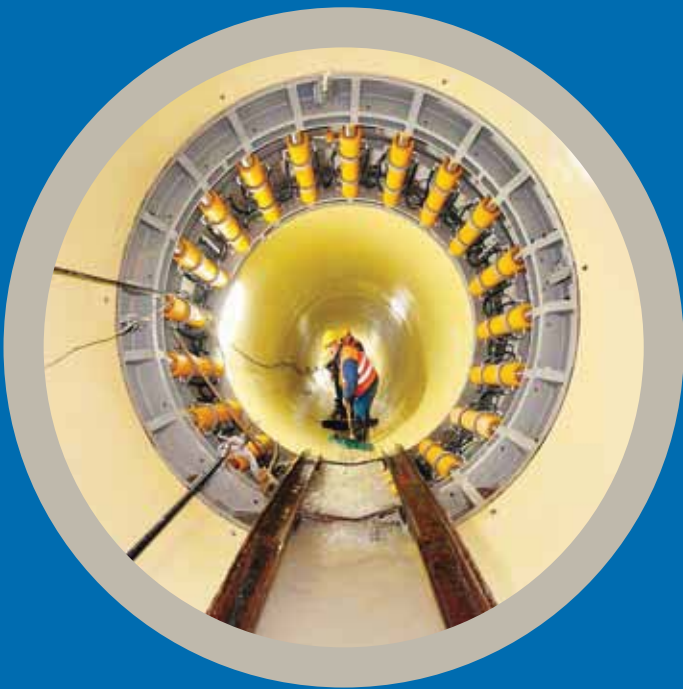
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Technical Product Data

Gravity Pipe Systems





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HOBAS Gravity Pipe Systems

Wide spread field of applications

Whether for sewage disposal, retaining channels, drainage lines or industrial applications: HOBAS Pipe Systems made of glass fiber reinforced plastic (GRP) are used around the world in many different areas. The roots of the composite material technology can be found in the automotive, aerospace and shipbuilding industry; HOBAS has been producing GRP pipes since the 1950s. The composite material was further developed over the years and is today available for complex challenges in the following applications:

Field of applications:

- Sewer systems
- Relining of circular pipe systems
- Relining of non circular pipe systems
- Trenchless jacking
- Reconstruction of industry systems
- Air pipe systems
- Shafts and manholes
- Bridge lines
- Retention systems
- Drinking water tanks

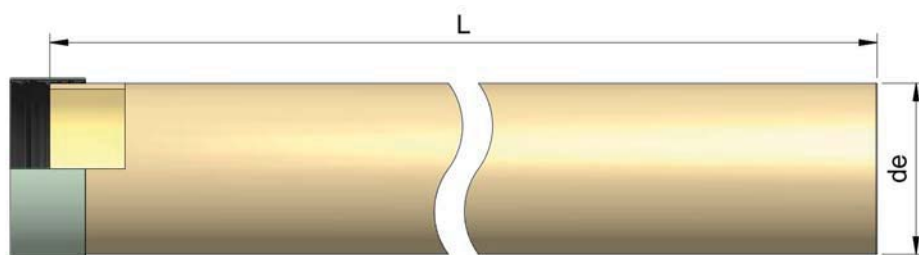
Features and advantages

- low weight and simple coupling technology decrease laying time
- homogenous wall structure through to patent registered centrifugal process
- high abrasion resistance
- low incrustations and sludge precipitations
- very smooth inner surface (roughness ≤ 0.1 mm)
- no sensitivity to frost and high temperatures (duroplaste characteristics)
- very low expansion coefficient
- high UV resistance
- high loading capacity
- very good performance in chemical resistance
- long life time
- deflection in coupling is possible
- numerous fittings available including shafts and manholes (seamless), inside and outside layer have high resistance
- simple handling
- laying is not dependent on weather conditions

PIPES	A01	Non-Pressure Pipes DN 150 - 1000
	A01	Non-Pressure Pipes DN 1100 - 3600
	A02	Double Pipes
	A03	Relining Pipes DN 750 - 1500
	A03	Relining Pipes DN 1535 - 3000
	A04	NC Line - Extract
	A05	Jacking Pipes de 272 - 501
	A05	Jacking Pipes de 530 - 752
	A05	Jacking Pipes de 820 - 1099
	A05	Jacking Pipes de 1229 - 1535
	A05	Jacking Pipes de 1638 - 2160
	A05	Jacking Pipes de 2250 - 3600
PIPE JOINTS	B01	Standard Pipe Joints
	B02	Special Couplings
FITTINGS	C01	Bends DN 150 - 1000
	C01	Bends DN 1100 - 3000
	C02	T-piece DN 150 - 800
	C02	T-piece DN 150 - 800
	C02	T-piece DN 900 - 1600
	C03	Y- piece DN 150 - 700
	C03	Y- piece DN 800 - 1600
	C04	Saddle - glued DN 200 - 400
	C04	Saddle - glued DN 500 - 1600
	C05	Saddle DN 300 -700
	C05	Saddle DN 700 - 1200
	C06	Reducers
	C07	Flange with GRP/Steel Loose Flange
	C08	GRP Fixed Flange
	C09	Blind flange from GRP and steel
MANHOLES	D01	Standard Manhole DN 1000 - 3600
	D02	Tangential Manhole DN 1000 - 3600
ACCESSORIES	E01	Masonry Coupling DN 150 - 1000
	E01	Masonry Coupling DN 1100 - 3600
	E02	Manhole Liner
	E03	Structural Adapters DN 150 - 1000
	E03	Structural Adapters DN 1100 - 3600
	F01	Material Data

B	Width
B1	de to product standard (EN 1796/EN 14364)
B2	de to GRP and casting standards
B3	de to GRP and PVC standards
B4	de to GRP and steel standards
BL	Length
DC	GRP coupling with sealing rings
de	Pipe external diameter
DEC	Coupling external diameter
DN	Nominal diameter
e	Pipe wall thickness
FWC	GRP coupling with full width EPDM gasket (A...asymmetric, S...symmetric)
GRP	Glass reinforced plastic (glass fiber reinforced, unsaturated polyester resin)
L	Length
LC	Coupling length
m	Mass
n	Number
DN _{Th}	Theoretical diameter
p _{max}	Maximum operating pressure
PN	Nominal pressure
PVC	Polyvinyl chloride
R	Radius
SN	Nominal stiffness
α	Angle (bend, deflection)

Non-Pressure Pipes DN 150 - 1000



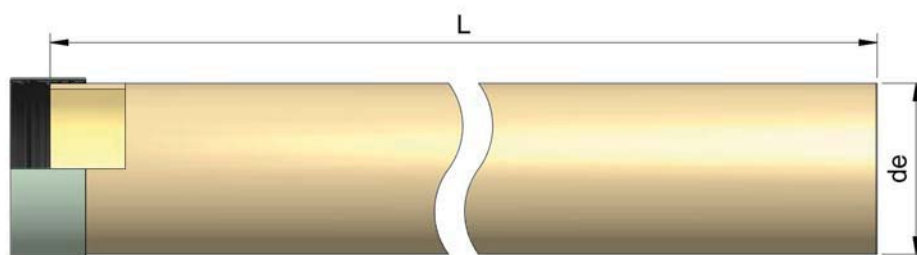
The standard length of the Pipe is 6m. Lengths of 1 / 2 / 3 m are available on request.

DN	Diameter series	de [mm]	SN 2500		SN 5000		SN 10000		SN 15000		SN 16000		SN 20000	
			m [kg/m]	e [mm]	m [kg/m]	e [mm]	m [kg/m]	e [mm]	m [kg/m]	e [mm]	m [kg/m]	e [mm]	m [kg/m]	e [mm]
150	B2	168					5	5	6	6	6	6	6	6
200	B2	220					8	7	9	7	10	7	10	8
250	B2	272					13	8	14	9	14	9	15	9
300	B2 B4	324					18	9	20	10	20	10	21	11
350	B2	376	15	7	19	8	24	10	26	11	27	12	29	12
400	B3	401	17	7	21	9	26	11	29	12	30	12	32	13
400	B2	427	19	8	24	9	30	11	33	13	34	13	36	14
450	B2	478	22	8	27	9	34	11	38	13	39	13	42	14
500	B3	501	24	8	30	10	37	12	42	13	43	14	46	14
500	B2	530	27	8	33	10	41	12	47	14	48	14	51	15
550	-	550	29	9	36	11	45	13	51	15	52	15	55	16
600	B1	616	36	10	45	12	56	14	63	16	64	17	69	18
650	-	650	40	10	50	12	62	15	70	17	72	17	76	19
700	B1	718	48	11	60	13	75	17	85	19	87	19	93	20
750	-	752	53	11	66	14	82	17	93	19	95	20	102	21
800	B1	820	63	12	78	15	98	19	110	21	113	21	120	23
860	-	860	69	13	86	16	107	19	121	22	124	22	132	24
900	B1	924	79	14	99	17	124	21	139	23	142	24	152	26
960	-	960	86	14	107	18	133	22	150	24	153	25	164	27
1000	B1	1026	98	15	122	19	151	23	171	26	174	26	187	28

Wall thicknesses and masses as guidelines (plus tolerances)

The standard length is 6 m (+0/-60 mm). Some pipes can also be supplied in shorter lengths depending on availability.

Non-Pressure Pipes DN 1100 - 3600



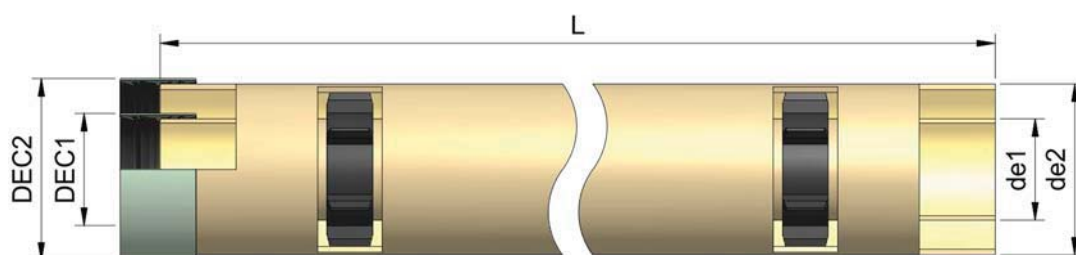
The standard length of the Pipe is 6m. Lengths of 1 / 2 / 3 m are available on request.

DN	Diameter series	de [mm]	SN 2500		SN 5000		SN 10000		SN 15000		SN 16000		SN 20000	
			m [kg/m]	e [mm]	m [kg/m]	e [mm]	m [kg/m]	e [mm]	m [kg/m]	e [mm]	m [kg/m]	e [mm]	m [kg/m]	e [mm]
1100	-	1099	112	16	141	20	175	25	196	28	201	28	215	30
1200	B1	1229	140	18	174	22	216	27	244	31	249	31	267	34
1280	-	1280	152	19	189	23	236	28	265	32	270	33	289	35
1350	-	1350	169	20	210	24	262	30	294	34	300	34	321	37
1400	B1	1434	190	21	237	26	294	32	331	36	338	36	362	39
1500	-	1499	208	21	258	27	322	33	362	37	368	38	395	41
1535	-	1535	220	22	274	27	340	34	382	38	389	39	418	42
1600	B1	1638	249	23	312	29	387	36	434	41	443	41	475	44
1720	-	1720	274	25	343	31	425	38	478	42	491	44	522	46
1800	B1	1842	314	26	393	33	487	40	547	45	559	46	599	50
1940	-	1940	346	27	434	34	538	42	609	48	621	49	661	52
2000	B1	2047	386	29	484	36	600	45	675	50	688	51	738	55
2160	-	2160	432	31	539	38	667	47	750	53	765	54	821	58
2200	B1	2250	465	31	584	39	723	49	813	55	836	56	890	60
2400	-	2400	533	34	665	42	823	52	926	59	945	60	1012	64
2400	B1	2454	557	35	694	43	860	53	968	60	987	61	1059	66
2555	-	2555	604	36	752	45	932	55	1048	62	1069	64	1147	68
3000	-	3000	829	42	1033	52	1281	65	1440	73	1469	74	1575	80
3600	-	3600	1189	50	1485	62	1840	77	2085	88	2127	89	2265	95

Wall thicknesses and masses as guidelines (plus tolerances)

The standard length is 6 m (+0/-60 mm). Some pipes can also be supplied in shorter lengths depending on availability.

Double Pipes



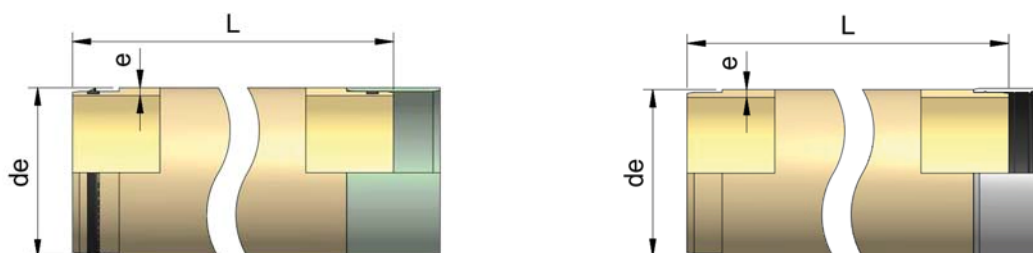
HOBAS Pipes can be used as pipe-in-pipe systems in such applications as drinking water protection areas or thermally insulated bridge drainage. Possible combinations are given in the table. For technical details, designs available and recommendations for installation, please contact your HOBAS Consultant. The standard length of the Pipe is 6m. Lengths of 1 / 2 / 3 m are available on request.

Double Pipe	Media pipe (SN 10.000)		Casing pipe (SN 10.000)	
	Outside diameter	Coupling outside diameter	Outside diameter	Coupling outside diameter
	de1 [mm]	DEC1 [mm]	de2 [mm]	DEC2 [mm]
200/300	220	260	324	360
250/350	272	310	376	420
300/400	324	360	427	470
350/450	376	420	478	520
400/500	427	470	530	580
500/600	530	580	616	660
600/700	616	660	718	760
700/800	718	760	820	870
800/900	820	870	924	970
900/1000	924	970	1026	1070
1000/1100	1026	1070	1099	1140
1100/1200	1099	1140	1229	1270
1200/1400	1229	1270	1434	1480
1250/1400	1280	1330	1434	1480
1350/1500	1350	1390	1499	1540
1400/1600	1434	1480	1638	1680
1500/1600	1499	1540	1638	1680
1500/1700	1535	1580	1720	1770
1600/1800	1638	1680	1842	1890
1700/1900	1720	1770	1940	1990
1800/2000	1842	1890	2047	2090

Wall thicknesses and weights as guidelines (plus tolerances)

The standard length is 6 m (+0/-60 mm). Some pipes can also be supplied in shorter lengths depending on availability.

