

ISO 9001

BUREAU VERITAS
Certification



ISO 14001

BUREAU VERITAS
Certification



Product Catalogue

POLYETHYLENE (PE) PRESSURE PIPES INTENDED FOR THE CONSTRUCTION OF:

- WATER SUPPLY SYSTEMS
- SEWERAGE SYSTEM
- GAS SUPPLY SYSTEMS
- IRRIGATION SYSTEMS

POLYETHYLENE PIPES INTENDED FOR:

- HEAVY DRAINAGE
- GROUND-COUPLED HEAT EXCHANGERS AND HEAT PUMPS



WATER
AND SEWERAGE
SYSTEMS



IRRIGATION
SYSTEMS



GROUND-COUPLED
HEAT EXCHANGERS
AND HEAT PUMPS



GAS
SUPPLY
SYSTEMS



CONTENTS

About Company	4
Technical information	6
PIPES FOR WATER SUPPLY SYSTEMS	16
PE 80	16
PE 100	18
PE 100-RC	20
PE 100-RC / PE 100	24
PIPES FOR SEWERAGE SYSTEMS	26
PE 100	26
PE 100-RC	28
PE 100-RC / PE 100	32
PIPES FOR GAS SUPPLY SYSTEMS	34
PE 100	34
PE 100-RC / PE 100-RC	36
PIPES FOR IRRIGATION SYSTEMS	38
SYSTEM PIPES FOR GROUND-COUPLED HEAT PUMPS	40
PE 100-RC	40
PE 100	41
SYSTEM PIPES FOR GROUND-COUPLED HEAT EXCHANGERS	42
DRAINAGE PIPES	45
Installation of polyethylene pipes	46
Transportation, handling and storage of polyethylene pipes	56

BRANCH OFFICES / PRODUCTION PLANTS

Trade office in Toruń
ul. Bukowa 27

Headquarters:
Targowisko 476 32-015 Kłaj



Branch Office in Kłaj
Kłaj 400



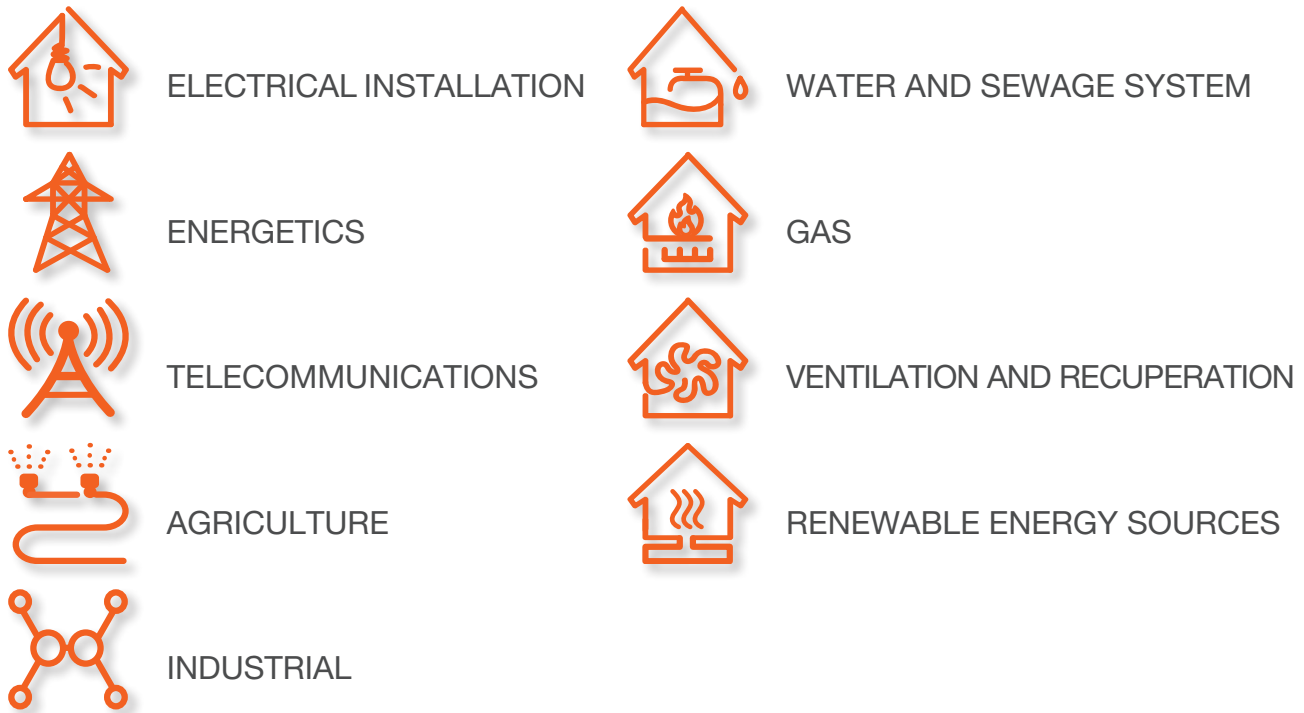
Branch Office in Bieruń
ul. Chemików 133



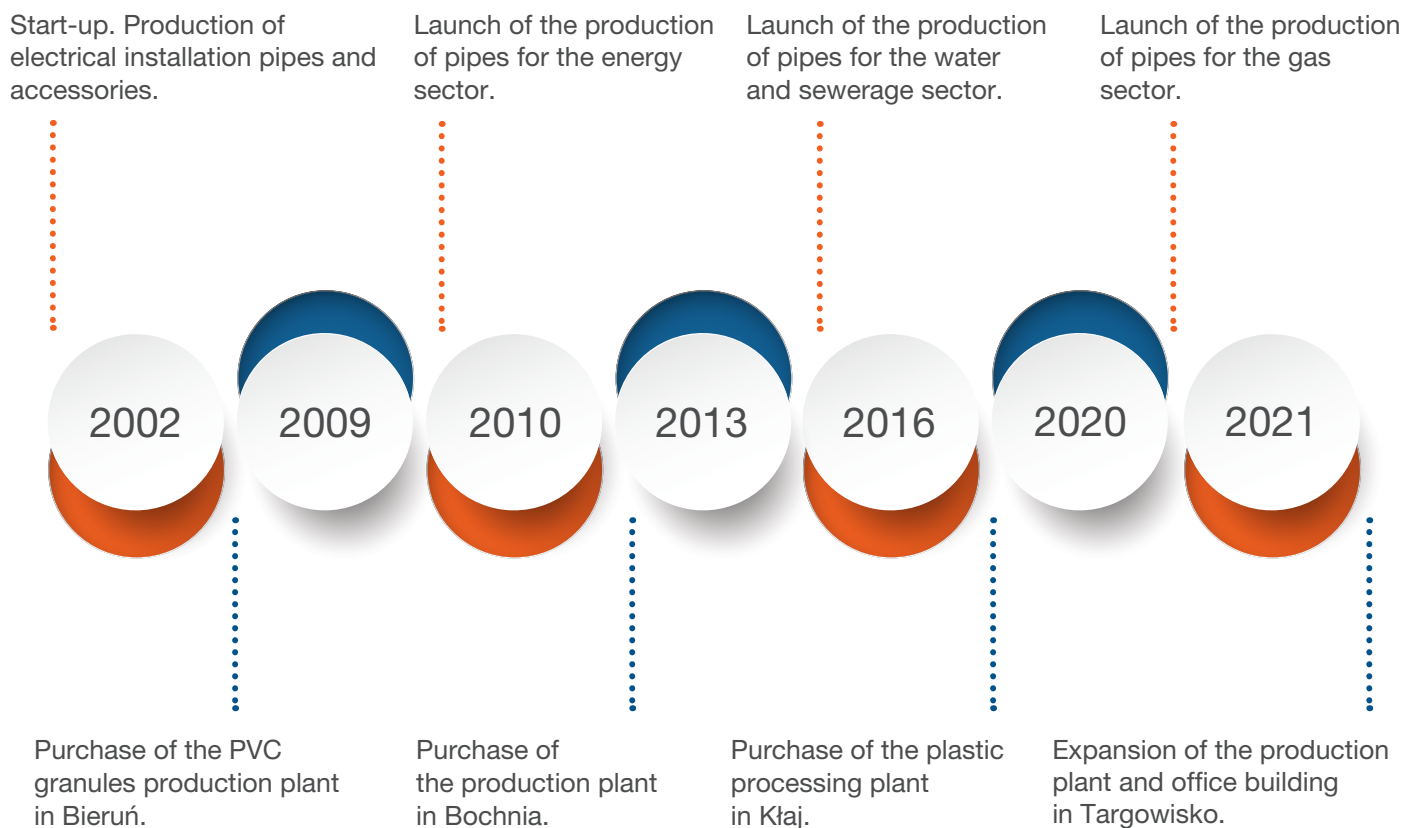
Branch Office in Bochnia
ul. Gazowa 6



TT PLAST S.A COMPANY IS A POLISH MANUFACTURER OF PLASTIC PIPES AND ACCESSORIES AS WELL AS PVC GRANULATES, WITH OVER 20 YEARS OF EXPERIENCE. OUR PRODUCTS ARE USED IN THE FOLLOWING SECTORS:



OUR HISTORY










Technical information: HDPE chemical resistance



Chemical substances		Level of resistance
Water		+
Acids	Weak	+
	Strong	+
	Hydrofluoric	+
Alkalis	Weak	+
	Strong	+
Inorganic salts		+
Halogens		-
Oxidizers		-
Solvents	Paraffinic hydrocarbons	-
	Halogenated alkanes	⊗
	Alcohols	+
	Ethers	■
	Esters	+
	Ketones	+
	Organic acids	+
Aromatic compounds	⊕	
Fuels		⊕
Petroleum		⊕
Fats, oils		+

- + Resistant;
- ⊕ Resistant to conditionally resistant;
- Conditionally resistant;
- ⊗ Conditionally resistant to non-resistant;
- Non-resistant

PROPERTIES

	Technical information	Pe 80	Pe 100	Pe 100-rc
	Density	≈940 kg/m ³	950 kg/m ³	950 kg/m ³
	Elastic modulus (short-term value)	≥700 MPa	1100 MPa	1100 MPa
	Tensile strength at yield	19-23 MPa	25 Mpa	25 Mpa
	Elongation at break	≥600%	≥600%	≥600%
	Oxidation induction time OIT (200°C)	≥20 min	≥20 min	≥20 min
	Resistance to slow crack growth (9,2 bar; 80°C)	≥165 h	1000 h	8760 h
	Recommended installation	with sand bedding	with sand bedding	without sand bedding

POLYETHYLENE PIPES - TECHNICAL SPECIFICATIONS

1. PIPES INTENDED FOR THE CONSTRUCTION OF WATER SUPPLY SYSTEMS:

The pipes are made of high-density polyethylene (HDPE).

