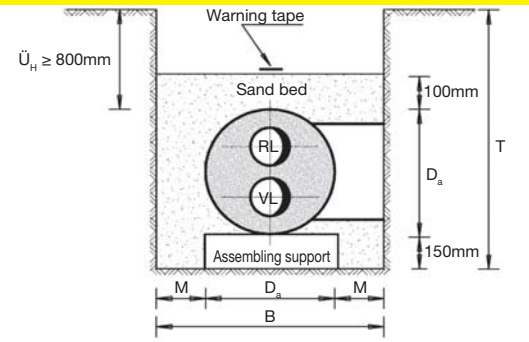
isoplus®

Transporting energy.

DOUBLE - PIPE

www.isoplus-pipes.com



System

isopipe-double is an effective supplement to the single pipe and a perfect solution for the transportation of district heating and district cooling with optimized **eco**logical and **eco**nomical customer efficiency.

With the construction-principle of the double pipe an optimum of insulation will be reached as **one** thermal-block, with the advantage that the double pipe will reach the same insulation as a 1x reinforced single pipe. Space- and cost saving by reduced trenches will additionally lower the construction expenses essentially.

The **isopipe**-double is produced in classical and continuous method (with diffusion barrier layer).

During the discontinuous production technique, the carrier pipe is prepared with spacers to which the leak detection wires are attached. The pre-assembled pipe is subsequently inserted into the casing pipe and the annular gap at the pipe ends is closed with foam covers. Afterwards, the foaming table must be set up at exactly the predetermined angle and the polyurethane foam must be sprayed into the lowest end of the pipe with an electronically controlled mixing head .

During the continuous production at the first step of the production line, the steel pipe rods will be mechanically coupled together. This string of pipes will then receive the leak detection wires, the polyurethane insulation layer, the diffusion barrier film, and the extruded polyethylene casing pipe in a continuous and CNC-controlled process.

Data depending on manufacturing and nominal diameter:

- DN 20 (¾“) up to DN 200 (8“) in classical discontinuous production
- DN 25 (1“) up to DN 100 (4“) in continuous production
- Standard insulation, 1x reinforced, 2x reinforced
- Available as 6, 12 or 16 m pipe bar
- **IPS-Cu** or **IPS-NiCr** as leak detection
- Thermal conductivity λ_{50} Disconti = 0,027 W/(m•K) at a PUR-Density of 60 kg/m^3
- Thermal conductivity λ_{50} Conti = 0,024 W/(m•K) at a PUR-Density of 60 kg/m^3
- Up to 90 K Spread [Δ_T] between flow- and return-line
- Carrier pipe P235TR1/TR2/GH according to EN 253, DIN EN 10217-1 or -2
- Operating temperature at the minimum according to EN 253 and 25 bar pressure

Advantages

⇒ 50% reduced use of connection couplers
⇒ reduced excavated material and re-installation
⇒ no trench jumps at branches (flow- and exit on same level)
⇒ essential reduction of expansion pads at angles and T-pieces
⇒ no additional fittings are required for expansion compensation
⇒ more fast total construction time, shorter traffic hindrance etc.
⇒ double working distance of leak detecting- and location systems
⇒ pipe-static dimensioning only for medium temperature of primary- and secondary line

Heat-Insulation

isoplus double-pipes will be insulated with Polyurethane-hard foam (PUR). Foamed continuously in the production street classical and continuous (with diffusion barrier layer) around the carrier pipe, a high quality insulation will be reached, with excellent thermal conductivity, at low specific weight, due to an exothermical chemical reaction.

isoplus is using generally PUR-foam which is 100 % free of chlorofluorocarbon (CFC). Cyclopentan (C_5H_{10}) is exclusively used as foaming agent. That means lowest possible ODP- and GWP-value at extremest heat insulation quality. ODP (ozone-reducing potential) = 0, GWP (greenhouse potential) = < 0,001 !