Relining Pipes DN 750 - 1500



Relining pipes are available with flush couplings. As alternative, Relining pipes are also available as standard pipes with FWC couplings (see A01). The standard length of the Pipe is 6m. Lengths of 1 / 2 / 3 m are available on request.

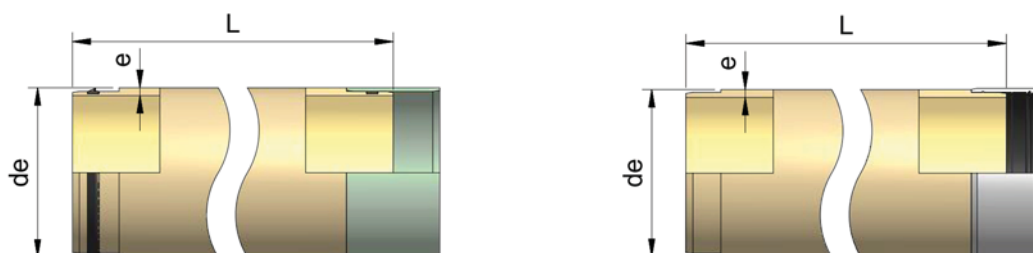
Allowable insertion force for pipes with flush couplings:

DN	de [mm]	Coupling	Allowable insertion force [kN]*											
			SN 5000			SN 10000			SN 16000			SN 20000		
			m [kg/m]	e [mm]	F [kN]	m [kg/m]	e [mm]	F [kN]	m [kg/m]	e [mm]	F [kN]	m [kg/m]	e [mm]	F [kN]
750	752	stainless steel										102	21	1142
800	820	stainless steel										120	23	1428
860	860	stainless steel										132	24	1756
900	924	GRP										152	26	1641
900	924	stainless steel										152	26	2042
960	960	GRP										164	27	1795
960	960	stainless steel										164	27	2265
1000	1026	GRP										187	28	2238
1000	1026	stainless steel							174	26	1938	187	28	2726
1100	1099	GRP							201	28	2097	215	30	2600
1100	1099	stainless steel				175	25	2063	201	28	2740	215	30	3245
1200	1229	GRP							249	31	2709	267	34	3460
1200	1229	stainless steel				216	27	2677	249	31	3625	267	34	4377
1280	1280	GRP							270	33	3117	289	35	3899
1280	1280	stainless steel				236	28	3197	270	33	4183	289	35	4965
1350	1350	GRP							300	34	3394	321	37	4218
1350	1350	stainless steel				262	30	3636	300	34	4676	321	37	5501
1400	1434	GRP				294	32	2795	338	36	3679	362	39	4558
1400	1434	stainless steel	237	26	3160	294	32	4273	338	36	5157	362	39	6037
1500	1499	GRP				322	33	3062	368	38	3986	395	41	5133
1500	1499	stainless steel	258	27	3176	322	33	4574	368	38	5499	395	41	6649

Wall thicknesses and pipe masses as minimum or guidelines (plus tolerances)

* The allowable insertion force is 1.75 times the safety factor for the ultimate load calculated

Relining Pipes DN 1535 - 3000



Relining pipes are available with flush couplings. As alternative, Relining pipes are also available as standard pipes with FWC couplings (see A01). The standard length of the Pipe is 6m. Lengths of 1 / 2 / 3 m are available on request.

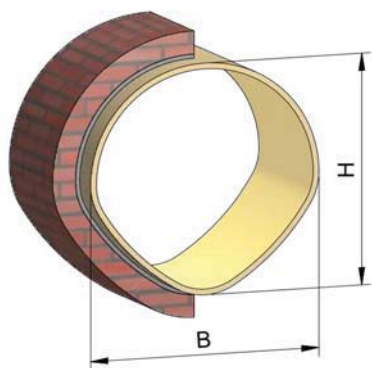
Allowable insertion force for pipes with flush couplings:

DN	de [mm]	Coupling	Allowable insertion force [kN]*											
			SN 5000			SN 10000			SN 16000			SN 20000		
			m [kg/m]	e [mm]	F [kN]	m [kg/m]	e [mm]	F [kN]	m [kg/m]	e [mm]	F [kN]	m [kg/m]	e [mm]	F [kN]
1535	1535	stainless steel	274	27	1903	340	34	3334	389	39	4519	418	42	5225
1535	1535	stainless steel	274	27	2417	340	34	3851	389	39	5036	418	42	5744
1600	1638	GRP	312	29	2156	387	36	3934	443	41	5195	475	44	6198
1600	1638	stainless steel	312	29	2882	387	36	4663	443	41	5926	475	44	6930
1720	1720	GRP	343	31	1909	425	38	3776	491	44	5363	522	46	6415
1720	1720	stainless steel	343	31	3540	425	38	5409	491	44	6998	522	46	8051
1800	1842	GRP	393	33	2538	487	40	4824	559	46	6242	599	50	7652
1800	1842	stainless steel	393	33	4376	487	40	6664	559	46	8084	599	50	9496
1940	1940	GRP	434	34	1717	538	42	4427	621	49	6219	661	52	7704
1940	1940	stainless steel	434	34	4869	538	42	7580	621	49	9372	661	52	10857
2000	2047	GRP	484	36	3367	600	45	6224	688	51	8114	738	55	9681
2000	2047	stainless steel	484	36	5784	600	45	8644	688	51	10537	738	55	12105
2160	2160	GRP	539	38	3434	667	47	6455	765	54	7119	821	58	10104
2160	2160	stainless steel	539	38	6720	667	47	9738	765	54	10405	821	58	13390
2200	2250	GRP	584	39	4584	723	49	7725	836	56	10150	890	60	11873
2200	2250	stainless steel	584	39	7801	723	49	10945	836	56	13373	890	60	15097
2400	2400	GRP	665	42	5262	823	52	9352	945	60	11566	1012	64	13769
2400	2454	GRP	694	43	5581	860	53	9769	987	61	12037	1059	66	14294
2555	2555	GRP	752	45	6411	932	55	10771	1069	64	13917	1147	68	15872
3000	3000	GRP	1033	52	6339	1281	65	11923	1469	74	16542	1575	80	18839

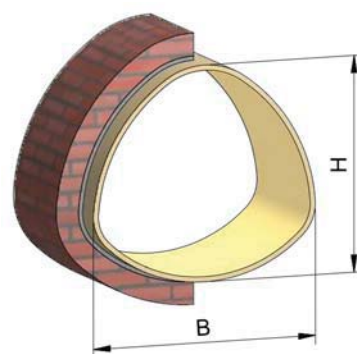
Wall thicknesses and pipe masses as minimum or guidelines (plus tolerances)

* The allowable insertion force is 1.75 times the safety factor for the ultimate load calculated

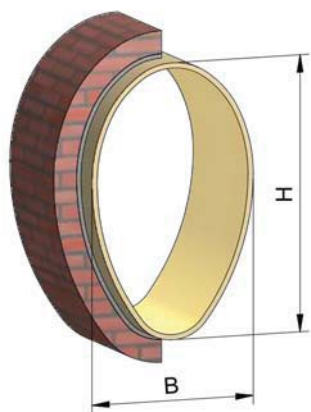
NC Line - Extract



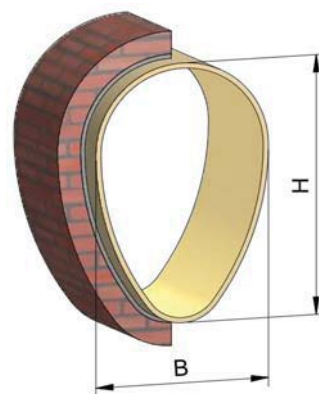
DN B/H	DN _{Th} * [mm]	A [m ²]	BL [m]
1600/1600	1543	1,869	3,00
1800/1800	1736	2,366	3,00



DN B/H	DN _{Th} * [mm]	A [m ²]	BL [m]
1360/1570	1469	1,596	2,00
2680/2590	2618	5,170	2,30



DN B/H	DN _{Th} * [mm]	A [m ²]	BL [m]
480/800	407	0,130	2,50
510/810	506	0,184	2,50
400/1000	632	0,287	2,50
750/1500	758	0,414	2,50
1100/1400	875	0,561	3,00
1080/1650	1011	0,735	2,50
1600/1800	1136	0,930	2,50



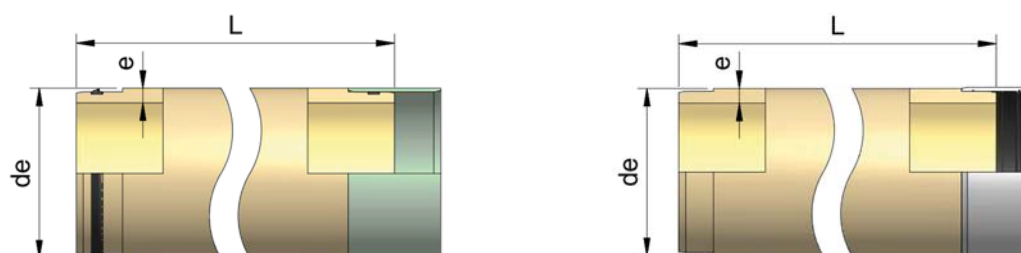
DN B/H	DN _{Th} * [mm]	A [m ²]	BL [m]
300/500	407	0,130	2,50
400/600	506	0,184	2,50
500/750	632	0,287	2,50
600/900	758	0,414	2,50
680/1050	875	0,561	3,00
800/1200	1011	0,735	2,50
900/1350	1136	0,930	2,50
1000/1500	1262	1,148	2,50
1200/1800	1515	1,654	3,00
1400/2100	1666	2,178	3,00

Extract from the range of non-circular cross-sections that can be supplied for rehabilitation and new installations to customer specifications

Other shapes available on request.

* theoretical diameter

Jacking Pipes de 272 - 501



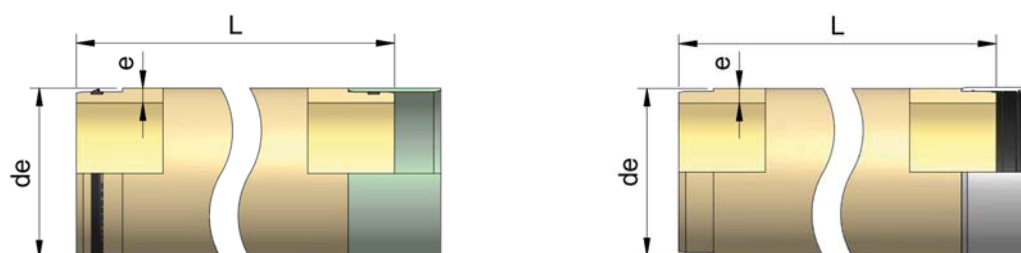
GRP jacking pipes with flush coupling (GRP or stainless steel) - allowable jacking forces. The standard length of the Pipe is 6m. Lengths of 1 / 2 / 3 m are available on request.

		Allowable jacking force [kN]*											
de [mm]		SN	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN
Coupling		32000	40000	50000	64000	80000	100000	128000	160000	200000	320000	640000	1000000
272	e [mm]										19	24	
	m [kg/m]										33	41	
	stainless steel F [kN]										204	297	
324	e [mm]									20	23	28	
	m [kg/m]									42	48	57	
	stainless steel F [kN]									273	341	452	
376	e [mm]							19	20	23	27	32	
	m [kg/m]							47	49	56	65	76	
	stainless steel F [kN]							297	324	405	424	638	
401	e [mm]						19	20	21	24	28	34	39
	m [kg/m]						50	53	55	62	72	86	97
	stainless steel F [kN]						315	344	373	459	572	736	868
	GRP F [kN]											647	779
427	e [mm]						19	20	21	24	28	34	39
	m [kg/m]						54	56	59	67	77	92	105
	stainless steel F [kN]						342	373	405	497	618	795	938
	GRP F [kN]											696	839
478	e [mm]					21	22	25	27	29	33	41	46
	m [kg/m]					66	72	78	84	90	101	124	137
	stainless steel F [kN]					449	519	588	657	725	859	1120	1278
	GRP F [kN]											1015	1173
501	e [mm]				20	22	24	26	28	30	35	43	48
	m [kg/m]				66	73	79	85	91	98	113	136	150
	stainless steel F [kN]				434	509	582	655	727	798	974	1247	1412
	GRP F [kN]										864	1137	1302

Wall thicknesses and pipe masses as minimum or guidelines plus tolerances to HOBAS company standard.

* The jacking force (kN) corresponds to a safety factor of 3.5 times against the ultimate force calculated. Static calculation of specific projects can result in differing allowable jacking forces.

Jacking Pipes de 530 - 752



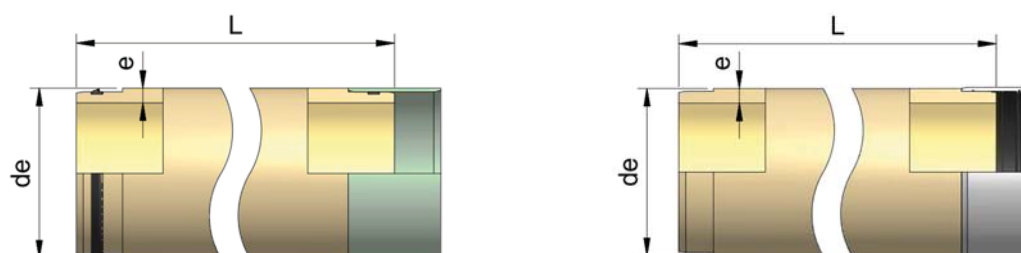
GRP jacking pipes with flush coupling (GRP or stainless steel) - allowable jacking forces. The standard length of the Pipe is 6m. Lengths of 1 / 2 / 3 m are available on request.