There are various types of pipes:

- a. single-layer (from materials: PE80, PE100, PE100-RC)
- b. double-layer (from materials: PE100 ; PE100-RC ; PE100/PE100-RC)
- c. three-layer (from materials: PE100 ; PE100-RC ; PE100-RC/PE100/PE100-RC)

The pipes are intended for:

- supply of pressurised water
- supply of drinking water
- supply of pre-treatment water
- supply of water for other purposes
- hydro-transport
- other purposes

2. PIPES INTENDED FOR THE CONSTRUCTION OF SEWERAGE SYSTEMS:

The pipes are made of high-density polyethylene (HDPE).

There are various types of pipes:

- a. single-layer (from materials: PE100, PE100-RC)
- b. double-layer (from materials: PE100 ; PE100-RC ; PE100/PE100-RC)
- c. three-layer (from materials: PE100 ; PE100-RC ; PE100-RC/PE100/PE100-RC)

The pipes are intended for:

- construction of the sewerage system for consumption and utility purposes
- construction of the storm water system
- construction of the vacuum sewer system
- construction of the sanitary sewerage system
- construction of the combined sewer system
- drainage of bridges and overpasses
- hydro-transport
- gravity sewer transfer
- pressure and vacuum drainage and sewerage in the ground
- other purposes

3. PIPES INTENDED FOR THE CONSTRUCTION OF GAS SUPPLY SYSTEMS:

The pipes are made of high-density polyethylene (HDPE).

There are various types of pipes:

- a. single-layer (from materials: PE100)
- b. double-layer (from materials: PE100-RC)

The pipes are intended for:

- construction of the gas supply systems
- supply of gaseous fuels
- other purposes

4. PIPES INTENDED FOR THE CONSTRUCTION OF IRRIGATION SYSTEMS:

The pipes are made of high-density polyethylene (HDPE).

There are various types of pipes: single layer (HDPE).

The pipes are intended for:

- irrigation of croplands
- irrigation of garden squares
- irrigation of orchards
- irrigation of gardens
- irrigation of greenhouses

5. PIPES INTENDED FOR THE CONSTRUCTION OF DRAINAGE SYSTEMS:

The pipes are made of high-density polyethylene (HDPE).

These are double-layer pipes with a corrugated external wall and a smooth internal wall.

There are half- and fully-perforated pipes:

- TP (Totally Perforated) = full drainage pipe (perforation throughout its 360° circumference)
- LP (Locally Perforated) = half drainage pipe (perforation in the upper part of the pipe at 240°)
- MP (Multi-Purpose Pipe) = multi-functional drainage pipe (perforation in the upper part of the pipe at 120°)
- UP - (Unperforated Pipe)

The pipes are intended for drainage of the following spaces and areas:

- public roads, motorways and other
- tracks
- airports
- car parks, manoeuvring areas
- industrial sites, storage yards
- landfill sites
- arable lands and other

6. PIPES INTENDED FOR THE CONSTRUCTION OF THE GROUND-COUPLED HEAT EXCHANGER SYSTEMS:

The pipes are made of high-density polyethylene (HDPE).

There are various types of pipes:

A: Smooth pipes

- ° double-layer (HDPE on the external wall, HDPE with antibacterial properties on the internal layer)
- ° at the customer's request, pipes are available in other options (single-, double- or three-layer)

B: Corrugated pipes

- ° double-layer (HDPE on the external wall, HDPE with antibacterial properties on the internal layer)

The pipes are intended for:

- construction of ground-coupled heat exchangers: Tube, gravel and air heat exchangers

7. PIPES INTENDED FOR THE CONSTRUCTION OF THE HEAT PUMP SYSTEMS:

The pipes are made of high-density polyethylene (HDPE).

There are various types of pipes:

a. single-layer (from materials:) PE100, PE100-RC)

Application:

- for the transport of glycol
- for the construction of ground collectors for underground heat pump systems
- for other purposes

ADVANTAGES OF USING POLYETHYLENE PIPES:

- Highly durable and leak-proof joints
- High chemical resistance to most chemical substances
- Constant capacity
- High flexibility allowing for the change of the direction of the pipes
- Low density (compared to steel, cast iron)
- Corrosion resistance
- Reduction of joints due to length of sections (from 12 to 200 metres)
- Temperature resistance
- Fault-free pipelines
- Pipes may be joined using butt fusion and electrofusion welding or mechanical fittings (depending on the pipe diameter)
- PE pipes may be joined with pipelines made of other materials by using flange fittings, PE/steel transition fittings or other suitable mechanical fasteners.

Marking of water and sewerage pipes

1	2	3	4	5	6	7	8	9	10	11	12											
WODA	=	TTPLAST	=	TARGOWISKO 476	=	KDWU	=	PE100	=	SDR 17	=	PN 10	=	110/6,6	=	17.02.16	=	13:52	=	PN-EN	=	100

1. application
2. manufacturer name / trademark
3. company address
4. Declaration of Performance
5. material (PE class)
6. pipe size series (ratio of nominal pipe diameter to wall thickness)
7. nominal pressure (PN)
8. external diameter / wall thickness
9. date of manufacture (day, month, year)
10. manufacture time
11. EN standard
12. metre counter

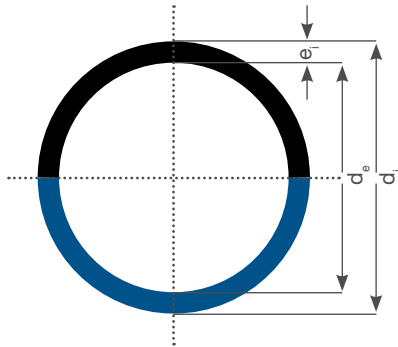
Marking of pipes for gas supply systems

1	2	3	4	5	6	7	8	9	10	11	12	13
GAZ - TT-GAZ-typ2 - TTPLAST TARGOWISKO 476, 32-015 Klaj	-		20 - KDWU - nr KOT - PE100RC/PE100RC - SDR11 - MOP10 - 250/22,7 - WSPÓŁWYTYŁACZANA - 24.11.2021 08:46 - PN EN									

1. application
2. marking of the goods
3. manufacturer name and address
4. construction mark and the last two digits of the year in which the product was put on the market
5. Declaration of Performance
6. National Technical Assessment Number
7. material (PE class)
8. pipe size series (ratio of nominal diameter to wall thickness)
9. maximum operating pressure (MOP)
10. external diameter / wall thickness
11. manufacturing technology
12. date (day, month, year) and time of manufacture
13. PN-EN standard

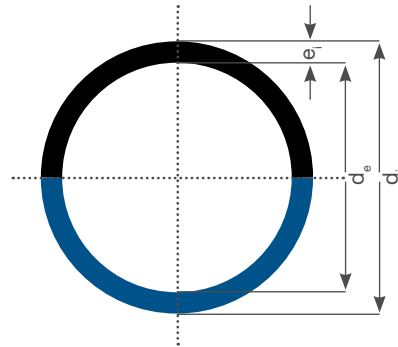
Pipes for water supply and sewerage systems

Made of raw material(s) PE 80



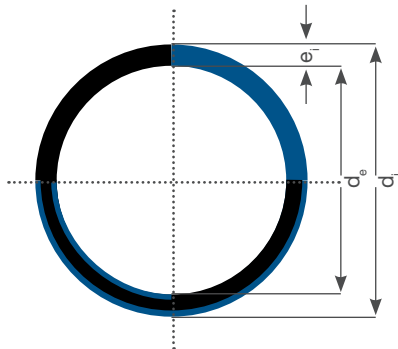
- a. single-layer pipes: blue, black or black with colour stripe

Made of raw material(s) PE 100



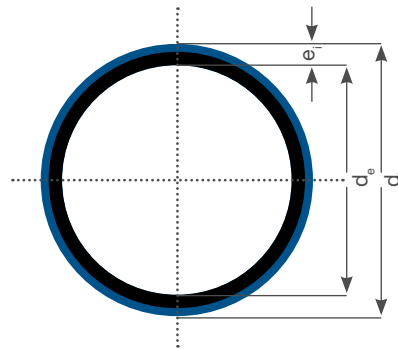
- a. single-layer pipes: blue, black or black with colour stripe
 b. double-layer pipes: blue external layer, black internal layer
 c. three-layer pipes: both blue external layers, black internal layer

Made of raw material(s) 100-RC



- a. single-layer pipes: blue, black or black with colour stripe
 b. double-layer pipes: blue external layer, black internal layer
 c. three-layer pipes: both blue external layers, black internal layer

