POLYETHYLENE (PE) SYSTEMS

PE 100 and PE 100-RC

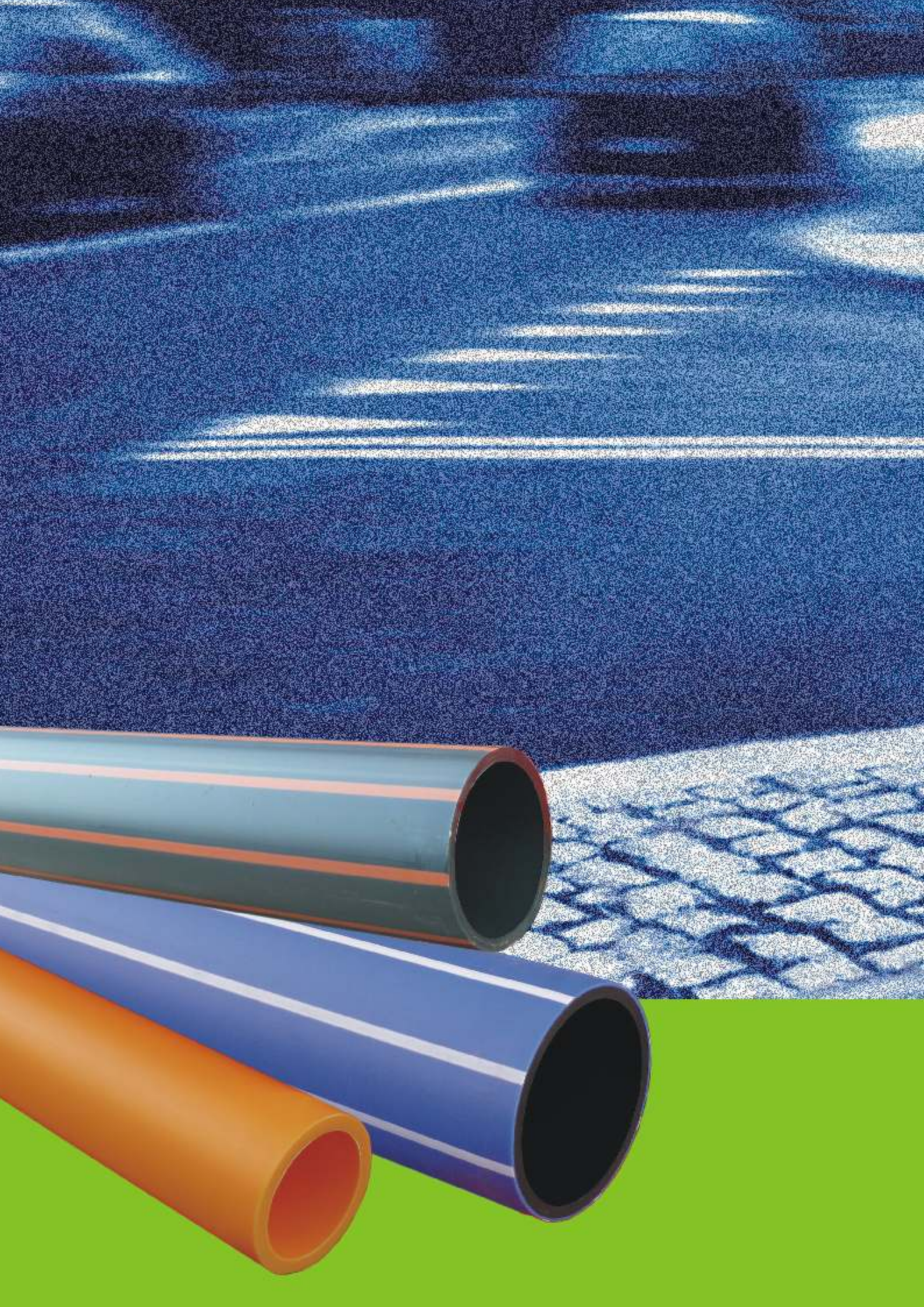
FOR INSTALLING PRESSURE WATER SUPPLY, SEWAGE AND GAS SUPPLY NETWORKS

ecological solutions

ISO 14001

ISO 9001

Kaczmarek



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Introduction

Share of plastics in newly built network systems of underground infrastructure has been growing – a more and more number of investors appreciates advantages of pipelines made in plastics technology. The most important ones are: water tightness, fastness, reliability and easiness for assembly and relatively low costs of manufacturing. A real quality and a durability of a specific pipeline depend on the quality of used materials, the quality of assembly works and the conditions of usage of that pipeline.

In order to support the contractors in elevating the quality of their assembly works, the Installation Instructions of polyethylene pipelines have been developed, the recommendations of which should be applied during the erection of pipelines made by KACZMAREK Malewo spółka jawna.

More and more common is to aim to increase the efficiency of laying out the pipes in the ground and to minimise the costs connected with these operations and difficulties for the road traffic. It manifests by widening the use of the excavation-free and narrow-trench techniques and giving up bedding haunching with sand in the conventional method of pipe laying in trenches. To avoid shorting the operation lifetime of pipes installed in such way, it is useful to apply the pipes of elevated scratching and puncture resistance. Making efforts to meet the market expectations, we offer you two-layer and three-layer pipes of increased strength: "TYTAN".

Technical Information

To manufacture pipes and segmental pipe fittings a high density polyethylene is used (marked with the abbreviation HDPE). This is a material that perfectly works in many piping applications. It is distinguished by high strength to impact loads that can be present at the stage of laying out the pipes, as well as a wide range of working temperatures, which allows to conduct the construction works at every season of the year.
Polyethylene is extremely chemically resistant to the most of chemical compounds. Some of chemicals, such as decahydronaphthalenes, aromatic hydrocarbons or halogen derivatives solve polyethylene in higher temperatures. Chemical decomposition of polyethylene proceeds as a result of the activity of strongly oxidising agents such as fuming sulphuric acid or nitric acid. Further details can be found in tables of chemical resistance of polyethylene. Please do not hesitate to contact us in case of any questions.

		PE HD 100	PE HD 100-RC
Density	ISO 1183	950 kg/m^3	950 kg/m^3
Modulus of elasticity (momentary value)	ISO 527-2	1100 MPa	1100 MPa
Tensile strength at yield	ISO 527-2	25 MPa	25 MPa
Elongation at break	ISO 527-2	> 600 %	> 600 %
Oxidative-induction time OIT (200°C)	EN 728	> 20 min	> 20 min
Resistance to slow crack growth (9.2bar, 80°C)	ISO 13479	> 1000 h	> 8760 h
Shore hardness (Shore's scale D)	ISO 868	> 65	> 65

Method of manufacture

The subject matter of these instructions are one-layer pipes made of polyethylene PE 100 and one-layer or two-layer ones of type TYTAN PE/PP and TYTAN PE/PP made of polyethylene PE 100-RC and polypropylene (PP) intended for pressure pipelines (water supply systems, gas fuels, pressurised and suction sewage pipelines) gravity systems (sanitary sewerage, drainage systems), as well as to make pipe culverts under road embankments laid underground along the roadway.

Polyethylene pipe PE 100, PE 100-RC (Type 1) – acc. to PAS 1075

One-layer pipes of solid walls made of polyethylene PE
- within the scope of outer diameters: 25 mm to 800 mm, of standard dimension ratios SDR 26; 21; 17; 13.6; 11; 9 acc. to the standard PN-EN 12201-2:2011
- within the scope of outer diameters: 25 mm to 630 mm, of standard dimension ratios SDR 17 and SDR 11 acc. to the standard PN-EN 1555-2:2012.

Polyethylene pipe PE 100-RC (Type 2) – acc. to PAS 1075

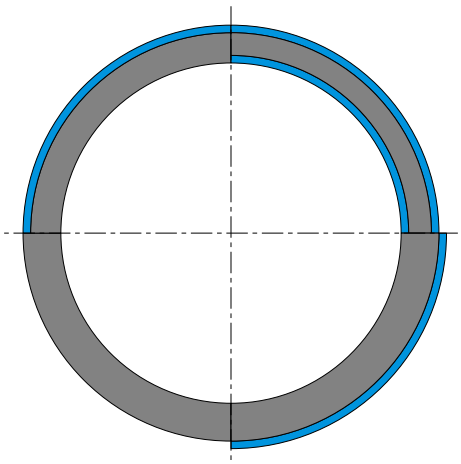
Two-layer or three-layer TYTAN PE/PE pipes are manufactured of PE type 100-RC of elevated resistance to slow crack growth and to stress corrosion.
Pipes TYTAN PE/PE are of the wall structure of two or three layers. The inner, basic layer is extruded of polyethylene, class PE 100-RC, and the outer layer that comprises approx. 10% of pipe wall thickness, is also extruded of polyethylene PE 100-RC. Both layers are molecularly bonded by co-extrusion, which gives a solid structure of pipe wall:
- within the scope of outer diameters: 75 mm to 500 mm, of standard dimension ratios SDR 17; SDR 11 acc. to the standard PN-EN 12201-2:2011;
- within the scope of outer diameters: 75 mm to 500 mm, of standard dimension ratios SDR 17 and SDR 11 acc. to the standard PN-EN 1555-2:2012.

Polyethylene pipe PE 100-RC with an additional outer protection layer made of PP (Type 3) – acc. to PAS 1075

Pipes TYTAN PE/PE are of two-layer wall structure. The inner layer makes a basic pipe extruded of polyethylene, class PE 100-RC, whereas the outer layer (top cover) is a pipe made of polypropylene PP co-extruded on a processing line together with the basic pipe. Both layers, thanks to co-extrusion, are molecularly bonded by co-extrusion, which gives a solid structure of pipe wall.
- within the scope of outer diameters: 75 mm to 500 mm, of standard dimension ratios SDR 17 and SDR 11 acc. to the standard PN-EN 12201-2:2011;
- within the scope of outer diameters: 75 mm to 500 mm, of standard dimension ratios SDR 17 and SDR 11 acc. to the standard PN-EN 1555-2:2012.

TYPE 2
Pipes made of polyethylene
TYTAN PE/PE; PE 100-RC
double layered
scope of diameters DN 32 - DN 500
series SDR 17; 11

TYPE 1
Pipes made of polyethylene
PE 100; PE 100-RC
single layered
scope of diameters DN 20 - DN 800
series SDR 33; 26; 21; 17; 13,6; 11; 9



TYPE 2
Pipes made of polyethylene
TYTAN 3PE; PE 100-RC
triple layered
scope of diameters DN 32 - DN 250
series SDR 17; 11

TYPE 3
Pipes made of polyethylene
TYTAN PE/PP; PE 100-RC / PP
double layered
scope of diameters DN 75 - DN 500
series SDR 17; 11

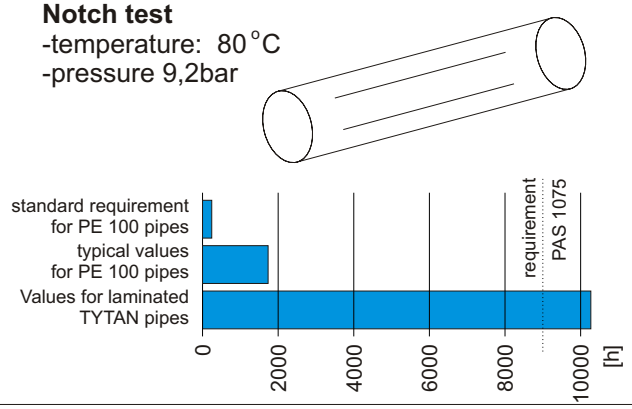
Characteristics of pipes TYTAN made of PE 100-RC

The research on TYTAN pipes made in the institute HESSEL Ingenieurtechnik GmbH and in the Oil and Gas Institute in Kraków confirm that their resistance to the effects of tight cracks and point loading that may be formed as a result of laying out the grid in native ground without the use of bedding or haunching and during the assembly or renovation of pipe systems using conventional and trenchless methods.
The characteristics of the research carried out is in compliance with the requirements of specification PAS 1075:2009-04 – Pipes made from polyethylene (PE100-RC) for alternative installation techniques. Technical requirements and testing (PAS – Publicly Available Specification)
A basis material for manufacturing pipes TYTAN PE, TYTAN PE/PE, TYTAN PE/PP is polyethylene PE 100-RC of the trade name BorSafeTM HE3490-LS-H, ELTEXTUB 121N6000, XRC20B, Vestolen A Rely 5922R, Hostalen CRP100 RESIST CR black, characterised of the elevated resistance to slow crack growth and point load. The outer protection layer of pipes TYTAN PE/PP is made of polypropylene PP.