		Allowable jacking force [kN]*											
de [mm]		SN	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN
Coupling		32000	40000	50000	64000	80000	100000	128000	160000	200000	320000	640000	1000000
530	e [mm]				20	23	24	26	28	31	36	44	51
	m [kg/m]				70	81	84	90	97	107	123	148	169
	stainless steel F [kN]				459	577	616	694	770	885	1071	1362	1608
	GRP F [kN]										957	1247	1492
550	e [mm]		20	21	22	24	26	28	30	33	38	47	53
	m [kg/m]		73	75	80	87	94	101	108	118	134	163	182
	stainless steel F [kN]		484	505	566	648	728	808	888	1006	1199	1537	1755
	GRP F [kN]									893	1086	1423	1640
616	e [mm]		21	23	25	27	29	32	34	37	43	50	58
	m [kg/m]		86	94	102	110	118	129	137	148	170	196	224
	stainless steel F [kN]		583	675	767	858	949	1083	1172	1304	1564	1860	2188
	GRP F [kN]								1040	1172	1432	1727	2055
650	e [mm]	21	24	25	26	28	30	33	35	38	44	54	62
	m [kg/m]	91	104	108	112	120	128	141	149	161	184	222	252
	stainless steel F [kN]	613	760	809	857	953	1049	1191	1285	1425	1700	2146	2491
	GRP F [kN]							1055	1148	1288	1563	2008	2352
718	e [mm]	23	25	27	28	30	32	35	40	43	48	59	68
	m [kg/m]	110	120	129	134	143	152	165	187	201	222	269	305
	stainless steel F [kN]	733	842	949	1003	1109	1215	1373	1633	1787	2040	2583	3012
	GRP F [kN]						1121	1278	1538	1691	1944	2486	2915
752	e [mm]	24	26	28	30	33	36	39	42	45	51	62	72
	m [kg/m]	121	130	140	150	164	178	192	206	220	247	296	338
	stainless steel F [kN]	800	913	1026	1138	1305	1470	1634	1797	1958	2276	2843	3342
	GRP F [kN]					1231	1396	1560	1722	1882	2199	2765	3263

Wall thicknesses and pipe masses as minimum or guidelines plus tolerances to HOBAS company standard.

* The jacking force (kN) corresponds to a safety factor of 3.5 times against the ultimate force calculated. Static calculation of specific projects can result in differing allowable jacking forces.

Jacking Pipes de 820 - 1099



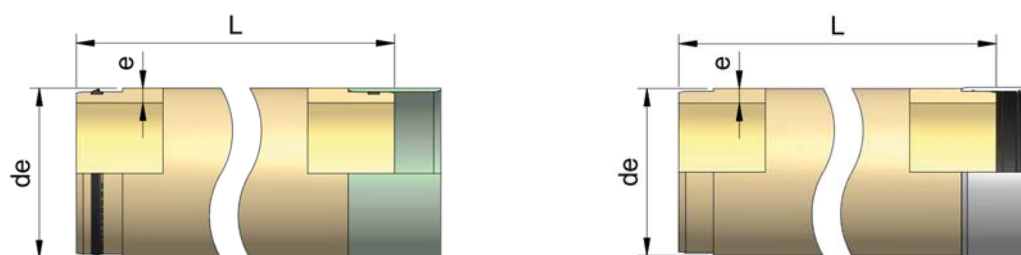
GRP jacking pipes with flush coupling (GRP or stainless steel) - allowable jacking forces. The standard length of the Pipe is 6m. Lengths of 1 / 2 / 3 m are available on request.

		Allowable jacking force [kN]*											
de [mm]		SN	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN
Coupling		32000	40000	50000	64000	80000	100000	128000	160000	200000	320000	640000	1000000
820	e [mm]	25	27	29	33	35	38	42	45	49	54	67	78
	m [kg/m]	137	148	158	179	190	205	226	241	261	286	349	400
	stainless steel F [kN]	964	1088	1211	1456	1578	1758	1998	2175	2410	2699	3433	4033
	GRP F [kN]				1229	1351	1531	1770	1947	2181	2471	3203	3802
860	e [mm]	27	29	31	35	37	40	43	47	51	58	72	
	m [kg/m]	155	166	178	199	210	227	243	264	285	321	392	
	stainless steel F [kN]	1140	1270	1399	1655	1783	1972	2160	2409	2655	3080	3905	
	GRP F [kN]				1407	1534	1724	1911	2160	2406	2830	3654	
924	e [mm]	29	32	34	37	40	42	46	50	54	62	77	
	m [kg/m]	179	197	209	227	244	256	279	302	324	369	450	
	stainless steel F [kN]	1302	1511	1649	1856	2061	2197	2466	2734	2998	3520	4470	
	GRP F [kN]			1448	1654	1859	1995	2264	2531	2796	3316	4265	
960	e [mm]	31	34	36	39	42	44	48	52	56	64	80	
	m [kg/m]	199	217	230	348	266	278	302	326	350	396	486	
	stainless steel F [kN]	1497	1714	1857	2072	2284	2425	2706	2983	3258	3801	4854	
	GRP F [kN]		1478	1621	1836	2048	2189	2469	2746	3021	3563	4615	
1026	e [mm]	34	36	38	41	44	48	52	56	61	68		
	m [kg/m]	233	246	259	279	298	324	350	375	407	450		
	stainless steel F [kN]	1830	1984	2138	2367	2595	2897	3196	3492	3859	4366		
	GRP F [kN]	1585	1739	1893	2122	2350	2651	2950	3246	3612	4118		
1099	e [mm]	35	38	41	44	48	51	56	59	64	73		
	m [kg/m]	257	278	300	321	348	369	403	424	457	517		
	stainless steel F [kN]	2040	2288	2535	2781	3106	3348	3748	3987	4380	5079		
	GRP F [kN]	1717	1965	2212	2457	2781	3023	3423	3661	4054	4752		

Wall thicknesses and pipe masses as minimum or guidelines plus tolerances to HOBAS company standard.

* The jacking force (kN) corresponds to a safety factor of 3.5 times against the ultimate force calculated. Static calculation of specific projects can result in differing allowable jacking forces.

Jacking Pipes de 1229 - 1535



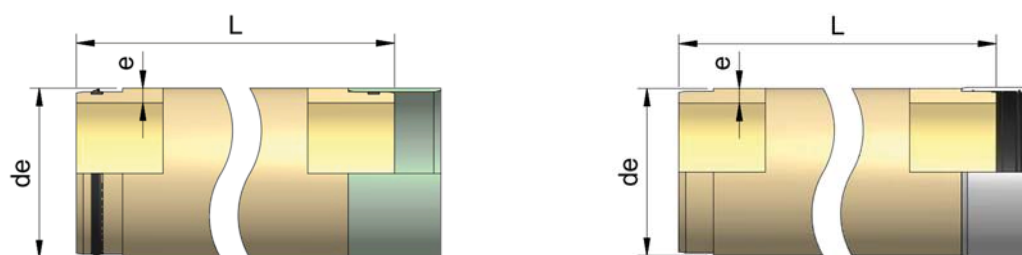
GRP jacking pipes with flush coupling (GRP or stainless steel) - allowable jacking forces. The standard length of the Pipe is 6m. Lengths of 1 / 2 / 3 m are available on request.

		Allowable jacking force [kN]*											
de [mm]		SN	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN
Coupling		32000	40000	50000	64000	80000	100000	128000	160000	200000	320000	640000	1000000
1229	e [mm]	40	43	46	49	53	56	61	66	71	81		
	m [kg/m]	328	352	376	399	430	454	492	530	568	642		
	stainless steel F [kN]	2748	3026	3302	3576	3940	4212	4660	5105	5546	6415		
	GRP F [kN]	2289	2566	2842	3116	3479	3750	4198	4643	5083	5951		
1280	e [mm]	41	45	47	52	55	59	64	68	73			
	m [kg/m]	351	384	400	441	465	497	537	569	608			
	stainless steel F [kN]	2968	3353	3545	4022	4306	4682	5149	5520				
	GRP F [kN]	2434	2819	3011	3487	3770	4146	4612	4983	5979			
1350	e [mm]	44	47	50	54	58	62	67	72				
	m [kg/m]	396	422	448	483	517	551	593	635				
	stainless steel F [kN]	3467	3771	4074	4476	4875	5272	5764	6252				
	GRP F [kN]	2825	3129	3432	3833	4232	4628	5120	5608				
1434	e [mm]	46	49	52	57	61	65	71	76				
	m [kg/m]	441	469	496	542	578	615	668	713				
	stainless steel F [kN]	3890	4215	4537	5072	5497	5919	6548	7067				
	GRP F [kN]	3150	3474	3796	4330	4755	5176	5804	6323				
1499	e [mm]	48	52	56	60	64	68	74	79				
	m [kg/m]	481	520	558	596	634	672	728	775				
	stainless steel F [kN]	4236	4688	5137	5583	6027	6469	7126	7669				
	GRP F [kN]	3476	3927	4376	4822	5265	5705	6361	6904				
1535	e [mm]	49	53	57	62	66	70	76	81				
	m [kg/m]	504	544	583	632	671	710	767	815				
	stainless steel F [kN]	3925	4389	4850	5423	5878	6331	7005	7562				
	GRP F [kN]	3664	4127	4587	5159	5614	6066	6739	7296				

Wall thicknesses and pipe masses as minimum or guidelines plus tolerances to HOBAS company standard.

* The jacking force (kN) corresponds to a safety factor of 3.5 times against the ultimate force calculated. Static calculation of specific projects can result in differing allowable jacking forces.

Jacking Pipes de 1638 - 2160



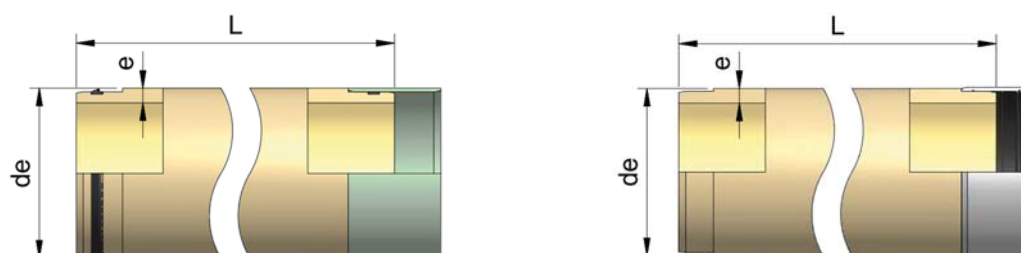
GRP jacking pipes with flush coupling (GRP or stainless steel) - allowable jacking forces. The standard length of the Pipe is 6m. Lengths of 1 / 2 / 3 m are available on request.

		Allowable jacking force [kN]*											
de [mm]		SN	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN
Coupling		32000	40000	50000	64000	80000	100000	128000	160000	200000	320000	640000	1000000
1638	e [mm]	52	56	60	65	70	75	81					
	m [kg/m]	569	611	653	706	757	809	870					
	stainless steel F [kN]	4585	5079	5570	6180	6786	7388	8106					
	GRP F [kN]	4218	4711	5202	5811	6417	7018	7734					
1720	e [mm]	55	59	64	68	73	78	84					
	m [kg/m]	632	676	731	775	830	884	948					
	stainless steel F [kN]	5201	5719	6363	6875	7512	8145	8899					
	GRP F [kN]	4381	4899	5542	6054	6690	7322	8075					
1842	e [mm]	59	63	68	73	78	83						
	m [kg/m]	726	774	833	892	950	1008						
	stainless steel F [kN]	6147	6703	7393	8080	8762	9441						
	GRP F [kN]	5224	5779	6469	7154	7836	8513						
1940	e [mm]	62	67	72	77	81	86						
	m [kg/m]	803	866	928	990	1039	1100						
	stainless steel F [kN]	6901	7631	8358	9080	9655	10370						
	GRP F [kN]	5492	6222	6947	7668	8242	8956						
2047	e [mm]	65	70	75	81	85							
	m [kg/m]	889	955	1021	1099	1151							
	stainless steel F [kN]	7763	8535	9302	10217	10824							
	GRP F [kN]	6549	7319	8086	9000	9606							
2160	e [mm]	69	74	79	85	90							
	m [kg/m]	995	1065	1134	1217	1285							
	stainless steel F [kN]	8828	9641	10450	11416	12216							
	GRP F [kN]	7402	8214	9022	9986	10785							

Wall thicknesses and pipe masses as minimum or guidelines plus tolerances to HOBAS company standard.

* The jacking force (kN) corresponds to a safety factor of 3.5 times against the ultimate force calculated. Static calculation of specific projects can result in differing allowable jacking forces.

Jacking Pipes de 2250 - 3600



GRP jacking pipes with flush coupling (GRP or stainless steel) - allowable jacking forces. The standard length of the Pipe is 6m. Lengths of 1 / 2 / 3 m are available on request.

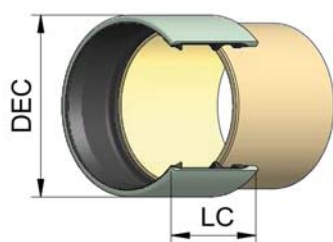
		Allowable jacking force [kN]*											
de [mm]		SN	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN
Coupling		32000	40000	50000	64000	80000	100000	128000	160000	200000	320000	640000	1000000
2250	e [mm]	71	76	82	87	94							
	m [kg/m]	1068	1141	1227	1299	1399							
	stainless steel F [kN]	9601	10450	11462	12302	13470							
	GRP F [kN]	7987	8835	9846	10685	11852							
2400	e [mm]	76	81	86	93	100							
	m [kg/m]	1218	1295	1372	1480	1586							
	GRP F [kN]	9251	10154	11053	12304	13548							
2454	e [mm]	80	82	88	95	102							
	m [kg/m]	1312	1344	1438	1548	1657							
	GRP F [kN]	10127	10497	11602	12884	14157							
2555	e [mm]	82	85	92	99	106							
	m [kg/m]	1400	1450	1565	1679	1792							
	GRP F [kN]	10846	11423	12765	14099	15425							
3000	e [mm]	94	100	108	117	127							
	m [kg/m]	1887	2003	2157	2330	2520							
	GRP F [kN]	13068	14425	16226	18240	20462							
3600**	e [mm]												
	m [kg/m]												
	GRP F [kN]												

Wall thicknesses and pipe masses as minimum or guidelines plus tolerances to HOBAS company standard.

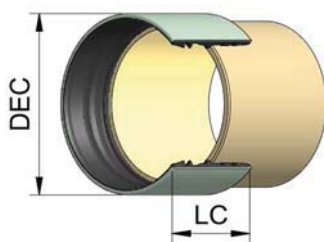
* The jacking force (kN) corresponds to a safety factor of 3.5 times against the ultimate force calculated. Static calculation of specific projects can result in differing allowable jacking forces.