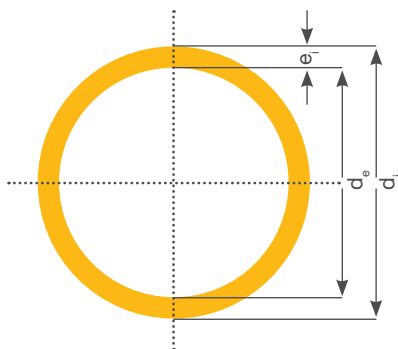
Made of raw material(s) PE 100-RC / PE 100



- a. double-layer pipes: blue external layer (approx. 10%) made of PE 100-RC raw material, black internal layer (approx. 90%) made of PE 100 raw material
 b. three-layer pipes: both blue external layers (approx. 10% each) made of PE 100-RC raw material, black internal layer (approx. 80%) made of PE 100 raw material

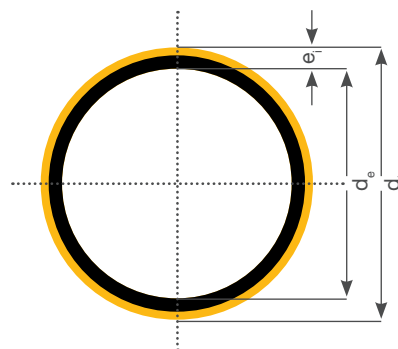
Pipes for gas supply systems

Made of raw material(s) PE 100



- a. single-layer pipes: yellow or orange

Made of raw material(s) PE 100-RC / PE 100-RC



- a. double-layer pipes: yellow or orange external layer (approx. 10%) made of PE 100-RC raw material, black internal layer (approx. 90%) made of PE 100 raw material

Joining methods

- compression fittings
- flange fittings
- butt fusion
- electrofusion welding

Basic colors, depending on application

- blue, navy blue, black with blue stripes - water pipes with a diameter of 20 to 630 mm for transporting drinking water, laid in the ground
- black, green, black with brown stripes - pipes for non-pressure sewage systems, pressure sewage systems, vacuum sewage systems in the ground and above the ground
- yellow, orange - pipes for gas systems

Pipes may be made in a different colour and/or with a different stripe colour.

Table 1

**Plastics piping systems for water supply and for drainage and sewerage under pressure - Polyethylene (PE)
Nominal/mean external diameter; Maximum out-of-roundness (ovality) according to PN-EN 12201-2+A1:2013-1**

Dimensions in millimetres

Nominal size DN/OD	Nominal external diameter dn	External diameter		Maximum out-of- roundness (ovality) b,d
		d _{em.min}	d _{em.max}	
16	16	16	16,3	1,2
20	20	20	20,3	1,2
25	25	25	25,3	1,2
32	32	32	32,3	1,3
40	40	40	40,4	1,4
50	50	50	50,4	1,4
63	63	63	63,4	1,5
75	75	75	75,5	1,6
90	90	90	90,6	1,8
110	110	110	110,7	2,2
125	125	125	125,8	2,5
140	140	140	140,9	2,8
160	160	160	161,0	3,2
180	180	180	181,1	3,6
200	200	200	201,2	4,0
225	225	225	226,4	4,5
250	250	250	251,5	5,0
280	280	280	281,7	9,8
315	315	315	316,9	11,1
355	355	355	357,2	12,5
400	400	400	402,4	14,0
450	450	450	452,7	15,6
500	500	500	503,0	17,5
560	560	560	563,4	19,6
630	630	630	633,8	22,1

Table 2**Plastics piping systems for water supply and for drainage and sewerage under pressure - Polyethylene (PE)****Wall(s) thickness according to PN-EN 12201-2+A1:2013-12**

Dimensions in millimetres

Nom. size DN/OD	Pipe series											
	SDR 6 S 2,5		SDR 7,4 S 3,2		SDR 9 S 4		SDR 11 S 5		SDR 13,6 S 6,3		SDR 17 S 8	
	Nominal pressure PN ^a in bar											
PE 80	PN 25		PN 20		PN 16		PN 12,5		PN 10		PN 8	
PE 100	-		PN 25		PN 20		PN 16		PN 12,5		PN 10	
Nom. size DN/OD	Wall(s) thickness ^b											
	e _{min}	e _{max}	e _{min}	e _{max}	e _{min}	e _{max}	e _{min}	e _{max}	e _{min}	e _{max}	e _{min}	e _{max}
16	3,0 ^c	3,4	2,3 ^c	2,7	2,0 ^c	2,3	-	-	-	-	-	-
20	3,4	3,9	3,0 ^c	3,4	2,3	2,7	2,0 ^c	2,3	-	-	-	-
25	4,2	4,8	3,5	4,0	3,0 ^c	3,4	2,3	2,7	2,0 ^c	2,3	-	-
32	5,4	6,1	4,4	5,0	3,6	4,1	3,0 ^c	3,4	2,4	2,8	2,0 ^c	2,3
40	6,7	7,5	5,5	6,2	4,5	5,1	3,7	4,2	3,0	3,5	2,4	2,8
50	8,3	9,3	6,9	7,7	5,6	6,3	4,6	5,2	3,7	4,2	3,0	3,4
63	10,5	11,7	8,6	9,6	7,1	8,0	5,8	6,5	4,7	5,3	3,8	4,3
75	12,5	13,9	10,3	11,5	8,4	9,4	6,8	7,6	5,6	6,3	4,5	5,1
90	15,0	16,7	12,3	13,7	10,1	11,3	8,2	9,2	6,7	7,5	5,4	6,1
110	18,3	20,3	15,1	16,8	12,3	13,7	10	11,1	8,1	9,1	6,6	7,4
125	20,8	23,0	17,1	19,0	14,0	15,6	11,4	12,7	9,2	10,3	7,4	8,3
140	23,3	25,8	19,2	21,3	15,7	17,4	12,7	14,1	10,3	11,5	8,3	9,3
160	26,6	29,4	21,9	24,2	17,9	19,8	14,6	16,2	11,8	13,1	9,5	10,6
180	29,9	33,0	24,6	27,2	20,1	22,3	16,4	18,2	13,3	14,8	10,7	11,9
200	33,2	36,7	27,4	30,3	22,4	24,8	18,2	20,2	14,7	16,3	11,9	13,2
225	37,4	41,3	30,8	34,0	25,2	27,9	20,5	22,7	16,6	18,4	13,4	14,9
250	41,5	45,8	34,2	37,8	27,9	30,8	22,7	25,1	18,4	20,4	14,8	16,4
280	46,5	51,3	38,3	42,3	31,3	34,6	25,4	28,1	20,6	22,8	16,6	18,4
315	52,3	57,7	43,1	47,6	35,2	38,9	28,6	31,6	23,2	25,7	18,7	20,7
355	59,0	65,0	48,5	53,5	39,7	43,8	32,2	35,6	26,1	28,9	21,1	23,4
400	---	---	54,7	60,3	44,7	49,3	36,3	40,1	29,4	32,5	23,7	26,2
450	---	---	61,5	67,8	50,3	55,5	40,9	45,1	33,1	36,6	26,7	29,5
500	---	---	---	---	55,8	61,5	45,4	50,1	36,8	40,6	29,7	32,8
560	---	---	---	---	62,5	68,9	50,8	56,0	41,2	45,5	33,2	36,7
630	---	---	---	---	70,3	77,5	57,2	63,1	46,3	51,1	37,4	41,3

^a PN values are based on C=1.25.^b Tolerances in accordance with class V PN-SO 11922-1:2020:02^c The calculated value of e_{min} according to PN-ISO 4065:2020-06 is rounded up to the nearest value of either 2.0, 2.3 or 3.0. This is to satisfy certain national requirements.**Pipe stiffness**

Initial stiffness value SN [kN/m ²]			
Young's Modul E [MPa]	SDR 11	SDR 13,6	SDR 17
700	58,3	29,2	14,2
800	66,7	33,3	16,3
1000	83,3	41,7	20,3
1100	91,7	45,8	22,4

Table 2

Wall thickness - continued

Dimensions in millimetres

	Pipe series							
	SDR 21 S 10		SDR 26 S 12,5		SDR 33 S 16		SDR 41 S 20	
	Nominal pressure PN ^a in bar							
PE 80	PN 6		PN 5		PN 4		PN 3,2	
PE 100	PN 8		PN 6		PN 5		PN 4	
Nom. size DN/OD	Wall(s) thickness ^b							
	e _{min}	e _{max}	e _{min}	e _{max}	e _{min}	e _{max}	e _{min}	e _{max}
16	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-
40	2,0 ^c	2,3	-	-	-	-	-	-
50	2,4	2,8	2,0	2,3	-	-	-	-
63	3,0	3,4	2,5	2,9	-	-	-	-
75	3,6	4,1	2,9	3,3	-	-	-	-
90	4,3	4,9	3,5	4,0	-	-	-	-
110	5,3	6,0	4,2	4,8	-	-	-	-
125	6,0	6,7	4,8	5,4	-	-	-	-
140	6,7	7,5	5,4	6,1	-	-	-	-
160	7,7	8,6	6,2	7,0	-	-	-	-
180	8,6	9,6	6,9	7,7	-	-	-	-
200	9,6	10,7	7,7	8,6	-	-	-	-
225	10,8	12,0	8,6	9,6	-	-	-	-
250	11,9	13,2	9,6	10,7	-	-	-	-
280	13,4	14,9	10,7	11,9	---	---	---	---
315	15,0	16,6	12,1	13,5	9,7	10,8	7,7	8,6
355	16,9	18,7	13,6	15,1	10,9	12,1	8,7	9,7
400	19,1	21,2	15,3	17,0	12,3	13,7	9,8	10,9
450	21,5	23,8	17,2	19,1	13,8	15,3	11,0x	12,2
500	23,9	26,4	19,1	21,2	15,3	17,0	12,3	13,7
560	26,7	29,5	21,4	23,7	17,2	19,1	13,7	15,2
630	30,0	33,1	24,1	26,7	19,3	21,4	15,4	17,1

^a PN values are based on C=1.25.

