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Steel pipe		Series 1			Series 2			Series 3		
DN, mm	Ød, mm	PE casing pipe ØD, mm	Insulation thickness, mm	Heat transfer coefficient W/m <sup>2</sup> K	PE casing pipe ØD, mm	Insulation thickness, mm	Heat transfer coefficient W/m <sup>2</sup> K	PE casing pipe ØD, mm	Insulation thickness, mm	Heat transfer coefficient W/m <sup>2</sup> K
20	26	90	29.5	0.125	110	39.5	0.108	125	47.0	0.099
25	33	90	26.0	0.152	110	36.0	0.128	125	43.5	0.116
32	42	110	31.5	0.157	125	39.0	0.140	140	46.5	0.127
40	48	110	28.5	0.180	125	36.0	0.158	140	43.5	0.142
50	57	125	31.5	0.189	140	39.0	0.167	160	49.5	0.147
50	60	125	30.0	0.201	140	37.5	0.176	160	48.0	0.154
65	76	140	29.5	0.236	160	40.0	0.198	180	50.0	0.173
80	89	160	33.5	0.245	180	43.5	0.208	200	53.5	0.184
100	108	180	34.0	0.276	200	44.0	0.235	225	56.0	0.202
100	114	200	41.0	0.254	225	53.0	0.216	250	65.5	0.190
125	133	200	31.5	0.335	225	43.5	0.272	250	56.0	0.232
125	139	225	40.5	0.293	250	53.0	0.247	280	68.0	0.212
150	159	250	43.0	0.310	280	58.0	0.256	315	75.5	0.217
150	168	250	38.5	0.347	280	53.5	0.281	315	71.0	0.234
200	219	315	45.5	0.377	355	65.5	0.297	400	87.5	0.245
250	273	400	60.5	0.365	450	85.5	0.290	500	110.5	0.245
300	324	450	60.0	0.418	500	85.0	0.330	560	115.0	0.270
350	355	500	69.5	0.405	560	99.5	0.318	630	134.0	0.259
350	377	500	58.5	0.476	560	88.5	0.360	630	123.0	0.287
400	406	560	74.0	0.430	630	108.5	0.330	710	148.5	0.267
400	426	560	64.0	0.492	630	98.5	0.365	710	138.5	0.290
450	457	560	48.5	0.624	630	83.0	0.433	710	123.0	0.331
500	508	630	57.5	0.602	710	97.5	0.422	800	142.0	0.324
500	530	630	46.5	0.714	710	86.5	0.473	800	131.0	0.353
600	610	710	46.5	0.799	800	91.0	0.508	900	141.0	0.374
700	711	800	40.5	0.970	900	90.5	0.577	1000	140.0	0.422
800	813	900	39.5	1.094	1000	89.0	0.65	—	—	—

In calculations of heat - transfer coefficients following assumptions were made:

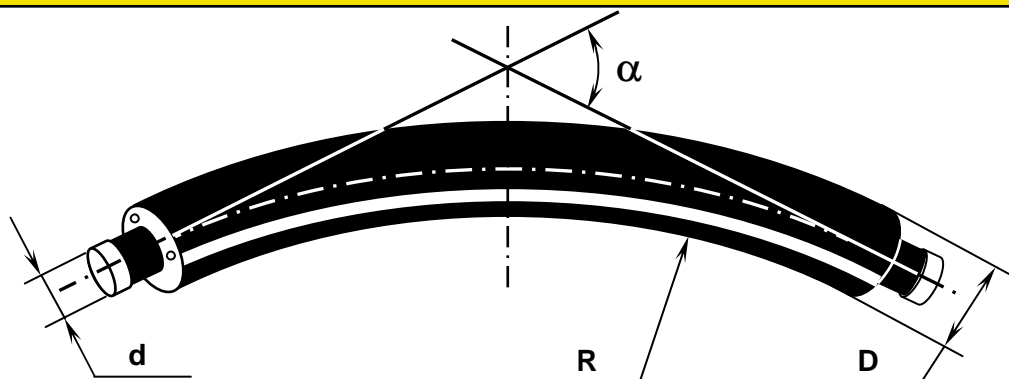
- heat insulation coefficient of PUR with blowing agent cyclopentane  $\lambda=0.026 \text{ W/m}^0\text{K}$ ;
- heat insulation coefficient of soil  $\lambda=1.1 \text{ W/m}^0\text{K}$ ;
- pipe depth - 0.6 m;
- average PE casing expansion at foam forming - 1%;
- distance e between pipes inside the trench is described in Heating main montage instructions CV4.04 (section 2, page 2.1.).

Material of service pipe - steel. On request - copper or stainless steel.

Material of casing pipe - high density polyethylene (HDPE).

**Preinsulated curved pipe**

**4.1.1.**



Max deflection angle for pipe length L =12 m:

DN, mm	∅ d, mm	Max deflection angle α
25 - 150	33 - 168	35°
200 - 250	219 - 273	25°
300	324	20°
350	355 - 377	15°
400	406 - 426	10°
450	457	7°
500	508 - 530	5°

Correlation between deflection and design radius of 12 m curved pipes:

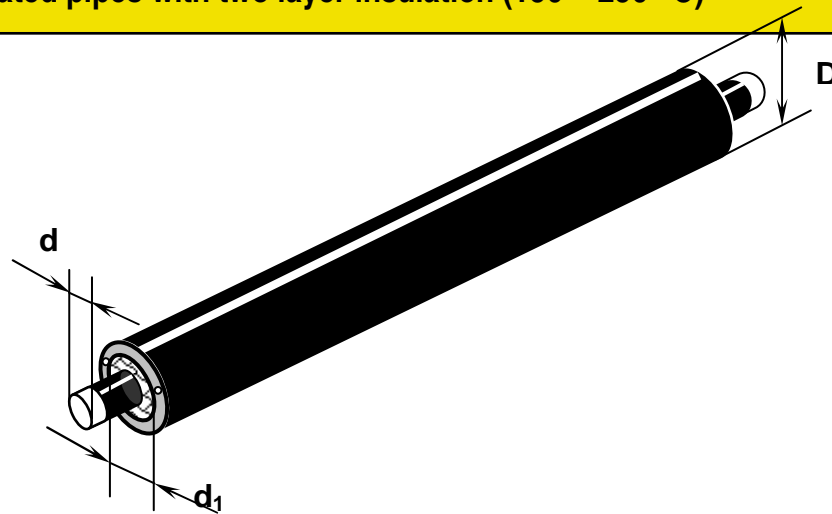
Deflection angle α	Design radius R, m	Deflection angle α	Design radius R, m	Deflection angle α	Design radius R, m	Deflection angle α	Design radius R, m
3°	230.0	12°	57.0	20°	34.0	28°	25.0
5°	140.0	13°	53.0	21°	33.0	29°	24.0
6°	115.0	14°	49.0	22°	31.0	30°	23.2
7°	98.0	15°	46.0	23°	30.0	31°	22.5
8°	86.0	16°	43.0	24°	29.0	32°	21.8
9°	76.0	17°	40.0	25°	28.0	33°	21.1
10°	69.0	18°	38.0	26°	27.0	34°	20.5
11°	62.0	19°	36.0	27°	26.0	35°	20.0

Allowable accuracy: DN 100 - 200 mm +/- 2°

DN 250 - 500 mm +/- 1°.

Pipes up to DN 80 mm is possible to bend at the installation site using special equipment.

**Preinsulated pipes with two layer insulation (150 – 250 °C) 4.1.2.**



Steel pipe		PE casing pipe ØD, mm		
DN, mm	Ø d, mm	Series 1	Series 2	Series 3
20	26	125	140	160
25	33	125	140	160
32	42	140	160	180
40	48	140	160	180
50	57	160	180	200
50	60	160	180	200
65	76	180	200	225
80	89	200	225	250
100	108	225	250	280
100	114	250	280	315
125	133	250	280	315
125	139	280	315	355
150	159	315	355	400
150	168	315	355	400
200	219	400	450	500
250	273	450	500	560
300	324	500	560	630
350	355	560	630	710
350	377	560	630	710
400	406	630	710	800
400	426	630	710	800

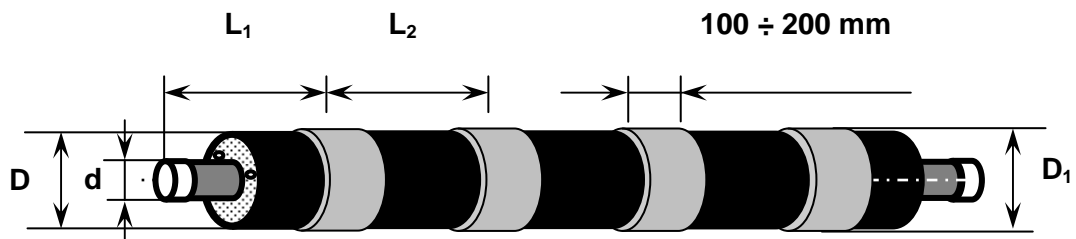
Pre-insulated pipes with two layer insulations are produced upon a request.

Pipe insulation consists of 2 layers: inner rock wool layer and outer layer of polypropylene (PUR) foam insulation.

Pre-insulated pipes are custom-made, calculated from thickness of rock wool layer (diameter  $d_1$ ) depending on heat-carrier temperature. Series ( $\varnothing D$ ) is defined from permissible level of loss.

Pipe casing: polyethylene HDPE or galvanized steel.

Fittings (fixed anchors, compensators, bends, T-branches) are made on the individual request.

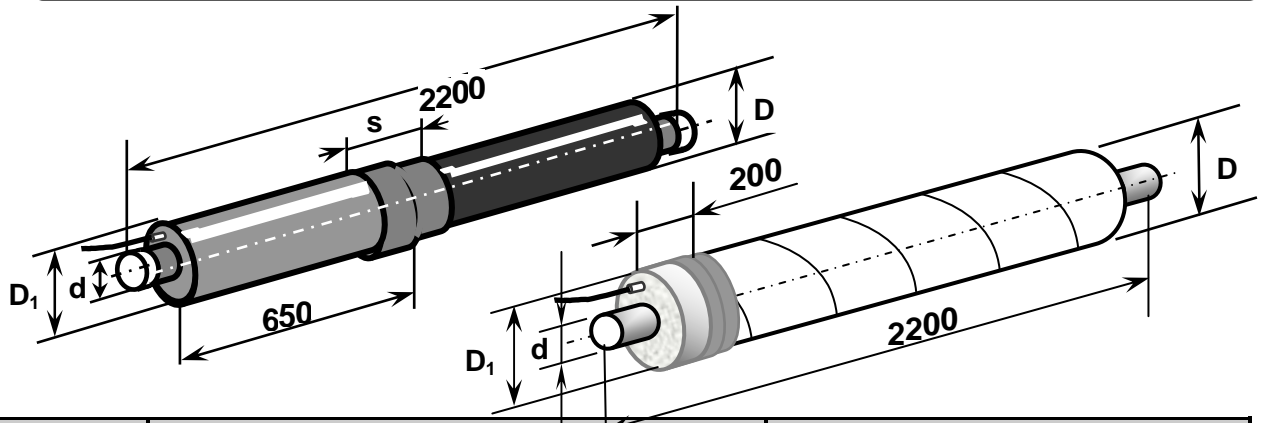


Steel pipe		Series 1		Series 2		Series 3	
DN, mm	Ød, mm	PE casing pipe ØD,mm	Protector diameter, ØD1,mm	PE casing pipe ØD,mm	Protector diameter, ØD1,mm	PE casing pipe ØD,mm	Protector diameter, ØD1,mm
20	26	90	124	110	144	125	159
25	33	90	124	110	144	125	159
32	42	110	144	125	159	140	174
40	48	110	144	125	159	140	174
50	57	125	159	140	174	160	198
50	60	125	159	140	174	160	198
65	76	140	174	160	198	180	218
80	89	160	198	180	218	200	239
100	108	180	218	200	239	225	264
100	114	200	239	225	264	250	290
125	133	200	239	225	290	250	290
125	139	225	264	250	290	280	321
150	159	250	290	280	321	315	357
150	168	250	290	280	321	315	357
200	219	315	357	355	399	400	444
250	273	400	444	450	497	500	548
300	324	450	497	500	548	560	610
350	355	500	548	560	610	630	680
400	406	560	610	630	680	710	760
400	426	560	610	630	680	710	760
450	457	560	610	630	680	710	760
500	508	630	680	710	760	800	850
500	530	630	680	710	760	800	850
600	610	710	760	800	850	900	950
700	711	800	850	900	950	1000	1050
800	813	900	950	1000	1050	-	-

Preinsulated pipes with protectors are used if during assembling process is needed in pushing of pipes through closed canals (pipes) -under the road, works, etc.

Minimum protector count on a pipe is 2 pieces. Sizes  $L_1=1,0\div 1,5$  m and  $L_2 =2,0\div 3,5$  m, value is dependant from preinsulated pipes length.

To avoid the contact with surface support, connecting caps diameter should be smaller than the states in the table protector diameter.