** On request

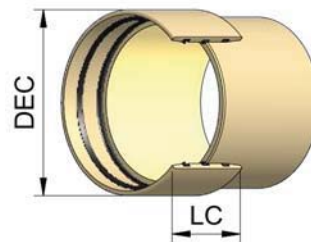
Standard Pipe Joints



FWC-A coupling



FWC-S coupling



DC coupling

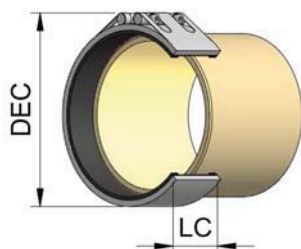
HOBAS Pipes are generally delivered to the construction site with a coupling mounted at the factory. The standard pipe joint is the FWC coupling consisting of a GRP sleeve with a permanently fitted, full width EPDM gasket seal with single sealing lip. FWC couplings are available for all nominal pressure ratings. The DC coupling is primarily used for smaller diameters. It consists of a GRP sleeve with EPDM sealing rings.

FWC-S coupling							
DN	de [mm]	LC [mm]	DEC [mm]	DN	de [mm]	LC [mm]	DEC [mm]
300	324	200	360	1600	1638	290	1680
350	376	200	420	1720	1720	290	1770
400	401	200	440	1800	1842	290	1890
400	427	200	470	1940	1940	290	1990
450	478	200	520	2000	2047	290	2090
500	501	200	550	2160	2160	290	2210
500	530	200	580	2200	2250	290	2300
550	550	200	600	2400	2400	290	2450
600	616	200	660	2400	2454	290	2490
650	650	200	700	2555	2555	290	2600
700	718	200/250	760	3000	3000	350	3040
750	752	250	800	3600	3600	350	3640
800	820	250	870				
860	860	250	910				
900	924	250	970				
960	960	250	1010				
1000	1026	250	1070				
1100	1099	250	1140				
1200	1229	250	1270				
1280	1280	250	1330				
1350	1350	250	1400				
1400	1434	250/290	1480				
1500	1499	290	1540				
1535	1535	290	1580				

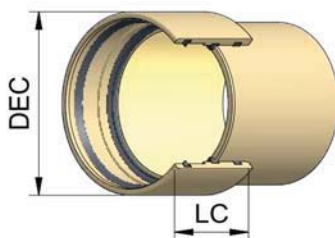
FWC-A coupling			
DN	de [mm]	LC [mm]	DEC [mm]
150	168	180	210
200	220	200	260
250	272	200	310
300	324	200	360
350	376	200	420
400	427	200	470
450	478	200	520
500	530	200	580
600	616	200	660
700	718	290	760
800	820	290	870
900	924	290	970
1000	1026	290	1070
1100	1099	290	1140
1200	1229	290	1270

DC coupling			
DN	de [mm]	LC [mm]	DEC [mm]
168	168	180	201
220	220	190	255
272	272	190	305
324	324	200	357

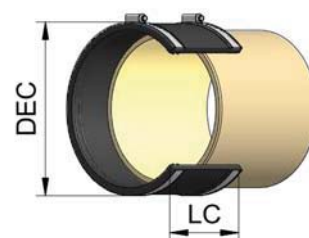
Special Couplings



Mechanical Couplings



Assembly coupling



Sleeve Coupling

Assembly coupling:

The assembly coupling, e.g. TeeKay or Straub system, consists of a stainless steel sleeve with a screw connection and rubber seal made of EPDM (NBR also possible on request).

Adapter coupling:

The DC-Coupling is fitted on one side to the PVC-mat, hence can be used as adapter coupling GRP/ PVC.

DN	de [mm]	LC [mm]	DEC [mm]
150	168	110	190
200	220	110	244
250	272	110	295
300	324	110	346
350	376	140	434
400	427	140	485
500	530	140	588
600	616	140	674
700	718	140	776
800	820	140	878
900	924	140	982
1000	1026	140	1084
1100	1099	210	1171
1200	1229	210	1301
1280	1280	210	1382
1400	1434	210	1536
1500	1499	210	1601
1600	1638	210	1740
1720	1720	210	1822
1800	1842	210	1944
2000	2047	210	2149
2160	2160	210	2262
2200	2250	210	2352
2400	2400	210	2502
2555	2555	210	2657
3000	3000	320	3102

Source: Teekay 2010

GFK DN	PVC DN	LC [mm]
150	150	180
200	200	180
250	250	180
300	300	180

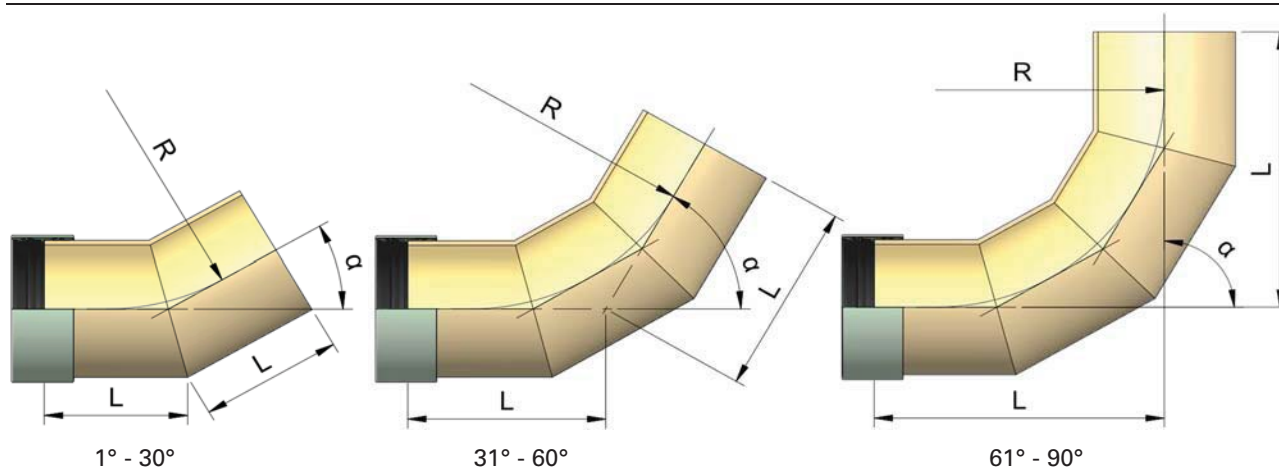
Sleeve Coupling:

Coupling system e.g. from FlexSeal for later assembly of gravity pipes. Suitable for connecting different pipe material.

DN	de [mm]	LC [mm]
150	150-175	120
200	200-225	150
250	250-275	150
300	305-335	185
350	355-385	185
400	405-430	185
500	510-540	185
600	590-620	185

Source: Flexseal 10/2010

Bends DN 150 - 1000



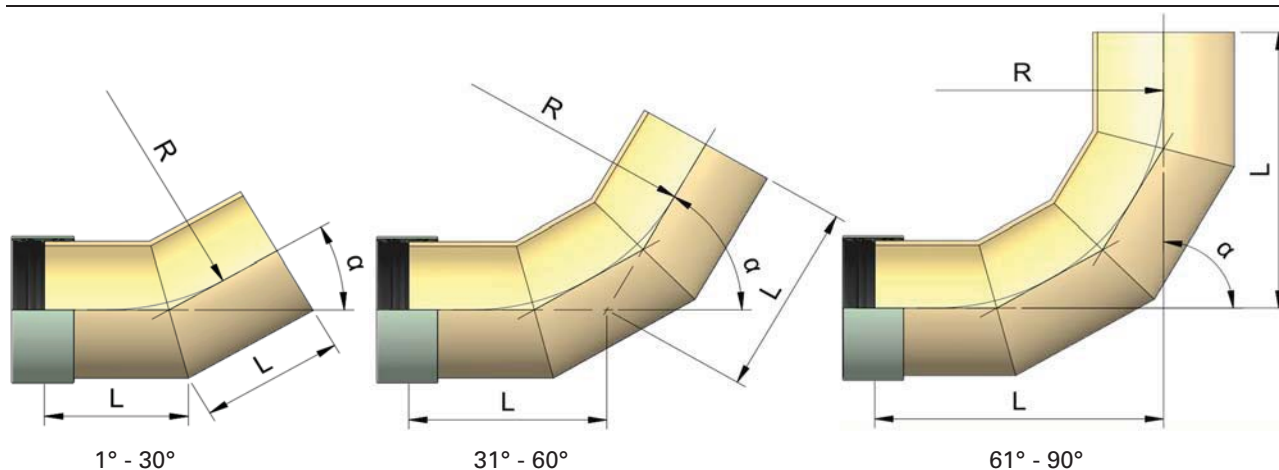
Installation lengths for bends consisting of segments

DN	de [mm]	R [mm]	Angle α						
			11,25°	15°	22,5°	30°	45°	60°	90°
			Number of segments Laying length L [mm]						
			2	2	2	2	3	3	4
150	168	370	300	300	300	300	350	400	525
200	220	400	300	300	300	300	350	400	525
250	272	430	300	300	300	300	375	425	575
300	324	450	300	300	300	300	400	450	650
350	376	525	325	325	325	325	425	500	700
400	401	600	350	350	350	350	450	525	750
400	427	600	375	375	375	375	475	550	800
450	478	675	375	375	375	375	500	575	850
500	501	750	400	400	400	400	525	600	900
500	530	750	400	400	400	400	525	625	950
550	550	825	450	450	450	450	600	650	1000
600	616	900	450	450	450	450	600	700	1075
650	650	975	475	475	475	475	650	750	1100
700	718	1050	475	475	475	475	650	775	1200
750	752	1125	500	500	500	500	700	800	1300
800	820	1200	525	525	525	525	700	850	1350
860	860	1290	550	550	550	550	725	875	1400
900	924	1350	550	550	550	550	725	875	1400
960	960	1440	575	575	575	575	750	900	1450
1000	1026	1270	575	575	575	575	750	925	1450

Size can be adapted to meet transport requirements

Tolerances to HOBAS Product Certificates

Bends DN 1100 - 3000



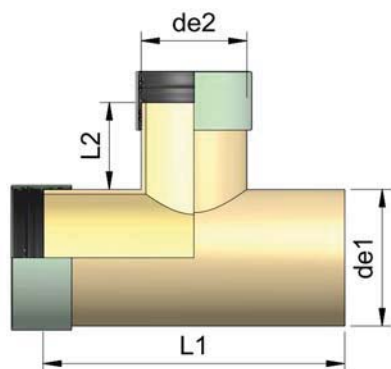
Installation lengths for bends consisting of segments

DN	de [mm]	R [mm]	Angle α						
			11,25°	15°	22,5°	30°	45°	60°	90°
			Number of segments Laying length L [mm]						
			2	2	2	2	3	3	4
1100	1099	1320	600	600	600	600	825	1025	1610
1200	1229	1370	600	600	600	600	825	1025	1600
1250	1280	1400	650	650	650	650	850	1050	1650
1300	1350	1450	650	650	650	650	850	1050	1650
1400	1434	1550	675	675	675	675	900	1100	1700
1500	1499	1600	800	800	800	800	1100	1300	2000
1535	1535	1650	800	800	800	800	1100	1300	2000
1600	1638	1700	800	800	800	800	1100	1300	2000
1700	1720	1800	800	800	800	800	1200	1400	2200
1800	1842	1950	850	850	850	850	1200	1400	2200
1900	1940	2000	850	850	850	850	1300	1500	2200
2000	2047	2100	900	900	900	900	1300	1500	2400
2100	2160	2170	900	900	900	900	1300	1500	2400
2200	2250	2270	950	950	950	950	1400	1600	2600
2400	2400	2470	1000	1000	1000	1000	1500	1700	2600
2453	2454	2500	1000	1000	1000	1000	1500	1700	2600
2500	2555	2600	1000	1000	1000	1000	1500	1700	2600
3000	3000	3000	1000	1000	1000	1000	1800	2000	3000

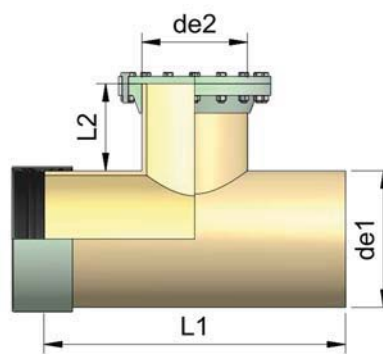
Size can be adapted to meet transport requirements

Tolerances to HOBAS Product Certificates

T-piece DN 150 - 800



Tees



Inspection pieces

T-shaped fitting consisting of segments, lengths of main pipe and outlet. Outlet with standard coupling or inspection opening

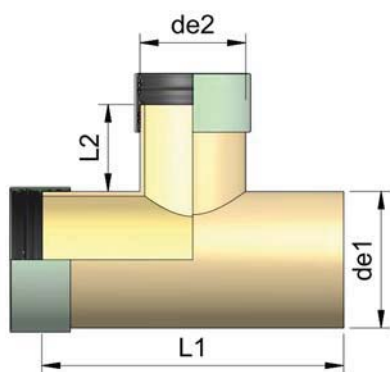
DN 2	150	200	250	300	350	400	500	600	700	800
de2 [mm]	168	220	272	324	376	427	530	616	718	820
L 2*	240	245	245	255	260	265	275	285	330	330

DN 1	de1 [mm]	L 1* [mm]									
150	168	750									
200	220	750	1000								
250	272	750	1000	1000							
300	324	750	1000	1000	1000						
350	376	750	1000	1000	1000	1000					
400	427	750	1000	1000	1000	1000	1000				
500	530	1000	1000	1000	1000	1000	1000	1500			
550	550	1000	1000	1000	1000	1000	1000	1500			
600	616	1000	1000	1000	1000	1000	1500	1500	1500		
650	650	1000	1000	1000	1000	1000	1500	1500	1500		
700	718	1000	1000	1000	1000	1000	1500	1500	1500	1500	
750	752	1000	1000	1000	1000	1000	1500	1500	1500	1500	
800	820	1000	1000	1000	1000	1000	1500	1500	1500	1500	1500
900	924	1000	1000	1000	1000	1500	1500	1500	1500	1500	2000
1000	1026	1000	1000	1000	1000	1500	1500	1500	1500	1500	2000
1100	1099	1000	1000	1000	1000	1500	1500	1500	1500	1500	2000
1200	1229	1500	1500	1500	1500	1500	1500	1500	1500	1500	2000
1280	1280	1500	1500	1500	1500	1500	1500	1500	1500	1500	2000
1350	1350	1500	1500	1500	1500	1500	1500	1500	1500	1500	2000
1400	1434	1500	1500	1500	1500	1500	1500	1500	2000	2000	2000
1500	1499	1500	1500	1500	1500	1500	1500	1500	2000	2000	2000