^b Tolerances in accordance with class V PN-SO 11922-1:2020:02

^c The calculated value of e_{min} according to PN-ISO 4065:2020-06 is rounded up to the nearest value of either 2.0, 2.3 or 3.0. This is to satisfy certain national requirements.

Bend radius for PE pipes

Temperature	Pipe size series: SDR 11; 13,6; 17
>20°C	20 x D
>10°C	35 x D
>0°C	50 x D

Table 3**Plastics piping systems for the supply of gaseous fuels - Polyethylene (PE)****Nominal/mean external diameter and maximum out-of-roundness (ovality) according to PN-EN 1555-2:2021-12**

Dimensions in millimetres

Nominal size DN/ODv	Nominal external diameter d_n	Nominal/mean external diameter ^a		Maximum out-of-roundness (ovality) ^{b c}
		$d_{em.min}$	$d_{em.max}$	
16	16	16	16,3	1,2
20	20	20	20,3	1,2
25	25	25	25,3	1,2
32	32	32	32,3	1,3
40	40	40	40,4	1,4
50	50	50	50,4	1,4
63	63	63	63,4	1,5
75	75	75	75,5	1,6
90	90	90	90,6	1,8
110	110	110	110,7	2,2
125	125	125	125,8	2,5
140	140	140	140,9	2,8
160	160	160	161,0	3,2
180	180	180	181,1	3,6
200	200	200	201,2	4,0
225	225	225	226,4	4,5
250	250	250	251,5	5,0
280	280	280	281,7	9,8
315	315	315	316,9	11,1
355	355	355	357,2	12,5
400	400	400	402,4	14,0
450	450	450	452,7	15,6
500	500	500	503,0	17,5
560	560	560	563,4	19,6
630	630	630	633,8	22,1

Table 4

Plastics piping systems for the supply of gaseous fuels - Polyethylene (PE)

Minimum pipe wall thickness with SDR 17.6, SDR 17, SDR 11 according to PN-EN 1555-2:2012

Dimensions in millimetres

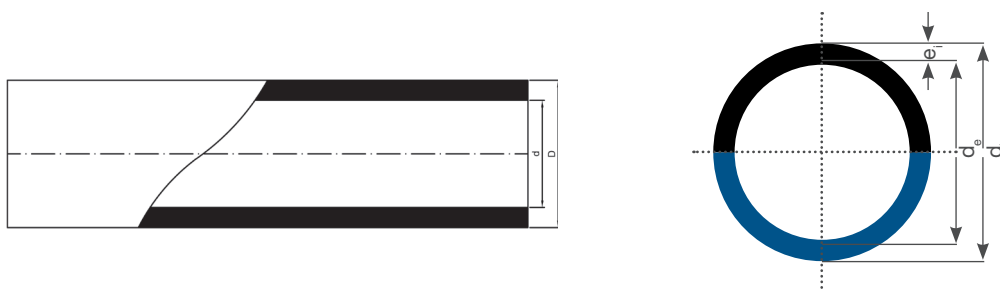
Nominal size DN/OD	Min. wall(s) thickness e_{min}^a		
	SDR 17,6 ^b	SDR 17	SDR 11
16	2,3 ^c	2,3 ^c	3,0 ^c
20	2,3 ^c	2,3 ^c	3,0 ^c
25	2,3 ^c	2,3 ^c	3,0 ^c
32	2,3 ^c	2,3 ^c	3,0
40	2,3	2,4	3,7
50	2,9	3,0	4,6
63	3,6	3,8	5,8
75	4,3	4,5	6,8
90	5,2	5,4	8,2
110	6,3	6,6	10,0
125	7,1	7,4	11,4
140	8,0	8,3	12,7
160	9,1	9,5	14,6
180	10,3	10,7	16,4
200	11,4	11,9	18,2
225	12,8	13,4	20,5
250	14,2	14,8	22,7
280	15,9	16,6	25,4
315	17,9	18,7	28,6
355	20,2	21,1	32,3
400	22,8	23,7	36,3
450	25,6	26,7	40,9
500	28,4	29,7	45,4
560	31,9	33,2	50,8
630	35,8	37,4	57,2

^a $e_{min} = e_n$

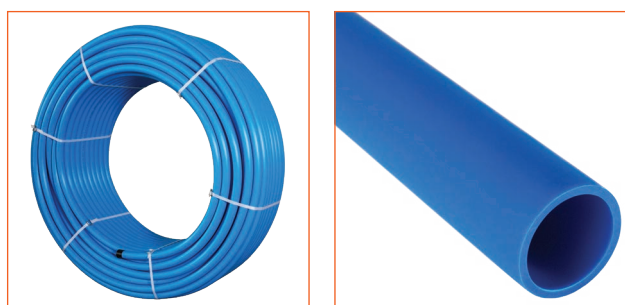
^b EN 1555-2:2021-12 refers to SDR 11 and SDR 17 in Table No 2. In some countries, SDR 17.6 is defined.

^c The calculated values of e_{min} have been rounded up to 2.3 mm for SDR 17.6 and 3.0 mm for SDR 11, respectively.

Pipes for water supply systems - PE 80



	Reference documents:	PN-EN 12201-2+A1:2013-12 HYGIENIC ATTESTATION
	PKWiU [Polish Classification of Products and Services]:	22.21.21.0
	Customs code:	3917 21 10
	Application:	<ul style="list-style-type: none"> - supply of pressurised water - supply of drinking water - supply of pre-treatment water - supply of water for other purposes - hydro-transport - other purposes
	Material:	PE 80
	Nominal pressure (PN):	PN 10 (SDR 13,6); PN 12,5 (SDR 11)
	SN:	SN 40 (SDR 13,6); SN 80 (SDR 11)
	Colour:	blue
	Ø ext. [mm] - coils:	20, 25, 32, 40, 50, 63, 75
	Coil length [m]:	100, 150, 200
	Notes:	<ul style="list-style-type: none"> * Possibility of producing pipe in a different colour and/or with a different stripe colour * Possibility of producing pipe with a different coil length

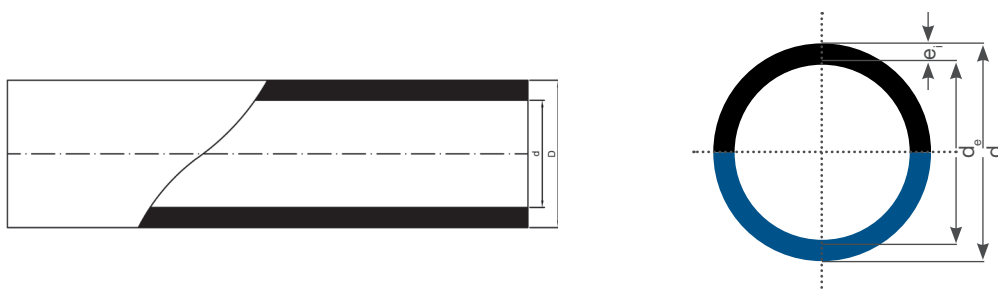











Single-layer pipes for water supply systems

Single layer pipes (blue)

		SDR-13,6		SDR-11			
	∅ ext.	▲ wall thickness	☐ index	▲ wall thickness	☐ index	coil length	bulk packaging
COILS	20			2,0	11270	200	2800
	25	2,0	11276	2,3	11271	200	1200
	32	2,4	11277	3,0	11272	200	1400
	40	3,0	11278a	3,7	11273a	150	900
	50	3,7	11279a	4,6	11274a	100	100
	63	4,7	11280	5,8	11300	100	100
	75	5,6	11299	6,8	12137	100	100

Pipes for water supply systems - PE 100



	Reference documents:	PN-EN 12201-2+A1:2013-12 HYGIENIC ATTESTATION
	PKWiU [Polish Classification of Products and Services]:	22.21.21.0
	Customs code:	3917 21 10
	Application:	- supply of pressurised water - supply of drinking water - supply of pre-treatment water - supply of water for other purposes - hydro-transport - other purposes
	Material:	PE 100
	Nominal pressure (PN):	PN 10 (SDR 17); PN 16 (SDR 11)
	SN:	SN 20 (SDR 17); SN 80 (SDR 11)
	Colour:	- 20-75: blue - 90-630: black with blue stripes
	∅ ext. [mm] - coils:	20; 25; 32; 40; 50; 63; 75; 90; 110
	∅ ext. [mm] - bars:	90; 110; 125; 140; 160; 180; 200; 225; 250; 280; 315; 355; 400; 450; 500; 560; 630
	Coil length [m]:	50; 100; 150; 200
	Bar length [m]:	12
	Notes:	* Possibility of producing pipe in a different colour and/or with a different stripe colour * Possibility of producing pipe with a different coil length

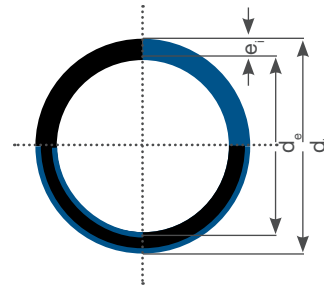
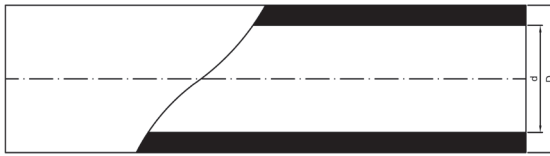