Steel pipe		Below ground pipeline						Above ground pipeline			
		Series 1		Series 2		Series 3		Series 1		Series 2	
DN, mm	Ød, mm	PE casing pipe ØD, mm	Steel seal ØD1, mm	PE casing pipe ØD, mm	Steel seal ØD1, mm	PE casing pipe ØD, mm	Steel seal ØD1, mm	Galvanized steel casing ØD, mm	Steel seal ØD1, mm	Galvanized steel casing ØD, mm	Steel seal ØD1, mm
20	26	90	100	110	127	125	139	100	114	125	139
25	33	90	100	110	127	125	139	100	114	125	139
32	42	110	127	125	139	140	150	100	114	125	139
40	48	110	127	125	139	140	150	125	139	160	168
50	57	125	139	140	150	160	168	125	139	160	168
50	60	125	139	140	150	160	168	125	139	160	168
65	76	140	150	160	168	180	192	160	168	180	192
80	89	160	168	180	192	200	219	160	168	180	192
100	108	180	192	200	219	225	235	180	192	200	219
100	114	200	219	225	235	250	273	200	219	225	235
125	133	200	219	225	235	250	273	200	219	225	235
125	139	225	235	250	273	280	300	225	235	250	273
150	159	250	273	280	300	315	335	250	273	315	335
150	168	250	273	280	300	315	335	250	273	315	335
200	219	315	335	355	375	400	420	315	335	355	375
250	273	400	420	450	470	500	520	400	420	450	470
300	324	450	470	500	520	560	580	450	470	500	520
350	355	500	520	560	580	630	650	500	520	560	580
350	377	500	520	560	580	630	650	500	520	560	580
400	406	560	580	630	650	710	725	560	580	630	650
400	426	560	580	630	650	710	725	560	580	630	650
450	457	560	580	630	650	710	725	560	580	630	650
500	508	630	650	710	725	800	820	630	650	710	725
500	530	630	650	710	725	800	820	630	650	710	725
600	610	710	725	800	820	900	920	710	725	800	820
700	711	800	820	900	920	1000	1020	800	820	900	920
800	813	900	920	1000	1020	-	-	-	-	-	-

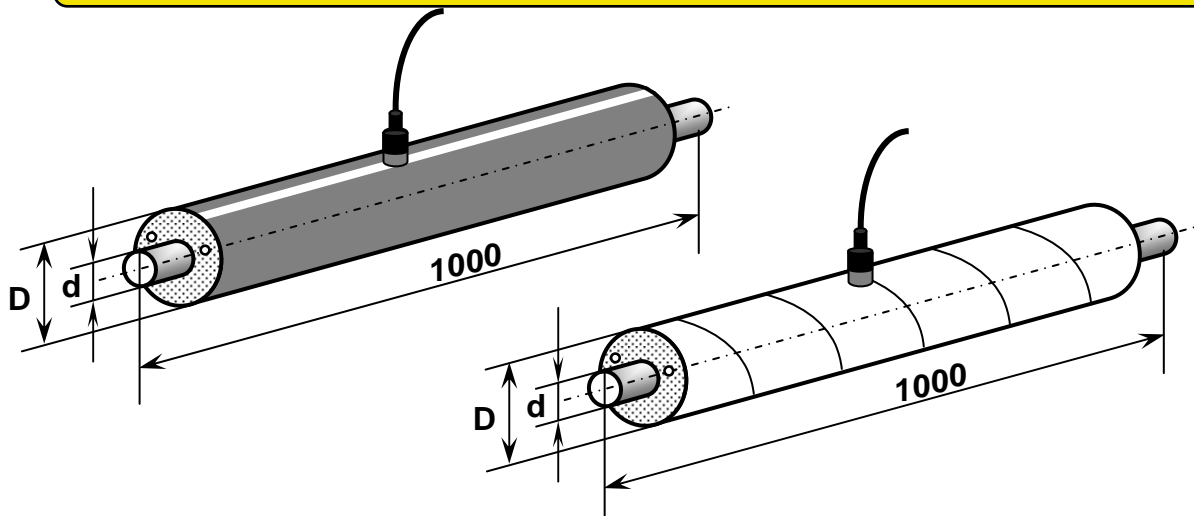
Introductory elements are for protection of preinsulated pipe when entering through buildings and wells.

Protective steel seal is welded to already working pipe and is connected to the pipe casing by heat-shrinkable tape with widths  $s=140-160$  mm, creating additional mechanical and hydraulic support.

For outgoing security wires the introductory element has 3,0 m long three gage cable.

**Introductory elements with cable**

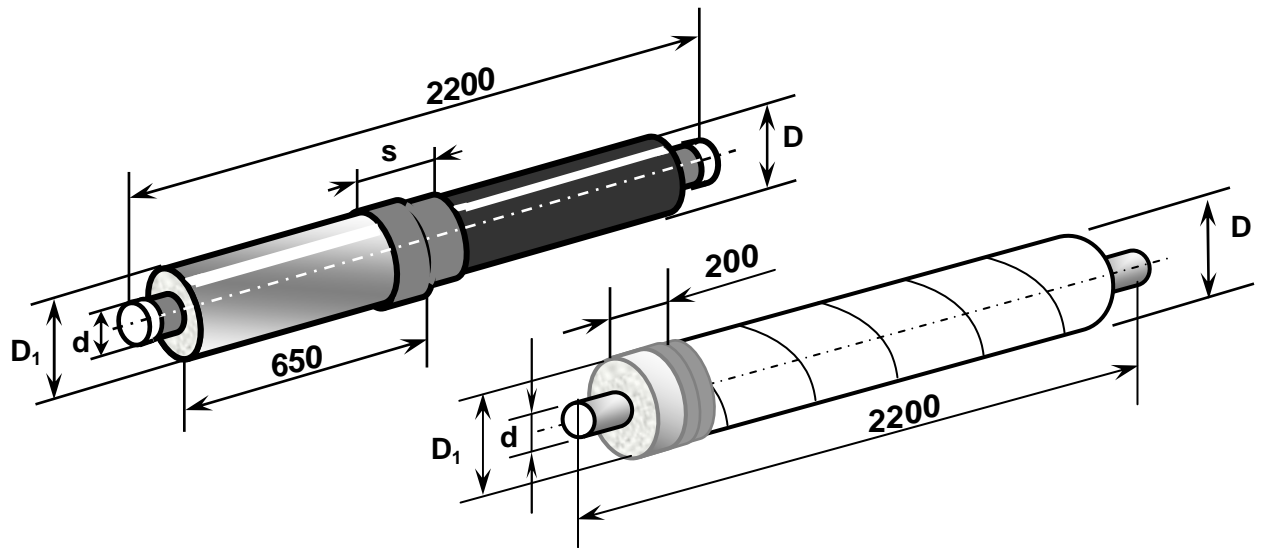
**4.1.5.**



Steel pipe		Diameter of PE casing pipe, mm			Diameter of galvanized steel casing, mm	
DN, mm	Ød, mm	Series 1	Series 2	Series 3	Series 1	Series 2
20	26	90	110	125	100	125
25	33	90	110	125	100	125
32	42	110	125	140	100	125
40	48	110	125	140	125	160
50	57	125	140	160	125	160
50	60	125	140	160	125	160
65	76	140	160	180	160	180
80	89	160	180	200	160	180
100	108	180	200	225	180	200
100	114	200	225	250	200	225
125	133	200	225	250	200	225
125	139	225	250	280	225	250
150	159	250	280	315	250	315
150	168	250	280	315	250	315
200	219	315	355	400	315	355
250	273	400	450	500	400	450
300	324	450	500	560	450	500
350	355	500	560	630	500	560
350	377	500	560	630	500	560
400	406	560	630	710	560	630
400	426	560	630	710	560	630
450	457	560	630	710	560	630
500	508	630	710	800	630	710
500	530	630	710	800	630	710
600	610	710	800	900	710	800
700	711	800	900	1000	800	900
800	813	900	1000	-	-	-

Alarm system wires from introductory element are connected by 7,0 m long five-part cable.

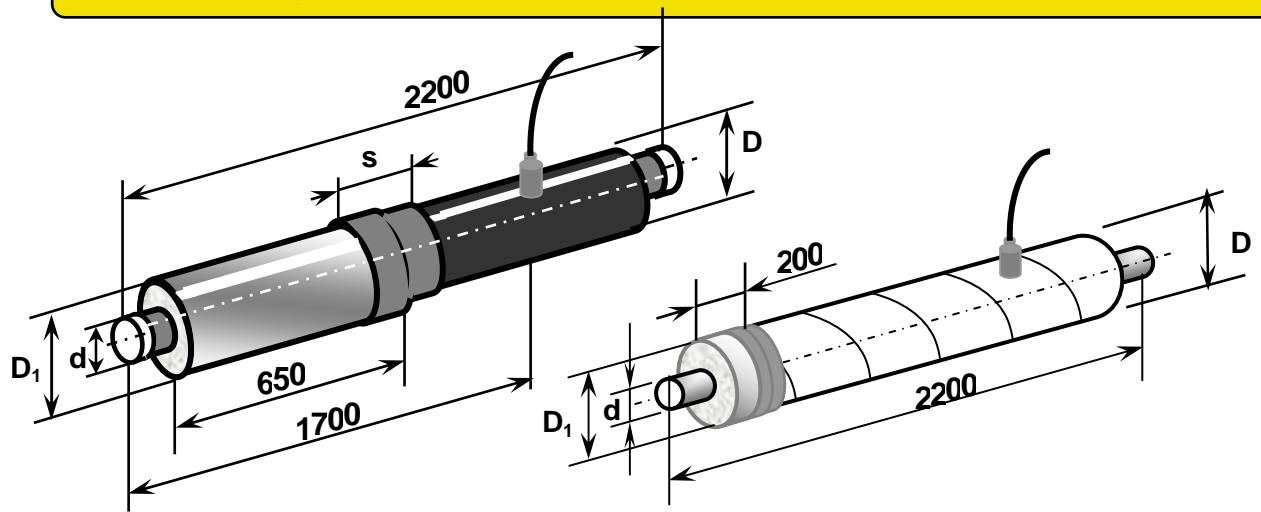




Steel pipe		Diameter of PE casing pipe, mm			Diameter of galvanized steel casing, mm	
DN, mm	∅d, mm	Series 1	Series 2	Series 3	Series 1	Series 2
20	26	90	110	125	100	125
25	33	90	110	125	100	125
32	42	110	125	140	100	125
40	48	110	125	140	125	160
50	57	125	140	160	125	160
50	60	125	140	160	125	160
65	76	140	160	180	160	180
80	89	160	180	200	160	180
100	108	180	200	225	180	200
100	114	200	225	250	200	225
125	133	200	225	250	200	225
125	139	225	250	280	225	250
150	159	250	280	315	250	315
150	168	250	280	315	250	315
200	219	315	355	400	315	355
250	273	400	450	500	400	450
300	324	450	500	560	450	500
350	355	500	560	630	500	560
350	377	500	560	630	500	560
400	406	560	630	710	560	630
400	426	560	630	710	560	630
450	457	560	630	710	560	630
500	508	630	710	800	630	710
500	530	630	710	800	630	710
600	610	710	800	900	710	800
700	711	800	900	1000	800	900
800	813	900	1000	-	-	-

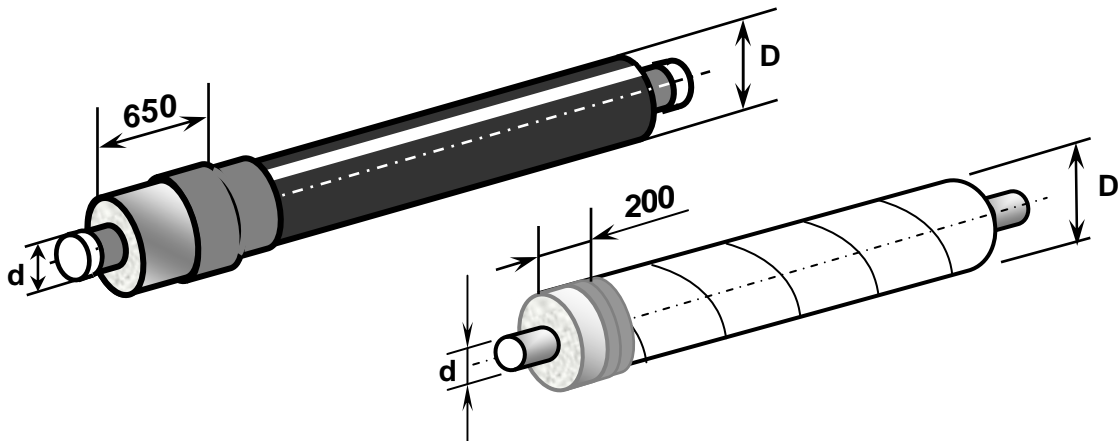
Alarm system wires underneath the metal case are in the loop connection.