Jacket Pipe

As jacket-pipe the reliable PEHD pipe with plain surface will be used for **isoplus** double-pipe. Polyethylene High Density is a seamless extruded, shock- and break proof, viscoplastic hard polyethylene.
According to EN 253 for optimum responsibility at PUR-Foam, Corona treated, Wall thickness at the minimum according to EN 253, thermal conductivity λ_{PE80} = 0,40 W/(m•K).
PEHD is resistant against weather conditions and UV-rays in a high extent as well as practically against all chemical reactions which may develop in the soil. Therefore PE is declared in all national and international standards as the only suitable material for direct buried pipe-lying.

Carrier Pipe

Welded, circular, unalloyed and calmed down steel, description and technical conditions acc. to EN 253, EN 10217-1 and -2.

Materials P235GH (1.0345), P235TR1 (1.0254), P235TR2 (1.0255). All pipes acc. to EN 10204 - 3.1 with acceptance certificate (APZ) approved. Starting from wall thickness > 3,0 mm with welding-seam preparation by 30° bevelled ends acc. to DIN EN ISO 9692-1.

ATTENTION: Seamless carrier pipes only available in traditional production. In continuous production carrier pipes are exclusively welded !

Connection Technology

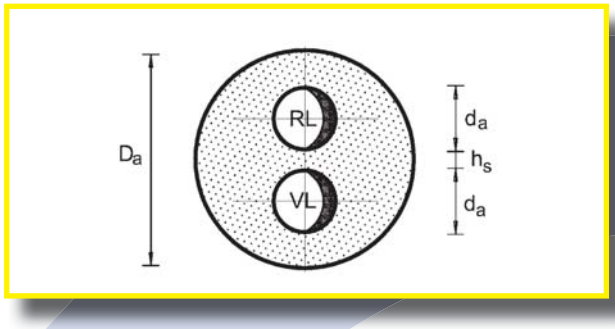
The joints between the steel pipes can be made using the following methods according to DIN ISO 857-1: manual arc welding, gas welding with oxygen-acetylene flame, tungsten inert gas (TIG) or a combination of processes. The testing and evaluation of the quality of the weld is according to AGFW Worksheet FW 446.

Application range

Maximum permissible operating temperature T_{max} :	at the minimum according to EN 253
Maximum permissible spread VL / RL (Δ_T) :	90 K
Maximum permissible operating pressure p_B :	25 bar
Maximum permissible axial tension σ_{max} :	190 N/mm²
Leak detecting:	**IPS-Cu** and **IPS-NiCr**, at continuous production only **IPS-Cu**
Possible liquids:	Heating water as well as other material resistant liquids

Technical data P235 at 20° C					
Property	**Unit**	**Value**	**Property**	**Unit**	**Value**
Volume weight ρ	kg/dm³	7,85	Elastic modulus E	N/mm²	211.800
Tensile stress R_m	N/mm²	360 - 500	Thermal conductivity λ	W/(m•K)	55,2
Yield stress R_e	N/mm²	235	Specific heat capacity c_m	kJ/kg°C	0,46
Wall roughness k	mm	0,02	Thermal expansion coeff. α	K^{-1}	11,3 • 10^{-6}