Single-layer pipes for water supply systems - PE 100

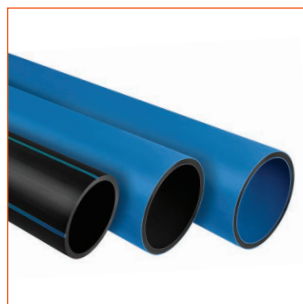
Single layer (blue or black with blue stripes)

		SDR-17		SDR-11			
	∅ ext.	∇ wall thickness	☒ index	∇ wall thickness	☒ index	coil / bar length	bulk packaging
COILS	20			2,0	11217	200	2800
	25			2,3	11218	200	1200
	32	2,0	11200	3,0	11219	200	1400
	40	2,4	11589	3,7	11588	150	900
	50	3,0	11593	4,6	12127	100	100
	63	3,8	11204	5,8	11222	100	100
	75	4,5	11205	6,8	11223	100	100
	90	5,4	11206	8,2	11224	50	50
	110	6,6	11207	10,0	11226	50	50
BARS	90	5,4	11208	8,2	11227	12	32/384
	110	6,6	11209	10,0	11228	12	26/312
	125	7,4	11210	11,4	11229	12	38/456
	140	8,3	11211	12,7	11230	12	38/456
	160	9,5	11212	14,6	11231	12	20/240
	180	10,7	11213	16,4	11232	12	17/204
	200	11,9	11214	18,2	11233	12	14/168
	225	13,4	11215	20,5	11234	12	11/132
	250	14,8	11216	22,7	11235	12	11/132
	280	16,6	12029	25,4	12037	12	4/48
	315	18,7	12030	28,6	12038	12	3/36
	355	21,1	12031	32,2	12039	12	3/36
	400	23,7	12032	36,3	12040	12	3/36
	450	26,7	12033	40,9	12041	12	2/24
	500	29,7	12034	45,4	12042	12	2/24
	560	33,2	12035	50,8	12043	12	2/24
	630	37,4	12036	57,2	12044	12	2/24

Pipes for water supply systems PE 100-RC: TT-RC - type 1, TT-RC - type 2, TT-RC - type 3



	Reference documents:	PN-EN 12201-2+A1:2013-12 HYGIENIC ATTESTATION, NATIONAL TECHNICAL ASSESSMENT ITB
	PKWiU [Polish Classification of Products and Services]:	22.21.21.0
	Customs code:	3917 21 10
	Application:	<ul style="list-style-type: none"> - supply of pressurised water - supply of drinking water - supply of pre-treatment water - supply of water for other purposes - hydro-transport - other purposes
	Material:	PE 100-RC
	Nominal pressure (PN):	PN 10 (SDR 17); PN 16 (SDR 11)
	SN:	SN 20 (SDR 17); SN 80 (SDR 11)
	Colour:	<ul style="list-style-type: none"> - black with blue stripes - external: blue, internal: black - both layers external and internal blue, black middle layer
	∅ ext. [mm] - coils:	20; 25; 32; 40; 50; 63; 75; 90; 110
	∅ ext. [mm] - bars:	90; 110; 125; 140; 160; 180; 200; 225; 250; 280; 315; 355; 400; 450; 500; 560; 630
	Coil length [m]:	50; 100; 150; 200
	Bar length [m]:	12
	Notes:	<ul style="list-style-type: none"> * Possibility of producing pipe in a different colour and/or with a different stripe colour * Possibility of producing pipe with a different length



*Pipes for water supply systems - PE 100-RC - TT-RC - type 1

Single layer (black with blue stripes)

		SDR-17		SDR-11			
	∅ ext.	∇ wall thickness	☒ index	∇ wall thickness	☒ index	coil / bar length	bulk packaging
COILS	20			2,0	11236	200	2 800
	25			2,3	11237	200	1 200
	32	2,0	11254	3,0	11238	200	1 400
	40	2,4	11255	3,7	12128	150	900
	50	3,0	11256	4,6	12129	100	100
	63	3,8	11257	5,8	11241	100	100
	75	4,5	11258	6,8	11242	100	100
	90	5,4	11259	8,2	11243	50	50
	110	6,6	11260	10,0	11244	50	50
BARS	90	5,4	11261	8,2	11245	12	32/384
	110	6,6	11262	10,0	11246	12	26/312
	125	7,4	11263	11,4	11247	12	38/456
	140	8,3	11264	12,7	11248	12	38/456
	160	9,5	11265	14,6	11249	12	20/240
	180	10,7	11266	16,4	11250	12	17/204
	200	11,9	11267	18,2	11251	12	14/168
	225	13,4	11268	20,5	11252	12	11/132
	250	14,8	11269	22,7	11253	12	11/132
	280	16,6	12045	25,4	12053	12	4/48
	315	18,7	12046	28,6	12054	12	3/36
	355	21,1	12047	32,2	12055	12	3/36
	400	23,7	12048	36,3	12056	12	3/36
	450	26,7	12049	40,9	12057	12	2/24
	500	29,7	12050	45,4	12058	12	2/24
	560	33,2	12051	50,8	12059	12	2/24
630	37,4	12052	57,2	12060	12	2/24	

* product available on request at the minimum production requirement

Pipes for water supply systems - PE 100-RC - TT-RC - type 2

Double-layer (external: blue, internal: black)

		SDR-17		SDR-11			
	∅ ext.	∇ wall thickness	☒ index	∇ wall thickness	☒ index	coil / bar length	bulk packaging
COILS	20			2,0	11430	200	2 800
	25			2,3	11431	200	1 200
	32	2,0	11387	3,0	11432	200	1 400
	40	2,4	11591	3,7	11590	150	900
	50	3,0	12130	4,6	12131	100	100
	63	3,8	11390	5,8	11435	100	100
	75	4,5	11391	6,8	11436	100	100
	90	5,4	11392	8,2	11437	50	50
	110	6,6	11393	10,0	11438	50	50
BARS	90	5,4	11403	8,2	11448	12	32/384
	110	6,6	11404	10,0	11449	12	26/312
	125	7,4	11405	11,4	11450	12	38/456
	140	8,3	11406	12,7	11451	12	38/456
	160	9,5	11407	14,6	11452	12	20/240
	180	10,7	11408	16,4	11453	12	17/204
	200	11,9	11409	18,2	11454	12	14/168
	225	13,4	11410	20,5	11455	12	11/132
	250	14,8	11411	22,7	11456	12	11/132
	280	16,6	12061	25,4	12069	12	4/48
	315	18,7	12062	28,6	12070	12	3/36
	355	21,1	12063	32,2	12071	12	3/36
	400	23,7	12064	36,3	12072	12	3/36
	450	26,7	12065	40,9	12073	12	2/24
	500	29,7	12066	45,4	12074	12	2/24
	560	33,2	12067	50,8	12075	12	2/24
630	37,4	12068	57,2	12076	12	2/24	

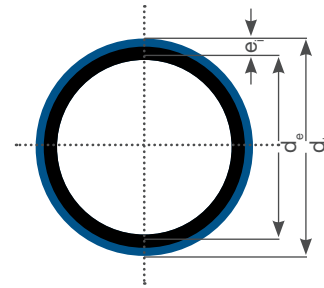
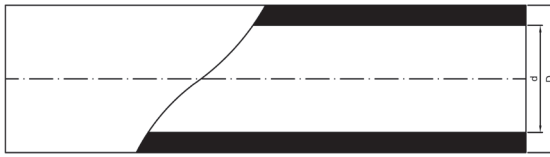
*Pipes for water supply systems - PE 100-RC - TT-RC - type 3

Three-layer (both external layer: blue, black middle layer)

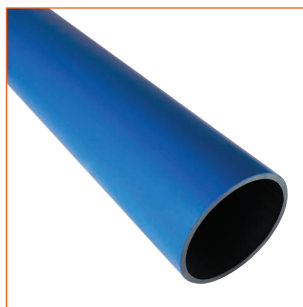
		SDR-17		SDR-11			
	∅ ext.	∇ wall thickness	☒ index	∇ wall thickness	☒ index	bar length	bulk packaging
BARS	90	5,4	11412	8,2	11457	12	32/384
	110	6,6	11413	10,0	11458	12	26/312
	125	7,4	11414	11,4	11459	12	38/456
	140	8,3	11415	12,7	11460	12	38/456
	160	9,5	11416	14,6	11461	12	20/240
	180	10,7	11417	16,4	11462	12	17/204
	200	11,9	11418	18,2	11463	12	14/168
	225	13,4	11419	20,5	11464	12	11/132
	250	14,8	11420	22,7	11465	12	11/132
	280	16,6	12077	25,4	12085	12	4/48
	315	18,7	12078	28,6	12086	12	3/36
	355	21,1	12079	32,2	12087	12	3/36
	400	23,7	12080	36,3	12088	12	3/36
	450	26,7	12081	40,9	12089	12	2/24
	500	29,7	12082	45,4	12090	12	2/24
	560	33,2	12083	50,8	12091	12	2/24
630	37,4	12084	57,2	12092	12	2/24	

* product available on request at the minimum production requirement

Pipes for water supply systems - PE 100-RC / PE 100 - TT-RC - type 2



	Reference documents:	PN-EN 12201-2+A1:2013-12 HYGIENIC ATTESTATION, NATIONAL TECHNICAL ASSESSMENT ITB
	PKWiU [Polish Classification of Products and Services]:	22.21.21.0
	Customs code:	3917 21 10
	Application:	<ul style="list-style-type: none"> - supply of pressurised water - supply of drinking water - supply of pre-treatment water - supply of water for other purposes - hydro-transport - other purposes
	Material:	PE 100-RC (approx. 10% of external layer), PE 100 (approx. 90% of internal layer)
	Nominal pressure (PN):	PN 10 (SDR 17); PN 16 (SDR 11)
	SN:	SN 20 (SDR 17); SN 80 (SDR 11)
	Colour:	external: blue internal: black
	Ø ext. [mm] - bars:	90; 110; 125; 140; 160; 180; 200; 225; 250; 280; 315; 355; 400; 450; 500; 560; 630
	Bar length [m]:	12
	Notes:	<ul style="list-style-type: none"> * Possibility of producing pipe in a different colour and/or with a different stripe colour * Possibility of producing pipe with a different length * Possibility of producing pipe with a different % ratio of individual layers * Possibility of producing three-layer pipes