## Introductory elements with metal seal and cable 4.1.7.



Steel pipe		Diameter of PE casing pipe, mm			Diameter of galvanized steel casing, mm	
DN, mm	Ød, mm	Series 1	Series 2	Series 3	Series 1	Series 2
20	26	90	110	125	100	125
25	33	90	110	125	100	125
32	42	110	125	140	100	125
40	48	110	125	140	125	160
50	57	125	140	160	125	160
50	60	125	140	160	125	160
65	76	140	160	180	160	180
80	89	160	180	200	160	180
100	108	180	200	225	180	200
100	114	200	225	250	200	225
125	133	200	225	250	200	225
125	139	225	250	280	225	250
150	159	250	280	315	250	315
150	168	250	280	315	250	315
200	219	315	355	400	315	355
250	273	400	450	500	400	450
300	324	450	500	560	450	500
350	355	500	560	630	500	560
350	377	500	560	630	500	560
400	406	560	630	710	560	630
400	426	560	630	710	560	630
450	457	560	630	710	560	630
500	508	630	710	800	630	710
500	530	630	710	800	630	710
600	610	710	800	900	710	800
700	711	800	900	1000	800	900
800	813	900	1000	-	-	-

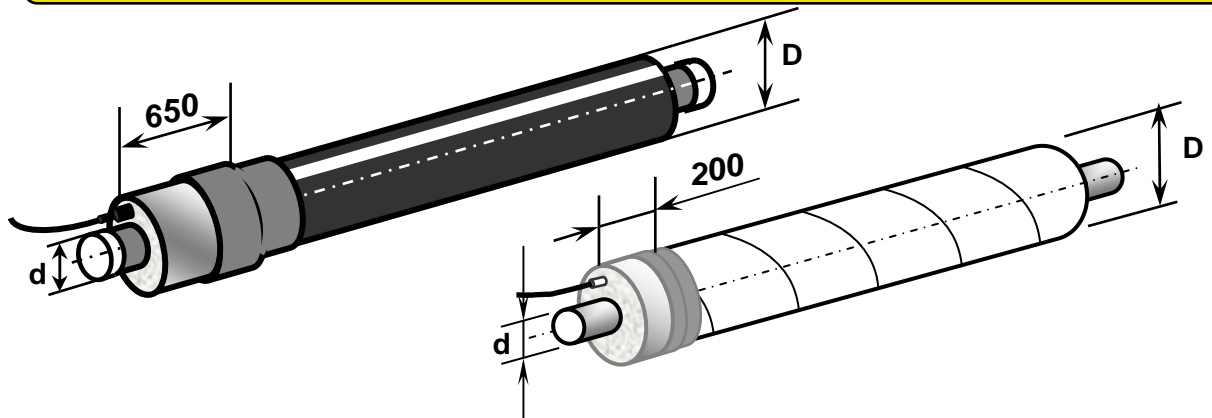
Alarm system wires underneath the metal case are in the loop connection.  
 Alarm system wires from introductory element are connected by 7,0 m long three-part cable.



Steel pipe		Diameter of PE casing pipe, mm			Diameter of galvanized steel casing, mm	
DN, mm	$\varnothing d$ , mm	Series 1	Series 2	Series 3	Series 1	Series 2
20	26	90	110	125	100	125
25	33	90	110	125	100	125
32	42	110	125	140	100	125
40	48	110	125	140	125	160
50	57	125	140	160	125	160
50	60	125	140	160	125	160
65	76	140	160	180	160	180
80	89	160	180	200	160	180
100	108	180	200	225	180	200
100	114	200	225	250	200	225
125	133	200	225	250	200	225
125	139	225	250	280	225	250
150	159	250	280	315	250	315
150	168	250	280	315	250	315
200	219	315	355	400	315	355
250	273	400	450	500	400	450
300	324	450	500	560	450	500
350	355	500	560	630	500	560
350	377	500	560	630	500	560
400	406	560	630	710	560	630
400	426	560	630	710	560	630
450	457	560	630	710	560	630
500	508	630	710	800	630	710
500	530	630	710	800	630	710
600	610	710	800	900	710	800
700	711	800	900	1000	800	900
800	813	900	1000	-	-	-

Alarm system wires underneath the metal case are in the loop connection.

**Preinsulated pipes with metal seal and cable output 4.1.9.**

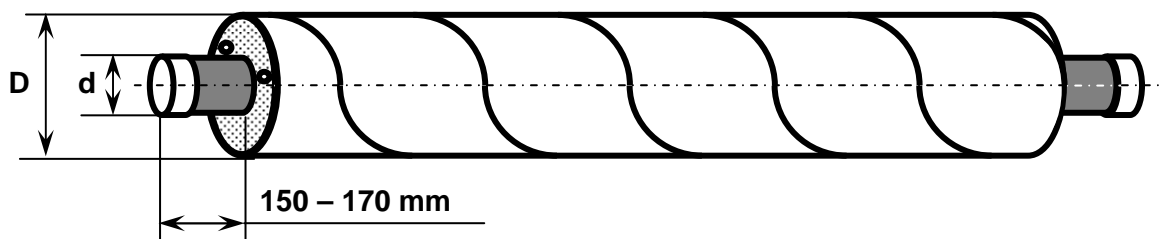


Steel pipe		Diameter of PE casing pipe, mm			Diameter of galvanized steel casing, mm	
DN, mm	Ød, mm	Series 1	Series 2	Series 3	Series 1	Series 2
20	26	90	110	125	100	125
25	33	90	110	125	100	125
32	42	110	125	140	100	125
40	48	110	125	140	125	160
50	57	125	140	160	125	160
50	60	125	140	160	125	160
65	76	140	160	180	160	180
80	89	160	180	200	160	180
100	108	180	200	225	180	200
100	114	200	225	250	200	225
125	133	200	225	250	200	225
125	139	225	250	280	225	250
150	159	250	280	315	250	315
150	168	250	280	315	250	315
200	219	315	355	400	315	355
250	273	400	450	500	400	450
300	324	450	500	560	450	500
350	355	500	560	630	500	560
350	377	500	560	630	500	560
400	406	560	630	710	560	630
400	426	560	630	710	560	630
450	457	560	630	710	560	630
500	508	630	710	800	630	710
500	530	630	710	800	630	710
600	610	710	800	900	710	800
700	711	800	900	1000	800	900
800	813	900	1000	-	-	-

Alarm system wires from introductory element are connected by 3,0 m long three-part cable.

**Preinsulated pipes in galvanized steel casing**

**4.2.**



Steel pipe		Series 1			Series 2		
DN, mm	Ø d, mm	Casing pipe ØD, mm	Insulation thickness, mm	Heat transfer coefficient W/m <sup>2</sup> K	Casing pipe ØD, mm	Insulation thickness, mm	Heat transfer coefficient W/m <sup>2</sup> K
20	26	100	36.5	0.117	125	49.0	0.102
25	33	100	33.0	0.142	125	45.5	0.120
32	42	100	28.5	0.179	125	41.0	0.145
40	48	125	38.0	0.165	160	55.5	0.133
50	57	125	33.5	0.199	160	51.0	0.154
50	60	125	32.0	0.212	160	49.5	0.162
65	76	160	41.5	0.212	180	51.5	0.184
80	89	160	35.0	0.266	180	45.0	0.224
100	108	180	35.5	0.305	200	45.5	0.256
100	114	200	42.5	0.280	225	55.0	0.234
125	133	200	33.0	0.380	225	45.5	0.300
125	139	225	42.5	0.326	250	55.0	0.270
150	159	250	45.0	0.348	315	77.5	0.234
150	168	250	40.5	0.394	315	73.0	0.254
200	219	315	47.5	0.433	355	67.5	0.330
250	273	400	63.0	0.416	450	88.0	0.321
300	324	450	62.5	0.483	500	87.5	0.369
350	355	500	72.0	0.465	560	102.0	0.352
350	377	500	61.0	0.561	560	91.0	0.405
400	406	560	76.5	0.496	630	111.5	0.366
400	426	560	66.5	0.581	630	101.5	0.410
450	457	560	51.0	0.774	630	86.0	0.498
500	508	630	60.5	0.735	710	100.5	0.479
500	530	630	49.5	0.909	710	89.5	0.547
600	610	710	49.5	1.034	800	94.5	0.591
700	711	800	84.5	0.669	900	134.5	0.452

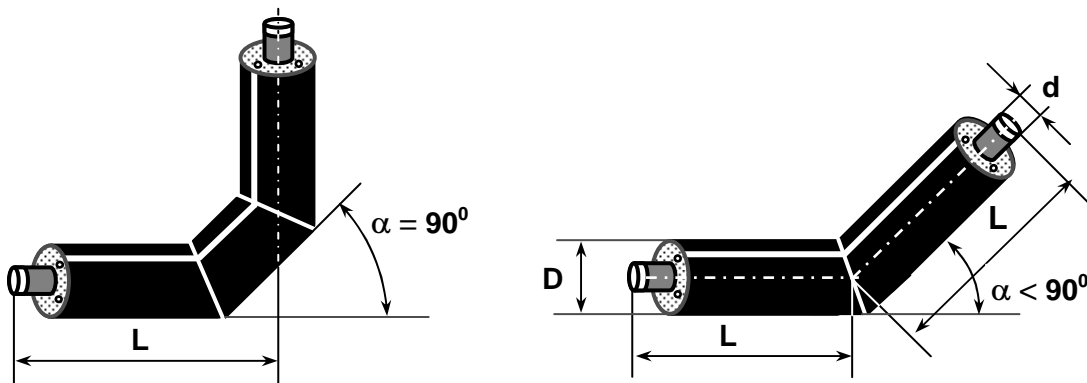
Use for installation of above - ground pipeline sections.

Heat insulation coefficient of PUR with cyclopentane  $\lambda=0.026$  W/m<sup>0</sup>K.

Upon the request, galvanized steel pipes can be also produced with alarm wires.

**Preinsulated bends**

**4.3.**



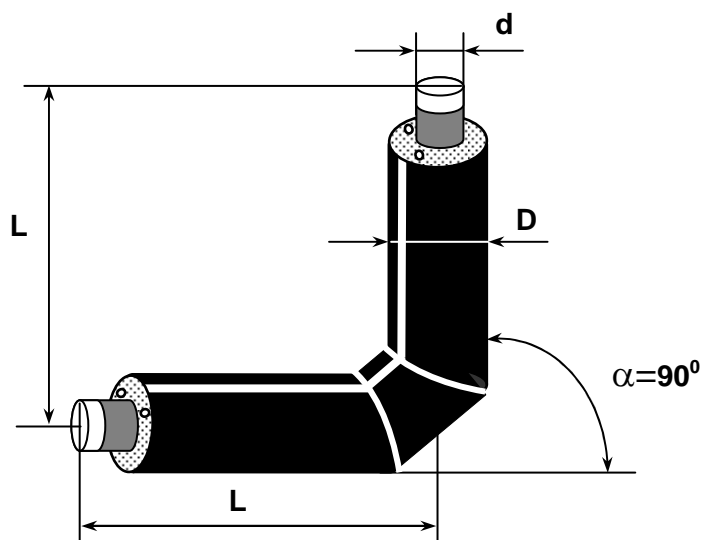
Steel pipe		PE casing pipe $\varnothing D$ , mm			Leg length L, m
DN, mm	$\varnothing d$ , mm	Series 1	Series 2	Series 3	
20	26	90	110	125	1.0x1.0
25	33	90	110	125	1.0x1.0
32	42	110	125	140	1.0x1.0
40	48	110	125	140	1.0x1.0
50	57	125	140	160	1.0x1.0
50	60	125	140	160	1.0x1.0
65	76	140	160	180	1.0x1.0
80	89	160	180	200	1.0x1.0
100	108	180	200	225	1.0x1.0
100	114	200	225	250	1.0x1.0
125	133	200	225	250	1.0x1.0
125	139	225	250	280	1.0x1.0
150	159	250	280	315	1.0x1.0
150	168	250	280	315	1.0x1.0
200	219	315	355	400	1.0x1.0
250	273	400	450	500	1.2x1.2
300	324	450	500	560	1.2x1.2
350	355	500	560	630	1.2x1.2
400	406	560	630	710	1.2x1.2
400	426	560	630	710	1.2x1.2
450	457	560	630	710	1.2x1.2
500	508	630	710	800	1.5x1.5
500	530	630	710	800	1.5x1.5
600	610	710	800	900	1.5x1.5
700	711	800	900	1000	1.5x1.5
800	813	900	1000	-	1.5x1.5

Standard bends " $\alpha$ " -  $90^\circ$ .

Bends with degrees from  $5^\circ$  to  $90^\circ$  and leg length up to 2,0 m can be made upon the request.