Double Pipe



Dimensions respectively Types

Disconti

Dimensions Steel Pipe P235					Dimensions Jacket Pipe PEHD												Clear Pipe-distance h_s in mm	Weight **G** without water in kg/m (**s** according to **isoplus**)		
Type	Nominal Diameter / Dimension in		Outside-Ø d_a in mm	Wall-thick-ness acc. to **isoplus** **s** in mm	Wall-thick-ness acc. to EN 253 **s** in mm	PEHD-Jacket Pipe Outside-Ø • Wall Thickness D_a • **s** in mm												Insulation Class		
						Insulation Class / Delivery Length **L** in m														
	DN	**Inch**				**Standard**	6	12	16	**1x reinf.**	6	12	16	**2x reinf.**	6	12	16		**Stand.**	**1x rf.**	**2x rf.**
DRD-20	**20**	3/4“	2 • 26,9	2,6	2,0	125 • 3,0	√	-	-	140 • 3,0	√	-	-	160 • 3,0	√	-	-	19	5,32	5,70	6,24
DRD-25	**25**	1“	2 • 33,7	3,2	2,3	140 • 3,0	√	√	-	160 • 3,0	√	√	-	180 • 3,0	√	√	-	19	7,03	7,57	8,16
DRD-32	**32**	1¼“	2 • 42,4	3,2	2,6	160 • 3,0	√	√	-	180 • 3,0	√	√	-	200 • 3,2	√	√	-	19	8,86	9,45	10,20
DRD-40	**40**	1½“	2 • 48,3	3,2	2,6	160 • 3,0	√	√	-	180 • 3,0	√	√	-	200 • 3,2	√	√	-	19	9,72	10,31	11,06
DRD-50	**50**	2“	2 • 60,3	3,2	2,9	200 • 3,2	√	√	-	225 • 3,4	√	√	-	250 • 3,6	√	√	-	20	12,79	13,80	14,91
DRD-65	**65**	2½“	2 • 76,1	3,2	2,9	225 • 3,4	√	√	-	250 • 3,6	√	√	-	280 • 3,9	√	√	-	20	16,02	17,13	18,65
DRD-80	**80**	3“	2 • 88,9	3,2	3,2	250 • 3,6	√	√	-	280 • 3,9	√	√	-	315 • 4,1	√	√	-	25	18,88	20,40	22,25
DRD-100	**100**	4“	2 • 114,3	3,6	3,6	315 • 4,1	√	√	√	355 • 4,5	√	√	√	400 • 4,8	√	√	√	25	27,73	30,24	33,25
DRD-125	**125**	5“	2 • 139,7	3,6	3,6	400 • 4,8	√	√	√	450 • 5,2	√	√	√	500 • 5,6	√	√	√	30	36,95	40,76	44,99
DRD-150	**150**	6“	2 • 168,3	4,0	4,0	450 • 5,2	√	√	√	500 • 5,6	√	√	√	560 • 6,0	√	√	√	40	47,90	52,13	58,54
DRD-200	**200**	8“	2 • 219,1	4,5	4,5	560 • 6,0	√	√	√	630 • 6,6	√	√	√	-	-	-	-	45	70,39	77,78	-

Conti

Dimensions Steel Pipe P235						Dimensions Jacket Pipe PEHD										Clear Pipe-distance h_s in mm	Weight **G** without water in kg/m (**s** according to **isoplus**)	
Type	Nominal Diameter / Dimension in		Outside-Ø d_a in mm	Wall thickness acc. to **isoplus** **s** in mm	Wall thickness acc. to EN 253 **s** in mm	PEHD-Jacket Pipe Outside-Ø • Wall Thickness D_a • **s** in mm											Insulation Class	
						Insulation Class / Delivery Length **L** in m												
	DN	**Inches**				**1x reinf.**	6	12	16	**2x reinf.**	6	12	16				**1x reinf.**	**2x reinf.**
KRD-25	**25**	1“	2 • 33,7	3,2	2,3	160 • 3,0	-	√	-	180 • 3,0	-	√	-		19		7,40	7,94
KRD-32	**32**	1¼“	2 • 42,4	3,2	2,6	180 • 3,0	-	√	-	200 • 3,2	-	√	-		19		9,24	9,93
KRD-40	**40**	1½“	2 • 48,3	3,2	2,6	180 • 3,0	-	√	-	200 • 3,2	-	√	-		19		10,11	10,80
KRD-50	**50**	2“	2 • 60,3	3,2	2,9	225 • 3,4	-	√	-	250 • 3,6	-	√	-		20		13,48	14,50
KRD-65	**65**	2½“	2 • 76,1	3,2	2,9	250 • 3,6	-	√	-	280 • 3,9	-	√	-		20		16,76	18,16
KRD-80	**80**	3“	2 • 88,9	3,2	3,2	280 • 3,9	-	√	-	315 • 4,1	-	√	-		25		19,94	21,64
KRD-100	**100**	4“	2 • 114,3	3,6	3,6	355 • 4,5	-	√	√	-	-	-	-		25		29,51	-