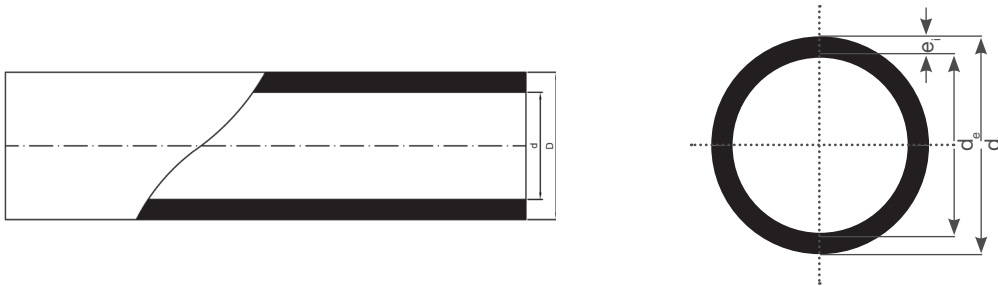















Pipes for water supply systems - PE 100-RC / PE 100 - TT-RC - type 2

Double-layer (external blue PE100-RC layer, internal black PE 100 layer)

		SDR-17		SDR-11			
	∅ ext.	∇ wall thickness	☒ index	∇ wall thickness	☒ index	bar length	bulk packaging
BARS	90	5,4	11466	8,2	11475	12	32/384
	110	6,6	11467	10,0	11476	12	26/312
	125	7,4	11468	11,4	11477	12	38/456
	140	8,3	11469	12,7	11478	12	38/456
	160	9,5	11470	14,6	11479	12	20/240
	180	10,7	11471	16,4	11480	12	17/204
	200	11,9	11472	18,2	11481	12	14/168
	225	13,4	11473	20,5	11482	12	11/132
	250	14,8	11474	22,7	11483	12	11/132
	280	16,6	12109	25,4	12117	12	4/48
	315	18,7	12110	28,6	12118	12	3/36
	355	21,1	12111	32,2	12119	12	3/36
	400	23,7	12112	36,3	12120	12	3/36
	450	26,7	12113	40,9	12121	12	2/24
	500	29,7	12114	45,4	12122	12	2/24
	560	33,2	12115	50,8	12123	12	2/24
630	37,4	12116	57,2	12124	12	2/24	

*Pipes for sewerage systems - PE 100



	Reference documents:	PN-EN 12201-2+A1:2013-12
	PKWiU [Polish Classification of Products and Services]:	22.21.21.0
	Customs code:	3917 21 10
	Application:	<ul style="list-style-type: none"> - construction of the sewerage system for consumption and utility purposes - construction of the storm water system - construction of the vacuum sewer system - construction of the sanitary sewerage system - construction of the combined sewer system - drainage of bridges and overpasses - hydro-transport - other purposes
	Material:	PE100
	Nominal pressure (PN):	PN 16 (SDR 11); PN 10 (SDR 17); PN 6 (SDR 26)
	SN:	SN 80 (SDR 11); SN 20 (SDR 17) ; SN 5 (SDR 26)
	Colour:	<ul style="list-style-type: none"> - black with brown stripes - black
	∅ ext. [mm] - coils:	20; 25; 32; 40; 50; 63; 75; 90; 110
	∅ ext. [mm] - bars:	90; 110; 125; 140; 160; 180; 200; 225; 250; 280; 315; 355; 400; 450; 500; 560; 630
	Coil length [m]:	50; 100; 150; 200
	Bar length [m]:	12
	Notes:	<ul style="list-style-type: none"> * Possibility of producing pipe in a different colour and/or with a different stripe colour * Possibility of producing pipe with a different coil length

* product available on request at the minimum production requirement



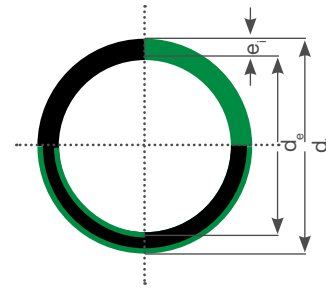
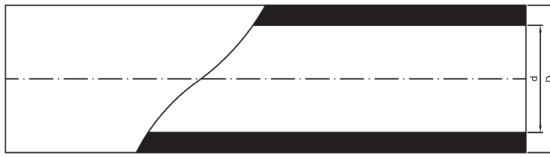
*Pipes for sewerage systems - PE 100

Single layer (black or black with brown stripes)

		SDR-26		SDR-17		SDR-11			
	∅ ext.	▲ wall thickness	☐ index	▲ wall thickness	☐ index	▲ wall thickness	☐ index	coil / bar length	bulk packaging
COILS	20					2,0	11317	200	2 800
	25					2,3	11318	200	1 200
	32			2,0	11301	3,0	11319	200	1 400
	40			2,4	11302	3,7	11320	150	900
	50			3,0	11303	4,6	11321	100	100
	63			3,8	11304	5,8	11322	100	100
	75			4,5	11305	6,8	11323	100	100
	90			5,4	11306	8,2	11324	50	50
	110			6,6	11307	10,0	11325	50	50
BARS	90	3,5	11335	5,4	11308	8,2	11326	12	32/384
	110	4,2	11336	6,6	11309	10,0	11327	12	26/312
	125	4,8	11337	7,4	11310	11,4	11328	12	38/456
	140	5,4	11338	8,3	11311	12,7	11329	12	38/456
	160	6,2	11339	9,5	11312	14,6	11330	12	20/240
	180	6,9	11340	10,7	11313	16,4	11331	12	17/204
	200	7,7	11341	11,9	11314	18,2	11332	12	14/168
	225	8,6	11342	13,4	11315	20,5	11333	12	11/132
	250	9,6	11343	14,8	11316	22,7	11334	12	11/132
	280	10,7	12152	16,6	12160	25,4	12168	12	4/48
	315	12,1	12153	18,7	12161	28,6	12169	12	3/36
	355	13,6	12154	21,1	12162	32,2	12170	12	3/36
	400	15,3	12155	23,7	12163	36,3	12171	12	3/36
	450	17,2	12156	26,7	12164	40,9	12172	12	2/24
	500	19,1	12157	29,7	12165	45,4	12173	12	2/24
	560	21,4	12158	33,2	12166	50,8	12174	12	2/24
630	24,1	12159	37,4	12167	57,2	12175	12	2/24	

* product available on request at the minimum production requirement

*Pipes for sewerage systems - PE 100-RC TT-RC - type 1, TT-RC - type 2, TT-RC - type 3



	Reference documents:	PN-EN 12201-2+A1:2013-12, NATIONAL TECHNICAL ASSESSMENT ITB
	PKWiU [Polish Classification of Products and Services]:	22.21.21.0
	Customs code:	3917 21 10
	Application:	<ul style="list-style-type: none"> - construction of the sewerage system for consumption and utility purposes - construction of the storm water system - construction of the vacuum sewer system - construction of the sanitary sewerage system - construction of the combined sewer system - drainage of bridges and overpasses - hydro-transport - other purposes
	Material:	PE 100-RC
	Nominal pressure (PN):	PN 16 (SDR 11); PN 10 (SDR 17)
	SN:	SN 80 (SDR 11); SN 20 (SDR 17)
	Colour:	<ul style="list-style-type: none"> - black or black with brown stripes - external: green, internal: black - both layers external and internal green, black middle layer
	∅ ext. [mm] - coils:	20; 25; 32; 40; 50; 63; 75; 90; 110
	∅ ext. [mm] - bars:	90; 110; 125; 140; 160; 180; 200; 225; 250; 280; 315; 355; 400; 450; 500; 560; 630
	Coil length [m]:	50; 100; 150; 200
	Bar length [m]:	12
	Notes:	<ul style="list-style-type: none"> * Possibility of producing pipe in a different colour and/or with a different stripe colour * Possibility of producing pipe with a different coil length * Possibility of producing pipe with a different % ratio of individual layers * Possibility of producing three-layer pipes * Possibility of producing pipe with other SDR on request

* product available on request at the minimum production requirement



*Pipes for sewerage systems - PE 100-RC - TT-RC - type 1

Single layer (black with brown stripes)

		SDR-17		SDR-11			
	Ø ext.	∇ wall thick-ness	☐ index	∇ wall thick-ness	☐ index	coil / bar length	bulk packaging
COILS	20			2,0	11500	200	2 800
	25			2,3	11501	200	1 200
	32	2,0	11484	3,0	11502	200	1 400
	40	2,4	11485	3,7	11503	150	900
	50	3,0	11486	4,6	11504	100	100
	63	3,8	11487	5,8	11505	100	100
	75	4,5	11488	6,8	11506	100	100
	90	5,4	11489	8,2	11507	50	50
	110	6,6	11490	10,0	11508	50	50
BARS	90	5,4	11491	8,2	11509	12	32/384
	110	6,6	11492	10,0	11510	12	26/312
	125	7,4	11493	11,4	11511	12	38/456
	140	8,3	11494	12,7	11512	12	38/456
	160	9,5	11495	14,6	11513	12	20/240
	180	10,7	11496	16,4	11514	12	17/204
	200	11,9	11497	18,2	11515	12	14/168
	225	13,4	11498	20,5	11516	12	11/132
	250	14,8	11499	22,7	11517	12	11/132
	280	16,6	12176	25,4	12184	12	4/48
	315	18,7	12177	28,6	12185	12	3/36
	355	21,1	12178	32,2	12186	12	3/36
	400	23,7	12179	36,3	12187	12	3/36
	450	26,7	12180	40,9	12188	12	2/24
	500	29,7	12181	45,4	12189	12	2/24
560	33,2	12182	50,8	12190	12	2/24	
630	37,4	12183	57,2	12191	12	2/24	