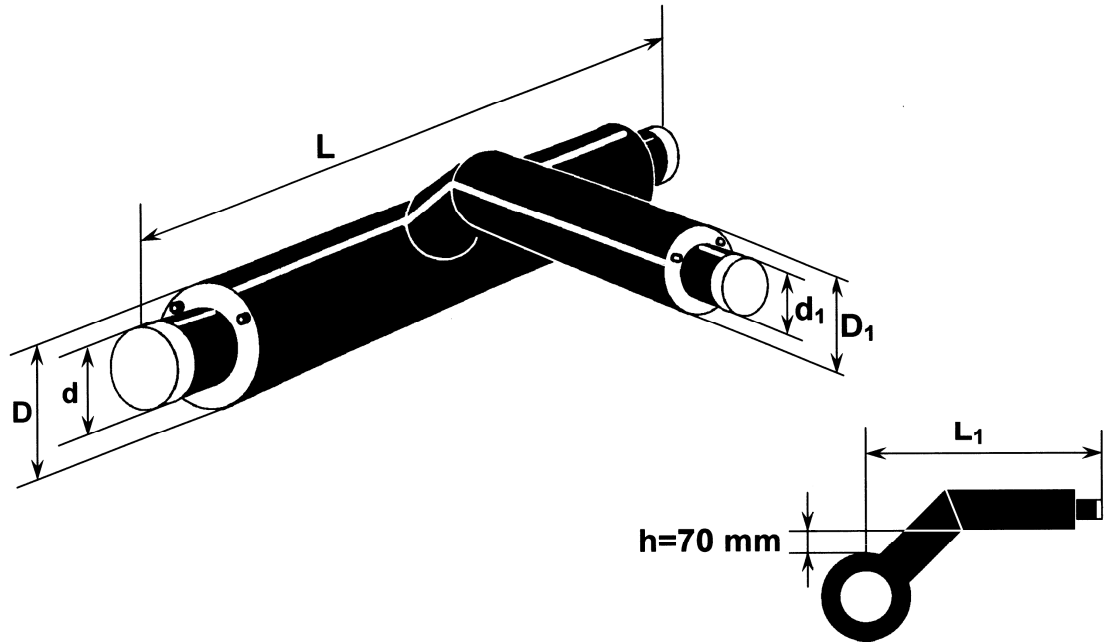
**Preinsulated vertical bends**

**4.3.1.**



Steel pipe		PE casing pipe $\varnothing D$ , mm			Leg length L, m
DN, mm	$\varnothing d$ , mm	Series 1	Series 2	Series 3	
20	26	90	110	125	1.5x1.5
25	33	90	110	125	1.5x1.5
32	42	110	125	140	1.5x1.5
40	48	110	125	140	1.5x1.5
50	57	125	140	160	1.5x1.5
50	60	125	140	160	1.5x1.5
65	76	140	160	180	1.5x1.5
80	89	160	180	200	1.5x1.5
100	108	180	200	225	1.5x1.5
100	114	200	225	250	1.5x1.5
125	133	200	225	250	1.5x1.5
125	139	225	250	280	1.5x1.5
150	159	250	280	315	1.5x1.5
150	168	250	280	315	1.5x1.5
200	219	315	355	400	1.5x1.5
250	273	400	450	500	1.5x1.5
300	324	450	500	560	1.5x1.5
350	355	500	560	630	1.5x1.5
400	406	560	630	710	1.5x1.5
400	426	560	630	710	1.5x1.5
450	457	560	630	710	1.5x1.5
500	508	630	710	800	1.5x1.5
500	530	630	710	800	1.5x1.5
600	610	710	800	900	1.5x1.5
700	711	800	900	1000	1.5x1.5
800	813	900	1000	-	1.5x1.5

Vertical bends are most commonly used for heating pipeline entering the buildings. Bends with length up to 2,0 m are made upon the request.



**Series 1, 2 and 3**

Main pipe		Branch pipe - $d_1 / L_1$ , mm					
$\varnothing d$ , mm	L, mm	26 - 60	76 - 139	159 - 219	273 - 355	406 - 630	711 - 813
26 - 60	1000	700					
76 - 139	1000	800	800				
159 - 219	1200	1000	1000	1000			
273 - 355	1500	1200	1200	1200	1200		
406 - 630	1500	1200	1300	1300	-	-	
406 - 630	1800	-	-	-	1500	1500	
711 - 813	2200	-	1300	1500	1700	2000	2200

For diameters of PE casing pipes and thickness of insulation layer see page 4.1.

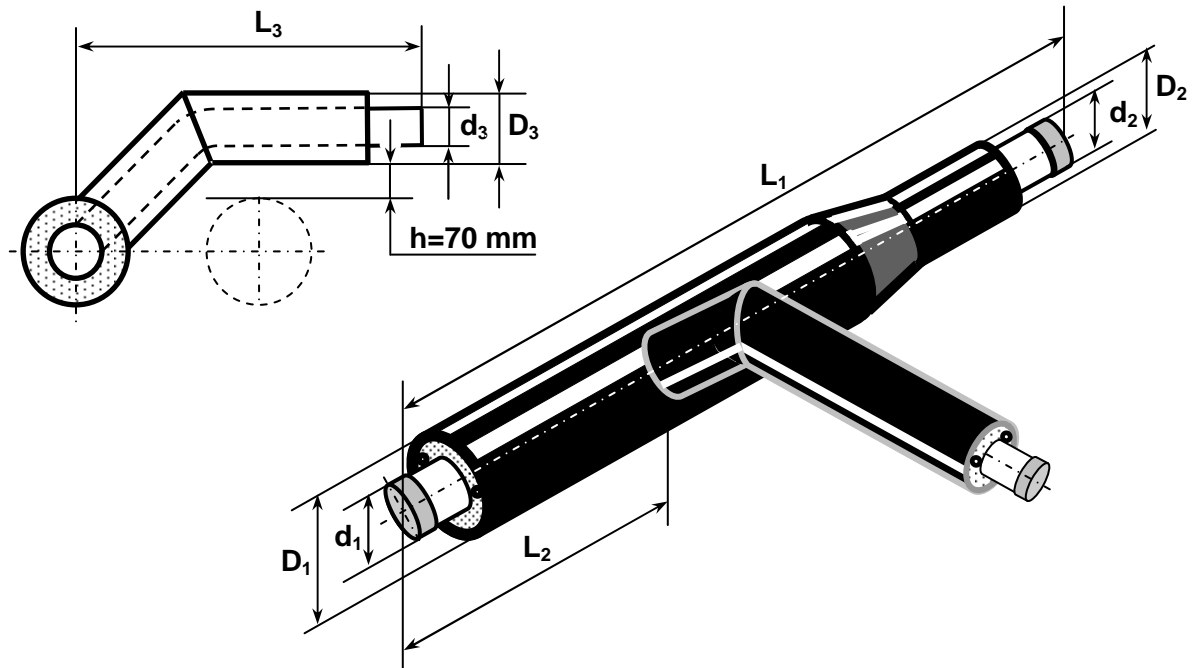
Diameter of branch  $d_1$  can not be greater than diameter of main pipe  $d$ .

T-pieces can be made upon the request:

- with any angle of branch pipe to the main pipe.



**Preinsulated perpendicular T-branches with reducer 4.4.1.**



**Series 1, 2 and 3**

Main pipe			Branch pipe - $\varnothing d_3 / L_3$ , mm					
$\varnothing d$ , mm	$L_1$ , mm	$L_2$ , mm	26 - 60	76 - 139	159 - 219	273 - 355	406 - 630	711 - 813
26 - 60	1200	500	700					
76 - 139	1200	500	800	800				
159 - 219	1400	600	1000	1000	1000			
273 - 355	1700	750	1200	1200	1200	1200		
406 - 630	1700	750	1200	1300	1300	-	-	
406 - 630	2000	900	-	-	-	1500	1500	
711 - 813	2500	1100	-	1300	1500	1700	2000	2200

For diameters of PE casing pipes and thickness of insulation layer see page 4.1.

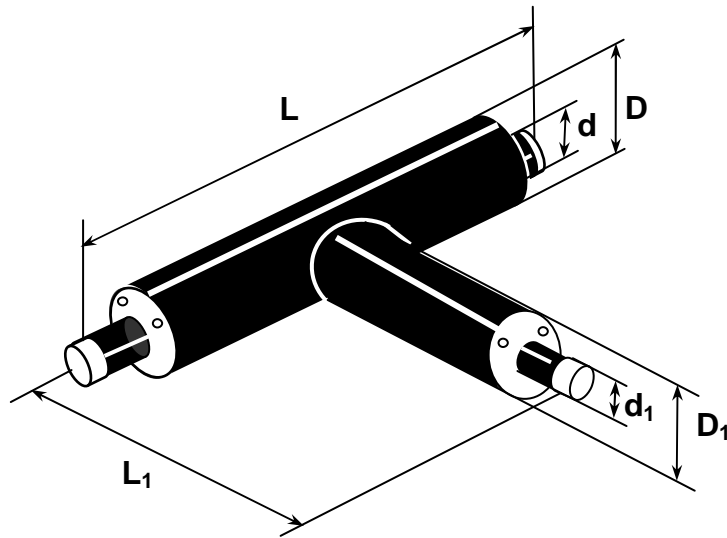
Pipe reducer diameters  $d_1/d_2$  see table on page 4.6.

Diameter of branch  $d_3$  can not be greater than the diameter of main  $d_1$ .

On request T-pieces can be produced:

- with any angle of branch pipe to the main pipe;
- with biggest reduction level (transition  $d_1/d_2$ ) than presented on page 4.6.

When ordering it is mandatory to inform of T-piece preference: right or left. On the drawing the T-piece is shown with right transition.



**Series 1, 2 and 3**

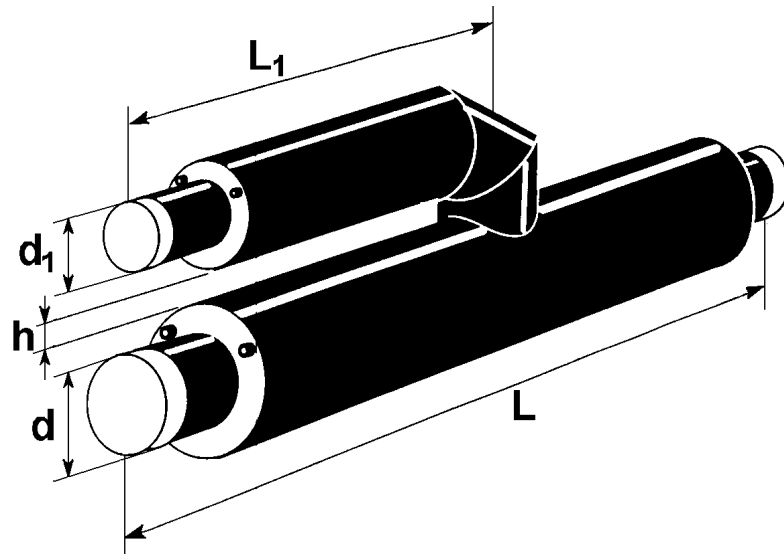
Main pipe		Branch pipe - $d_1 / L_1$ , mm					
$\varnothing d$ , mm	L, mm	26 - 60	76 - 139	159 - 219	273 - 355	406 - 630	711 - 813
26 - 60	1000	700					
76 - 139	1000	800	800				
159 - 219	1200	1000	1000	1000			
273 - 355	1500	1200	1200	1200	1200		
406 - 630	1500	1200	1300	1300	-	-	
406 - 630	1800	-	-	-	1500	1500	
711 - 813	2200	-	1300	1500	1700	2000	2200

For diameters of PE casing pipes and thickness of insulation layer see page 4.1.

Diameter of branch  $d_1$  can not be greater than diameter of main pipe  $d$ .

**Preinsulated parallel T-branches**

**4.5.**



**Series 1, 2, and 3**

Main pipe Ød, mm	Branch pipe Ød <sub>1</sub> , mm	L, mm	L <sub>1</sub> , mm	h, mm
26 - 168	26 - 76	1000	500	100
	89 - 168	1200	600	100
219 - 820	26 - 139	1200	600	100
	159 - 168	1400	700	100
	219 - 273	1800	900	200
	324 - 355	2000	1000	300
	406 - 426	2200	1100	350
	457 - 530	2500	1250	500
	610	2800	1400	500
	711	3200	1600	600
	813	3400	1700	700

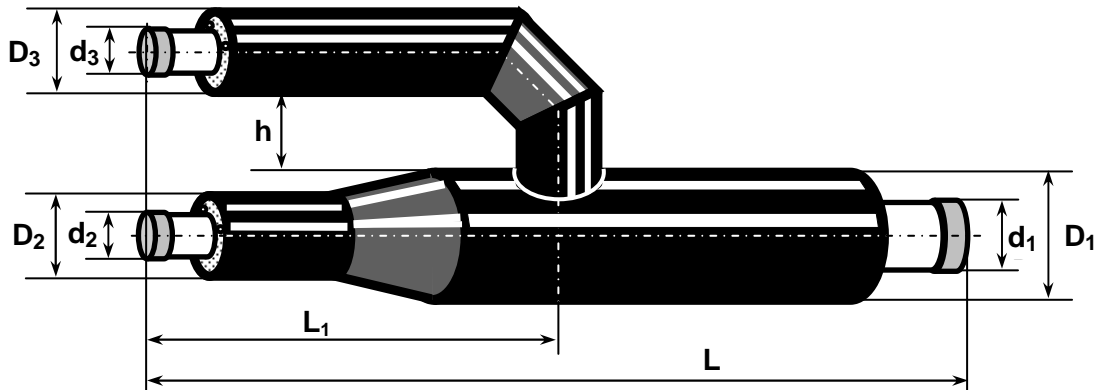
For diameters of PE casing pipes and thickness of insulation layer see page 4.1.