Resistance to slow crack growth (Notch Test)

Notch test acc. to PN EN ISO 13479 is a pressure test carried out on a specimen of pipe notched on its surface, submersed in water and exposed to hydrostatic pressure (80°C; 9.2bar).
The notch test allows to state the resistance of tested pipe toslow crack growth.
Pipes "TYTAN" meet the requirements – the result >8760 hours (TYTAN >10,000 h).

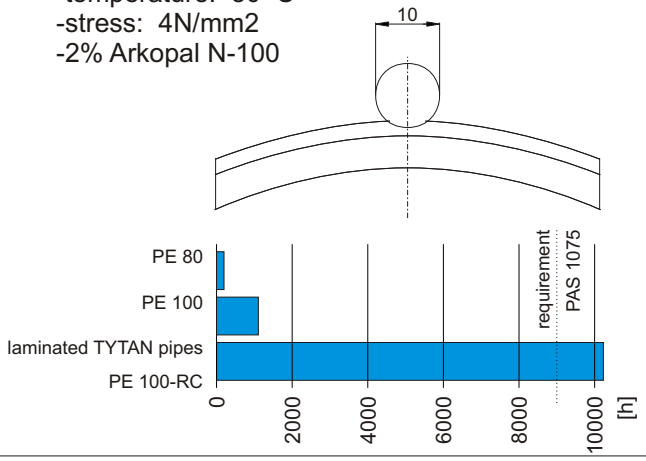
Notch test
-temperature: 80°C
-pressure 9,2bar



Resistance to point loads (PLT - Point Loading Test)

PLT ball test acc. to Dr. Hessel that is in other words the resistance to slow crack growth of pipe systems with outer point loadings, can be determined in the point loading test (PLT). "TYTAN" pipes were tested with PLT. "TYTAN" pipes meet the requirements – the result >8760 hours (4 N/mm^2; 80°C; 2% Arkopal N-100) as it has been published in suitable literature concerning laying PE pipes with no sand bedding and haunching; PAS 1075 (TYTAN > 10 000 h).

Point loading test (PLT) of Dr. Hessel
-temperature: 80°C
-stress: 4N/mm2
-2% Arkopal N-100

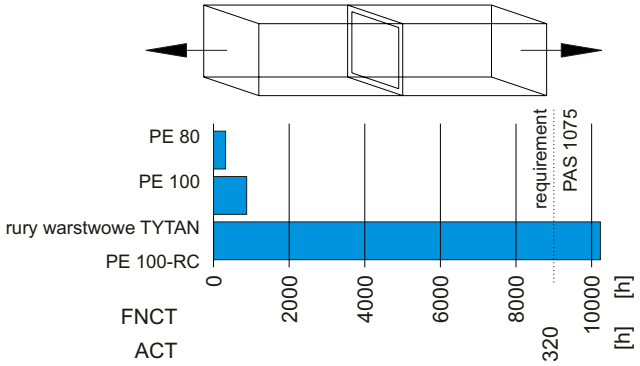


FNCT test (Full Notch Creep Test) / ACT

The FNCT test is carried out on a cut sample taken from a pipe in order to manifest its resistance to the effect of surrounding environment. To determine the resistance of TYTAN PE pipe to the slow crack growth in the full notch creep test (the FNCT test with the use of ACT procedure), have been submitted this test acc. to ISO 16770; PN-EN 12814-3 with the use of water solution NM5 in temperature 90°C; the load of 4 N/mm^2. The correlation between FNCT (4 N/mm^2; 80°C; 2% Arkopal N-100) and ACT procedure is: 320h ACT=8760h FNCT. "TYTAN PE" pipes meet requirements PAS 1075- the test >320 hours (TYTAN >849 h).

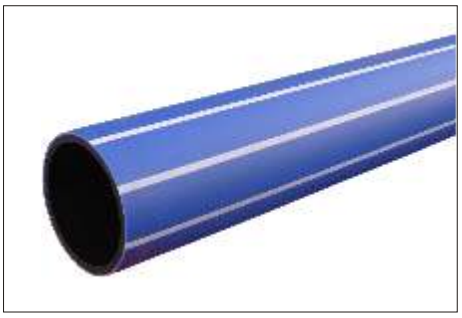
FNCT Test
-temperature: 80°C
-stress: 4N/mm2
-2% Arkopal N-100

ACT Test
-temperature: 90°C
-stress: 4N/mm2
-NM 5



Intended use

The offer applies to the pipeline systems made of polyethylene (PE 100, PE 100-RC), buried in soil and laid out over the ground intended for:
- transport potable water;
- water before its purification,
- pressure systems for stormwater and sewage systems,
- suction sewerage systems,
- water for other purposes.



Standards, approvals, attestations

PN-EN 12201-2:2012 Plastics piping systems for water supply and for drainage and sewerage under pressure – Polyethylene (PE) – Part 2: Pipes

PN-EN 12201-3:2012 Plastics piping systems for water supply and for drainage and sewerage under pressure — Polyethylene (PE) – Part 3: Fittings

Technical Approval AT/2009-03-2465 Pipes and fittings made of polyethylene (PE) and pipes TYTAN PE/PE, TYTAN PE/PP with a layer made polyethylene (PE) or polypropylene (PP) – issued by the Road and Bridge Research Institute in Warsaw.

Technical approval ITB AT-15-7451/2012 Pipes made of PE 100RC of trade names TYTAN PE, TYTAN PE/PE, TYTAN PLUS PE/PE, TYTAN PE/PP and TYTAN PLUS PE/PP for water supply and sewerage pipelines under pressure.

Technical Approval ITB AT-15-8454/2010 Segmental fittings made of polyethylene PE 80, PE 100 and PE 100 RC for polyethylene water supply and sewerage pipelines under pressure.

Certificate of Compliance with PAS 1075:2009-04 – Pipes made of polyethylene (PE100-RC) TYTAN for alternative pipe-laying techniques – issued by **DIN CERTCO.**

Opinion of Central Mining Institute of 30 June 2008 on the possibilities of the use of laminated pipes and fittings TYTAN PE/PE and PE/PP in the areas with mining effects.

Opinion of Central Mining Institute of 30 June 2008 on the possibilities of the use of pipes segmental fittings made of PE in the areas with mining effects in the installation under pressure for the transport of water.

Sanitary Certificate HK/W/0749/01/2008 Heat sealed PE pipes and fittings issued by National Institute of Public Heath – National Institute of Hygiene (NIPH-NIH) in Warsaw.

Range of products – schedule of supplies

	Nominal pressure PN of pipelines made of PE 100						
	SDR 33 S 16	SDR 26 S 12,5	SDR 21 S 10	SDR 17 S 8	SDR 13,6 S 6,3	SDR 11 S 5	SDR 9 S 4
Water supply pipes C>1,25							
PE 100	PN 5	PN 6	PN 8	PN 10	PN 12,5	PN 16	PN 20
TYTAN PE made of PE 100-RC				PN 10		PN 16	
TYTAN PE/PE made of PE 100-RC				PN 10		PN 16	
TYTAN PE/PP made of PE 100-RC / PP				PN 10		PN 16	
Sewerage pipes C>1,25							
PE 100	PN 5	PN 6	PN 8	PN 10	PN 12,5	PN 16	PN 20
TYTAN PE made of PE 100-RC				PN 10		PN 16	
TYTAN PE/PE made of PE 100-RC				PN 10		PN 16	
TYTAN PE/PP made of PE 100-RC / PP				PN 10		PN 16	

PN – is valid for pipes for water supply and sewerage systems at temperature 20°C

Intended use

The offer applies to the pipeline systems made of polyethylene (PE 100, PE 100-RC), buried in ground, intended for gas fuel piping.

Standards, approvals, attestations

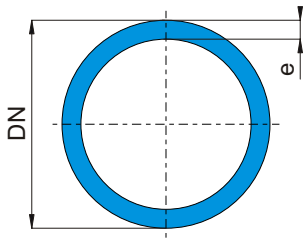
PN-EN 1555-2:2012 Plastics piping systems for gas fuels – Polyethylene (PE) – Part 2: Pipes
PN-EN 1555-3:2012 Plastics piping systems for gaseous fuels – Polyethylene (PE) – Part 3: Fittings
Technical Approval INiG AT/2012-03-05 Laminated polyethylene pipes type TYTAN PE and TYTAN PE/PE, intended for pipage of gaseous fuels
Certificate No. 160/12 entitling to mark the product with a safety symbol, issued by ZETOM Katowice
Certificate of Compliance No. 159/12 with PN-EN 1555-2:2012, issued by ZETOM Katowice
Certificate of Compliance with PAS 1075:2009-04 – Pipes made of polyethylene (PE100-RC) TYTAN for alternative pipe-laying techniques – issued by **DIN CERTCO.**
Opinion of Central Mining Institute of 30 June 2008 on the possibilities of the use of pipes and fittings made of PE80 and PE100 for gaseous fuels transported in the areas with mining effects.
Decision No. M-19-141/3-11 – entitling to manufacture pipes and fittings of PE intended for use to lay out and repair technical appliances subjected to technical inspection, issued by Office of Technical Inspection (UDT).