* product available on request at the minimum production requirement

*Pipes for sewerage systems - PE 100-RC - TT-RC - type 2

Double-layer (external: green, internal: black)

		SDR-17		SDR-11			
	∅ ext.	∇ wall thickness	☰ index	∇ wall thickness	☰ index	coil / bar length	bulk packaging
COILS	20			2,0	12199	200	2 800
	25			2,3	12200	200	1 200
	32	2,0	12192	3,0	12201	200	1 400
	40	2,4	12193	3,7	12202	150	900
	50	3,0	12194	4,6	12203	100	100
	63	3,8	12195	5,8	12204	100	100
	75	4,5	12196	6,8	12205	100	100
	90	5,4	12197	8,2	12206	50	50
	110	6,6	12198	10,0	12207	50	50
BARS	90	5,4	12208	8,2	12225	12	32/384
	110	6,6	12209	10	12226	12	26/312
	125	7,4	12210	11,4	12227	12	38/456
	140	8,3	12211	12,7	12228	12	38/456
	160	9,5	12212	14,6	12229	12	20/240
	180	10,7	12213	16,4	12230	12	17/204
	200	11,9	12214	18,2	12231	12	14/168
	225	13,4	12215	20,5	12232	12	11/132
	250	14,8	12216	22,7	12233	12	11/132
	280	16,6	12217	25,4	12234	12	4/48
	315	18,7	12218	28,6	12235	12	3/36
	355	21,1	12219	32,2	12236	12	3/36
	400	23,7	12220	36,3	12237	12	3/36
	450	26,7	12221	40,9	12238	12	2/24
	500	29,7	12222	45,4	12239	12	2/24
	560	33,2	12223	50,8	12240	12	2/24
630	37,4	12224	57,2	12241	12	2/24	

* product available on request at the minimum production requirement

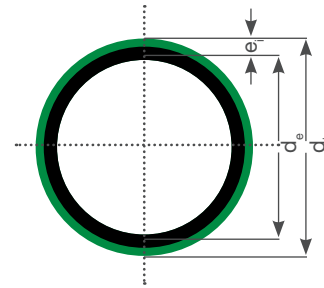
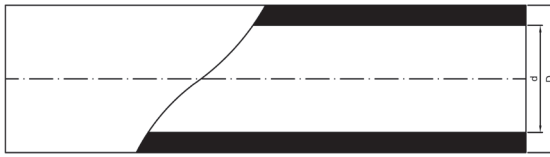
*Pipes for sewerage systems - PE 100-RC - TT-RC - type 3












Three-layer (external and internal: green, black middle layer)

		SDR-17		SDR-11			
	∅ ext.	▲ wall thickness	☰ index	▲ wall thickness	☰ index	coil / bar length	bulk packaging
BARS	90	5,4	12242	8,2	12259	12	32/384
	110	6,6	12243	10,0	12260	12	26/312
	125	7,4	12244	11,4	12261	12	38/456
	140	8,3	12245	12,7	12262	12	38/456
	160	9,5	12246	14,6	12263	12	20/240
	180	10,7	12247	16,4	12264	12	17/204
	200	11,9	12248	18,2	12265	12	14/168
	225	13,4	12249	20,5	12266	12	11/132
	250	14,8	12250	22,7	12267	12	11/132
	280	16,6	12251	25,4	12268	12	4/48
	315	18,7	12252	28,6	12269	12	3/36
	355	21,1	12253	32,2	12270	12	3/36
	400	23,7	12254	36,3	12271	12	3/36
	450	26,7	12255	40,9	12272	12	2/24
	500	29,7	12256	45,4	12273	12	2/24
	560	33,2	12257	50,8	12274	12	2/24
630	37,4	12258	57,2	12275	12	2/24	

* product available on request at the minimum production requirement

*Pipes for sewerage systems - PE 100-RC / PE 100 - TT-RC - type 2



	Reference documents:	PN-EN 12201-2+A1:2013-12, NATIONAL TECHNICAL ASSESSMENT ITB
	PKWiU [Polish Classification of Products and Services]:	22.21.21.0
	Customs code:	3917 21 10
	Application:	<ul style="list-style-type: none"> - construction of the sewerage system for consumption and utility purposes - construction of the storm water system - construction of the vacuum sewer system - construction of the sanitary sewerage system - construction of the combined sewer system - drainage of bridges and overpasses - hydro-transport - other purposes
	Material:	PE 100-RC (approx. 10% of external layer), PE 100 (approx. 90% of internal layer)
	Nominal pressure (PN):	PN 16 (SDR 11); PN 10 (SDR 17)
	SN:	SN 80 (SDR 11); SN 20 (SDR 17)
	Colour:	<ul style="list-style-type: none"> - black with brown stripes - black - external: green, internal: black
	Ø ext. [mm] - bars:	90; 110; 125; 140; 160; 180; 200; 225; 250; 280; 315; 355; 400; 450; 500; 560; 630
	Bar length [m]:	12
	Notes:	<ul style="list-style-type: none"> * Possibility of producing pipe in a different colour and/or with a different stripe colour * Possibility of producing pipe with a different length * Possibility of producing pipe with a different % ratio of individual layers * Possibility of producing three-layer pipes

* product available on request at the minimum production requirement



*Pipes for sewerage systems - PE 100-RC / PE 100 - TT-RC - type 2

*Double-layer (external PE 100-RC black with brown stripe, internal PE 100 black)

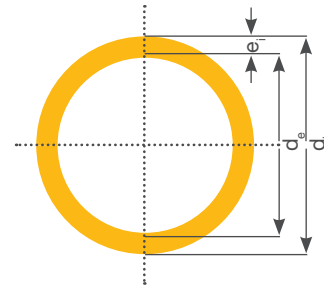
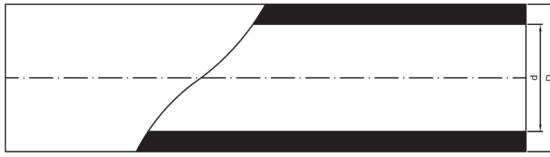
		SDR-17		SDR-11			
		∇ wall thickness	☐ index	∇ wall thickness	☐ index	bar length	bulk packaging
BARS	90	5,4	11518	8,2	11527	12	32/384
	110	6,6	11519	10,0	11528	12	26/312
	125	7,4	11520	11,4	11529	12	38/456
	140	8,3	11521	12,7	11530	12	38/456
	160	9,5	11522	14,6	11531	12	20/240
	180	10,7	11523	16,4	11532	12	17/204
	200	11,9	11524	18,2	11533	12	14/168
	225	13,4	11525	20,5	11534	12	11/132
	250	14,8	11526	22,7	11535	12	11/132
	280	16,6	12276	25,4	12284	12	4/48
	315	18,7	12277	28,6	12285	12	3/36
	355	21,1	12278	32,2	12286	12	3/36
	400	23,7	12279	36,3	12287	12	3/36
	450	26,7	12280	40,9	12288	12	2/24
	500	29,7	12281	45,4	12289	12	2/24
	560	33,2	12282	50,8	12290	12	2/24
630	37,4	12283	57,2	12291	12	2/24	












*Double-layer (external layer PE 100-RC green, internal PE 100 black)

		SDR-17		SDR-11			
		∇ wall thickness	☐ index	∇ wall thickness	☐ index	bar length	bulk packaging
BARS	90	5,4	12292	8,2	12309	12	32/384
	110	6,6	12293	10,0	12310	12	26/312
	125	7,4	12294	11,4	12311	12	38/456
	140	8,3	12295	12,7	12312	12	38/456
	160	9,5	12296	14,6	12313	12	20/240
	180	10,7	12297	16,4	12314	12	17/204
	200	11,9	12298	18,2	12315	12	14/168
	225	13,4	12299	20,5	12316	12	11/132
	250	14,8	12300	22,7	12317	12	11/132
	280	16,6	12301	25,4	12318	12	4/48
	315	18,7	12302	28,6	12319	12	3/36
	355	21,1	12303	32,2	12320	12	3/36
	400	23,7	12304	36,3	12321	12	3/36
	450	26,7	12305	40,9	12322	12	2/24
	500	29,7	12306	45,4	12323	12	2/24
	560	33,2	12307	50,8	12324	12	2/24
630	37,4	12308	57,2	12325	12	2/24	

* product available on request at the minimum production requirement

Pipes for gas supply systems - PE 100 TT-GAZ



	Reference documents:	PN-EN 1555-2:2021-12, NATIONAL TECHNICAL ASSESSMENT OF THE OIL AND GAS INSTITUTE (INiG) ZETOM SAFETY MARK, NATIONAL CERTIFICATE OF CONSTANCY OF PERFORMANCE
	PKWiU [Polish Classification of Products and Services]:	22.21.21.0
	Customs code:	3917 21 10
	Application:	- construction of the gas supply systems - supply of gaseous fuels - other purposes
	Material:	PE 100
	Nominal pressure (PN):	MOP 10 (SDR11); MOP 6 (SDR17; 17,6);
	SN:	SN 80 (SDR 11); SN 20 (SDR 17); SN 16 (SDR 17,6)
	Colour:	yellow, orange
	Ø ext. [mm] - bars:	90; 110; 125; 140; 160; 180; 200; 225; 250; 280; 315; 355; 400; 450; 500; 560; 630
	Bar length [m]:	12
	Notes:	* Possibility of producing pipe with a different length * Possibility of producing 90 and 110 diameter pipes in coil