Diameter of branch **d<sub>1</sub>** can not be greater than diameter of main pipeline **d**.

Upon the request following parallel T-pieces can be made:

- with any angle of branch pipe to the main pipe.

**Preinsulated parallel T-branches with reducer 4.5.1.**



**Series 1, 2 and 3**

Main pipe Ø d, mm	Branch pipe Ø d <sub>3</sub> , mm	L, mm	L <sub>1</sub> , mm	h, mm
26 - 168	26 - 60	1000	500	100
	76 - 139	1200	600	100
219 - 813	76 - 89	1200	600	100
	108 - 168	1400	700	100
	219 - 273	1800	900	200
	324 - 355	2000	1000	300
	406 - 426	2200	1100	350
	457 - 530	2500	1250	500
	610	2800	1400	500
	711	3200	1600	600
	813	3400	1700	700

For diameters of PE casing pipes and thickness of insulation layer see page 4.1.

Diameter of branch  $d_3$  can not be greater than diameter of main pipeline  $d_1$ .

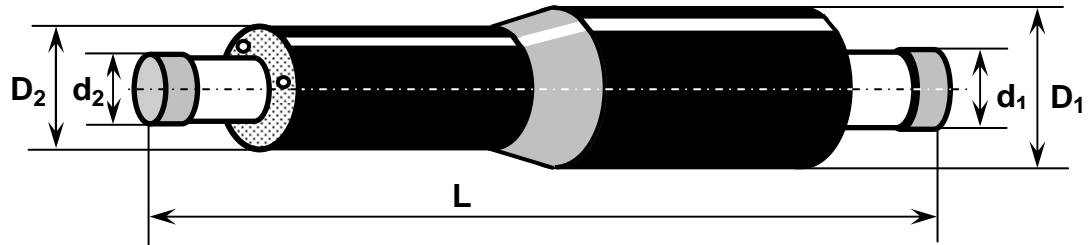
For pipe diameter reducers  $d_1/d_2$  see table on page 4.6.

On request are made following parallel T-pieces:

- with any angle of branch pipe to the main pipe, including direction of the branch opposite of the direction of the heating flow.
- with bigger reduction level (transition  $d_1/d_2$ ) than presented on page 4.6.

**Preinsulated diameter reducers**

**4.6.**



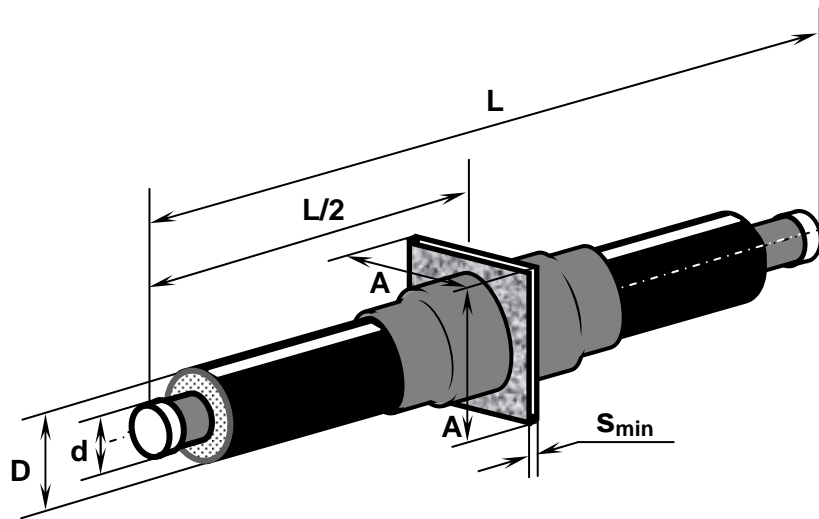
Ød <sub>1</sub> , mm	Ød <sub>2</sub> , mm																				L, m						
	26	33	42	48	57	60	76	89	108	114	133	139	159	168	219	273	324	355	377	406		426	457	508	530	610	711
33	+																										1.0
42	+	+																									1.0
48	+	+	+																								1.0
57	+	+	+	+																							1.0
60	+	+	+	+	+																						1.0
76		+	+	+	+	+																					1.0
89			+	+	+	+	+																				1.0
108				+	+	+	+	+																			1.0
114					+	+	+	+	+																		1.0
133					+	+	+	+	+	+																	1.0
139						+	+	+	+	+																	1.0
159							+	+	+	+	+																1.0
168								+	+	+	+	+															1.0
219									+	+	+	+	+														1.0
273										+	+	+	+	+													1.2
324										+	+	+	+	+	+												1.2
355											+	+	+	+	+												1.2
377												+	+	+	+	+											1.2
406													+	+	+	+	+										1.2
426														+	+	+	+	+									1.2
457															+	+	+	+	+								1.2
508																+	+	+	+	+							1.2
530																	+	+	+	+	+						1.2
610																		+	+	+	+	+					1.2
711																						+	+	+	+		1.2
813																							+	+	+	+	1.2

For casing pipe dimensions **D<sub>1</sub>** and **D<sub>2</sub>** see page 4.1.

On request: reducer can be produced as one product together with perpendicular or parallel T-branches, see pages 4.4.1 and 4.5.1.

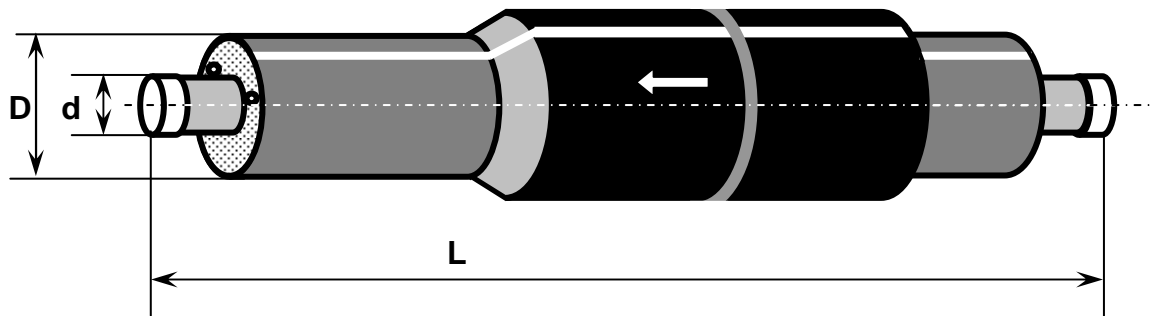
**Preinsulated fixed anchors**

**4.7.**



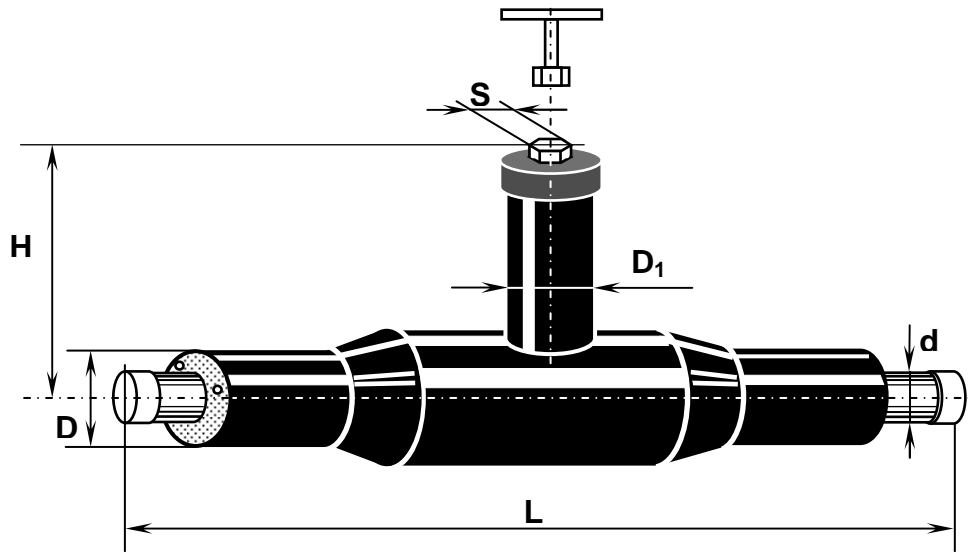
Steel pipe Ød, mm	Series 1			Series 2			Series 3			Length L, m
	PE casing ØD, mm	Size of anchor plate, mm		PE casing ØD, mm	Size of anchor plate, mm		PE casing ØD, mm	Size of anchor plate, mm		
		A	S <sub>min</sub>		A	S <sub>min</sub>		A	S <sub>min</sub>	
42	110	210	20	125	225	20	140	240	20	2.0
48	110	210	20	125	225	20	140	240	20	2.0
57	125	225	20	140	240	20	160	260	20	2.0
60	125	225	20	140	240	20	160	260	20	2.0
76	140	240	20	160	260	20	180	280	25	2.0
89	160	260	20	180	280	25	200	300	25	2.0
108	180	280	25	200	300	25	225	325	25	2.0
114	200	300	25	200	300	25	250	350	25	2.0
133	200	300	25	225	325	25	250	350	25	2.0
139	225	325	25	250	350	25	280	380	25	2.0
159	250	350	25	280	380	25	315	415	25	2.3
168	250	350	25	280	380	25	315	415	25	2.3
219	315	415	25	355	455	25	400	500	30	2.3
273	400	500	30	450	550	30	500	600	30	2.3
324	450	550	30	500	600	30	560	660	30	2.3
355	500	600	30	560	660	30	630	730	30	2.3
406	560	660	40	630	730	40	710	810	40	2.5
426	560	660	40	630	730	40	710	810	40	2.5
457	560	660	40	630	730	40	710	810	40	2.5
508	630	730	40	710	810	40	800	900	40	2.5
530	630	730	40	710	810	40	800	900	40	2.5
610	710	810	50	800	900	50	900	1000	50	3.0
630	800	900	50	900	1000	50	X	X	X	3.0

Anchor plate next to working pipe is strengthened with additional steady ribs.



Steel pipe Ød, mm	PE casing pipe ØD, mm			Length of max compensation, mm	Length L, m
	Series 1	Series 2	Series 3		
48	110	125	140	100	2.2
57	125	140	160	100	2.2
60	125	140	160	100	2.2
76	140	160	180	100	2.2
89	160	180	200	100	2.2
108	180	200	225	125	2.2
114	200	225	250	125	2.2
133	200	225	250	125	2.2
139	225	250	280	125	2.2
159	250	280	315	125	2.2
168	250	280	315	125	2.2
219	315	355	400	150	2.2
273	400	450	500	150	2.2
324	450	500	560	150	2.2
355	500	560	630	150	2.2
406	560	630	710	150	2.5
426	560	630	710	150	2.5
457	560	630	710	150	2.5
508	630	710	800	150	2.8
530	630	710	800	150	2.8
610	710	800	900	150	2.8

Water flow is marked with an arrow.



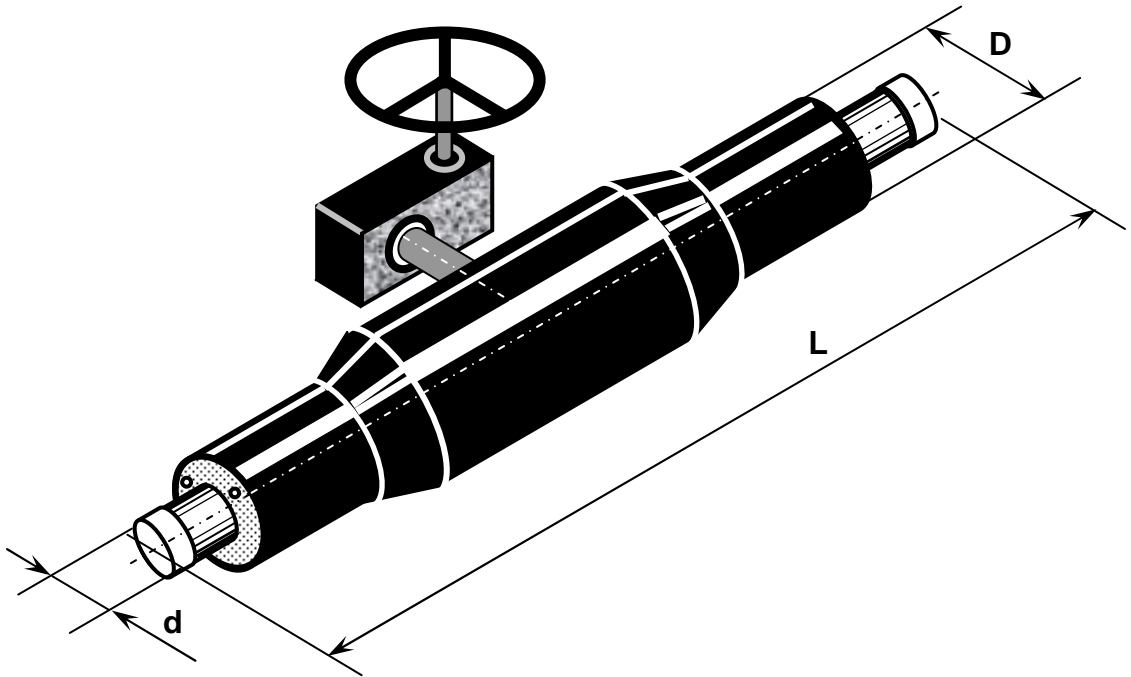
Steel pipe		PE casing pipe ØD, mm			ØD <sub>1</sub> , mm	L, mm	H, mm	S, mm
DN, mm	Ød, mm	Series1	Series 2	Series3				
25	33	90	110	125	110	1500	480	19
32	42	110	125	140	110	1500	485	19
40	48	110	125	140	110	1500	494	19
50	57	125	140	160	110	1500	500	19
50	60	125	140	160	110	1500	500	19
65	76	140	160	180	110	1500	505	19
80	89	160	180	200	110	1500	515	19
100	108	180	200	225	125	1500	525	27
100	114	200	225	250	125	1500	525	27
125	133	200	225	250	140	1500	545	27
125	139	225	250	280	140	1500	545	27
150	159	250	280	315	140	1500	565	27
150	168	250	280	315	140	1500	565	27
200	219	315	355	400	140	1500	585	50
250	273	400	450	500	180	1500	613	50
300	324	450	500	560	180	1800	664	50

The construction of ball valve control axis provides possibility to open and close the valve from above-ground using T-shaped end key.