For nominal diameters DN 25 to DN 65 isoplus provides only steel pipes and fittings with wall thickness of 3,2 mm! This is also to observe in comparison with competitors.

Length of bare steel pipe ends 220mm ± 10mm. Wall thickness jacket pipe **isoplus** according to EN 253, Wall thickness carrier pipe **isoplus** according to AGFW FW 401. The mentioned steel wall thicknesses are corresponding with the standard wall thicknesses of **isoplus**, which are generally calculated against inside pressure [p] acc. to DIN 2413. The mentioned weights are valid for steel wall thicknesses acc. to **isoplus**, material density [ρ] P235 = Ø 7,85 kg/dm³, PUR-Foam = Ø 0,07 kg/dm³ (Disconti) resp. ∅ 0,065 kg/dm³ (Konti), PEHD = Ø 0,95 kg/dm³. In the tubular rod may be auxiliary webs due to the production but these have no pipe-static function (Note at electrothermical bias). In order to improve and to follow the technical development we will reserve technical modifications of the values mentioned in the table.

Energy

Thermal Transmission Coefficient [u] and Heat Loss [q]

Type	Jacket-Pipe Outside-Ø D_a in mm			Coefficient u_{DRD} in W/(m•K)			q at Average Temperature T_M = 100 °C in W/m			q at Average Temperature T_M = 80 °C in W/m			q at Average Temperature T_M = 60 °C in W/m		
	Insulation Class			Insulation Class			Insulation Class			Insulation Class			Insulation Class		
	Stand.	1x rf.	2x rf.	Stand.	1x rf.	2x rf.	Stand.	1x rf.	2x rf.	Stand.	1x rf.	2x rf.	Stand.	1x rf.	2x rf.
DRD - 20	125	140	160	0,1830	0,1608	0,1423	16,472	14,474	12,808	12,812	11,257	9,961	9,151	8,041	7,115
DRD - 25	140	160	180	0,1981	0,1700	0,1516	17,828	15,299	13,641	13,866	11,899	10,610	9,905	8,500	7,578
DRD - 32	160	180	200	0,2154	0,1856	0,1661	19,387	16,708	14,949	15,079	12,995	11,627	10,771	9,282	8,305
DRD - 40	160	180	200	0,2573	0,2144	0,1882	23,154	19,296	16,935	18,009	15,008	13,171	12,863	10,720	9,408
DRD - 50	200	225	250	0,2495	0,2076	0,1833	22,454	18,686	16,494	17,464	14,534	12,829	12,475	10,381	9,163
DRD - 65	225	250	280	0,2923	0,2430	0,2074	26,311	21,868	18,665	20,464	17,008	14,517	14,617	12,149	10,370
DRD - 80	250	280	315	0,3343	0,2653	0,2199	30,087	23,874	19,792	23,401	18,569	15,394	16,715	13,264	10,995
DRD - 100	315	355	400	0,3348	0,2635	0,2197	30,130	23,716	19,769	23,435	18,446	15,376	16,739	13,176	10,983
DRD - 125	400	450	500	0,3100	0,2488	0,2126	27,899	22,388	19,135	21,699	17,413	14,883	15,499	12,438	10,631
DRD - 150	450	500	560	0,3763	0,2914	0,2379	33,866	26,228	21,413	26,340	20,399	16,654	18,815	14,571	11,896
DRD - 200	560	630	-	0,4115	0,3037	-	37,033	27,330	-	28,803	21,256	-	20,574	15,183	-