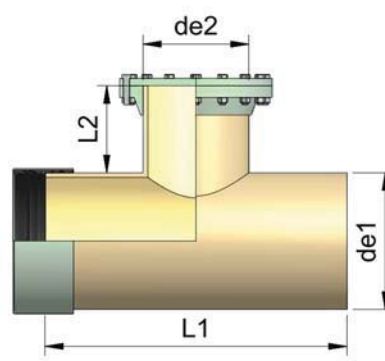
* (± 10 mm)

Tolerances to HOBAS Product Certificates

T-piece DN 150 - 800



Tees



Inspection pieces

T-shaped fitting consisting of segments, lengths of main pipe and outlet. Outlet with standard coupling or inspection opening

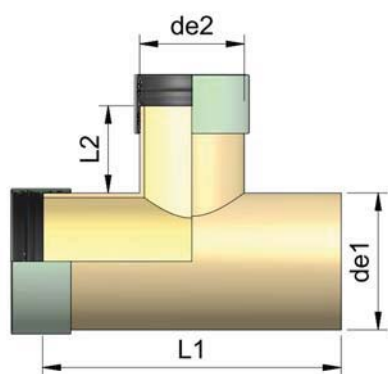
DN 2	150	200	250	300	350	400	500	600	700	800
de2 [mm]	168	220	272	324	376	427	530	616	718	820
L 2*	240	245	245	255	260	265	275	285	330	330

DN 1	de1 [mm]	L 1* [mm]									
1600	1638	1500	1500	1500	1500	1500	1500	1500	2000	2000	2000
1720	1720	1500	1500	1500	1500	1500	1500	1500	2000	2000	2000
1800	1842	1500	1500	1500	1500	1500	1500	1500	2000	2000	2000
1940	1940	1500	1500	1500	1500	1500	1500	1500	2000	2000	2000
2000	2047	1500	1500	1500	1500	1500	1500	1500	2000	2000	2000
2160	2160	1500	1500	1500	1500	1500	1500	1500	2000	2000	2000
2200	2250	1500	1500	1500	1500	1500	1500	1500	2000	2000	2000
2400	2400	1500	1500	1500	1500	1500	1500	1500	2000	2000	2000
2400	2454	1500	1500	1500	1500	1500	1500	1500	2000	2000	2000
2555	2555	1500	1500	1500	1500	1500	1500	1500	2000	2000	2000
3000	3000	1500	1500	1500	1500	1500	1500	1500	2000	2000	2000

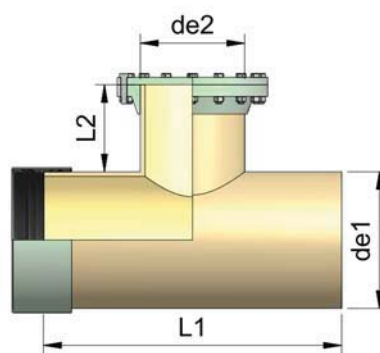
* (± 10 mm)

Tolerances to HOBAS Product Certificates

T-piece DN 900 - 1600



Tees



Inspection pieces

T-shaped fitting consisting of segments, lengths of main pipe and outlet. Outlet with standard coupling or inspection opening

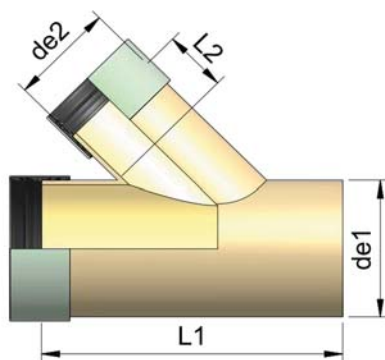
DN 2	900	1000	1100	1200	1280	1300	1400	1535	1600
de2 [mm]	924	1026	1099	1229	1280	1350	1434	1535	1638
L 2*	340	350	360	370	380	340	400	430	430

DN 1	de1 [mm]	L 1* [mm]									
1000	1026	2000	2000								
1100	1099	2000	2000	2000							
1200	1229	2000	2500	2500	3000						
1280	1280	2000	2500	2500	3000	3000					
1350	1350	2500	2500	2500	3000	3000	3000				
1400	1434	2500	2500	2500	3000	3000	3000	3000			
1500	1499	2500	2500	2500	3000	3000	3000	3000			
1535	1535	2500	2500	2500	3000	3000	3000	3000	3000		
1600	1638	2500	2500	2500	3000	3000	3000	3000	3000	3000	
1720	1720	2500	2500	2500	3000	3000	3000	3000	3000	3000	
1800	1842	2500	2500	2500	3000	3000	3000	3000	3000	3000	
1940	1940	2500	2500	2500	3000	3000	3000	3000	3000	3000	
2000	2047	2500	2500	2500	3000	3000	3000	3000	3000	3000	
2160	2160	2500	2500	2500	3000	3000	3000	3000	3000	3000	
2200	2250	2500	2500	2500	3000	3000	3000	3000	3000	3000	
2400	2400	2500	2500	2500	3000	3000	3000	3000	3000	3000	
2400	2454	2500	2500	2500	3000	3000	3000	3000	3000	3000	
2555	2555	2500	2500	2500	3000	3000	3000	3000	3000	3000	
3000	3000	2500	2500	2500	3000	3000	3000	3000	3000	3000	

* (± 10 mm)

Tolerances to HOBAS Product Certificates

Y- piece DN 150 - 700



It can be connected to other materials with suitable transition couplings. Standard angles are 45° and 60°, other angles are available on request.

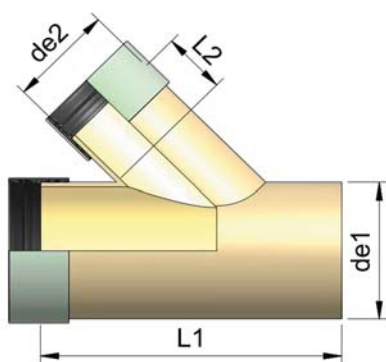
DN 2	150	200	250	300	350	400	500	600	700
de2 [mm]	168	220	272	324	376	427	530	616	718
L 2*	250	250	250	250	250	275	275	275	325

DN 1	de1 [mm]	L 1* [mm]								
150	168	740								
200	220	740	1000							
250	272	740	1000	1000						
300	324	740	1000	1000	1000					
350	376	740	1000	1000	1000	1000				
400	427	740	1000	1000	1000	1000	1200			
500	530	1000	1000	1000	1000	1000	1200	1500		
600	616	1000	1000	1000	1000	1000	1200	1500	1750	
700	718	1000	1000	1000	1000	1000	1200	1500	1750	1750
800	820	1000	1000	1000	1000	1000	1200	1500	1750	1750
900	924	1500	1500	1500	1500	1500	1500	2000	2000	2000
1000	1026	1500	1500	1500	1500	1500	1500	2000	2000	2000
1100	1099	1500	1500	1500	1500	1500	1500	2000	2000	2000
1200	1229	1500	1500	1500	1500	1500	1500	2000	2000	2000
1280	1280	1500	1500	1500	1500	1500	1500	2000	2000	2000
1400	1434	1500	1500	1500	1500	1500	1500	2000	2000	2000
1500	1499	1500	1500	1500	1500	1500	1500	2000	2000	2000
1600	1638	1500	1500	1500	1500	1500	1500	2000	2000	2000
1700	1720	2000	2000	2000	2000	2000	2000	2000		
1800	1842	2000	2000	2000	2000	2000	2000	2000		
1900	1940	2000	2000	2000	2000	2000	2000	2000		
2000	2046	2000	2000	2000	2000	2000	2000	2000		
2100	2160	2000	2000	2000	2000	2000	2000	2000		
2200	2250	2000	2000	2000	2000	2000	2000	2000		
2400	2400	2000	2000	2000	2000	2000	2000	2000		
2500	2555	2000	2000	2000	2000	2000	2000	2000		

* (± 10 mm)

Tolerances to HOBAS Product Certificates

Y- piece DN 800 - 1600



It can be connected to other materials with suitable transition couplings. Standard angles are 45° and 60°, other angles are available on request.

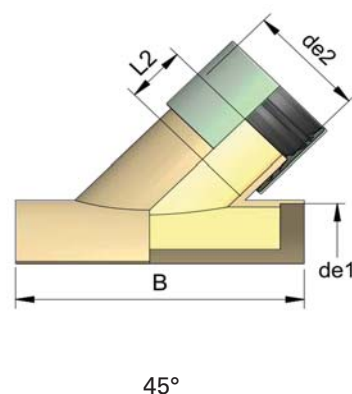
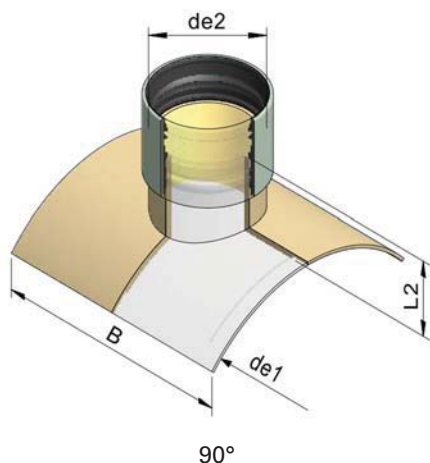
DN 2	800	900	1000	1100	1200	1280	1400	1500	1600
de2 [mm]	820	924	1026	1099	1229	1280	1434	1499	1638
L 2*	325	325	375	375	400	400	450	450	450

DN 1	de1 [mm]	L 1* [mm]								
600	616									
700	718									
800	820	2000								
900	924	2000	2500							
1000	1026	2000	2500	2500						
1100	1099	2000	2500	2500	2500					
1200	1229	2000	2500	2500	2500	3000				
1280	1280	2000	2500	2500	2500	3000	3000			
1400	1434	2000	2500	2500	2500	3000	3000	3000		
1500	1499	2000	2500	2500	2500	3000	3000	3000	3000	
1600	1638	2000	2500	2500	2500	3000	3000	3000	3000	3500

* (± 10 mm)
Tolerances to HOBAS Product Certificates

All figures quoted are values and may vary slightly from the finished product due to manufacturing tolerances. The information and recommendations reflect the state of our knowledge at the time of publication. They cannot therefore be construed as an express or implied warranty. The details must be checked and, if necessary, agreed in each individual case. HOBAS cannot accept any liability. This also applies to errors, omissions and changes to technical data without notice.

Saddle - glued DN 200 - 400

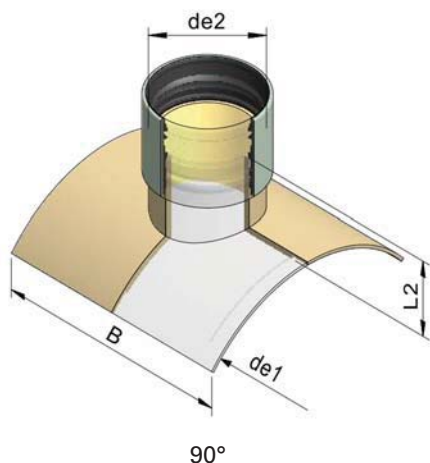


Saddles are for connecting sewers at a later date. The outlet is generally at an angle of 45° or 90°. Saddles can be supplied, which are completely flush with the pipe's inside diameter. HOBAS supplies glued and screwed saddles. The dimensions can vary depending on national regulations. Transitions to other materials are available.

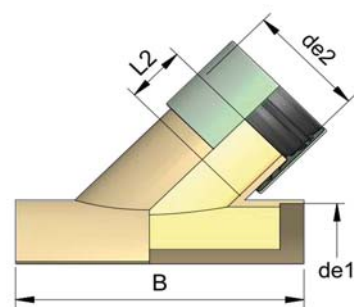
Main pipe		Outlet	L2 = 250 mm (+/-10)			B (min) [mm]	
DN 1	de1 [mm]	DN 2	de2 [mm]			Outlet	
			GRP	VC*	PVC	45°	90°
200	220	150	168	186	160	470	400
250	272	150	168	186	160	470	400
		200	220		200	520	440
300	324	150	168	186	160	470	400
		200	220	242	200	520	440
		250	272		250	590	490
350	376	150	168	186	160	470	400
		200	220	242	200	520	440
		250	272		250	590	490
		300	324		315	690	560
400	401	150	168	186	160	470	400
		200	220	242	200	520	440
		250	272		250	590	490
		300	324		315	690	560
400	427	150	168	186	160	470	400
		200	220	242	200	520	440
		250	272		250	590	490
		300	324		315	690	560
		350	376		350	730	590

* For DN 150: with GRP sleeve (normal load)

Saddle - glued DN 500 - 1600



90°



45°

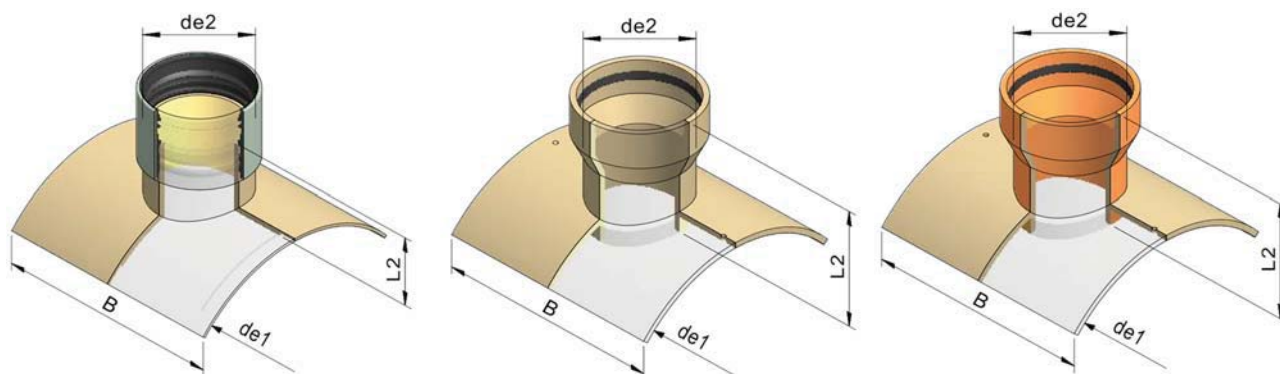
Saddles are for connecting sewers at a later date. The outlet is generally at an angle of 45° or 90°. Saddles can be supplied, which are completely flush with the pipe's inside diameter. HOBAS supplies glued and screwed saddles. The dimensions can vary depending on national regulations. Transitions to other materials are available.