It is possible to order different height of the valve **H**.

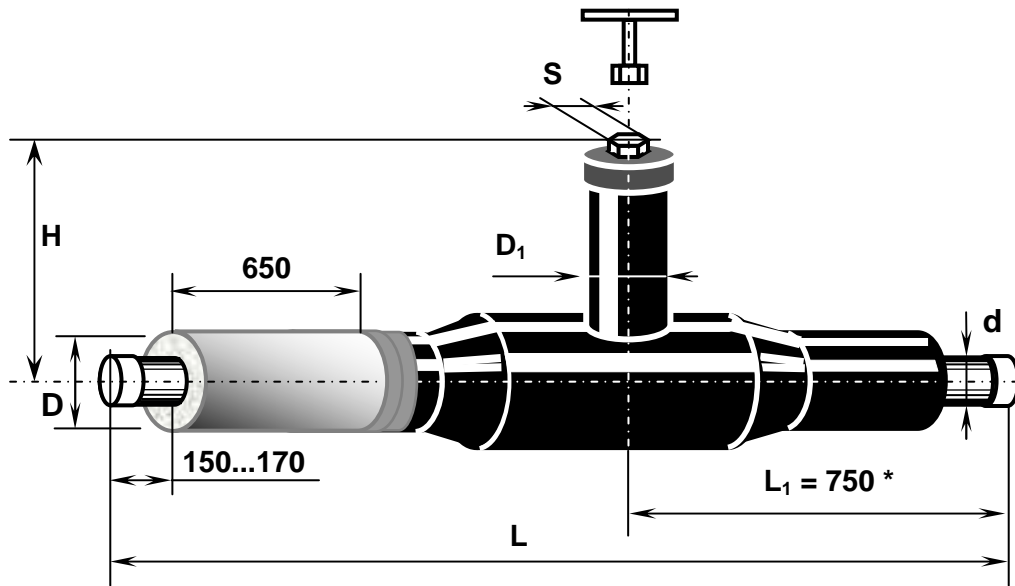


**Preinsulated valves with manual gear actuator 4.9.1.**



Steel pipe		PE casing pipe ØD, mm			L, mm
DN, mm	Ød, mm	Series1	Series 2	Series3	
200	219	315	355	400	1500
250	273	400	450	500	1500
300	324	450	500	560	1800
350	355	500	560	630	1800
350	377	500	560	630	1800
400	406	560	630	710	1800
400	426	560	630	710	1800
450	457	560	630	710	2000
500	508	630	710	800	2000
500	530	630	710	800	2000
600	610	710	800	900	2000
700	710	800	900	1000	2000
800	813	900	1000	—	2000

Not shown actuator sizes are produced by manufacturers' specification.



Steel pipe		PE casing pipe ØD, mm			ØD <sub>1</sub> , mm	L, mm	H, mm	S, mm
DN, mm	Ød, mm	Series1	Series 2	Series3				
25	33	90	110	125	110	2100	480	19
32	42	110	125	140	110	2100	485	19
40	48	110	125	140	110	2100	494	19
50	57	125	140	160	110	2100	500	19
50	60	125	140	160	110	2300	500	19
65	76	140	160	180	110	2300	505	19
80	89	160	180	200	110	2300	515	19
100	108	180	200	225	125	2300	525	27
100	114	200	225	250	125	2300	525	27
125	133	200	225	250	140	2300	545	27
125	139	225	250	280	140	2300	545	27
150	159	250	280	315	140	2300	565	27
150	168	250	280	315	140	2300	565	27
200	219	315	355	400	140	2500	585	50
250	273	400	450	500	180	2700	613	50
300	324	450	500	560	180	2800	664	50

\* Valve DN 300 mm with size L<sub>1</sub> = 900 mm.

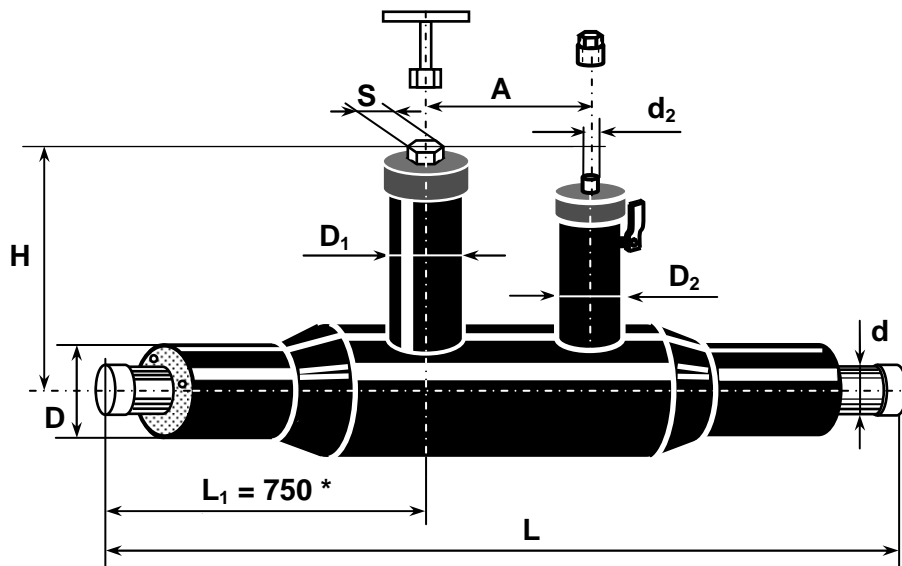
The construction of ball valve control axis provides possibility to open and close the valve from above-ground using T-shaped end key.

Protective steel seal is welded to already working pipe and is connected to the pipe casing by heat-shrinkable tape with widths s=140 - 160 mm, creating additional mechanical and hydraulic support.

Alarm system wires underneath the metal case are in the loop connection. On request: metal seal can be made with three-wire cable output.

It is possible to order different height of the valve H.

**Preinsulated valves with one (1) air release/drainage unit 4.10.**



Steel pipe and valve		Unit $\varnothing d_2$								L, mm
		Air release unit				Drainage unit				
DN, mm	$\varnothing d$ , mm	DN, mm	$\varnothing d_2$ , mm	$\varnothing D_2$ , mm	A, mm	DN, mm	$\varnothing d_2$ , mm	$\varnothing D_2$ , mm	A, mm	
25	33	20	26	110	300	20	26	110	300	1500
32	42	20	26	110	300	25	33	110	300	1500
40	48	20	26	110	300	32	42	110	300	1500
50	57	25	33	110	300	32	42	110	300	1500
50	60	25	33	110	300	32	42	110	300	1500
65	76	25	33	110	300	32	42	110	300	1500
80	89	32	42	110	300	40	48	110	300	1500
100	108	32	42	110	320	50	60	125	320	1500
100	114	32	42	110	320	50	60	125	320	1500
125	133	40	48	110	320	50	60	125	320	1500
125	139	40	48	110	320	50	60	125	320	1500
150	159	40	48	110	340	80	89	160	340	2000
150	168	40	48	110	340	80	89	160	340	2000
200	219	50	60	125	360	100	114	200	380	2000
250	273	50	60	125	360	100	114	200	380	2000
300	324	50	60	125	360	100	114	200	380	2200

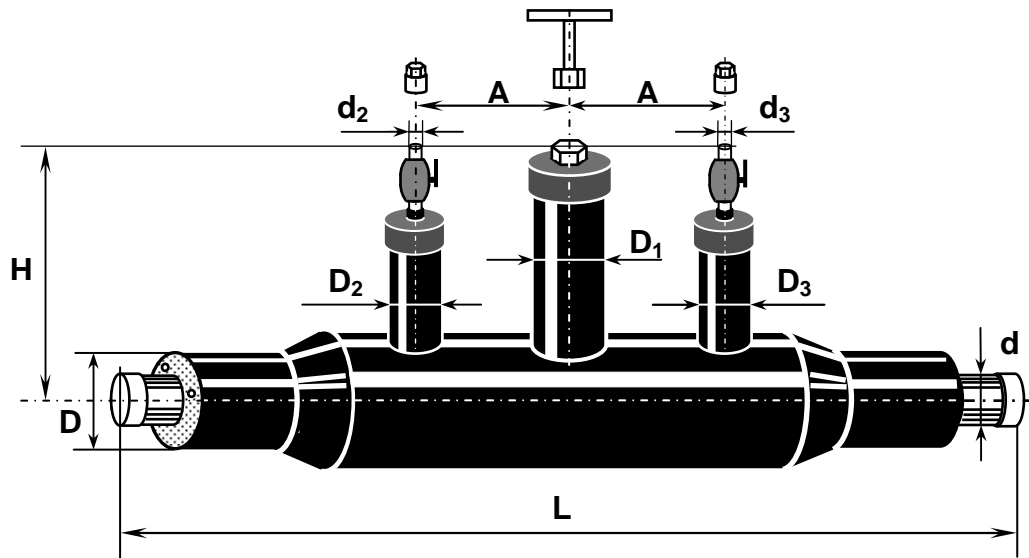
\* Valve DN 300 mm with size  $L_1 = 900$  mm.

For dimensions  $D$ ,  $D_1$ ,  $H$ ,  $S$  see page 4.9.

The construction of ball valve control axis provides possibility to open and close the valve from above-ground using T-shaped end key.

Other diameters  $d_1$  and height  $H_1$  of air release / drainage units not shown in the table are available upon the request.

**Preinsulated valves with two (2) air release/ drainage units 4.11.**



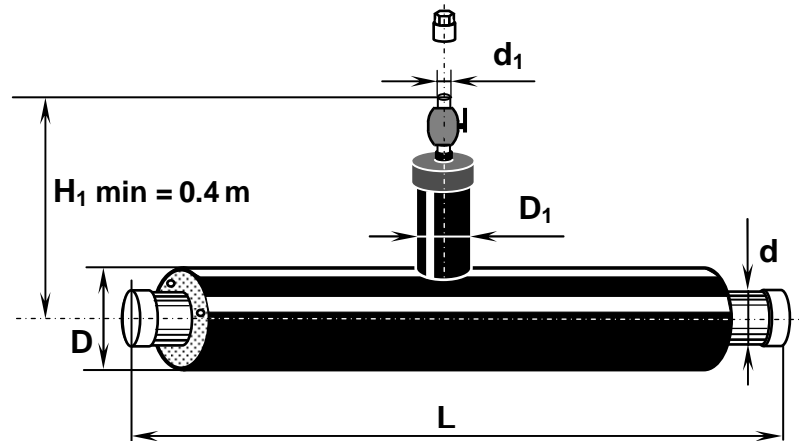
Steel pipe $\varnothing d$ and valve $\varnothing d_1$		Unit $\varnothing d_2$ and/or $d_3$						A, mm	L, mm
		Air release unit			Drainage unit				
DN, mm	$\varnothing d$ , mm	DN, mm	$\varnothing d_2$ , mm	$\varnothing D_2$ , mm	DN, mm	$\varnothing d_3$ , mm	$\varnothing D_3$ , mm		
25	33	20	26	110	20	26	110	300	1500
32	42	20	26	110	25	33	110	300	1500
40	48	20	26	110	32	42	110	300	1500
50	57	25	33	110	32	42	110	300	1500
50	60	25	33	110	32	42	110	300	1500
65	76	25	33	110	32	42	110	300	1500
80	89	32	42	110	40	48	110	300	1500
100	108	32	42	110	50	60	125	320	1500
100	114	32	42	110	50	60	125	320	1500
125	133	40	48	110	50	60	125	320	2000
125	139	40	48	110	50	60	125	320	2000
150	159	40	48	110	80	89	160	340	2500
150	168	40	48	110	80	89	160	340	2500
200	219	50	60	125	100	114	200	380	2500
250	273	50	60	125	100	114	200	380	2500
300	324	50	60	125	100	114	200	380	2500

Dimensions **D**, **D<sub>1</sub>**, **H**, **S** see on page 4.9.