Range of products – schedule of supplies

	SDR 17 S 8	SDR 11 S 5
Gas pipes C>2,0		
PE 100	PN 6	PN 10
double layered PE 100 / PE 100	PN 6	PN 10
TYTAN PE made of PE 100-RC	PN 6	PN 10
TYTAN PE/PE made of PE 100-RC	PN 6	PN 10
TYTAN PE/PP made of PE 100-RC / PP	PN 6	PN 10

PE HD 100 pipes
for water supply systems

acc. to PN-EN 12201-2



DN/OD	SDR 26 PN 6 e [mm]	weight [kg/m]	index -	SDR 17 PN 10 e [mm]	weight [kg/m]	index -	SDR 11 PN 16 e [mm]	weight [kg/m]	index -
in coils									
32				2,0	0,19	3121248800	3,0	0,28	3121268800
40				2,4	0,29	3121348780	3,7	0,43	3121368780
50				3,0	0,45	3121448760	4,6	0,66	3121468760
63				3,8	0,71	3121548760	5,8	1,05	3121568760
75				4,5	1,01	3121648760	6,8	1,47	3121668760
90				5,4	1,45	3121849740	8,2	2,13	3121869740
110				6,6	2,17	3122049740	10,0	3,17	3122069740
in straight segments									
90	3,5	0,96	3121829540	5,4	1,45	3121849540	8,2	2,13	3121869540
110	4,2	1,41	3122029540	6,6	2,17	3122049540	10,0	3,17	3122069540
125	4,8	1,83	3122129540	7,4	2,80	3122149540	11,4	4,11	3122169540
140	5,4	2,31	3122229540	8,3	3,47	3122249540	12,7	5,13	3122269540
160	6,2	3,03	3122329540	9,5	4,54	3122349540	14,6	6,74	3122369540
180	6,9	3,79	3122429540	10,7	5,75	3122449540	16,4	8,51	3122469540
200	7,7	4,70	3122529540	11,9	7,10	3122549540	18,2	10,50	3122569540
225	8,6	5,91	3122629540	13,4	9,00	3122649540	20,5	13,30	3122669540
250	9,6	7,32	3122729540	14,8	11,04	3122749540	22,7	16,37	3122769540
280	10,7	9,14	3122829540	16,6	13,87	3122849540	25,4	20,52	3122869540
315	12,1	11,63	3122929540	18,7	17,58	3122949540	28,6	25,99	3122969540
355	13,6	14,73	3123029540	21,1	22,35	3123049540	32,2	32,98	3123069540
400	15,3	18,68	3123129540	23,7	28,30	3123149540	36,3	41,89	3123169540
450	17,2	23,62	3123229540	26,7	35,86	3123249540	40,9	53,09	3123269540
500	19,1	29,14	3123329540	29,7	44,32	3123349540	45,4	65,49	3123369540
560	21,4	36,57	3123429540	33,2	55,49	3123449540	50,8	82,08	3123469540
630	24,1	46,33	3123529540	37,4	70,32	3123549540	57,2	103,96	3123569540
710	27,2	58,93	3123629540	42,1	89,22	3123649540	64,5	132,11	3123669540
800	30,6	74,70	3123729540	47,4	113,19	3123749540	72,6	167,56	3123769540

Dimensions:

* dimension referenced to outer diameter DN/OD

diameter DN 32 -110 – coils

diameter DN 90 - 800 – straight segments of standard length – 12 m.

other lengths of pipes at the request

pipes in other dimensional series available at the request

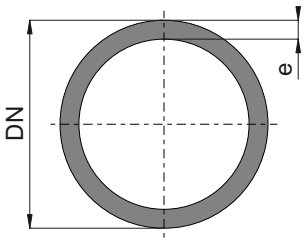
Colour:

diameter DN 32 – 75 – light blue

diameter DN 90 – 800 – black with light blue strips

PE HD 100 pipes
for sewerage systems

acc. to PN-EN 12201-2



DN/OD	SDR 26 PN 6 e [mm]	weight [kg/m]	index -	SDR 17 PN 10 e [mm]	weight [kg/m]	index -	SDR 11 PN 16 e [mm]	weight [kg/m]	index -
in coils									
32				2,0	0,19	3321249800	3,0	0,28	3321269800
40				2,4	0,29	3321349780	3,7	0,43	3321369780
50				3,0	0,45	3321449760	4,6	0,66	3321469760
63				3,8	0,71	3321549760	5,8	1,05	3321569760
75				4,5	1,01	3321649760	6,8	1,47	3321669760
90				5,4	1,45	3321849740	8,2	2,13	3321869740
110				6,6	2,17	3322049740	10,0	3,17	3322069740
in straight segments									
90	3,5	0,96	3321829540	5,4	1,45	3321849540	8,2	2,13	3321869540
110	4,2	1,41	3322029540	6,6	2,17	3322049540	10,0	3,17	3322069540
125	4,8	1,83	3322129540	7,4	2,80	3322149540	11,4	4,11	3322169540
140	5,4	2,31	3322229540	8,3	3,47	3322249540	12,7	5,13	3322269540
160	6,2	3,03	3322329540	9,5	4,54	3322349540	14,6	6,74	3322369540
180	6,9	3,79	3322429540	10,7	5,75	3322449540	16,4	8,51	3322469540
200	7,7	4,70	3322529540	11,9	7,10	3322549540	18,2	10,50	3322569540
225	8,6	5,91	3322629540	13,4	9,00	3322649540	20,5	13,30	3322669540
250	9,6	7,32	3322729540	14,8	11,04	3322749540	22,7	16,37	3322769540
280	10,7	9,14	3322829540	16,6	13,87	3322849540	25,4	20,52	3322869540
315	12,1	11,63	3322929540	18,7	17,58	3322949540	28,6	25,99	3322969540
355	13,6	14,73	3323029540	21,1	22,35	3323049540	32,2	32,98	3323069540
400	15,3	18,68	3323129540	23,7	28,30	3323149540	36,3	41,89	3323169540
450	17,2	23,62	3323229540	26,7	35,86	3323249540	40,9	53,09	3323269540
500	19,1	29,14	3323329540	29,7	44,32	3323349540	45,4	65,49	3323369540
560	21,4	36,57	3323429540	33,2	55,49	3323449540	50,8	82,08	3323469540
630	24,1	46,33	3323529540	37,4	70,32	3323549540	57,2	103,96	3323569540
710	27,2	58,93	3323629540	42,1	89,22	3323649540	64,5	132,11	3323669540
800	30,6	74,70	3323729540	47,4	113,19	3323749540	72,6	167,56	3323769540

Dimensions:

* dimension referenced to outer diameter DN/OD

diameter DN 32 -110 – coils

diameter DN 90 - 800 – straight segments of standard length – 12 m.

other lengths of pipes at the request

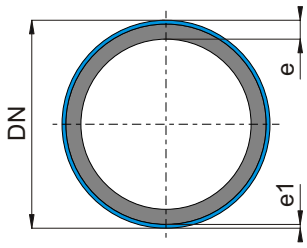
pipes in other dimensional series available at the request

Colour:

diameter DN 32 – 800 – black

PE HD 100-RC pipes
for water supply systems

acc. to PN-EN 12201-2



	SDR 17 PN 10				SDR 11 PN 16			
DN/OD	e [mm]	e1 [mm]	weight [kg/m]	index -	e [mm]	e1 [mm]	weight [kg/m]	index -
in coils								
32	2,0	0,4	0,19	3721248800	3,0	0,6	0,28	3721268800
40	2,4	0,4	0,29	3721348780	3,7	0,6	0,43	3721368780
50	3,0	0,6	0,45	3721448760	4,6	1,0	0,66	3721468760
63	3,8	0,6	0,71	3721548760	5,8	1,2	1,05	3721568760
75	4,5	1,0	1,01	3721648760	6,8	1,5	1,47	3721668760
90	5,4	1,2	1,45	3721848740	8,2	1,5	2,13	3721868740
110	6,6	1,5	2,17	3722048740	10,0	2,0	3,17	3722068740
in straight segments								
90	5,4	1,2	1,45	3721848540	8,2	1,5	2,13	3721868540
110	6,6	1,5	2,17	3722048540	10,0	2,0	3,17	3722068540
125	7,4	1,5	2,80	3722148540	11,4	2,0	4,11	3722168540
140	8,3	1,5	3,47	3722248540	12,7	2,0	5,13	3722268540
160	9,5	2,0	4,54	3722348540	14,6	2,3	6,74	3722368540
180	10,7	2,0	5,75	3722448540	16,4	2,3	8,51	3722468540
200	11,9	2,0	7,10	3722548540	18,2	2,5	10,50	3722568540
225	13,4	2,3	9,00	3722648540	20,5	2,5	13,30	3722668540
250	14,8	2,3	11,04	3722748540	22,7	2,5	16,37	3722768540
280	16,6	2,3	13,87	3722848540	25,4	2,7	20,52	3722868540
315	18,7	2,5	17,58	3722948540	28,6	3,0	25,99	3722968540
355	21,1	2,5	22,35	3723048540	32,2	3,5	32,98	3723068540
400	23,7	2,7	28,30	3723148540	36,3	4,0	41,89	3723168540
450	26,7	2,7	35,86	3723248540	40,9	4,0	53,09	3723268540
500	29,7	3,0	44,32	3723348540	45,4	4,5	65,49	3723368540
560	33,2	3,5	55,49	3713449540	50,8	5,0	82,08	3713469540
630	37,4	4,0	70,32	3713549540	57,2	6,0	103,96	3713569540
710	42,1	4,5	89,22	3713649540	64,5	6,0	132,11	3713669540
800	47,4	5,0	113,19	3713749540	72,6	6,0	167,56	3713769540

Dimensions:

* dimension referenced to outer diameter DN/OD

diameter DN 32 -110 – coils

diameter DN 90 - 800 – straight segments of standard length – 12 m

diameter DN 560 - 800 – one-layer pipes

other lengths of pipes at the request

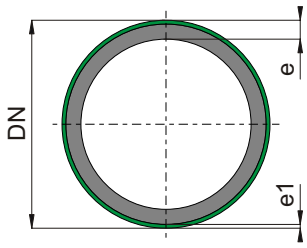
Colour:

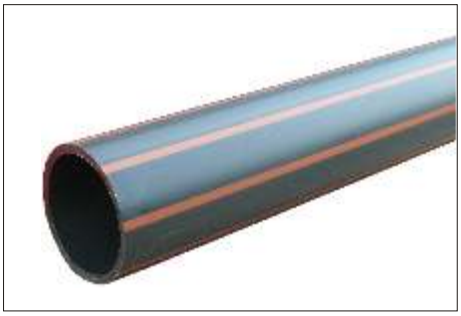
diameter DN 32 - 500 – inner layer: black; outer layer: blue

diameter DN 560 - 800 – black with blue strips

PE HD 100-RC pipes
for sewerage systems

acc. to PN-EN 12201-2





	SDR 17 PN 10				SDR 11 PN 16			
DN/OD	e [mm]	e1 [mm]	weight [kg/m]	index -	e [mm]	e1 [mm]	weight [kg/m]	index -
in coils								
32	2,0	0,4	0,19	3921246800	3,0	0,6	0,28	3921266800
40	2,4	0,4	0,29	3921346780	3,7	0,6	0,43	3921366780
50	3,0	0,6	0,45	3921446760	4,6	1,0	0,66	3921466760
63	3,8	0,6	0,71	3921546760	5,8	1,2	1,05	3921566760
75	4,5	1,0	1,01	3921646760	6,8	1,5	1,47	3921666760
90	5,4	1,2	1,45	3921846740	8,2	1,5	2,13	3921866740
110	6,6	1,5	2,17	3922046740	10,0	2,0	3,17	3922066740
in straight segments								
90	5,4	1,2	1,45	3921846540	8,2	1,5	2,13	3921866540
110	6,6	1,5	2,17	3922046540	10,0	2,0	3,17	3922066540
125	7,4	1,5	2,80	3922146540	11,4	2,0	4,11	3922166540
140	8,3	1,5	3,47	3922246540	12,7	2,0	5,13	3922266540
160	9,5	2,0	4,54	3922346540	14,6	2,3	6,74	3922366540
180	10,7	2,0	5,75	3922446540	16,4	2,3	8,51	3922466540
200	11,9	2,0	7,10	3922546540	18,2	2,5	10,50	3922566540
225	13,4	2,3	9,00	3922646540	20,5	2,5	13,30	3922666540
250	14,8	2,3	11,04	3922746540	22,7	2,5	16,37	3922766540
280	16,6	2,3	13,87	3922846540	25,4	2,7	20,52	3922866540
315	18,7	2,5	17,58	3922946540	28,6	3,0	25,99	3922966540
355	21,1	2,5	22,35	3923046540	32,2	3,5	32,98	3923066540
400	23,7	2,7	28,30	3923146540	36,3	4,0	41,89	3923166540
450	26,7	2,7	35,86	3923246540	40,9	4,0	53,09	3923266540
500	29,7	3,0	44,32	3923346540	45,4	4,5	65,49	3923366540
560	33,2	3,5	55,49	3913449540	50,8	5,0	82,08	3913469540
630	37,4	4,0	70,32	3913549540	57,2	6,0	103,96	3913569540
710	42,1	4,5	89,22	3913649540	64,5	6,0	132,11	3913669540
800	47,4	5,0	113,19	3913749540	72,6	6,0	167,56	3913769540