Main pipe		Outlet	L2 = 250 mm (+/-10)			B (min)	
DN 1	de1 [mm]	DN 2	de2 [mm]			Outlet	
			GRP	VC*	PVC	45°	90°
500	501	150	168	186	160	470	400
		200	220	242	200	520	440
		250	272		250	590	490
		300	324		315	690	560
		350	376		350	730	590
500	530	150	168	186	160	470	400
		200	220	242	200	520	440
		250	272		250	590	490
		300	324		315	690	560
		350	376		350	730	590
		400	427		400	810	640
		150	168	186	160	470	400
		200	220	242	200	520	440
		250	272		250	590	490
		300	324		315	690	560
		350	376		350	730	590
		400	427		400	810	640
		150	168	186	160	470	400
		200	220	242	200	520	440
		250	272		250	590	490
		300	324		315	690	560
		350	376		350	730	590
		400	427		400	810	640
		150	168	186	160	470	400
		200	220	242	200	520	440
		250	272		250	590	490
		300	324		315	690	560
		350	376		350	730	590
		400	427		400	810	640
		500	530		500	950	740

* For DN 150: with GRP sleeve (normal load)

** For DN 600 - 1600 same values

Saddle DN 300 -700



GRP

Vitrified Clay

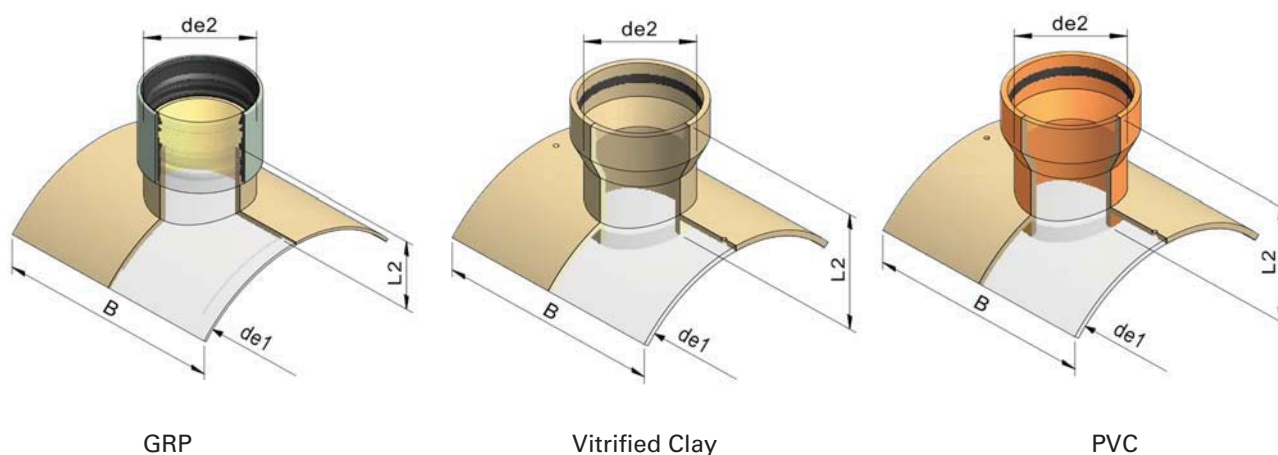
PVC

Saddles are for connecting sewers at a later date. The outlet is generally at an angle of 90°. Saddles can be supplied, which are completely flush with the pipe's inside diameter. HOBAS supplies glued and screwed saddles. The dimensions can vary depending on national regulations. Transitions to other materials are available.

Main pipe		Outlet DN 2	de2 [mm]			B (min) [mm]	L2(min) [mm]
DN 1	de1 [mm]		GRP	VC*	PVC		
300	324	150	168	186	160	370	200
350	376	150	168	186	160	370	200
400	401	150	168	186	160	370	200
		200	220		200	420	200
400	427	150	168	186	160	370	200
		200	220		200	420	200
500	501	150	168	186	160	370	200
		200	220		200	420	200
		250	272		250	480	250
500	530	150	168	186	160	370	200
		200	220		200	420	200
		250	272		250	480	250
550	550	150	168	186	160	370	200
		200	220		200	420	200
		250	272		250	480	250
600	616	150	168	186	160	370	200
		200	220		200	420	200
		250	272		250	480	250
		300	324		315	530	250
650	650	150	168	186	160	370	200
		200	220		200	420	200
		250	272		250	480	250
		300	324		315	530	250
700	718	150	168	186	160	370	200

* for DN 150: with GRP sleeve for VC (normal load)

Saddle DN 700 - 1200

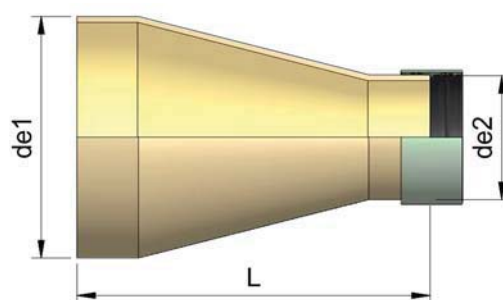
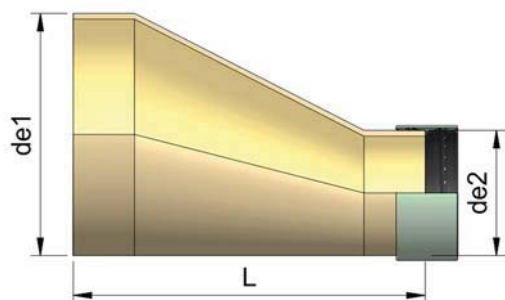


Saddles are for connecting sewers at a later date. The outlet is generally at an angle of 90°. Saddles can be supplied, which are completely flush with the pipe's inside diameter. HOBAS supplies glued and screwed saddles. The dimensions can vary depending on national regulations. Transitions to other materials are available.

Main pipe		Outlet	de2 [mm]			B (min)	L2(min)
DN 1	de1 [mm]	DN 2				[mm]	[mm]
700	718	200	220		200	420	200
		250	272		250	480	250
		300	324		315	530	250
750	752	150	168	186	160	370	200
		200	220		200	420	200
		250	272		250	480	250
		300	324		315	530	250
800	820	150	168	186	160	370	200
		200	220		200	420	200
		250	272		250	480	250
		300	324		315	530	250
850	860	150	168	186	160	370	200
		200	220		200	420	200
		250	272		250	480	250
		300	324		315	530	250
900	924	150	168	186	160	370	200
		200	220		200	420	200
		250	272		250	480	250
		300	324		315	530	250
950 - 1200**	960 - 1229**	150	168	186	160	370	200
		200	220		200	420	200
		250	272		250	480	250
		300	324		315	530	250

* for DN 150: with GRP sleeve for VC (normal load)

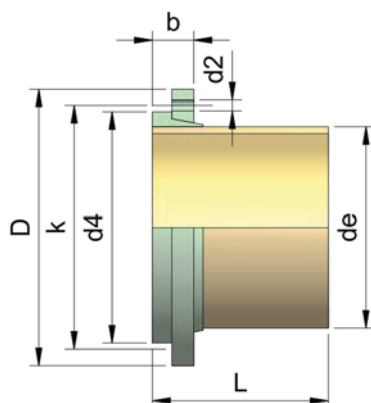
** for DN 950 - 1200 same values



Lengths for concentric and eccentric reducers

de1 [mm]	de2 [mm]	L [mm]	de2 [mm]	L [mm]	de2 [mm]	L [mm]	de2 [mm]	L (mm) [mm]
220	168	750						
272	220	750	168	900				
324	272	750	220	900	168	1000		
376	324	750	272	900	220	1000	168	1200
427	376	750	324	900	272	1000	220	1200
478	427	750	376	900	324	1000	272	1200
530	478	750	427	1000	376	1000	324	1200
550	530	750	478	1000	427	1000	376	1200
616	550	750	530	1000	478	1000	427	1200
650	616	750	550	1000	530	1000	478	1200
718	650	1000	616	1000	550	1200	530	1200
752	718	1000	650	1000	616	1200	550	1200
820	752	1000	718	1000	650	1200	616	1200
860	820	1000	752	1000	718	1200	650	1200
924	860	1000	820	1000	752	1200	718	1200
960	924	1000	860	1000	820	1200	752	1200
1026	960	1000	924	1000	860	1200	820	1500
1099	1026	1000	960	1000	924	1200	860	1500
1229	1099	1100	1026	1200	960	1500	924	1500
1280	1229	1100	1099	1200	1026	1500	960	1500
1350	1280	1100	1229	1200	1099	1500	1026	1750
1434	1348	1100	1280	1200	1229	1500	1099	1750
1499	1434	1100	1348	1200	1280	1500	1229	1750
1535	1499	1100	1434	1200	1348	1500	1280	1750
1638	1535	1200	1499	1200	1434	1500	1348	1750
1720	1638	1200	1535	1500	1499	1500	1434	1750
1842	1720	1200	1638	1500	1535	1750	1499	1750
1940	1842	1200	1720	1500	1638	1750	1535	1750
2047	1940	1200	1842	1500	1720	1750	1638	2000
2160	2046	1200	1940	1500	1842	1750	1720	2000
2250	2160	1500	2046	1500	1940	1750	1842	2000
2400	2250	1500	2160	1500	2046	1750	1940	2000
2454	2400	1500	2250	1500	2160	1750	2046	2000
2555	2454	1500	2400	1500	2250	1750	2160	2000
3000	2555	1500	2453	2000	2400	2500	2250	3000

Flange with GRP/Steel Loose Flange

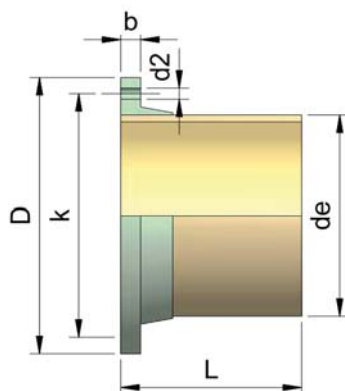


The collar flanges are made from either galvanised steel or GRP. The flange drilling complies with DIN 2501 / EN 1092-1 for PN 10. The nominal pressure class required must be indicated in the order.

DN	de [mm]	L [mm]	D [mm]	k [mm]	d4 [mm]	d2 [mm]	n*	Screws	GRP b [mm]	Steel b [mm]
150	168	400	285	240	214	22	8	8 x M20	55	50
200	220	400	340	295	268	22	8	8 x M20	57	50
250	272	400	395	350	320	22	12	12 x M20	62	55
300	324	400	460	400	376	22	12	12 x M20	68	60
350	376	400	520	460	436	22	16	16 x M20	74	65
400	427	400	565	515	487	26	16	16 x M24	82	75
450	478	400	640	565	535	26	20	20 x M24	94	-
500	530	400	670	620	592	26	20	20 x M24	63	85
600	616	400	780	725	693	30	20	20 x M28	72	100
700	718	400	910	840	808	30	24	24 x M28	80	110
800	820	500	1025	950	915	33	24	24 x M30	83	125
900	924	500	1125	1050	1015	33	28	28 x M30	85	147
1000	1026	500	1225	1160	1122	36	28	28 x M33	93	158
1200	1229	500	1484	1380	1339	39	32	32 x M36	95	170
1400	1434	500	1685	1590	1535	42	36	36 x M39	120	-

* Number of holes

GRP Fixed Flange

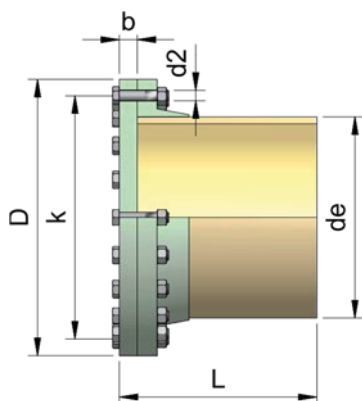


The fixed flange consists of a piece of pipe having the same pressure class as the pipeline, a flange collar is bonded to it. The flange drilling complies with DIN 2501 / EN 1092-1 for PN 10. The nominal pressure class required must be indicated in the order.

DN	de [mm]	L [mm]	D [mm]	k [mm]	d2 [mm]	n*	Screws	b [mm]
150	168	400	285	240	22	8	8 x M20	23
200	220	400	340	295	22	8	8 x M20	25
250	272	400	395	350	22	12	12 x M20	28
300	324	400	460	400	22	12	12 x M20	32
350	376	400	520	460	22	16	16 x M20	36
400	427	400	565	515	26	16	16 x M24	40
450	478	400	640	565	26	20	20 x M24	44
500	530	400	670	620	26	20	20 x M24	28
600	616	400	780	725	30	20	20 x M28	34
700	718	400	910	840	30	24	24 x M28	36
800	820	500	1025	950	33	24	24 x M30	38
900	924	500	1125	1050	33	28	28 x M30	40
1000	1026	500	1225	1160	36	28	28 x M33	45
1100	1099	500	1340	1270	36	32	32 x M36	45
1200	1229	500	1484	1380	39	32	32 x M36	55
1400	1434	500	1685	1590	42	36	36 x M39	60
1600	1638	500	1930	1820	48	40	40 x M45	70
1800	1842	500	2130	2020	48	44	44 x M45	75
2000	2046	500	2345	2230	48	48	48 x M45	80
2200	2250	500	2555	2440	56	52	52 x M53	90
2400	2400	500	2760	2650	56	56	56 x M53	95

* Number of screws

Blind flange from GRP and steel

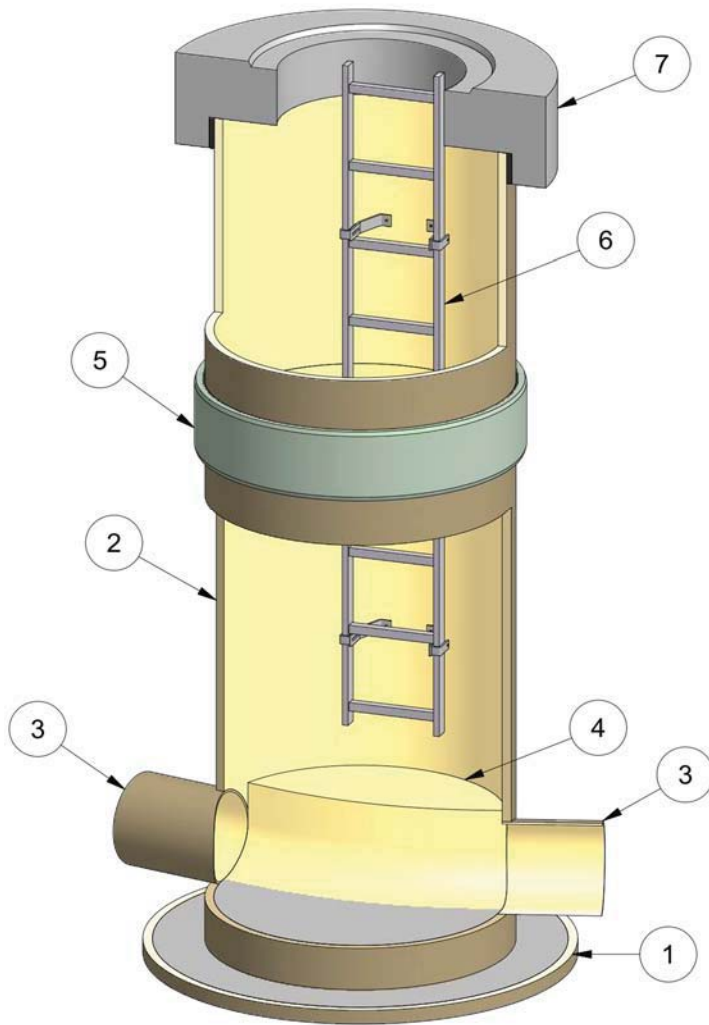


Blind flanges can be supplied in either GRP or galvanised steel. The flange drilling complies with DIN 2501 / EN 1092-1 for PN 10. The nominal pressure class required must be indicated in the order.