The construction of ball valve control axis provides possibility to open and close the valve from above-ground using T-shaped end key.

Same valve set or same nominal diameter units that are not shown in the table are available upon the request. Different height **H** can also be changed upon the request.

**Preinsulated T-branches with air release/ drainage unit 4.12.**

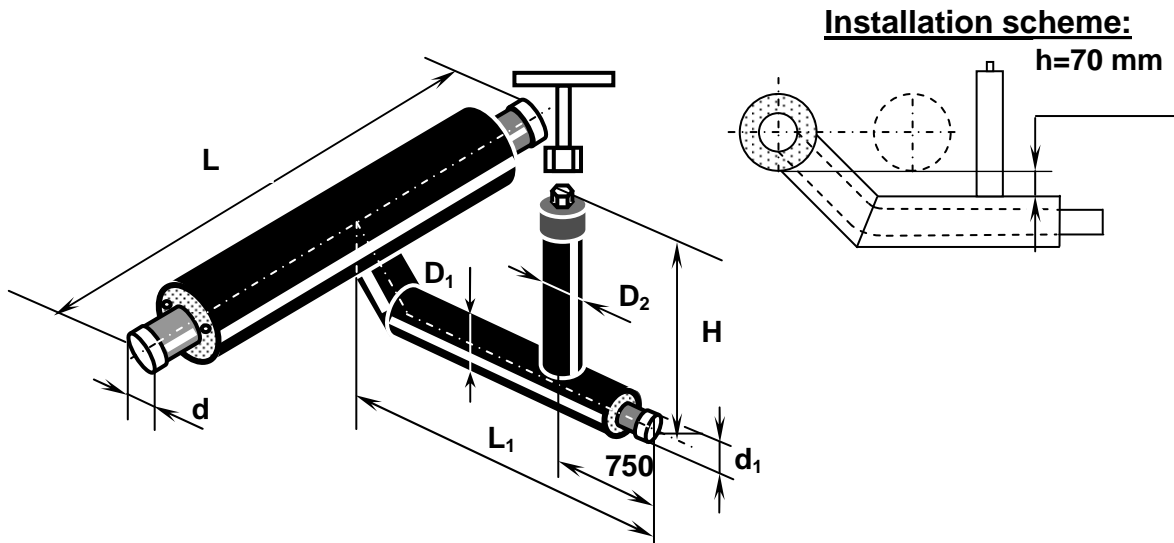


Steel pipe		Unit $\varnothing d_1$						L, mm
		Air release unit			Drainage unit			
DN, mm	$\varnothing d$ , mm	DN, mm	$\varnothing d_1$ , mm	$\varnothing D_1$ , mm	DN, mm	$\varnothing d_1$ , mm	$\varnothing D_1$ , mm	
25	33	20	26	90	20	26	90	1000
32	42	20	26	110	25	33	110	1000
40	48	20	26	110	32	42	110	1000
50	57	25	33	110	32	42	110	1000
50	60	25	33	110	32	42	110	1000
65	76	25	33	110	32	42	110	1000
80	89	32	42	110	40	48	110	1000
100	108	32	42	110	50	60	125	1000
100	114	32	42	110	50	60	125	1000
125	133	40	48	110	50	60	125	1000
125	139	40	48	110	50	60	125	1000
150	159	40	48	110	80	89	160	1200
150	168	40	48	110	80	89	160	1200
200	219	50	60	125	100	114	200	1200
250	273	50	60	125	100	114	200	1200
300	324	50	60	125	100	114	200	1200
350	355	65	76	140	125	139	225	1200
400	406	65	76	140	125	139	225	1200
400	426	65	76	140	125	139	225	1200
450	457	65	76	140	125	139	225	1200
500	508	65	76	140	150	168	250	1200
500	530	65	76	140	150	168	250	1200
600	610	80	89	160	200	219	315	1400
700	711	80	89	160	200	219	315	1400
800	813	100	114	200	250	273	400	1400

Used for air release or water drainage.

Dimensions of main pipeline see on page 4.1.

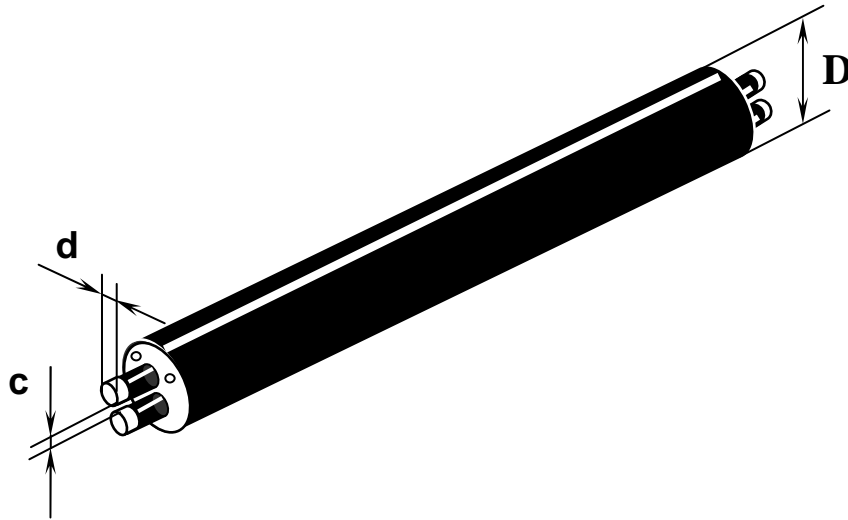
It is possible to order different diameter of unit  $d_1$  and height of handle  $H_1$ .



Steel pipe		T-branch with drainage unit				L, mm	L <sub>1</sub> , mm
DN, mm	∅d, mm	DN, mm	∅d <sub>1</sub> , mm	∅D <sub>1</sub> , mm	∅D <sub>2</sub> , mm		
25	33	20	26	90	110	1000	1500
32	42	25	33	90	110	1000	1500
40	48	32	42	110	110	1000	1500
50	57	32	42	110	110	1000	1500
50	60	32	42	110	110	1000	1500
65	76	32	42	110	110	1000	1500
80	89	40	48	110	110	1000	1500
100	108	50	60 (57)	125	110	1200	1500
100	114	50	60 (57)	125	110	1200	1500
125	133	50	60 (57)	125	110	1200	1500
125	139	50	60 (57)	125	110	1200	1500
150	159	80	89	160	110	1200	1500
150	168	80	89	160	110	1200	1500
200	219	100	114 (108)	200	125	1400	2000
250	273	100	114 (108)	200	125	1400	2000
300	324	100	114 (108)	200	125	1400	2000
355	355	125	139 (133)	225	140	1600	2000
400	406	125	139 (133)	225	140	1600	2200
400	426	125	139 (133)	225	140	1600	2200
450	457	125	139 (133)	225	140	1600	2200
500	508	150	168 (159)	250	140	1800	2400
500	530	150	168 (159)	250	140	1800	2400
600	610	200	219	315	140	2000	2800
700	711	200	219	315	140	2200	2900
800	813	250	273	400	180	2300	3000

Dimensions of main pipeline and valves see on pages 4.1 and 4.9.

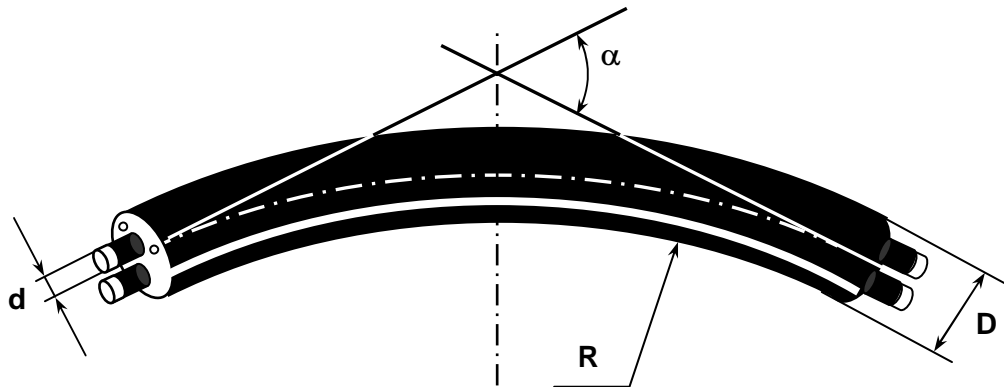
It is possible to order different diameter of valve  $d_1$ , height  $H$  and branch length  $L_1$ .



Steel pipe			PE casing pipe	
DN, mm	Ød, mm	c, mm	Series 1 ØD, mm	Series 2 ØD, mm
20	26	19	125	140
25	33	19	140	160
32	42	19	160	180
40	48	19	160	180
50	60	20	200	225
65	76	20	225	250
80	89	25	250	280
100	114	25	315	355
125	139	30	400	450
150	168	40	450	500

Material of service pipe is steel. On the request copper and stainless steel can be used.

Casing material is high density polypropylene (HDPE).



Steel pipe		PE casing pipe		Max deflection angle $\alpha$
DN, mm	$\varnothing d$ , mm	Series 1 $\varnothing D$ , mm	Series 2 $\varnothing D$ , mm	
20	26	125	140	35°
25	33	140	160	35°
32	42	160	180	35°
40	48	160	180	35°
50	60	200	225	35°
65	76	225	250	35°
80	89	250	280	35°
100	114	315	355	25°
125	139	400	450	20°
150	168	450	500	15°

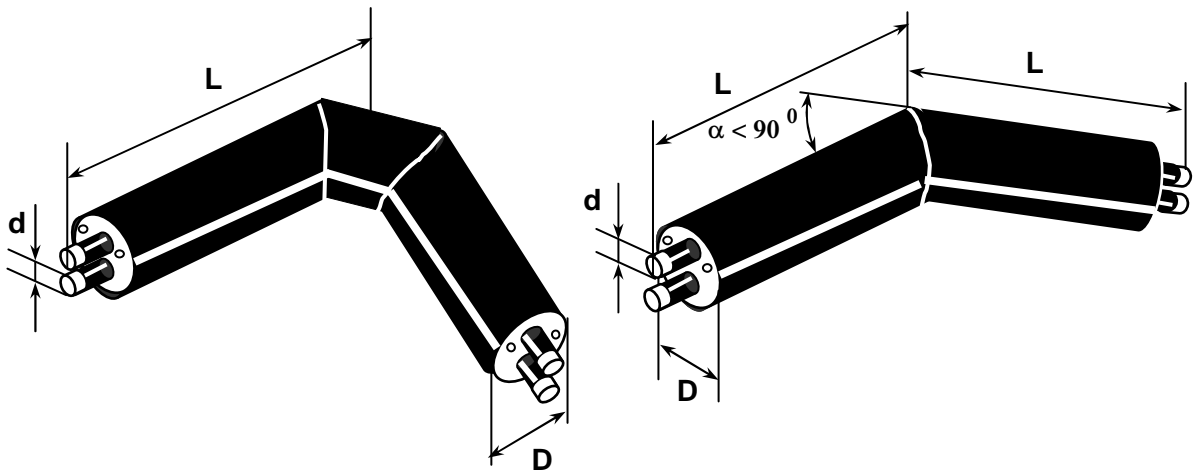
Allowable accuracy of DN 2x80 mm ÷ 2x150 mm  $\pm 2^\circ$ .

For relation between angle and radius curvature for L = 12 m pipe review table on page 4.1.1.



**Preinsulated double pipe bends**

**4.14.**



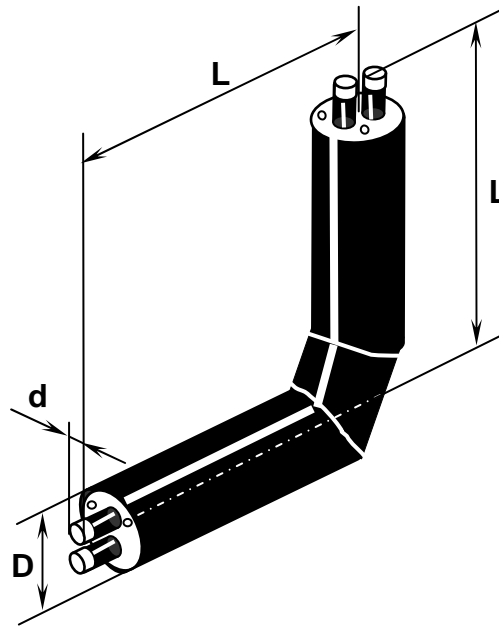
Steel pipe		PE casing pipe		Leg length L, m
DN, mm	Ød, mm	Series 1 ØD, mm	Series 2 ØD, mm	
20	26	125	140	1.0x1.0
25	33	140	160	1.0x1.0
32	42	160	180	1.0x1.0
40	48	160	180	1.0x1.0
50	60	200	225	1.0x1.0
65	76	225	250	1.0x1.0
80	89	250	280	1.0x1.0
100	114	315	355	1.0x1.0
125	139	400	450	1.0x1.0
150	168	450	500	1.0x1.0

Angle " $\alpha$ " in a standard bends is  $90^{\circ}$ .