Dimensions:

* dimension referenced to outer diameter DN/OD

diameter DN 32 -110 – coils

diameter DN 90 - 800 – straight segments of standard length – 12 m

diameter DN 560 - 800 – one-layer pipes

other lengths of pipes at the request

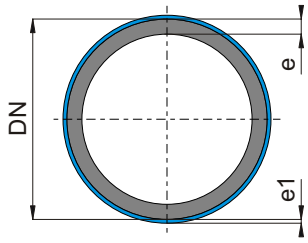
Colour:

diameter DN 32 - 500 – inner layer: black; outer layer: brown

diameter DN 560 - 800 – black with light brown strips

PE HD 100-RC/PP pipes
for water supply systems

acc. to PN-EN 12201-2



	SDR 17 PN 10				SDR 11 PN 16			
DN/OD	e [mm]	e1 [mm]	weight [kg/m]	index -	e [mm]	e1 [mm]	weight [kg/m]	index -
63	3,8	0,8	0,87	3731548540	5,8	0,8	1,21	3731568540
75	4,5	1,0	1,24	3731648540	6,8	1,0	1,70	3731668540
90	5,4	1,2	1,79	3731848540	8,2	1,2	2,46	3731868540
110	6,6	1,5	2,68	3732048540	10,0	1,5	3,69	3732068540
125	7,4	1,5	3,34	3732148540	11,4	1,5	4,69	3732168540
140	8,3	1,5	4,12	3732248540	12,7	1,5	5,78	3732268540
160	9,5	2,0	5,53	3732348540	14,6	2,0	7,73	3732368540
180	10,7	2,0	6,87	3732448540	16,4	2,0	9,63	3732468540
200	11,9	2,0	8,34	3732548540	18,2	2,0	11,74	3732568540
225	13,4	2,3	10,60	3732648540	20,5	2,3	14,91	3732668540
250	14,8	2,3	12,83	3732748540	22,7	2,3	18,15	3732768540
280	16,6	2,3	15,87	3732848540	25,4	2,3	22,51	3732868540
315	18,7	2,5	20,02	3732948540	28,6	2,5	28,43	3732968540
355	21,1	2,5	25,10	3733048540	32,2	2,5	35,73	3733068540
400	23,7	2,7	31,64	3733148540	36,3	2,7	45,23	3733168540
450	26,7	2,7	39,62	3733248540	40,9	2,7	56,85	3733268540
500	29,7	3,0	48,95	3733348540	45,4	3,0	70,12	3733368540

Dimensions:

* dimension referenced to outer diameter DN/OD

diameter DN 63 - 500 – straight segments of standard length – 12 m

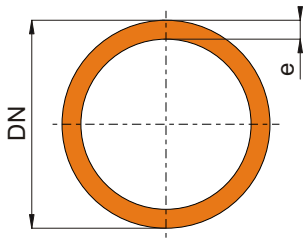
other lengths of pipes at the request

Colour:

diameter DN 63 - 500 – inner layer: black; outer layer: blue

PE HD 100 pipes
for gas systems

acc. to PN-EN 1555-2



	SDR 17			SDR 11		
DN/OD	e [mm]	weight [kg/m]	index -	e [mm]	weight [kg/m]	index -
in coils						
32	2,0	0,19	3521225800	3,0	0,28	3521255800
40	2,4	0,29	3521325780	3,7	0,43	3521355780
50	3,0	0,45	3521425760	4,6	0,66	3521455760
63	3,8	0,71	3521525760	5,8	1,05	3521555760
75	4,5	1,01	3521625760	6,8	1,47	3521655760
90	5,4	1,45	3521825740	8,2	2,13	3521855740
110	6,6	2,17	3522025740	10,0	3,17	3522055740
in straight segments						
90	5,4	1,45	3521825540	8,2	2,13	3521855540
110	6,6	2,17	3522025540	10,0	3,17	3522055540
125	7,4	2,80	3522125540	11,4	4,11	3522155540
140	8,3	3,47	3522225540	12,7	5,13	3522255540
160	9,5	4,54	3522325540	14,6	6,74	3522355540
180	10,7	5,75	3522425540	16,4	8,51	3522455540
200	11,9	7,10	3522525540	18,2	10,50	3522555540
225	13,4	9,00	3522625540	20,5	13,30	3522655540
250	14,8	11,04	3522725540	22,7	16,37	3522755540
280	16,6	13,87	3522825540	25,4	20,52	3522855540
315	18,7	17,58	3522925540	28,6	25,99	3522955540
355	21,1	22,35	3523025540	32,2	32,98	3523055540
400	23,7	28,30	3523125540	36,3	41,89	3523155540
450	26,7	35,86	3523225540	40,9	53,09	3523255540
500	29,7	44,32	3523325540	45,4	65,49	3523355540
560	33,2	55,49	3523425540	50,8	82,08	3523455540
630	37,4	70,32	3523525540	57,2	103,96	3523555540

Dimensions:

* dimension referenced to outer diameter DN/OD

diameter DN 32 - 110 – coils

diameter DN 90 - 630 – straight segments of standard length – 12 m

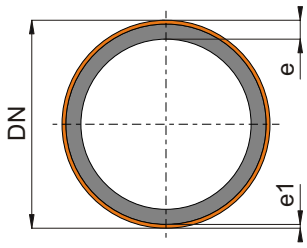
other lengths of pipes at the request

Colour:

diameter DN 32 - 630 – orange

PE HD 100-RC / PE HD 100-RC pipes
for gas systems

acc. to PN-EN 1555-2



DN/OD	SDR 17 e [mm]	weight [kg/m]	index -	SDR 11 e [mm]	weight [kg/m]	index -
in coils						
32	2,0	0,19	4121225800	3,0	0,28	4121255800
40	2,4	0,29	4121325780	3,7	0,43	4121355780
50	3,0	0,45	4121425760	4,6	0,66	4121455760
63	3,8	0,71	4121525760	5,8	1,05	4121555760
75	4,5	1,01	4121625760	6,8	1,47	4121655760
90	5,4	1,45	4121825740	8,2	2,13	4121855740
110	6,6	2,17	4122025740	10,0	3,17	4122055740
in straight segments						
90	5,4	1,45	4121825540	8,2	2,13	4121855540
110	6,6	2,17	4122025540	10,0	3,17	4122055540
125	7,4	2,80	4122125540	11,4	4,11	4122155540
140	8,3	3,47	4122225540	12,7	5,13	4122255540
160	9,5	4,54	4122325540	14,6	6,74	4122355540
180	10,7	5,75	4122425540	16,4	8,51	4122455540
200	11,9	7,10	4122525540	18,2	10,50	4122555540
225	13,4	9,00	4122625540	20,5	13,30	4122655540
250	14,8	11,04	4122725540	22,7	16,37	4122755540
280	16,6	13,87	4122825540	25,4	20,52	4122855540
315	18,7	17,58	4122925540	28,6	25,99	4122955540
355	21,1	22,35	4123025540	32,2	32,98	4123055540
400	23,7	28,30	4123125540	36,3	41,89	4123155540
450	26,7	35,86	4123225540	40,9	53,09	4123255540
500	29,7	44,32	4123325540	45,4	65,49	4123355540
560	33,2	55,49	4113425540	50,8	82,08	4113455540
630	37,4	70,32	4113525540	57,2	103,96	4113555540

Dimensions:

* dimension referenced to outer diameter DN/OD

diameter DN 32 - 110 – coils

diameter DN 90 - 630 – straight segments of standard length – 12 m

diameter DN 560 - 630 – one-layer pipes

other lengths of pipes at the request

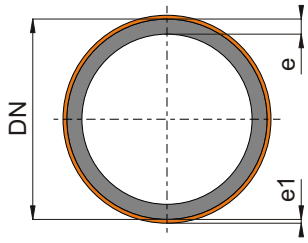
Colour:

diameter DN 32 - 500 – inner layer: black; outer layer: orange

diameter DN 560 - 630 – orange

PE HD100-RC/PP pipes
for gas systems

acc. to PN-EN 1555-2



	SDR 17				SDR 11			
DN/OD	e [mm]	e1 [mm]	weight [kg/m]	index -	e [mm]	e1 [mm]	weight [kg/m]	index -
75	4,5	1,0	1,24	4131625760	6,8	1,0	1,70	4131655760
90	5,4	1,2	1,79	4131825540	8,2	1,2	2,46	4131855540
110	6,6	1,5	2,68	4132025540	10,0	1,5	3,69	4132055540
125	7,4	1,5	3,34	4132125540	11,4	1,5	4,69	4132155540
140	8,3	1,5	4,12	4132225540	12,7	1,5	5,78	4132255540
160	9,5	2,0	5,53	4132325540	14,6	2,0	7,73	4132355540
180	10,7	2,0	6,87	4132425540	16,4	2,0	9,63	4132455540
200	11,9	2,0	8,34	4132525540	18,2	2,0	11,74	4132555540
225	13,4	2,3	10,60	4132625540	20,5	2,3	14,91	4132655540
250	14,8	2,3	12,83	4132725540	22,7	2,3	18,15	4132755540
280	16,6	2,3	15,87	4132825540	25,4	2,3	22,51	4132855540
315	18,7	2,5	20,02	4132925540	28,6	2,5	28,43	4132955540
355	21,1	2,5	25,10	4133025540	32,2	2,5	35,73	4133055540
400	23,7	2,7	31,64	4133125540	36,3	2,7	45,23	4133155540
450	26,7	2,7	39,62	4133225540	40,9	2,7	56,85	4133255540
500	29,7	3,0	48,95	4133325540	45,4	3,0	70,12	4133355540

Dimensions:

* dimension referenced to outer diameter DN/OD

diameter DN 75 - 500 – straight segments of standard length – 12 m

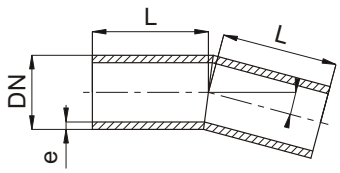
other lengths of pipes at the request

Colour:

diameter DN 75 - 500 – inner layer: black; outer layer: orange

PE HD 100 segmental bend
1° - 30°
for water supply
for sewerage systems
acc. to PN-EN 12201-3

for gas systems
acc. to PN-EN 1555-3



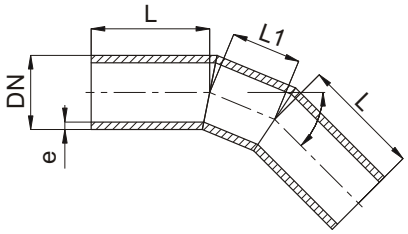
		SDR 17		SDR 11	
DN/OD	L [mm]	e [mm]	index	e [mm]	index
90	180	5,4	3241184150	8,2	3241186150
110	180	6,6	3241204150	10,0	3241206150
125	200	7,4	3241214150	11,4	3241216150
140	200	8,3	3241224150	12,7	3241226150
160	220	9,5	3241234150	14,6	3241236150
180	220	10,7	3241244150	16,4	3241246150
200	240	11,9	3241254150	18,2	3241256150
225	240	13,4	3241264150	20,5	3241266150
250	300	14,8	3241274150	22,7	3241276150
280	300	16,6	3241284150	25,4	3241286150
315	360	18,7	3241294150	28,6	3241296150
355	400	21,1	3241304150	32,2	3241306150
400	460	23,7	3241314150	36,3	3241316150
450	520	26,7	3241324150	40,9	3241326150
500	600	29,7	3241334150	45,4	3241336150
560	700	33,2	3241344150	50,8	3241346150
630	750	37,4	3241354150	57,2	3241356150
710	800	42,1	3241364150	64,5	3241366150
800	850	47,4	3241374150	72,6	3241376150