Heat Loss Comparison Double- to Single-Pipe, T_M = 80 °C

Double-Pipe - Standard Insul.			2x Single-Pipe - Standard Insulation				2x Single-Pipe - 1x reinforced Insul.			
DN / D_a	u_{DRD} in W/(m•K)	q_{DRD} in W/m	DN / D_a	u_{DRE} in W/(m•K)	q_{DRE} in W/m	Saving in %	DN / D_a	u_{DRE} in W/(m•K)	q_{DRE} in W/m	Saving in %
20 / 125	0,1830	12,812	20 / 90	0,2590	18,132	29,34	20 / 110	0,2228	15,599	17,87
25 / 140	0,1981	13,866	25 / 90	0,3128	21,899	36,68	25 / 110	0,2616	18,309	24,26
32 / 160	0,2154	15,079	32 / 110	0,3178	22,248	32,22	32 / 125	0,2839	19,875	24,13
40 / 160	0,2573	18,009	40 / 110	0,3620	25,341	28,93	40 / 125	0,3187	22,307	19,27
50 / 200	0,2495	17,464	50 / 125	0,4026	28,180	38,03	50 / 140	0,3526	24,679	29,23
65 / 225	0,2923	20,464	65 / 140	0,4650	32,550	37,13	65 / 160	0,3959	27,714	26,16
80 / 250	0,3343	23,401	80 / 160	0,4837	33,857	30,88	80 / 180	0,4152	29,065	19,49
100 / 315	0,3348	23,435	100 / 200	0,5085	35,597	34,17	100 / 225	0,4297	30,077	22,09
125 / 400	0,3100	21,699	125 / 225	0,5761	40,325	46,19	125 / 250	0,4918	34,428	36,97
150 / 450	0,3763	26,340	150 / 250	0,6737	47,161	44,15	150 / 280	0,5589	39,123	32,67
200 / 560	0,4115	28,803	200 / 315	0,7372	51,607	44,19	200 / 355	0,5906	41,339	30,32

Double-Pipe - 1x reinforced Insul.			2x Single-Pipe - 1x reinforced Insulation				2x Single-Pipe - 2x reinforced Insul.			
DN / D_a	u_{DRD} in W/(m•K)	q_{DRD} in W/m	DN / D_a	u_{DRE} in W/(m•K)	q_{DRE} in W/m	Saving in %	DN / D_a	u_{DRE} in W/(m•K)	q_{DRE} in W/m	Saving in %
20 / 140	0,1608	11,257	20 / 110	0,2228	15,599	27,83	20 / 125	0,2056	14,394	21,79
25 / 160	0,1700	11,899	25 / 110	0,2616	18,309	35,01	25 / 125	0,2382	16,671	28,62
32 / 180	0,1856	12,995	32 / 125	0,2839	19,875	34,61	32 / 140	0,2581	18,067	28,07
40 / 180	0,2144	15,008	40 / 125	0,3187	22,307	32,72	40 / 140	0,2865	20,054	25,16
50 / 225	0,2076	14,534	50 / 140	0,3526	24,679	41,11	50 / 160	0,3114	21,795	33,32
65 / 250	0,2430	17,008	65 / 160	0,3959	27,714	38,63	65 / 180	0,3488	24,419	30,35
80 / 280	0,2653	18,569	80 / 180	0,4152	29,065	36,11	80 / 200	0,3694	25,857	28,19
100 / 355	0,2635	18,446	100 / 225	0,4297	30,077	38,67	100 / 250	0,3810	26,670	30,84
125 / 450	0,2488	17,413	125 / 250	0,4918	34,428	49,42	125 / 280	0,4277	29,938	41,84
150 / 500	0,2914	20,399	150 / 280	0,5589	39,123	47,86	150 / 315	0,4686	32,805	37,82
200 / 630	0,3037	21,256	200 / 355	0,5906	41,339	48,58	200 / 400	0,4943	34,604	38,57