The bends with degrees from  $5^{\circ}$  to  $90^{\circ}$  and leg length up to 2,0 m can be made on request.

**Preinsulated double pipe vertical bends**

**4.14.1.**

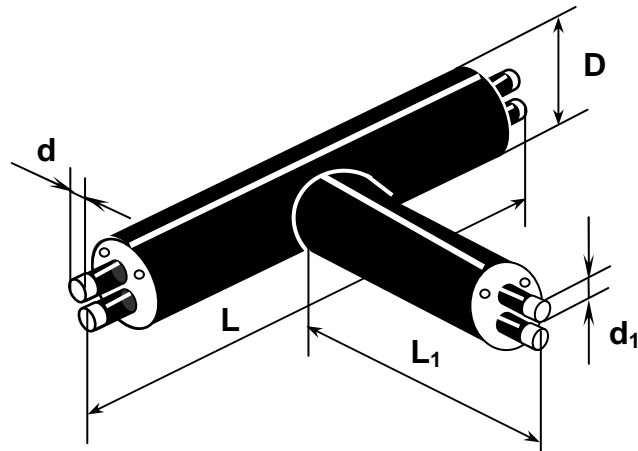


Steel pipe		PE casing pipe		Leg length L, m
DN, mm	Ød, mm	Series 1 ØD, mm	Series 2 ØD, mm	
20	26	125	140	1.5x1.5
25	33	140	160	1.5x1.5
32	42	160	180	1.5x1.5
40	48	160	180	1.5x1.5
50	60	200	225	1.5x1.5
65	76	225	250	1.5x1.5
80	89	250	280	1.5x1.5
100	114	315	355	1.5x1.5
125	139	400	450	1.5x1.5
150	168	450	500	1.5x1.5

Different leg length up to 2,0 m can be made on request.

**Preinsulated double pipe T-branches**

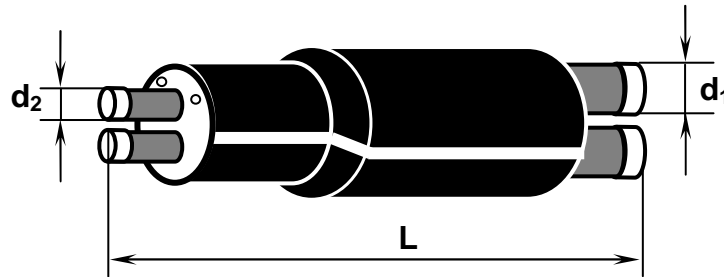
**4.15.**



Main pipe		Branch pipe $\varnothing d_1 / L_1$ , mm		
$\varnothing d$ , mm	L, mm	26 - 76	89 - 139	168
26 - 76	1000	700		
89 - 139	1200	800	800	
168	1500	1000	1000	1000

**Preinsulated double pipe diameter reducers**

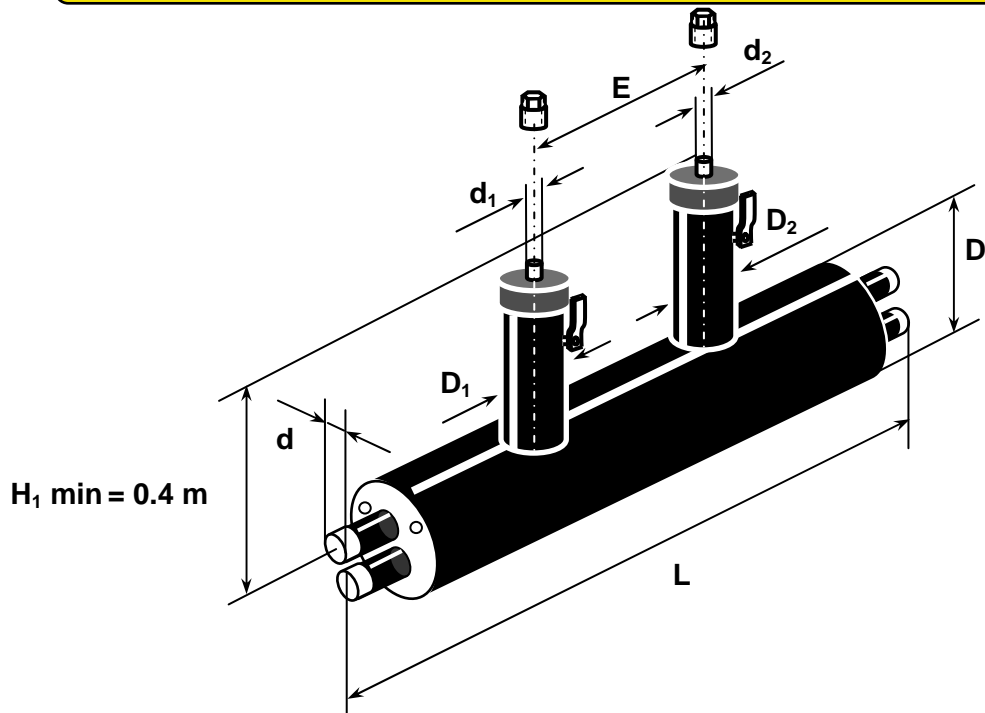
**4.16.**



Steel pipe		PE casing pipe		Length L, m
DN, mm	Ød, mm	Series 1 ØD, mm	Series 2 ØD, mm	
20	26	125	140	1.0
25	33	140	160	1.0
32	42	160	180	1.0
40	48	160	180	1.2
50	60	200	225	1.2
65	76	225	250	1.3
80	89	250	280	1.3
100	114	315	355	1.3
125	139	400	450	1.5
150	168	450	500	1.5

Nomenclatures of reducer diameters  $d_1/d_2$  see table on page 4.6.

**Preinsulated double pipe air release/drainage units 4.17.**

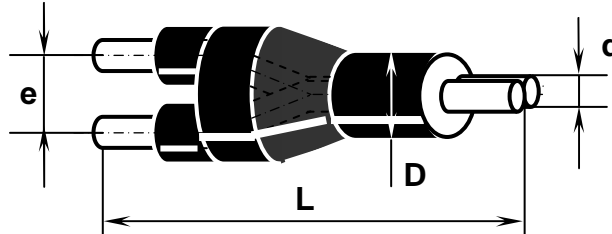


Steel pipe		Units						E, mm	L, mm
		For air release			For drainage				
DN, mm	$\varnothing d$ , mm	DN, mm	$\varnothing d_1$ , mm	$\varnothing D_1$ , mm	DN, mm	$\varnothing d_2$ , mm	$\varnothing D_2$ , mm		
25	33	20	26	110	20	26	110	320	1600
32	42	20	26	110	25	33	110	320	1600
40	48	20	26	110	32	42	110	320	1600
50	60	25	33	110	32	42	110	320	1600
65	76	25	33	110	32	42	110	320	1600
80	89	32	42	110	40	48	110	340	1600
100	114	32	42	110	50	60	125	340	1600
125	139	40	48	110	50	60	125	340	1600
150	168	40	48	110	80	89	160	340	1800

For diameter of casing pipe **D** see page 4.14.

When making an order it is possible to agree on unit diameter  $d_1$ ,  $d_2$  and height  $H_1$ .

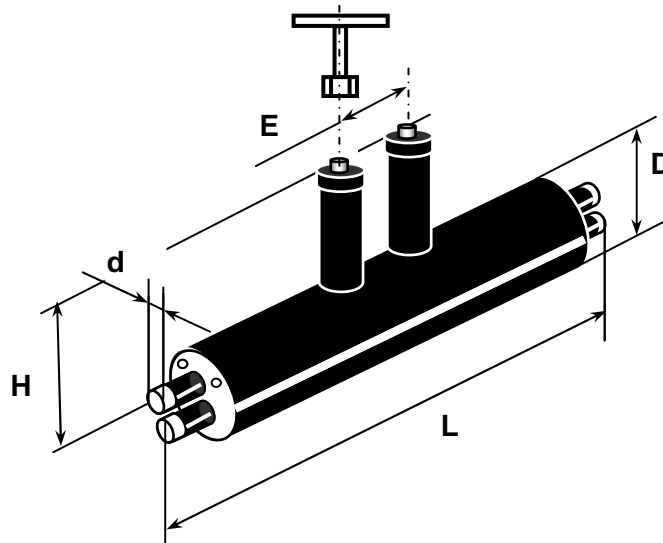
View from above:



Steel pipe		PE casing pipe		e, mm	Length L, m
DN, mm	∅d, mm	Series 1 ∅D, mm	Series 2 ∅D, mm		
20	26	125	140	260	1.8
25	33	140	160	260	1.8
32	42	160	180	280	1.8
40	48	160	180	280	2.0
50	60	200	225	290	2.0
65	76	225	250	310	2.0
80	89	250	280	330	2.2
100	114	315	355	430	2.2
125	139	400	450	450	2.4
150	168	450	500	480	2.7

Two (2) different transformation executions are possible (**please indicate in the order!**):

- from two pipe system to double pipe system;
- from double pipe system to two pipe system.

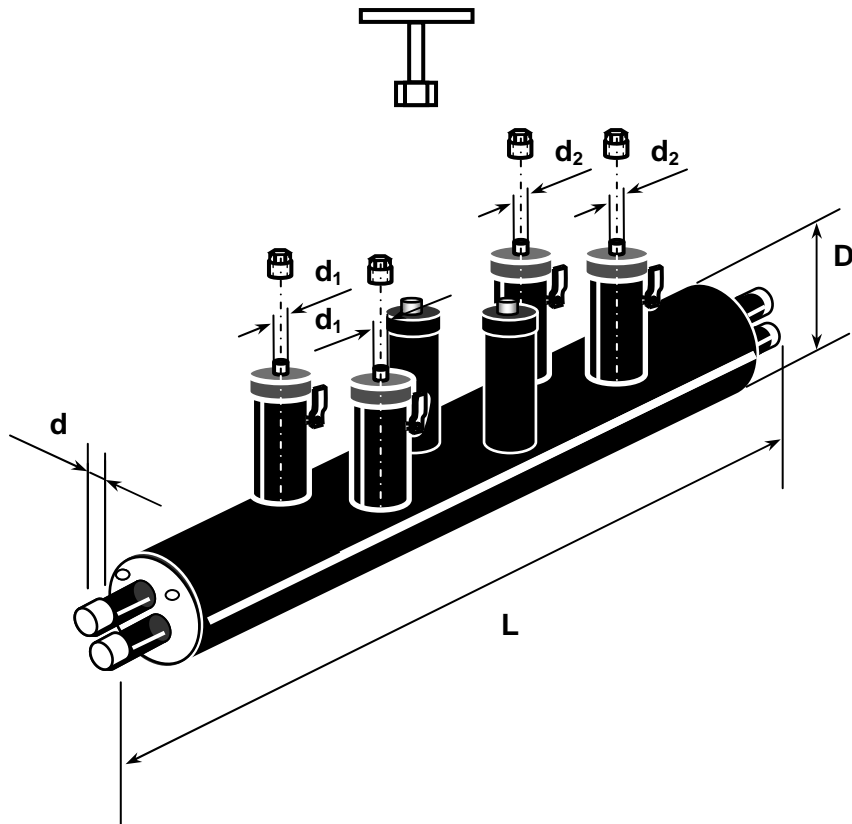


Steel pipe		PE casing pipe		E, mm	Length L, m
DN, mm	Ød, mm	Series 1 ØD, mm	Series 2 ØD, mm		
20	26	125	140	320	2.0
25	33	140	160	320	2.0
32	42	160	180	320	2.0
40	48	160	180	320	2.0
50	60	200	225	320	2.3
65	76	225	250	320	2.3
80	89	250	280	340	2.5
100	114	315	355	340	2.5
125	139	400	450	340	2.8
150	168	450	500	360	3.0

The construction of ball valve control axis provides possibility to open and close the valve from above-ground using T-shaped end key.

Dimensions of valves **H**, **D**<sub>1</sub>, **S** see table on page 4.9.

It is possible to order different height of the valve **H**.



Steel pipe		PE casing pipe		Length L, m
DN, mm	Ød, mm	Series 1 ØD, mm	Series 2 ØD, mm	
20	26	125	140	3.0
25	33	140	160	3.0
32	42	160	180	3.0
40	48	160	180	3.0
50	60	200	225	3.3
65	76	225	250	3.3
80	89	250	280	3.5
100	114	315	355	3.5
125	139	400	450	3.8
150	168	450	500	4.0

The construction of ball valve control axis provides possibility to open and close the valve from above-ground using T-shaped end key.

Dimensions of valves **H**, **S**, **D1**, **D2**, **d1**, **d2** see table on page 4.9.

It is possible to order different height of the valve **H**.