Dimensions:
* dimension referenced to outer diameter DN/OD
pressure reduction factor 0.8 with SF=1.25
other dimensional series of bends at the request
index established for bends for water supply systems, angle 15

Colour:
diameter DN 90 - 800 – black with blue strips – water
diameter DN 90 - 800 – black – sewerage systems
diameter DN 90 - 630 – orange – gas

PE HD 100 segmental bend
31° - 60°
for water supply
for sewerage systems
acc. to PN-EN 12201-3

for gas systems
acc. to PN-EN 1555-3



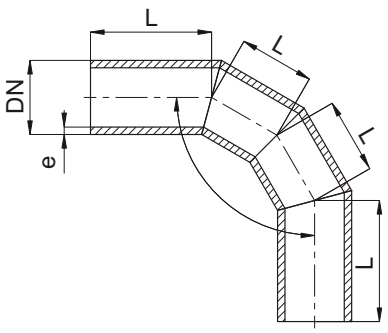
			SDR 17		SDR 11	
DN/OD	L [mm]	L1 [mm]	e [mm]	index	e [mm]	index
90	180	91	5,4	3241184450	8,2	3241186450
110	180	95	6,6	3241204450	10,0	3241206450
125	200	108	7,4	3241214450	11,4	3241216450
140	200	122	8,3	3241224450	12,7	3241226450
160	220	139	9,5	3241234450	14,6	3241236450
180	220	155	10,7	3241244450	16,4	3241246450
200	240	173	11,9	3241254450	18,2	3241256450
225	240	194	13,4	3241264450	20,5	3241266450
250	300	216	14,8	3241274450	22,7	3241276450
280	300	242	16,6	3241284450	25,4	3241286450
315	360	272	18,7	3241294450	28,6	3241296450
355	400	307	21,1	3241304450	32,2	3241306450
400	460	346	23,7	3241314450	36,3	3241316450
450	520	390	26,7	3241324450	40,9	3241326450
500	600	435	29,7	3241334450	45,4	3241336450
560	700	487	33,2	3241344450	50,8	3241346450
630	750	548	37,4	3241354450	57,2	3241356450
710	800	618	42,1	3241364450	64,5	3241366450
800	850	696	47,4	3241374450	72,6	3241376450

Dimensions:
* dimension referenced to outer diameter DN/OD
pressure reduction factor 0.8 with SF=1.25
other dimensional series of bends at the request
index established for bends for water supply systems, angle 45

Colour:
diameter DN 90 - 800 – black with blue strips – water
diameter DN 90 - 800 – black – sewerage systems
diameter DN 90 - 630 – orange – gas

PE HD 100 segmental bend
61° - 90°
for water supply
for sewerage systems
acc. to PN-EN 12201-3

for gas systems
acc. to PN-EN 1555-3



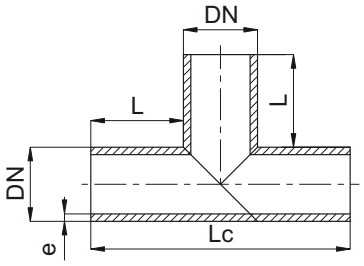
			SDR 17		SDR 11	
DN/OD	L [mm]	L1 [mm]	e [mm]	index	e [mm]	index
90	180	109	5,4	3241184900	8,2	3241186900
110	180	117	6,6	3241204900	10,0	3241206900
125	200	134	7,4	3241214900	11,4	3241216900
140	200	151	8,3	3241224900	12,7	3241226900
160	220	172	9,5	3241234900	14,6	3241236900
180	220	193	10,7	3241244900	16,4	3241246900
200	240	215	11,9	3241254900	18,2	3241256900
225	240	241	13,4	3241264900	20,5	3241266900
250	300	268	14,8	3241274900	22,7	3241276900
280	300	300	16,6	3241284900	25,4	3241286900
315	360	337	18,7	3241294900	28,6	3241296900
355	400	380	21,1	3241304900	32,2	3241306900
400	460	426	23,7	3241314900	36,3	3241316900
450	520	483	26,7	3241324900	40,9	3241326900
500	600	535	29,7	3241334900	45,4	3241336900
560	700	600	33,2	3241344900	50,8	3241346900
630	750	675	37,4	3241354900	57,2	3241356900
710	800	760	42,1	3241364900	64,5	3241366900
800	850	856	47,4	3241374900	72,6	3241376900

Dimensions:
* dimension referenced to outer diameter DN/OD
pressure reduction factor 0.8 with SF=1.25
other dimensional series of bends at the request
index established for bends for water supply systems, angle 90

Colour:
diameter DN 90 - 800 – black with blue strips – water
diameter DN 90 - 800 – black – sewerage systems
diameter DN 90 - 630 – orange – gas

PE HD 100 segmental pipe tee
90°
for water supply
for sewerage systems
acc. to PN-EN 12201-3

for gas systems
acc. to PN-EN 1555-3



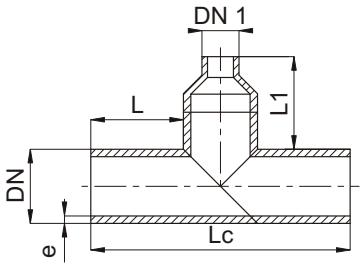
			SDR 17		SDR 11	
DN/OD	L [mm]	Lc [mm]	e [mm]	index	e [mm]	index
90	180	450	5,4	3242180040	8,2	3242180060
110	180	470	6,6	3242200040	10,0	3242200060
125	200	525	7,4	3242210040	11,4	3242210060
140	200	540	8,3	3242220040	12,7	3242220060
160	220	600	9,5	3242230040	14,6	3242230060
180	220	620	10,7	3242240040	16,4	3242240060
200	240	680	11,9	3242250040	18,2	3242250060
225	240	705	13,4	3242260040	20,5	3242260060
250	300	850	14,8	3242270040	22,7	3242270060
280	300	880	16,6	3242280040	25,4	3242280060
315	360	1035	18,7	3242290040	28,6	3242290060
355	400	1155	21,1	3242300040	32,2	3242300060
400	460	1320	23,7	3242310040	36,3	3242310060
450	520	1490	26,7	3242320040	40,9	3242320060
500	600	1700	29,7	3242330040	45,4	3242330060
560	700	1960	33,2	3242340040	50,8	3242340060
630	750	2130	37,4	3242350040	57,2	3242350060
710	800	2310	42,1	3242360040	64,5	3242360060
800	850	2500	47,4	3242370040	72,6	3242370060

Dimensions:
* dimension referenced to outer diameter DN/OD
pressure reduction factor 0.6 with SF=1.25
other dimensional series of pipe tees at the request
index established for pipe tees for water supply systems, angle 90

Colour:
diameter DN 90 - 400 – black with blue strips – water
diameter DN 90 - 400 – black – sewerage systems
diameter DN 90 - 400 – orange – gas

PE HD 100 segmental pipe adapting tee 90°
for water supply
for sewerage systems
acc. to PN-EN 12201-3

for gas systems
acc. to PN-EN 1555-3



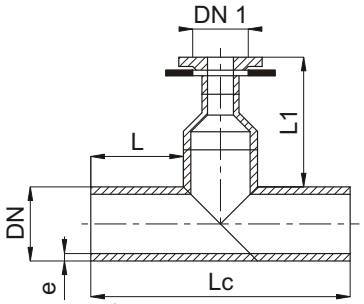
					SDR 17		SDR 11	
DN/OD	DN/OD1	L [mm]	L1 [mm]	Lc [mm]	e [mm]	index	e [mm]	index
90	63	180	310	450	5,4	3243181540	8,2	3243181560
110	63	180	320	470	6,6	3243201540	10,0	3243201560
110	90	180	310	470	6,6	3243201840	10,0	3243201860
125	63	200	320	525	7,4	3243211540	11,4	3243211560
125	90	200	320	525	7,4	3243211840	11,4	3243211860
125	110	200	315	525	7,4	3243212040	11,4	3243212060
140	63	200	-	540	8,3	3243221540	12,7	3243221560
140	90	200	-	540	8,3	3243221840	12,7	3243221860
140	110	200	-	540	8,3	3243222040	12,7	3243222060
160	63	220	350	600	9,5	3243231540	14,6	3243231560
160	90	220	350	600	9,5	3243231840	14,6	3243231860
160	110	220	370	600	9,5	3243232040	14,6	3243232060
200	63	240	480	680	11,9	3243251540	18,2	3243251560
200	90	240	480	680	11,9	3243251840	18,2	3243251860
200	110	240	500	680	11,9	3243252040	18,2	3243252060
200	160	240	350	680	11,9	3243252340	18,2	3243252360
225	63	240	510	705	13,4	3243261540	20,5	3243261560
225	90	240	510	705	13,4	3243261840	20,5	3243261860
225	110	240	530	705	13,4	3243262040	20,5	3243262060
225	160	240	380	705	13,4	3243262340	20,5	3243262360
250	90	300	580	850	14,8	3243271840	22,7	3243271860
250	110	300	600	850	14,8	3243272040	22,7	3243272060
250	160	300	450	850	14,8	3243272340	22,7	3243272360
250	225	300	415	850	14,8	3243272640	22,7	3243272660
280	90	300	730	880	16,6	3243281840	25,4	3243281860
280	110	300	750	880	16,6	3243282040	25,4	3243282060
280	160	300	600	880	16,6	3243282340	25,4	3243282360
280	225	300	565	880	16,6	3243282640	25,4	3243282660
315	90	360	780	1035	18,7	3243291840	28,6	3243291860
315	110	360	800	1035	18,7	3243292040	28,6	3243292060
315	160	360	650	1035	18,7	3243292340	28,6	3243292360
315	225	360	510	1035	18,7	3243292640	28,6	3243292660
355	90	400	910	1155	21,1	3243301840	32,2	3243301860
355	110	400	930	1155	21,1	3243302040	32,2	3243302060
355	160	400	780	1155	21,1	3243302340	32,2	3243302360
355	225	400	640	1155	21,1	3243302640	32,2	3243302660
355	315	400	490	1155	21,1	3243302940	32,2	3243302960
400	90	460	1010	1320	23,7	3243311840	36,3	3243311860
400	110	460	1030	1320	23,7	3243312040	36,3	3243312060
400	160	460	880	1320	23,7	3243312340	36,3	3243312360
400	225	460	740	1320	23,7	3243312640	36,3	3243312660
400	315	460	590	1320	23,7	3243312940	36,3	3243312960

Dimensions: * dimension referenced to outer diameter DN/OD
other dimensional series of pipe tees at the request
Colour: diameter DN 90 - 400 – black with blue strips – water; black – sewerage systems; orange – gas

pressure reduction factor 0.6 with SF=1.25
index established for pipe tees for water supply systems, angle 90