Double-Pipe - 2x reinforced Insul.			2x Single-Pipe - 2x reinforced Insul.			
DN / D_a	u_{DRD} in W/(m•K)	q_{DRD} in W/m	DN / D_a	u_{DRE} in W/(m•K)	q_{DRE} in W/m	Saving in %
20 / 160	0,1423	9,961	20 / 125	0,2056	14,394	30,79
25 / 180	0,1516	10,610	25 / 125	0,2382	16,671	36,36
32 / 200	0,1661	11,627	32 / 140	0,2581	18,067	35,64
40 / 200	0,1882	13,171	40 / 140	0,2865	20,054	34,32
50 / 250	0,1833	12,829	50 / 160	0,3114	21,795	41,14
65 / 280	0,2074	14,517	65 / 180	0,3488	24,419	40,55
80 / 315	0,2199	15,394	80 / 200	0,3694	25,857	40,47
100 / 400	0,2197	15,376	100 / 250	0,3810	26,670	42,35
125 / 500	0,2126	14,883	125 / 280	0,4277	29,938	50,29
150 / 560	0,2379	16,654	150 / 315	0,4686	32,805	49,23

The mentioned data are based on a covering height [ÜH] of 0,80 m, a thermal conductivity of soil [λ_E] of 1,0 W/(m•K), a soil temperature [T_E] of 10 °C and pipe distances from the Single-Pipe correspond to the minimum assembly distance [M], see page 7.
$T_M = (T_{VL} + T_{RL}) : 2$

Example: (100 °C + 60 °C) : 2 = 80 °C

All values are based on a thermal conductivity of polyurethane foam λ_{50} = 0,027 W/(m•K).

Discontinuous Production

Thermal Transmission Coefficient [u] and Heat Loss [q]

Type	Jacket-Pipe Outside-Ø D_a in mm		Coefficient u_{KRD} in W/(m•K)		**q** at Average Temperature T_M = 100 °C in W/m		**q** at Average Temperature T_M = 80 °C in W/m		**q** at Average Temperature T_M = 60 °C in W/m	
	Insulation Class		Insulation Class		Insulation Class		Insulation Class		Insulation Class	
	1x reinforced	2x reinforced	1x reinforced	2x reinforced	1x reinforced	2x reinforced	1x reinforced	2x reinforced	1x reinforced	2x reinforced
KRD - 25	160	180	0,1526	0,1359	13,734	12,228	10,682	9,511	7,630	6,793
KRD - 32	180	200	0,1667	0,1490	15,007	13,408	11,672	10,429	8,337	7,449
KRD - 40	180	200	0,1929	0,1690	17,360	15,207	13,502	11,828	9,645	8,449
KRD - 50	225	250	0,1866	0,1644	16,791	14,798	13,060	11,509	9,329	8,221
KRD - 65	250	280	0,2187	0,1862	19,681	16,760	15,307	13,036	10,934	9,311
KRD - 80	280	315	0,2389	0,1975	21,503	17,776	16,725	13,826	11,946	9,876
KRD - 100	355	-	0,2371	-	21,338	-	16,596	-	11,854	-