DN	de [mm]	L [mm]	D [mm]	k [mm]	d2 [mm]	n*	Screws	GRP b [mm]	Steel b [mm]
150	168	400	285	240	22	8	8 x M20	20	22
200	220	400	340	295	22	8	8 x M20	24	24
250	272	400	395	350	22	12	12 x M20	28	26
300	324	400	460	400	22	12	12 x M20	32	26
350	376	400	520	460	22	16	16 x M20	34	26
400	427	400	565	515	26	16	16 x M24	38	26
450	478	400	640	565	26	20	20 x M24	45	-
500	530	400	670	620	26	20	20 x M24	45	30
600	616	400	780	725	30	20	20 x M28	66	34
700	718	400	910	840	30	24	24 x M28	75	38
800	820	500	1025	950	33	24	24 x M30	80	42
900	924	500	1125	1050	33	28	28 x M30	100	48
1000	1026	500	1225	1160	36	28	28 x M33	110	54
1200	1229	500	1484	1380	39	32	32 x M36	120	60

* Number of screws

Standard Manhole DN 1000 - 3600



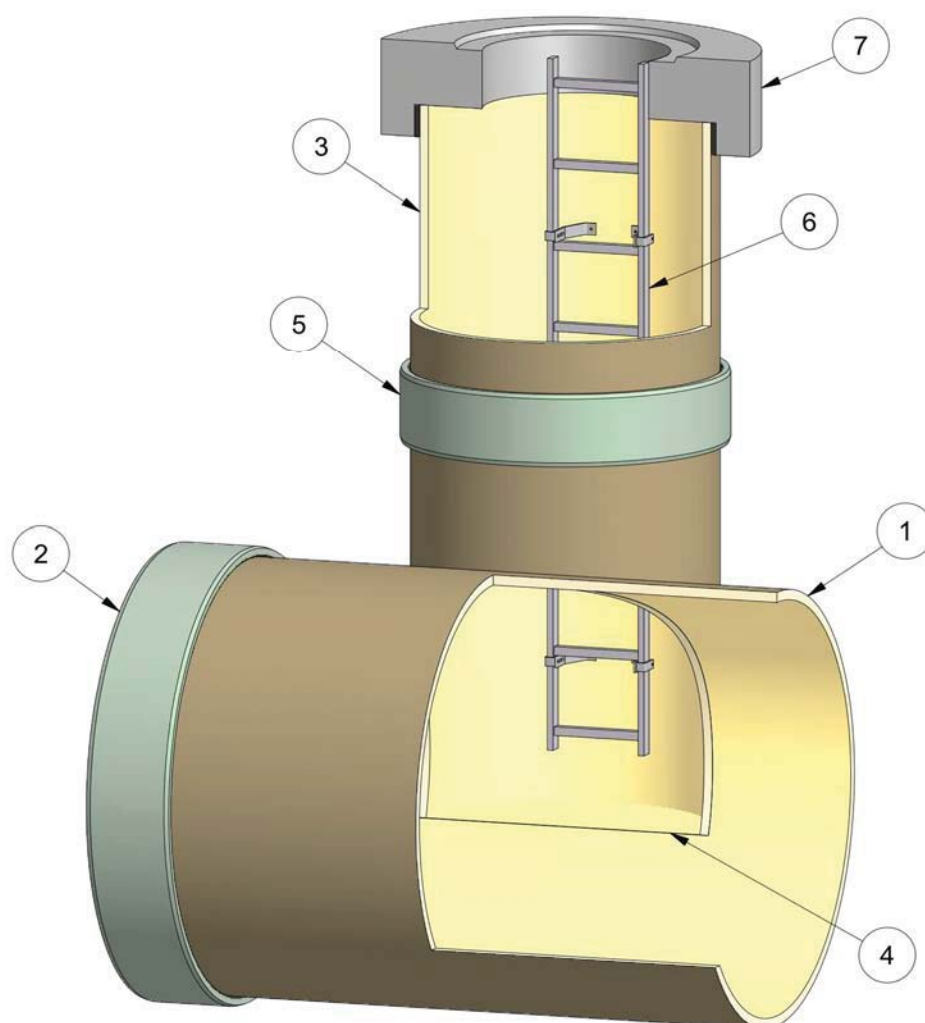
DN	Outlet [mm]
1000	150 - 500
1100	150 - 500
1200	150 - 600
1400	150 - 800
1500	150 - 900
1600	150 - 1100
1700	150 - 1200
1800	150 - 1200
2000	150 - 1600
2200	150 - 1700
2400	150 - 1800
2400	150 - 2000
2555	150 - 2000
3000	150 - 2400
3600	150 - 2400

Standard Manhole consisting of:

- 1 Anti-flotation anchor (either as GRP base plate or laminated over with concrete upturn)
- 2 Manhole pipe
- 3 Port
- 4 Bench (depending on national circumstances on site or directly from factory)
- 5 Coupling on manhole pipe (for design in several parts)
- 6 Ladder
- 7 Manhole cover (accessories on request)

The HOBAS Standard Manhole is made of GRP throughout and corrosion resistant both on the inside and outside. It consists of a HOBAS Pipe with a suitably designed channel.

Tangential Manhole DN 1000 - 3600

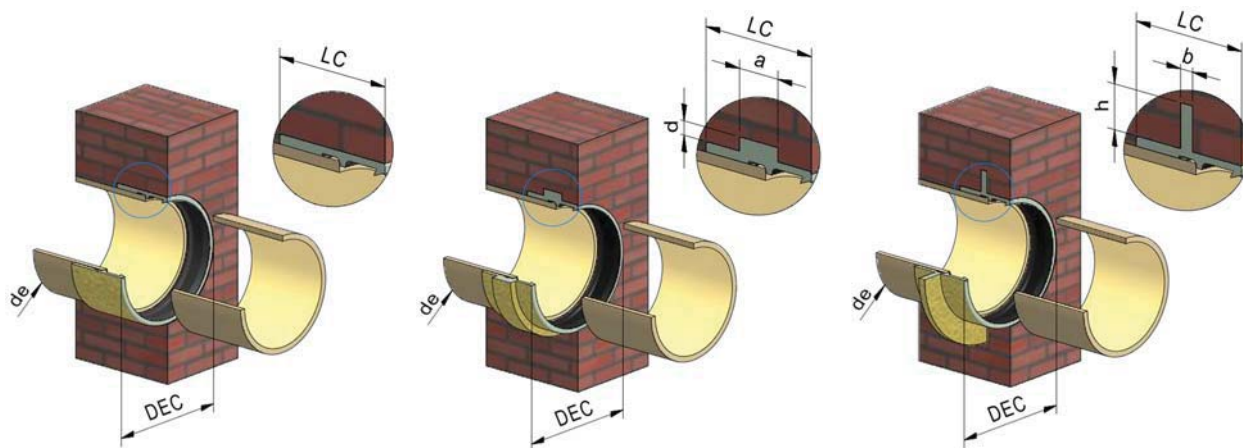


Tangential Manhole consisting of:

- 1 Main pipe (from DN 800)
- 2 Coupling on main pipe
- 3 Manhole pipe (Standard DN 1000 or DN 1200)
- 4 Bench (sanded)
- 5 Coupling on manhole pipe (for design in several parts)
- 6 Ladder
- 7 Manhole cover (accessories on request)

To prevent excessive loads on the laminates and deformation at the joints between the actual manhole and pipe, these manholes have to be encased in concrete. This safety measure can be dispensed with if installation conditions allow and the Technical Service agrees.

Masonry Coupling DN 150 - 1000



Masonry coupling with pipe ring, sand cover (TYPE A)

Masonry coupling with pipe ring, sand cover and thrust ring (TYPE B)

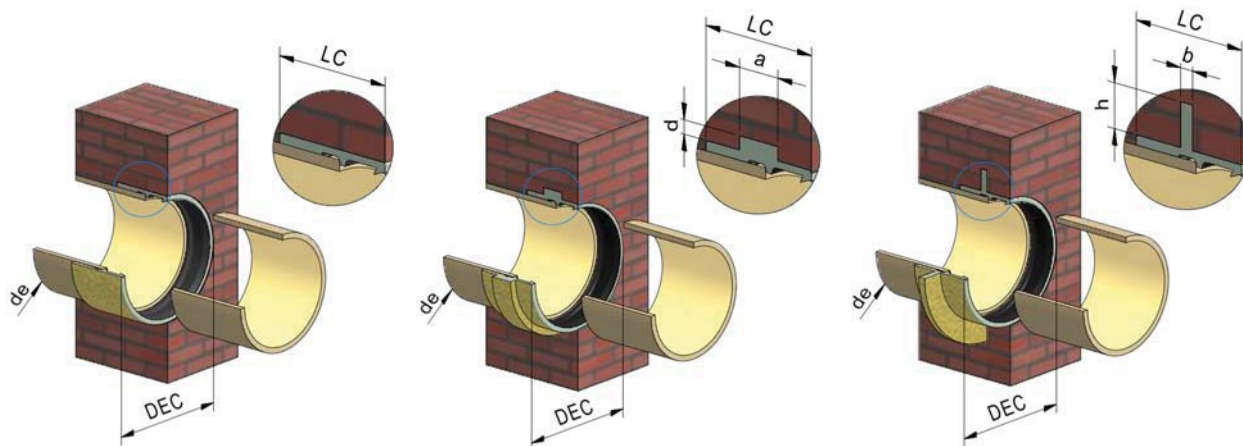
Masonry coupling with pipe ring, sand cover and collar (TYPE C)

The masonry coupling is for joining pipes to concrete manholes and walls. The standard length is 300 mm. Others can be selected as required, but should not be less than LC.

DN	de [mm]	LC [mm]	DEC [mm]	allowable deflection*	a [mm]	b [mm]	d [mm]	h [mm]
150	168	180	210	3°	50	8	8	80
200	220	200	260	3°	50	8	9	80
250	272	200	310	3°	50	8	10	80
300	324	200	360	3°	50	8	11	80
350	376	200	420	3°	50	8	12	80
400	427	200	470	3°	50	8	13	80
450	478	200	520	3°	50	8	14	80
500	530	200	580	3°	50	8	15	80
550	550	200	600	3°	50	8	16	80
600	616	200	660	2°	50	8	17	80
650	650	200	700	2°	50	8	19	80
700	718	290	760	2°	50	8	19	80
750	752	290	800	2°	50	8	21	80
800	820	290	870	2°	80	10	22	80
860	860	250	910	2°	80	10	23	80
900	924	290	970	2°	80	10	25	80
960	960	250	1010	1°	80	10	25	100
1000	1026	290	1070	1°	80	12	27	100

*allowable pipe deflection in the joint

Masonry Coupling DN 1100 - 3600



Masonry coupling with pipe ring, sand cover (TYPE A)

Masonry coupling with pipe ring, sand cover and thrust ring (TYPE B)

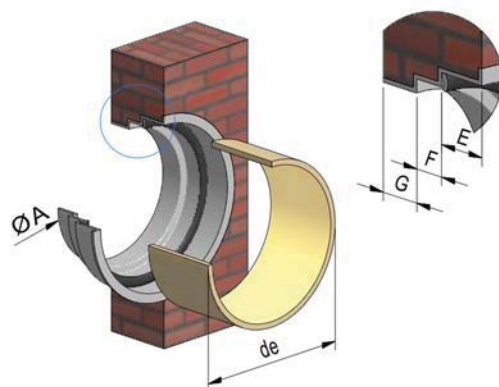
Masonry coupling with pipe ring, sand cover and collar (TYPE C)

The masonry coupling is for joining pipes to concrete manholes and walls. The standard length is 300 mm. Others can be selected as required, but should not be less than LC.