PE HD 100 segmental pipe adapting tee with flange outlet 90°
for water supply
for sewerage systems
acc. to PN-EN 12201-3

for gas systems
acc. to PN-EN 1555-3



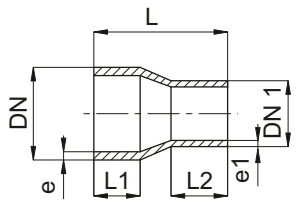
					SDR 17		SDR 11	
DN/OD	DN/OD1	L [mm]	L1 [mm]	Lc [mm]	e [mm]	index	e [mm]	index
90	50	180	415	450	5,4	3244181540	8,2	3244181560
110	50	180	435	470	6,6	3244201540	10,0	3244201560
110	80	180	430	470	6,6	3244201840	10,0	3244201860
125	50	200	425	525	7,4	3244211540	11,4	3244211560
125	80	200	440	525	7,4	3244211840	11,4	3244211860
125	100	200	445	525	7,4	3244212040	11,4	3244212060
140	50	200	-	540	8,3	3244221540	12,7	3244221560
140	80	200	-	540	8,3	3244221840	12,7	3244221860
140	100	200	-	540	8,3	3244222040	12,7	3244222060
160	50	220	455	600	9,5	3244231540	14,6	3244231560
160	80	220	470	600	9,5	3244231840	14,6	3244231860
160	100	220	500	600	9,5	3244232040	14,6	3244232060
200	50	240	585	680	11,9	3244251540	18,2	3244251560
200	80	240	600	680	11,9	3244251840	18,2	3244251860
200	100	240	630	680	11,9	3244252040	18,2	3244252060
200	150	240	510	680	11,9	3244252340	18,2	3244252360
225	50	240	615	705	13,4	3244261540	20,5	3244261560
225	80	240	630	705	13,4	3244261840	20,5	3244261860
225	100	240	660	705	13,4	3244262040	20,5	3244262060
225	150	240	540	705	13,4	3244262340	20,5	3244262360
250	80	300	700	850	14,8	3244271840	22,7	3244271860
250	100	300	730	850	14,8	3244272040	22,7	3244272060
250	150	300	610	850	14,8	3244272340	22,7	3244272360
250	200	300	545	850	14,8	3244272640	22,7	3244272660
280	80	300	850	880	16,6	3244281840	25,4	3244281860
280	100	300	880	880	16,6	3244282040	25,4	3244282060
280	150	300	760	880	16,6	3244282340	25,4	3244282360
280	200	300	695	880	16,6	3244282640	25,4	3244282660
315	80	360	900	1035	18,7	3244291840	28,6	3244291860
315	100	360	930	1035	18,7	3244292040	28,6	3244292060
315	150	360	810	1035	18,7	3244292340	28,6	3244292360
315	200	360	640	1035	18,7	3244292640	28,6	3244292660
355	80	400	1030	1155	21,1	3244301840	32,2	3244301860
355	100	400	1060	1155	21,1	3244302040	32,2	3244302060
355	150	400	940	1155	21,1	3244302340	32,2	3244302360
355	200	400	770	1155	21,1	3244302640	32,2	3244302660
355	300	400	650	1155	21,1	3244302940	32,2	3244302960
400	80	460	1130	1320	23,7	3244311840	36,3	3244311860
400	100	460	1160	1320	23,7	3244312040	36,3	3244312060
400	150	460	1040	1320	23,7	3244312340	36,3	3244312360
400	200	460	870	1320	23,7	3244312640	36,3	3244312660
400	300	460	750	1320	23,7	3244312940	36,3	3244312960

Dimensions: * dimension referenced to outer diameter DN/OD
other dimensional series of pipe tees at the request
Colour: diameter DN 90 - 400 – black with blue strips – water; black – sewerage systems; orange – gas

pressure reduction factor 0.6 with SF=1.25
index established for pipe tees for water supply systems, angle 90

PE HD 100 centric adaption
for water supply
for sewerage systems
acc. to PN-EN 12201-3

for gas systems
acc. to PN-EN 1555-3



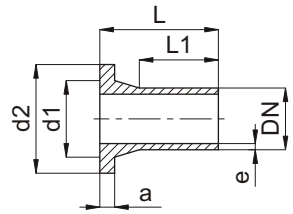
					SDR 17			SDR 11		
DN/OD	DN/OD1	L [mm]	L1 [mm]	L2 [mm]	e [mm]	e1 [mm]	index	e [mm]	e1 [mm]	index
90	63	130	45	55	5,4	3,8	3246181540	8,2	5,8	3246181560
90	75	130	45	55	5,4	4,5	3246181640	8,2	6,8	3246181660
110	63	140	50	55	6,6	3,8	3246201540	10,0	5,8	3246201560
110	75	140	50	55	6,6	4,5	3246201640	10,0	6,8	3246201660
110	90	130	45	60	6,6	5,4	3246201840	10,0	8,2	3246201860
125	63	120	40	40	7,4	3,8	3246211540	11,4	5,8	3246211560
125	75	120	40	50	7,4	4,5	3246211640	11,4	6,8	3246211660
125	90	120	40	50	7,4	5,4	3246211840	11,4	8,2	3246211860
125	110	115	40	50	7,4	6,6	3246212040	11,4	10,0	3246212060
160	63	130	50	45	9,5	3,8	3246231540	14,6	5,8	3246231560
160	75	130	50	45	9,5	4,5	3246231640	14,6	6,8	3246231660
160	90	130	45	45	9,5	5,4	3246231840	14,6	8,2	3246231860
160	110	150	60	60	9,5	6,6	3246232040	14,6	10,0	3246232060
160	125	135	50	50	9,5	7,4	3246232140	14,6	11,4	3246232160
160	140	135	50	50	9,5	8,3	3246232240	14,6	12,7	3246232260
180	160	120	50	40	10,7	9,5	3246242340	16,4	14,6	3246242360
200	160	145	60	50	11,9	9,5	3246252340	18,2	14,6	3246252360
200	180	110	60	40	11,9	10,7	3246252440	18,2	16,4	3246252460
225	160	145	60	50	13,4	9,5	3246262340	20,5	14,6	3246262360
225	180	110	50	40	13,4	10,7	3246262440	20,5	16,4	3246262460
225	200	110	50	40	13,4	11,9	3246262540	20,5	18,2	3246262560
250	160	150	40	65	14,8	9,5	3246272340	22,7	14,6	3246272360
250	200	115	45	40	14,8	11,9	3246272540	22,7	16,4	3246272560
250	225	115	45	50	14,8	13,4	3246272640	22,7	20,5	3246272660
280	225	125	35	30	16,6	13,4	3246282640	25,4	20,5	3246282660
280	250	90	35	30	16,6	14,8	3246282740	25,4	22,7	3246282760
315	225	180	35	30	18,7	13,4	3246292640	28,6	20,5	3246292660
315	250	130	35	30	18,7	14,8	3246292740	28,6	22,7	3246292760
315	280	80	35	30	18,7	16,6	3246292840			
355	315	90	40	30	21,1	18,7	3246302940			
400	315	140	40	30	23,7	18,7	3246312940			
400	355	90	40	30	23,7	21,1	3246313040			
450	315	200	40	30	26,7	18,7	3246322940			
450	355	155	40	30	26,7	21,1	3246323040			
450	400	90	40	30	26,7	23,7	3246323140			
500	450	90	40	30	29,7	26,7	3246333240			
560	450	135	25	30	33,2	26,7	3246343240			
560	500	85	35	25	33,2	29,7	3246343340			
630	450	180	30	30	37,4	26,7	3246353240			
630	500	130	30	25	37,4	29,7	3246353340			
630	560	80	30	30	37,4	33,2	3246353440			

Dimensions:
* dimension referenced to outer diameter DN/OD

Colour:
diameter DN 90 - 630; black – watter supply; sewerage, gas

PE HD 100 flanged bushing
for water supply
for sewerage systems
acc. to PN-EN 12201-3

for gas systems
acc. to PN-EN 1555-3



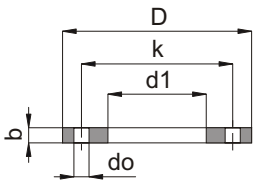
					SDR 17			SDR 11		
DN/OD	L [mm]	L1 [mm]	d1 [mm]	d2 [mm]	a [mm]	e [mm]	index	a [mm]	e [mm]	index
63	105	70	75	102	14	3,8	3247154000			
75	120	85	89	122	16	4,5	3247164000			
90	120	80	105	138	17	5,4	3247184000			
110	130	85	125	158	18	6,6	3247204000			
125	150	120	132	158	25	7,4	3247214000	25	11,4	3247216000
140	125	70	154	188	25	8,3	3247224000	25	12,7	3247226000
160	160	115	175	212	18	9,5	3247234000	25	14,6	3247236000
180	160	125	182	212	30	10,7	3247244000	30	16,4	3247246000
200	130	70	232	268	32	11,9	3247254000	32	18,2	3247256000
225	130	70	235	268	24	13,4	3247264000	32	20,5	3247266000
250	155	90	285	320	35	14,8	3247274000	35	22,7	3247276000
280	155	100	291	320	35	16,6	3247284000	35	25,4	3247286000
315	160	110	335	370	30	18,7	3247294000	35	28,6	3247296000
355	130	70	373	430	30	21,1	3247304000	40	32,2	3247306000
400	140	70	427	482	34	23,7	3247314000	46	36,3	3247316000
450	150	60	514	585	46	26,7	3247324000	60	40,9	3247326000
500	140	60	530	585	46	29,7	3247334000	60	45,4	3247336000
560	135	60	615	685	50	33,2	3247344000	60	50,8	3247346000
630	130	55	642	685	50	37,4	3247354000	60	57,2	3247356000

Dimensions:
* dimension referenced to outer diameter DN/OD

Colour:
diameter DN 63 - 630 – black – water supply, sewerage, gas

Steel galvanised flange
for water supply
for sewerage systems
for gas systems

acc. to PN-ISO 9624



PN 10

DN/OD PE	DN [mm]	D [mm]	d1 [mm]	b [mm]	k [mm]	do [mm]	hole quantity	hole quantity	index
200	200	340	236	20	295	22	8	M20	3291254100
225	200	340	238	20	295	22	8	M20	3291264100
250	250	395	289	24	350	22	12	M20	3291274100
280	250	395	295	24	350	22	12	M20	3291284100
315	300	445	339	28	400	22	12	M20	3291294100
355	350	505	377	30	460	20	16	M20	3291304100
400	400	565	431	32	515	26	16	M24	3291314100
450	500	670	517	38	620	26	20	M24	3291324100
500	500	670	533	38	620	26	20	M24	3291334100
560	600	780	618	44	725	30	20	M24	3291344100
630	600	780	645	44	725	30	20	M24	3291354100

PN 16

63	50	165	78	16	125	18	4	M16	3291156100
75	65	185	92	16	145	18	4	M16	3291166100
90	80	200	108	18	160	18	8	M16	3291186100
110	100	220	128	18	180	18	8	M16	3291206100
125	100	220	135	18	180	18	8	M16	3291216100
140	125	250	158	18	210	18	8	M16	3291226100
160	150	285	178	20	240	22	8	M20	3291236100
180	150	285	186	20	240	22	8	M20	3291246100
200	200	340	236	23	295	22	12	M20	3291256100
225	200	340	238	23	295	22	12	M20	3291266100
250	250	405	289	29	355	26	12	M24	3291276100
280	250	405	295	29	355	26	12	M24	3291286100
315	300	460	339	34	410	26	12	M24	3291296100
355	350	520	376	36	470	26	16	M24	3291306100
400	400	580	431	41	525	30	16	M27	3291316100

Transportation and storage of PE pipes

PE pipes are supplied in a form of coils or straight segments palleted in bundles. While pipe handling and storing, pay a special attention not to damage them. Polyethylene is a material of relatively low mechanical scratch resistance.

Pipes shall be stored on even surfaces. Pipe in coils may be stored horizontally (requirement for gas pipes) with storage height up to 1.5 m, or vertically in a single layer (a vertically positioned pipe coil shall not be additionally loaded). Factory packaged in bundle pipes in straight segments with the use of wooden frames can be stored in layers up to the height of 3 m, at the same time, a higher frame of bundle should be rested on a lower bundle frame. If pipes are unpackaged, they may be stored in prism of up to 7 pipe layers maximally and up to the height not higher than 1 m, at the same time, the lower layer should rest on wooden sleepers and from their sides the prism should be secured with supports against movement. The spacing of sleepers and supports should be 12 m. If in prism are present pipes of different stiffness, the pipes of their higher stiffness should be laid on the bottom of the prism.