Heat Loss Comparison Double- to Single-Pipe, T_M = 80 °C

Double-Pipe - 1x reinforced Insul.			2x Single-Pipe - 1x reinforced Insul.				2x Single-Pipe - 2x reinforced Insul.			
DN / D_a	u_{KRD} in W/(m•K)	q_{KRD} in W/m	**DN / D_a**	u_{KRE} in W/(m•K)	q_{KRE} in W/m	Saving in %	**DN / D_a**	u_{KRE} in W/(m•K)	q_{KRE} in W/m	Saving in %
25 / 160	0,1526	10,682	**25 / 110**	0,2355	16,488	**35,21**	**25 / 125**	0,2141	14,990	**28,74**
32 / 180	0,1667	11,672	**32 / 125**	0,2559	17,910	**34,83**	**32 / 140**	0,2322	16,254	**28,19**
40 / 180	0,1929	13,502	**40 / 125**	0,2877	20,136	**32,94**	**40 / 140**	0,2581	18,066	**25,26**
50 / 225	0,1866	13,060	**50 / 140**	0,3186	22,302	**41,44**	**50 / 160**	0,2806	19,640	**33,50**
65 / 250	0,2187	15,307	**65 / 160**	0,3581	25,067	**38,93**	**65 / 180**	0,3147	22,029	**30,51**
80 / 280	0,2389	16,725	**80 / 180**	0,3756	26,295	**36,40**	**80 / 200**	0,3334	23,337	**28,33**
100 / 355	0,2371	16,596	**100 / 225**	0,3885	27,196	**38,98**	**100 / 250**	0,3437	24,057	**31,01**

Double-Pipe - 2x reinforced Insul.			2x Single-Pipe - 2x reinforced Insul.			
DN / D_a	u_{KRD} in W/(m•K)	q_{KRD} in W/m	**DN / D_a**	u_{KRE} in W/(m•K)	q_{KRE} in W/m	Saving in %
25 / 180	0,1359	9,511	**25 / 125**	0,2141	14,990	**36,55**
32 / 200	0,1490	10,429	**32 / 140**	0,2322	16,254	**35,84**
40 / 200	0,1690	11,828	**40 / 140**	0,2581	18,066	**34,53**
50 / 250	0,1644	11,509	**50 / 160**	0,2806	19,640	**41,40**
65 / 280	0,1862	13,036	**65 / 180**	0,3147	22,029	**40,82**
80 / 315	0,1975	13,826	**80 / 200**	0,3334	23,337	**40,76**

The mentioned data are based on a covering height [ÜH] of 0,80 m, a thermal conductivity of soil [λ_E] of 1,0 W/(m•K), a soil temperature [T_E] of 10 °C and pipe distances from the Single-Pipe correspond to the minimum assembly distance [M], see following page.

$T_M = (T_{VL} + T_{RL}) : 2$ => Example: (100 °C + 60 °C) : 2 = 80 °C

All values are based on a thermal conductivity of polyurethane foam λ_{50} = 0,024 W/(m•K).

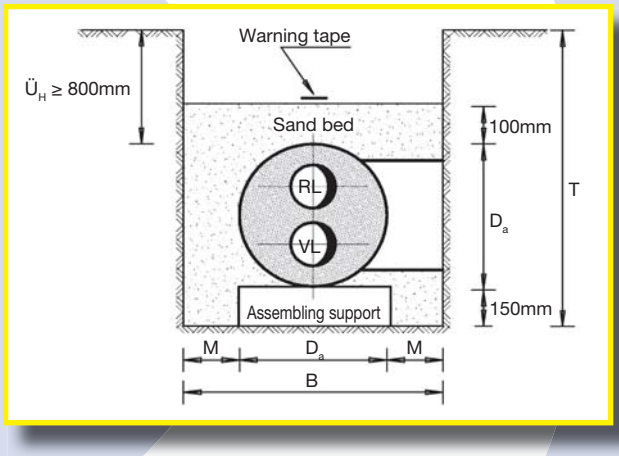
Technics

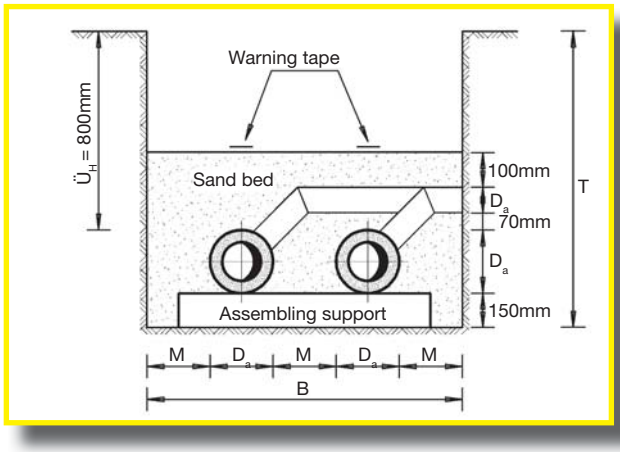
Transmittable Capacity [P]