DN	de [mm]	LC [mm]	DEC [mm]	allowable deflection*	a [mm]	b [mm]	d [mm]	h [mm]
1100	1099	290	1140	1°	80	12	29	100
1200	1229	290	1270	1°	80	12	30	100
1280	1280	250	1330	1°	80	12	32	100
1300	1350	250	1400	1°	80	12	34	100
1400	1434	250	1480	1°	100	15	35	100
1500	1499	290	1540	0,5°	100	15	38	100
1535	1535	290	1580	0,5°	100	15	38	100
1600	1638	290	1680	0,5°	120	15	39	100
1700	1720	290	1770	0,5°	120	20	42	100
1800	1842	290	1890	0,5°	120	20	45	120
1900	1940	290	1990	0,5°	120	20	46	120
2000	2047	290	2090	0,5°	120	20	49	120
2100	2160	290	2210	0,5°	120	20	49	120
2200	2250	290	2300	0,5°	120	20	50	120
2400	2400	290	2450	0,5°	120	20	55	120
2400	2454	290	2490	0,5°	120	20	55	120
2500	2555	290	2600	0,5°	120	20	67	150
3000	3000	340	3040	0,5°	150	20	67	150
3600	3600	340	3640	0,5°	150	20	67	150

*allowable pipe deflection in the joint

Manhole Liner

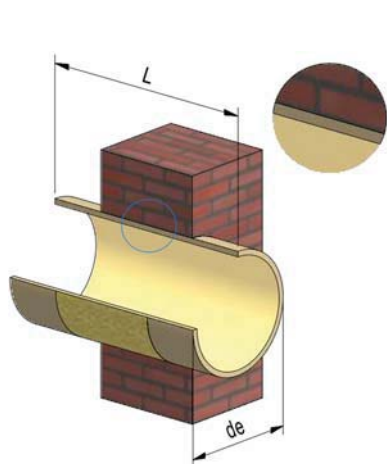


Manhole liners are made of PP, PS (up to around DN 300) or GRP (around DN 400 or larger). They have a water barrier on the outside or quartz sand coating, depending on the manufacturer.

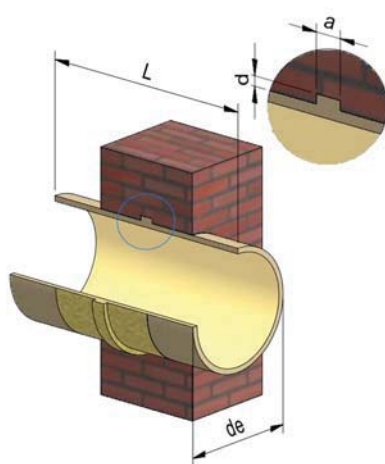
DN	de [mm]	allowable deflection*	ØA [mm]	E [mm]	F [mm]	G [mm]
150	168	3°	150	70	40	55
200	220	3°	207	70	40	55
250	272	3°	256	70	40	55
300	324	3°	306	70	40	55
350	376	3°	355	70	40	55
400	427	3°	404	70	40	55
500	530	3°	502	70	40	55
600	616	2°	585	70	40	55
700	718	2°	683	70	40	55
800	820	2°	780	70	40	55
900	924	2°	878	70	40	55
1000	1026	1°	975	70	40	55
1200	1229	1°	1170	70	40	55

*allowable pipe deflection in the joint

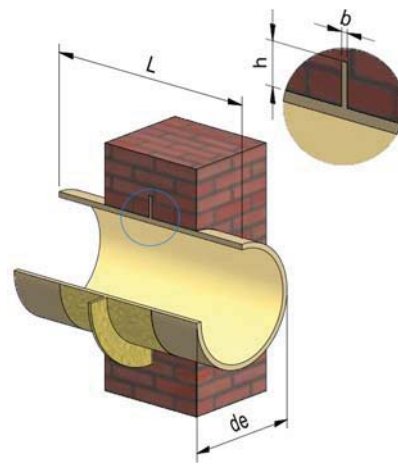
Structural Adapters DN 150 - 1000



Structural adapter, sand covered
(TYPE E)



Structural adapter, sand covered
with thrust ring (TYPE F)

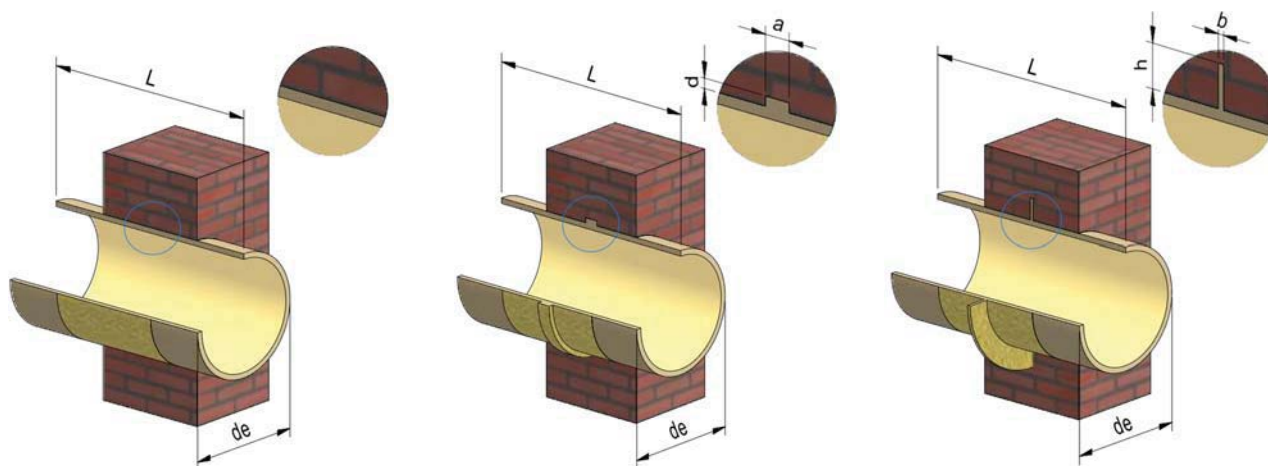


Structural adapter, sand covered
with collar (TYPE G)

It consists of a modified pipe with sanding, on request also with a thrust ring or masonry collar. The standard length is 0.5 or 1 m up to DN 1100 and 0.5 or 1.5 m for DN 1200 according to national standards. Other lengths available on request.

DN	de [mm]	a [mm]	b [mm]	d [mm]	h [mm]	L [mm]
150	168	50	8	8	80	500 / 1000
200	220	50	8	9	80	500 / 1000
250	272	50	8	10	80	500 / 1000
300	324	50	8	11	80	500 / 1000
350	376	50	8	12	80	500 / 1000
400	427	50	8	13	80	500 / 1000
450	478	50	8	14	80	500 / 1000
500	530	50	8	15	80	500 / 1000
550	550	50	8	16	80	500 / 1000
600	616	50	8	17	80	500 / 1000
650	650	50	8	19	80	500 / 1000
700	718	50	8	19	80	500 / 1000
750	752	50	8	21	80	500 / 1000
800	820	80	10	22	80	500 / 1000
860	860	80	10	23	80	500 / 1000
900	924	80	10	25	80	500 / 1000
960	960	80	10	25	100	500 / 1000
1000	1026	80	12	27	100	500 / 1000

Structural Adapters DN 1100 - 3600



Structural adapter, sand covered (TYPE E)

Structural adapter, sand covered with thrust ring (TYPE F)

Structural adapter, sand covered with collar (TYPE G)

It consists of a modified pipe with sanding, on request also with a thrust ring or masonry collar. The standard length is 0.5 or 1 m up to DN 1100 and 0.5 or 1.5 m for DN 1200 according to national standards. Other lengths available on request.

DN	de [mm]	a [mm]	b [mm]	d [mm]	h [mm]	L [mm]
1100	1099	80	12	29	100	500/ 1500
1200	1229	80	12	30	100	500/ 1500
1280	1280	80	12	32	100	500/ 1500
1350	1350	80	12	34	100	500/ 1500
1400	1434	100	15	35	100	500/ 1500
1500	1499	100	15	38	100	500/ 1500
1535	1535	100	15	38	100	500/ 1500
1600	1638	120	15	39	100	500/ 1500
1700	1720	120	20	42	100	500/ 1500
1800	1842	120	20	45	120	500/ 1500
1900	1940	120	20	46	120	500/ 1500
2000	2047	120	20	49	120	500/ 1500
2100	2160	120	20	49	120	500/ 1500
2200	2250	120	20	50	120	500/ 1500
2400	2400	120	20	55	120	500/ 1500
2400	2454	120	20	55	120	500/ 1500
2500	2555	120	20	67	150	500/ 1500
3000	3000	150	20	67	150	500/ 1500
3600	3600	150	20,0	67	150,0	500/ 1500

Material Data

The laminate structure of HOBAS GRP Pipes may vary, depending on the requirements such as pressure class (PN), stiffness (S) longitudinal tensile strength. The material data in the table is therefore simply to be regarded as a guideline.

We can provide more accurate material data for specific pipes on request.

Properties/long-term values:

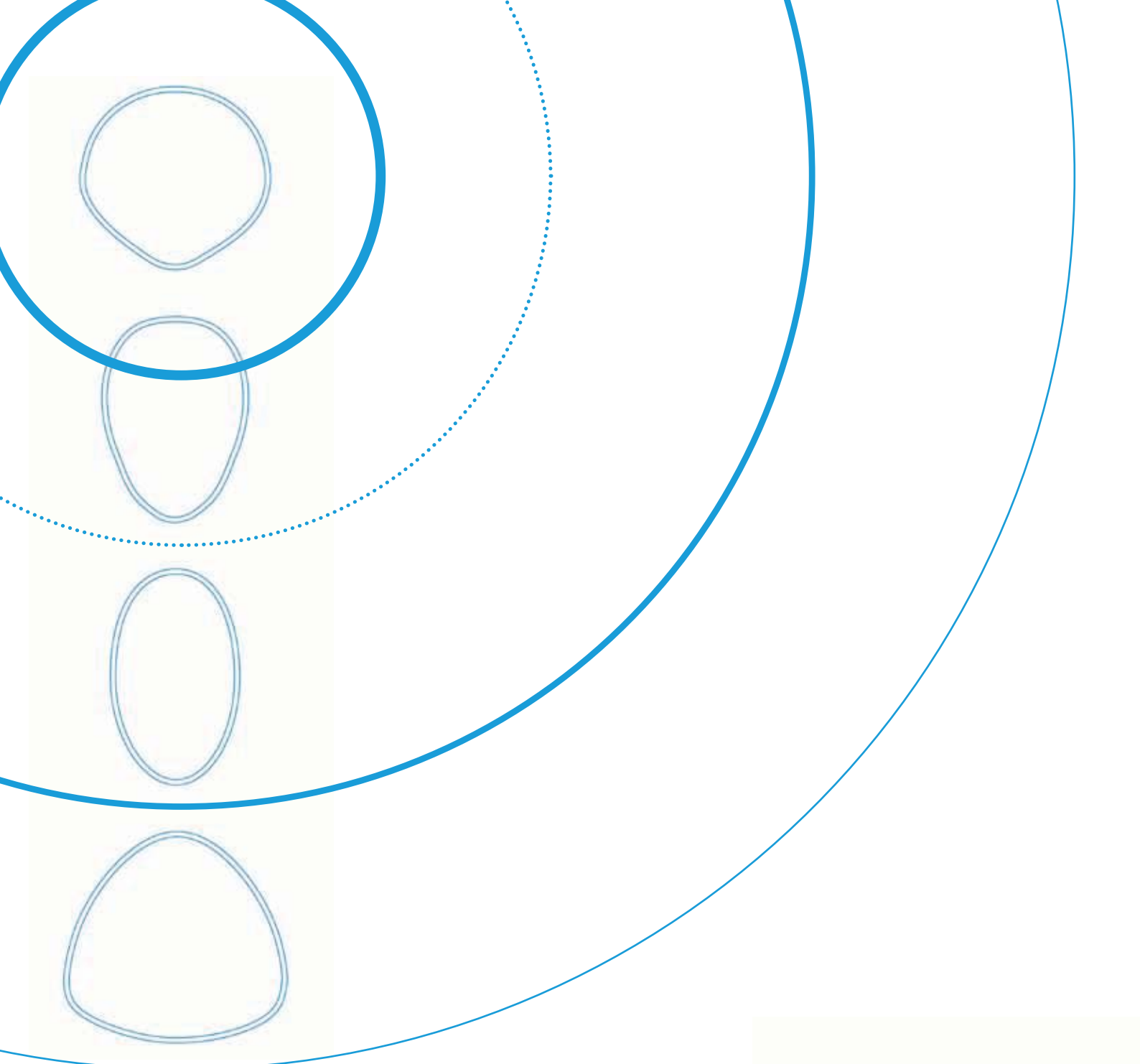
The properties of the pipes manufactured, such as stiffness, ring deflection and longitudinal tensile strength are routinely checked as part of quality assurance. Geometric properties, such as wall thickness, outside diameter and liner thickness, are measured and checked to internal quality standards.

Test procedures and regulations are defined in the applicable standards. You will find more detailed information about them and other material tests, such as abrasion, long-term values, hydraulic properties, chemical resistance, etc. in our brochure CC-GRP Pipes Features, Tests and Benefits.

Material data	Unit	Orientation	
		Circumferential	Longitudinal
Density	kg/m ³	~ 2000	
Tensile elastic modulus (at 23°C)	MPa	10000 - 15000	10000 - 12000
Tensile strength (standard)	MPa	90 - 130	15 - 40
Tensile strength (locked design)	MPa	200	80 - 100
Tensile strain (at break): < PN 10	%	1.2 - 1.5	0.25
Tensile strain (at break): ≥ PN 10	%	1.8 - 2.0	1.0 - 1.4
Poisson's ratio	-	~ 0.3	~ 0.25
Compressive elastic modulus (at 23°C)	MPa	12000 - 18000	12000 - 18000
Compressive strength	MPa	130 - 140	90 - 100
Compressive strain (at break)	%	1.2 - 1.5	1.8 - 2.0
Flexural modulus	MPa	10000 - 15000	-
Flexural strength	MPa	120 - 140	15 - 40
Flexural strain (at break)	%	1.6 - 2.2	1.0
Circumferential strain at PN	%	0.2 - 0.3	-
Circumferential strain at 1.5 x PN	%	0.3 - 0.4	-
Temperature resistance	°C	≤ 40 *	
Chemical resistance (pH range)	pH	1 - 10 **	
Temperature expansion coefficient	1/K	26 - 30 x 10 ⁻⁶	
Thermal conductivity	W/m/K	0.5 - 1.0	
Heat capacity	kJ/kg/K	1.0 - 1.4	
Pressure wave propagation rate	m/s	~ 450	
Roughness (to Colebrook White) k	mm	0.01 - 0.016	

*Temperature up to 80°C on request

**Higher/lower pH on request



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HOBAS Group Worldwide

HOBAS manufactures and markets HOBAS CC-GRP Pipe Systems. The HOBAS Network includes HOBAS Production Facilities and Sales Organizations in Europe and throughout the world.

We develop and manufacture HOBAS Products conserving nature's resources and with respect for our environment. Visit our website to find out more about the HOBAS Environmental Policy.