The pipes may be stored outdoors during the time of 12 months. If it is expected to store them longer, it is beneficial to protect them against the exposure of direct sunlight (UV) by placing them by roofing. Besides, it should be provided a free flow of air.
When pipes are loaded or unloaded with the use of crane, the slings made of soft ropes (nylon, cotton and hempen etc.) shall be used – under no circumstances do not use steel ropes or chains. It is recommended that the pipes in their factory packages are to be unloaded with the use of forklift trucks.
The pipes of smaller diameters (e.g. up to 160 mm) may be handled on the erection site manually. It is inadmissible to drag them onto the ground, throwing them or rolling.
While unrolling the pipes in coil, keep special caution, because the pipe end is unwound with a considerable force.

Installing pipelines

At the stage of assembling pipelines, various techniques are used. Several components of the pipeline system may be joined with a method of butt welding or electric resistance welding (ERW), or by applying a mechanic connector, e.g. clamping fittings. To connect with pipelines made of the materials other than PE, flange fittings, suitable mechanic joints or transient PE/steel fittings may be applied.

Butt welding

Joining PE pipes using the method of butt welding consist in heating and suitable plasticising the pipe ends of the connected elements by a butting contact of face surfaces with a heating plate and then pressing mutually of the joined elements with a suitable force after removing the heating plate applied to heat the pipe ends. The joint is taken to be structurally strong only when the time necessary for cooling is elapsed (then is the earliest moment when you can connect out the coupled elements out of the heat sealing machine clamps); the welded joint will achieve a full load capacity only when is completely cooled down (temperature in every point of it does not exceed 20°C or ambient temperature). This technique is used to join elements of diameter not less than 63 mm; additionally the joined pipes should be laid out in their straight segments (bar-bells).
Detailed instructions you can find in the "Instructions for the installation of polyethylene (PE) pipelines issued by our Company.

Electric resistance welding (ERW)

Electric resistance welding is generally used to join elements of lower diameters, usually up to 200-225 mm (however, on the market you can find the electric resistance heating muffs of diameter even to 500 mm), especially up to 63 mm. Electro resistance fittings are the connectors of muff type, therefore the process of joining takes place between an inner surface of fitting (a muff) bell an outer surface of pipes or bare ends of joined fittings. Thanks to the fact that a surface of joint of the electro resistance fitting with pipe may be much larger than the area of pipe cross-section, then the connections made with this technique are stronger than the pipe itself. Time elapsing does not change its joining feature and so long-time strength of it is higher than one (the long-time strength is defined in relation to the long-temporary strength of pipe as itself).

Flange joints implemented with neck bushes

To connect with flanged fittings or with other elements of network infrastructure equipped with flanges, flanged stub pipes (neck bushes) are used. These pipe fittings are made of polyethylene and can be butt heated or by electro-resistance of the pipe end, or another connector, e.g. a T-pipe. Before heating the bush, put a steel clamping flange that suits with its size and is suitably protected against corrosion.

Clamping fittings

Lower diameter PE pipes (usually up to 63 mm, though on the market are available fittings of diameter up to 110 mm) used to transport potable water or for the installations of sewerage systems (pressure or suction ones) can be joined using clamping fittings. Such elements can be of different structure. However, you should notice that the construction of fittings (their strengths) and the applied system of sealing the connection, and the protection of pipe against disconnecting the fitting, provide a safe operation of the system during minimum 50 years (a sealing element and a clamping element that tightens itself on the pipe, should cooperate with the outer surface of the pipe).

PE-steel transient fittings

Gas systems are usually installed by using PE-steel connections that enable joining a section of gas pipeline made of polyethylene with a segment made of steel tubes. They are in two versions of manufacture of the steel end: with a bare pipe terminal or with a flanged pipe terminal. As long as the performance of flanged connection does not make any problem, in the case of bare pipe end intended for welding, it is necessary to remember to protect the connection of steel with PE against overheating.

Laying out pipelines

Distances of pipelines from other elements of the underground infrastructure

New pipelines shall be localised so as to not to collide with the existing underground systems, not to effect negatively on such systems, not to induce any hazard of a disaster, and to enable conducting repair works (both on the pipeline and on the elements of other infrastructure in its vicinity). These distances are defined by building law and suitable provisions. They have to be shown in the pipeline design. Bearing in mind that the strength of PE material lowers with the increase of its temperature, a particular caution shall be exercised while laying out the pipeline near heat distribution network or power cables. Minimum distances for water supply systems and gas pipelines are given in table below.

Minimum distances of PE pipelines from buried utilities — table 3

Type of infrastructure		
Water supply pipelines		Minimum distance [m.]
1.	Power cables	
	MW and LV up to 20 kV	0,50
	Single MV-cable above 20 kV	0,75
	Bundle of MV-cables above 20 kV	0,75 - 1,0
	HV-cables	1,0 - 1,25
2.	Teletechnical cables	0,8 - 2,5
3.	Gas pipelines	1,0
4.	Heat distribution pipelines (insulated with the same thermal insulation as for water supply pipeline)	1,5
5.	Water supply pipelines	1,0
Gas pipelines		
1.	Power cables	
	Up to 15 kV	0,5
	Above 15 kV	1,0
2.	Buildings	1,0
3.	Sewerage, heat distribution ducts, water supply pipelines, cable ducts and other duct systems that have connections with rooms for humans and animals.	1,5
4.	Sewerage, heat distribution ducts, water supply pipelines, cable ducts and other duct systems that do not have any connections with rooms for humans and animals	1,0

Bending pipelines on the erection site

Plastic pipelines are flexible. In particular, it concerns polyethylene (PE) pipes. This feature of PE pipes can be usually applied while changing a route of the pipeline laid out. Below you can find a simple method of calculating the conditions to change the route of pipeline, which, at the same time, has the effect on a shape of trench.
In Table 5, a so called radius of bending pipes is given, the value of which is a multiplicity of pipe outer diameter (Dy). Polyethylene undergoes transformation into a vitreous state only at -80°C (HDPE) or -120°C (MDPE). Within the temperatures, at which the installation works are conducted, polyethylene stays in its elastic state. The lower temperature of installed pipe the more rigid it is. With growth of pipe temperature, its stiffness grows, too. Therefore, the bend radius for PE pipes is determined depending on the ambient temperature at which the works are carried out. IT also depends on pipe stiffness (of the dimensional series SDR).

PE pipe bend radii — table 4

Temperature	Dimensional series SDR [-]				
	11	13,6	17	21	26
> 20 C	20 x Dy	20 x Dy	20 x Dy	25 x Dy	30 x Dy
> 10 C	35 x Dy	35 x Dy	35 x Dy	45 x Dy	55 x Dy
> 0 C	50 x Dy	50 x Dy	50 x Dy	60 x Dy	70 x Dy

Overview

The installation of pipeline can be implemented basing on:
- Detailed design that determines parameters of used pipes and pipe fittings together with the material of which they are to be made;
- The technologies of joining of the individual pipes and pipe fittings;
- The location of planned pipeline with reference to the other elements of underground infrastructure and buildings;
- The conditions for laying out the pipeline

The design should be developed on the basis of the analysis of geotechnical soil survey, and if necessary, it should contain the guidelines defining the way of soil subbase improvement or securing the pipeline against rising to the ground surface. According to the requirements, a soil compaction index around the pipeline has to be determined.

Maximum operation pressures (for pressure tests) of PE pipeline that corresponds to its nominal pressure (PN), depends on the class of pipe material (PE 80 or PE 100), pipe dimensional series (SDR) and protection ratio for pipeline construction (C) dependent on a type of transported medium or the conditions of pipeline operation i.e. temperature, chemical environment. It should be underlined here that pressure to which the pipe id undergone during tightness testing (see item 6) can reach 1.5 x operational pressure. So, the criterion of pipe selection is the maximum operational pressure, not the testing pressure of the pipeline. Maximum operational pressures for PE pipelines are listed in Table 1,

table 1

Nominal pressure of PE pipelines

Pipeline type	SDR 33	SDR 26	SDR 21	SDR 17	SDR 13,6	SDR 11	SDR 9
	PE 100	PE 100	PE 100	PE 100	PE 100	PE 100	PE 100
Water supply pipes C>1,25	PN 5	PN 6	PN 8	PN 10	PN 12,5	PN 16	PN 20
Sewerage pipes C>1,25	PN 5	PN 6	PN 8	PN 10	PN 12,5	PN 16	PN 20
Gas pipes C>2,0				PN 6		PN 10	

For the erection of pressure-free pipelines, their ring stiffness (SR) is an important pipe parameter. The lower value of momentary ring stiffness the higher diligence should be while making bedding haunching and backfill of the pipeline laid down. Practically, the pipes of SDR value from 11 to 17 can be laid out with a moderate thoroughness of soil compacting or even without the soil compacting (e.g. while narrow-trench pipeline laying out), provided that such conditions are permissible for the location of the pipeline laid out (e.g. when it is laid out in the greenery area, but not within the roadway). Ring stiffness of the pipe depends on a elasticity modulus of its material and on pipe geometric dimensions (SDR). Values of elasticity module for polyethylene class PE 80 and PE 100 are similar, therefore the values of momentary ring stiffness of pipes made of PE 80 and PE 100, belonging to the same dimensional series SDR, are equal one another. Values of momentary ring stiffness for PE pipes are listed in Table 2.

table 2

Values of momentary ring stiffness for PE 100 pipes

Pipeline type	SDR 26	SDR 21	SDR 17	SDR 13,6	SDR 11	SDR 9
SR [kPa]	> 4	> 8	> 16	> 32	> 64	> 128

With pipe material temperature decrease its stiffness and brittleness increase. Conducting the installation works at ambient temperatures below 0°C is possible, however it is not recommended. Under these conditions the material used to make a pipeline bedding, haunching and backfilling in highly frozen (at nights the temperature is much lower), thus it is hard to provide proper compaction rate of the material, besides falling down large pieces of frozen soil material would damage the pipeline (microcracks perceptible with the naked eye. Apart of this, the quality of the work made by fitters in such circumstances is lowered, too.

Dimensions of the pipeline trench cross-section and possible soil stabilisation shall be defined in the technical design. The width of trench bottom depends on a pipe diameter and the technology of conducting the works. A rule should be adopted that the trench to be made should be as narrow as it is possible. While laying out the pipelines in green areas, where the pipes are not under large loads and any possible slight soil subsidence does not make any problem and the narrow-trench pipeline laying out can be applied (the trench is implemented with the use of chain excavator with a width of bucket little more larger than the laid pipe diameter. The earthworks shall be conducted in accordance with technical guidelines of implementing and the acceptance of building and assembly works and health and safety rules. The works can be made manually or with the use of mechanic equipment. The trench bottom shall be made with a slope defined in the technical design, even and void of elements with sharp edges and the ones larger of size of 60 mm. If soil and load conditions indicate the necessity of strengthening the soil subbase, it can be made in a form of gravel bedding of thickness approx. 20 cm. Do not lay out PE pipes on concrete foundations or do not backfill the with grout (concreting a short segment of pipeline, or a segmental pipe bend, pipe tee or other pipe fittings, or the use of concrete weights are permissible).