Type	Volume Flow V´ in m³/h		Flow Speed w in m/s		Transmittable Capacity P in kW at spread					
					20 K		30 K		40 K	
	from	to	from	to	from	to	from	to	from	to
DN 20	0,703	1,547	0,50	1,10	16	36	25	54	33	72
DN 25	1,148	2,526	0,50	1,10	27	59	40	88	53	118
DN 32	2,348	4,695	0,60	1,20	55	109	82	164	109	218
DN 40	3,151	6,303	0,60	1,20	73	147	110	220	147	293
DN 50	5,879	11,757	0,70	1,40	137	273	205	410	273	547
DN 65	9,781	19,563	0,70	1,40	228	455	341	683	455	910
DN 80	15,395	30,791	0,80	1,60	358	716	537	1.074	716	1.432
DN 100	25,945	51,891	0,80	1,60	604	1.207	905	1.811	1.207	2.414
DN 125	49,639	89,350	1,00	1,80	1.155	2.078	1.732	3.118	2.309	4.157
DN 150	87,185	152,573	1,20	2,10	2.028	3.549	3.042	5.324	4.056	7.098
DN 200	174,732	299,541	1,40	2,40	4.064	6.968	6.097	10.451	8.129	13.935

All data are based on an average specific thermal capacity [c_m] of the water of 4.187 J/(kg•K). The flow speed [w] has generally to be determined on dependence of application.

Comparison Trench Excavation - Double standard / Single reinforced





Type	Double-Pipe - Standard Insulation					2x Single-Pipe - 1x reinforced Insul.					Saving
	PEHD-Ø D_a in mm	Trench Dimension				PEHD-Ø D_a in mm	Trench Dimension				
		Distance M in mm	Depth T in m	Width B in m	Area A in m²		Distance M in mm	Depth T in m	Width B in m	Area A in m²	< in %
DN 20	125	150	1,075	0,425	0,457	110	150	1,060	0,670	0,710	**35,67**
DN 25	140	150	1,090	0,440	0,480	110	150	1,060	0,670	0,710	**32,47**
DN 32	160	150	1,110	0,460	0,511	125	150	1,075	0,700	0,753	**32,15**
DN 40	160	150	1,110	0,460	0,511	125	150	1,075	0,700	0,753	**32,15**
DN 50	200	150	1,150	0,500	0,575	140	150	1,090	0,730	0,796	**27,74**
DN 65	225	200	1,175	0,625	0,734	160	200	1,110	0,920	1,021	**28,09**
DN 80	250	200	1,200	0,650	0,780	180	200	1,130	0,960	1,085	**28,10**
DN 100	315	200	1,265	0,715	0,904	225	200	1,175	1,050	1,234	**26,69**
DN 125	400	200	1,350	0,800	1,080	250	200	1,200	1,100	1,320	**18,18**
DN 150	450	300	1,400	1,050	1,470	280	300	1,230	1,460	1,796	**18,14**
DN 200	560	300	1,510	1,160	1,752	355	300	1,305	1,610	2,101	**16,63**

The values are based on a covering height [ÜH] of 0,80 m, a sand-bed of 0,10 m, a assembling support of 0,15 m as well as on a trench excavation without escarp and side slope.
The soil-width [B] is calculated from jacket-pipe-diameter [D_a] and the minimum assembling distance [M] depending from dimension.

Double-Pipe

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