Laying out pipeline in a trench

A trench bottom shall be filled with a 10 cm thick bedding layer of the unfrozen material of grain size below 20 mm with no sharp stones or other crushed/broken material. If local soil fulfils these requirements, there is no need to use any bedding layer. If the pipeline is laid out in a rocky soil or containing stones of diameter larger than 60 mm, then the thickness of bedding layer shall be increased at least by 5 cm so that its upper surface be 5-10 cm above the upper edge of rocks or stones in the trench bottom. The pipeline is laid out on the bedding. It can be assembled on the trench bottom, but it is not convenient. Usually the assembly of pipeline is conducted on the trench edge or along the route of planned pipeline (this method is used during the narrow-trench pipeline laying out) and then it is lowered to the bottom of the trench. The pipelines of smaller diameters can be lowered manually, but for the pipelines of larger diameters (and of larger own weight) soft slings and rolls strung on a rope and caught to the trencher bucket may be used for this purpose (applying the rolls drawn along the pipeline makes the whole operation fastened).
To overcome small field obstacles or there is enough place, the change in direction of pipeline route can be made on the way of bending pipes. This method is inasmuch advantageous that it does not eliminate the necessity of making additional joints (which results in shortening the assembly time and increases the reliability of the pipeline laid out) and reduces flow disturbances of the transported medium (lower flow resistances). Sometimes, to overcome unexpected field obstacles using the method of bending pipeline, a minor correction of trench route is needed, which would bring a considerably faster solution than the operation of removal the arisen obstacle (provided that it would be possible) or the performance of a suitable pipeline bypass using pipe fittings (additional costs).

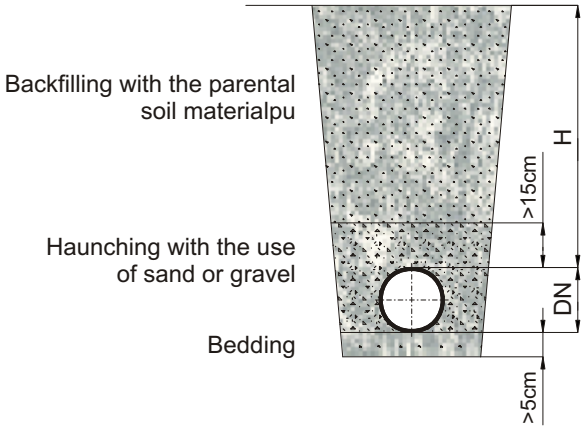
Haunching and backfilling the pipeline

PE pipes such, like other pipes made of thermoplastics, ale the elastic pipes, therefore, they do not transfer the outer loads by themselves as it is in the case of pipes made of such materials like steel, iron cast, stoneware or concrete, but a part of the loads is transferred by the soil that surrounds the loaded pipeline. The better soil compaction of this soil the more closely it adheres to the outer surface of pipe and the higher participation is in transferring loads and the lower deflection of the pipe occur along the pipeline.
Hence, in view of the load distribution affecting the pipeline, more beneficial is to compact thoroughly the haunching soil adhering the pipeline, but it is always connected with higher costs of erection works. The results of field research and observations of the behaviour of plastic pipelines made over tenths of years allow to formulate the following conclusions:
The quality of assembly work (mainly, the quality of making pipeline bedding) affects to the great extend (80%) on a size of pipeline deflection and the higher these deflections may be if the lower is the momentary ring deflection of applied pipes.

In the case of laying out pipes with momentary ring stiffness of more than 8 kPa, the pipeline deflections are relatively low irrespective of the work quality.
If the pipeline built of the pipes of momentary ring stiffness above 8 kPa is laid out in green areas where soil settlement is less significant, it is possible to apply cost-saving techniques of laying pipelines in soil consisting in laying pipes on the trench bottom and making pipeline bedding and haunching without applying soil compacting. The haunching shall be made laying material layers 10-30 cm thick up to the height of at least 30 cm above the pipeline top. The material used for haunching has to keep the same requirements as the material used to make pipeline bedding. If the parental soil keeps these requirements, it can be used to make pipeline haunching. If technical design provides for and defines the performance conditions, it is possible to apply haunching material that does not keep the requirements stated above. The compaction ratio is stated by the design. The compaction may be made using mechanical equipment or manually (with tampers or by treading down with legs). For required medium and high compaction ratios of pipeline haunching, it is recommended to use mechanical compaction appliances.

First layer of haunching should be carefully spread on both sides of the pipe paying closer attention on a thorough filling spaces in the vicinity of a contact of pipe with the haunching soil (the so-called fillets). While compacting this layer it should be careful and not to induce pipeline rise.
The haunching of pipelines laid under roads should be compacted up to 95% of the modified Proctor's value in order to avoid the effects of larger soil settlement. Outside these areas less thorough soil compactions may be applied up to the values 85-90% or event to 75% of modified Proctor's value, at the same time, the depth of laying out the pipeline in not significant here (it is assumed that the level of pipeline soil coverage is not less than 0,8 m). After completing the pipeline haunching (the coverage of pipe top – min. 30 cm) the rest part of pipeline trench space should be backfilled up to the ground surface level or up to the level stated in the technical design, in such way and with such material that provides suitable load capacity for the assumed operation loads (roadways, sidewalks etc.). In many cases, to make pipeline haunching the parental soil can be used, it does not contain any elements (such as stones) of size above 300 mm. In green areas soil compaction is not necessary.

Laying out in a conventional trench



Methods of soil compacting — tabela 3

Type of the equipment for soil compacting	Own weight of the equipment [kg]	Maximum thickness of soil layer before compacting		Min. thickness of the protection soil layer above the pipe [m.]	Compaction multiplicity of one soil layer	
		gravel, sand [m.]	clay, silt [m.]		up to 85% of Proctor's modif	up to 90% of Proctor's modif.
Dense treading	-	0,10	-	-	1	3
Hand tamper	15	0,15	0,10	0,30	1	3
Vibration tamper	50 - 100	0,30	0,20 - 0,25	0,50	1	3
Vibrator plate compactor with a separate plate	50 - 100	0,20	-	0,50	1	4
Vibrator plate compactor	50 - 100	0,15	-	0,50	1	4
	100 - 200	0,20	-	0,40	1	4
	400 - 600	0,40	0,20	0,80	1	4

The use of TYTAN pipes

The use of TYTAN pipes for alternative method of laying out pipelines

More and more common is to aim to increase the efficiency of laying out the pipes in the ground and to minimise the costs connected with these operations and difficulties for the road traffic. Due to savings costs and work time, the trench-free and narrow-trench techniques are preferred, where making pipe haunching and bedding, necessary for laying out pipelines in the conventional method, are useless. In recent years, several installation techniques have achieved level of commonly accepted technical solutions, mainly because of economic benefits resulting from their use.

Compared with excavation methods using the protection sand bedding, the new methods raise requirements for pipe systems applied in them.

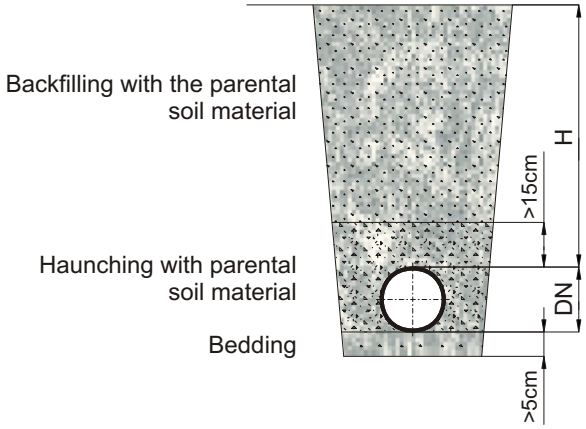
To avoid shorting the use lifetime of pipes installed in such way, it is useful to apply the pipes of elevated scratching and puncture resistance. Making efforts to meet the market expectations, we offer you PE 100-RC pipes of increased strength: "TYTAN".

Below you can find a short characteristics of pipe laying methods using TYTAN pipes.

Trench method of laying pipes without sand bedding and haunching

This method is characterised of the fact that while lying the pipe in a trench no sand bedding and haunching is made. It exposes the pipe to scratches and point loads from stones or hard parts of the parental soil. To make pipeline bedding, haunching and to backfill the trench the parental soil is used, which lowers costs and shortens the time of the erection work performance. In rocky soils, thanks to the properties of TYTAN pipes, it is possible to use the crushed rock material, which eliminates expensive soil replacement.

Trench for PE TYTAN pipes with the use of parental soil material of the trench



Use of TYTAN pipes

Trench-free renovation and replacement of pipelines

Sliplining
This method consists in the renovation of an old pipeline by inserting a new pipeline of respectively smaller outer diameter, However, it is related with the decrease in hydraulic capacity of the pipeline. New pipes, during the operation of their inserting inside the old pipeline, are exposed to scratches from rough and sharp inner surfaces of the old pipeline.

Burstlining / Splitting
This method consists in destroying the old pipeline and laying out the new one in a place of the old pipeline. A head of percussive mechanism bursts and splits the old pipeline and pushes its crushed elements on sides. In its place a new pipeline of the same diameter or larger is pulled in. The pipeline is exposed to scratches and point stresses of the crushed elements of the old pipeline.

Trenchless laying out the pipelines

Horizontal directional drillings (HDD)
With this technique a hole in soil is made by drilling, to which a pipeline is pulled in. If the route of drilled hole can be changed in a controlled way, the drilling is called "steerable drilling". Naturally, on the route of drilling different type obstacles may occur, which in the contact with the pipeline pulled in can scratch it and then make point stresses after completing the pipeline installation.

Moling
The method used to lay relatively short sections of pipelines, e.g. while crossing the roads. A head equipped with a percussive mechanism, pushes soil on sides creating a space for the inserted pipeline. The pipeline pulled in is exposed to strong scratches of its outer surface and on point stresses from pebbly and rocky soils.

Work acceptance

Polyethylene is a material which, under the action of a permanent load, undergoes deflection that increases with elapsing the time when this load is applied. Such event is called creeping (a dynamic fatigue). Additionally, polyethylene is a material of low thermal conductivity with reference to conventional materials. These different features of polyethylene (PE) make that not all respective documents or their parts may be referred directly to the pipelines made of PE. Below are presented the information to be considered by contractors and representatives of investors during the acceptance of PE pipelines.

Water supply pipeline tightness test

Requirements and tests during the acceptance of water supply pipelines are stated by the Polish standard PN-B-10725:1997. However, this standard does not contain a procedure for testing tightness of pipeline segments since it does not include PE pipe dynamic fatigue (creeping) during the test, which is a cause of pressure drop inside the pipeline and, at the same time, the problems with completing the tightness test with a positive result. Therefore, the tightness tests of PE pipeline segments shall be carried out in compliance with a procedure stated in Appendix A.27 to the standard EN 805, the contents of which is presented below. Besides the procedure of testing tightness of pipeline segments, all other requirements of standard PN-B-10725 shall be applicable.

Gas pipeline tightness test

Tightness test of Gas PE pipelines shall be made according to the standard PN-92-M-34503 „Gas pipelines and gas engineering installations. Pipeline testing".
The applied level of testing pressure does not induce so high creeping (dynamic fatigue) of PE as in the cases of water supply systems and moreover, the compressibility of gas used to carry out tightness testing causes that alterations in pipeline volume do not have any noticeable effect on changes in inner pressure.
It should only be paid an attention on the fact that PE is a good insulator. When the tested pipeline is filled with compressed air with the use of a compressor, the appropriate test for tightness can be started up only after lowering temperature of pipeline and air contained in it down to the level of ambient temperature, which may last even a few hours. The negligence of this condition may be a cause of inner pressure drop not only as a result of leakage occurrence, but as the effect of phase transition in a constant volume of the tested gas pipeline segment, together with temperature drop of the gas (here: air) a pressure drop is accompanied.

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