* product available on request at the minimum production requirement

** EN 1555-2:2021-12 refers to SDR 11 and SDR 17 in Table No 2. In some countries, SDR 17.6 is defined.



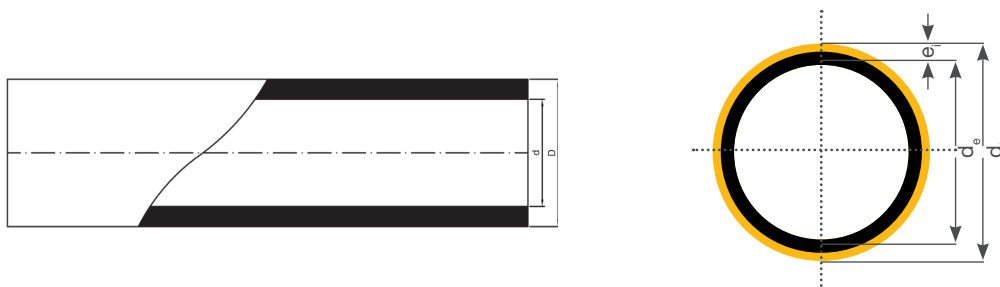
*Pipes for gas supply systems - PE 100 TT-GAZ












Single layer (yellow or orange)

		SDR-17,6		SDR-17		SDR-11			
	∅ ext.	▲ wall thickness	☐ index	▲ wall thickness	☐ index	▲ wall thickness	☐ index	bar length	bulk packaging
BARS	90	5,2	12326	5,4	12343	8,2	12360	12	32/384
	110	6,3	12327	6,6	12344	10,0	12361	12	26/312
	125	7,1	12328	7,4	12345	11,4	12362	12	38/456
	140	8,0	12329	8,3	12346	12,7	12363	12	38/456
	160	9,1	12330	9,5	12347	14,6	12364	12	20/240
	180	10,3	12331	10,7	12348	16,4	12365	12	17/204
	200	11,4	12332	11,9	12349	18,2	12366	12	14/168
	225	12,8	12333	13,4	12350	20,5	12367	12	11/132
	250	14,2	12334	14,8	12351	22,7	12368	12	11/132
	280	15,9	12335	16,6	12352	25,4	12369	12	4/48
	315	17,9	12336	18,7	12353	28,6	12370	12	3/36
	355	20,2	12337	21,1	12354	32,3	12371	12	3/36
	400	22,8	12338	23,7	12355	36,3	12372	12	3/36
	450	25,6	12339	26,7	12356	40,9	12373	12	2/24
	500	28,4	12340	29,7	12357	45,4	12374	12	2/24
	560	31,9	12341	33,2	12358	50,8	12375	12	2/24
630	35,8	12342	37,4	12359	57,2	12376	12	2/24	

* product available on request at the minimum production requirement

Pipes for gas supply systems PE 100-RC / PE 100-RC TT-GAZ type 2



	Reference documents:	PN-EN 1555-2:2021-12, NATIONAL TECHNICAL ASSESSMENT OF THE OIL AND GAS INSTITUTE (INiG) ZETOM SAFETY MARK, NATIONAL CERTIFICATE OF CONSTANCY OF PERFORMANCE
	PKWiU [Polish Classification of Products and Services]:	22.21.21.0
	Customs code:	3917 21 10
	Application:	- construction of the gas supply systems - supply of gaseous fuels - other purposes
	Material:	PE 100-RC
	Nominal pressure (PN):	MOP 10 (SDR11); MOP 6 (SDR17; 17,6);
	SN:	SN 80 (SDR 11); SN 20 (SDR 17); SN 16 (SDR 17,6)
	Colour:	external: yellow or orange, internal: black
	Ø ext. [mm] - coils:	16; 20; 25; 32; 40; 50; 63; 90; 110
	Ø ext. [mm] - bars:	90; 110; 125; 140; 160; 180; 200; 225; 250; 280; 315; 355; 400; 450; 500; 560; 630
	Coil length [m]:	50; 100
	Bar length [m]:	12
	Notes:	* Possibility of producing pipe with a different length * Possibility of producing 90 and 110 diameter pipes in coil

** EN 1555-2:2021-12 refers to SDR 11 and SDR 17 in Table No 2. In some countries, SDR 17.6 is defined.

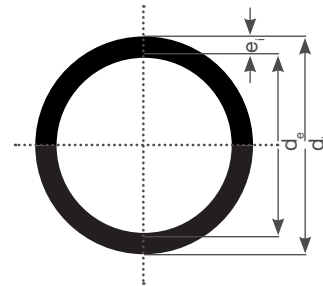
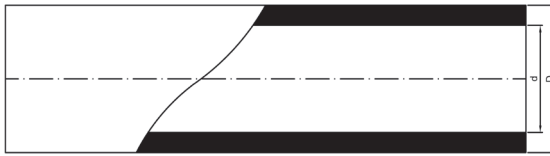


Pipes for gas supply systems PE 100-RC / PE 100-RC TT-GAZ type 2

Double-layer (external PE 100-RC yellow, internal PE 100-RC black)

		SDR-17,6		SDR-17		SDR-11			
	∅ ext.	▲ wall(s) thickness	☐ index	▲ wall(s) thickness	☐ index	▲ wall(s) thickness	☐ index	coil / bar length	bulk packaging
COILS	16	2,3	12377	2,3	12404	3,0	12431	100	-
	20	2,3	12378	2,3	12405	3,0	12432	100	-
	25	2,3	12379	2,3	12406	3,0	12433	100	1100
	32	2,3	12380	2,3	12407	3,0	12434	100	1000
	40	2,3	12381	2,4	12408	3,7	12435	100	900
	50	2,9	12382	3,0	12409	4,6	12436	100	100
	63	3,6	12383	3,8	12410	5,8	12437	100	100
	75	4,3	12384	4,5	12411	6,8	12438	100	100
	90	5,2	12385	5,4	12412	8,2	12439	50	50
	110	6,3	12386	6,6	12413	10,0	12440	50	50
BARS	90	5,2	12387	5,4	12414	8,2	12441	12	32/384
	110	6,3	12388	6,6	12415	10,0	12442	12	26/312
	125	7,1	12389	7,4	12416	11,4	12443	12	38/456
	140	8,0	12390	8,3	12417	12,7	12444	12	38/456
	160	9,1	12391	9,5	12418	14,6	12445	12	20/240
	180	10,3	12392	10,7	12419	16,4	12446	12	17/204
	200	11,4	12393	11,9	12420	18,2	12447	12	14/168
	225	12,8	12394	13,4	12421	20,5	12448	12	11/132
	250	14,2	12395	14,8	12422	22,7	12449	12	11/132
	280	15,9	12396	16,6	12423	25,4	12450	12	4/48
	315	17,9	12397	18,7	12424	28,6	12451	12	3/36
	355	20,2	12398	21,1	12425	32,3	12452	12	3/36
	400	22,8	12399	23,7	12426	36,3	12453	12	3/36
	450	25,6	12400	26,7	12427	40,9	12454	12	2/24
	500	28,4	12401	29,7	12428	45,4	12455	12	2/24
	560	31,9	12402	33,2	12429	50,8	12456	12	2/24
630	35,8	12403	37,4	12430	57,2	12457	12	2/24	

*Pipes for irrigation systems - HDPE



	Reference documents:	Company standard: ZN TTPLAST 001-2017:04
	PKWiU [Polish Classification of Products and Services]:	22.21.21.0
	Customs code:	3917 21 10
	Application:	<ul style="list-style-type: none"> - irrigation of croplands - irrigation of garden squares - irrigation of orchards - irrigation of gardens - irrigation of greenhouses
	Material:	HDPE
	Nominal pressure (PN):	PN 10 (SDR 17); PN 6 (SDR 21)
	Colour:	black
	Ø ext. [mm] - coils:	32; 40; 50; 63; 75; 90; 110
	Bar length [m]:	50; 100; 150; 200; 300
	Notes:	<ul style="list-style-type: none"> * Possibility of producing pipe with a brown stripe * Possibility of producing pipe with a different coil length * Possibility of producing pipe with an individual overprint

* product available on request at the minimum production requirement

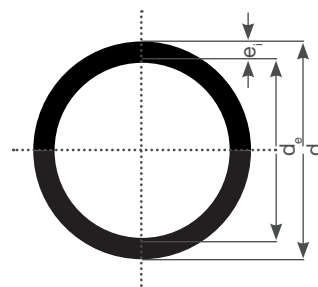
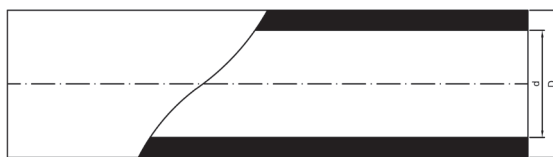













*Pipes for irrigation systems - HDPE

		SDR-21		SDR-17		
	∅ ext.	△ wall(s) thickness	☰ index	△ wall(s) thickness	☰ index	coil length
COILS	32			2,0	11292	300
	40	2,0	11344	2,4	11293	250
	50	2,4	11345	3,0	11294	200
	63	3,0	11346 / 11581	3,8	11295 / 11578	150 / 200
	75	3,6	11347	4,5	11296	100
	90	4,3	11348 / 11596	5,4	11297 / 11579	50 / 100
	110			6,6	11298 / 11580	50 / 100

* product available on request at the minimum production requirement

*System pipes for ground-coupled heat pumps - PE 100-RC



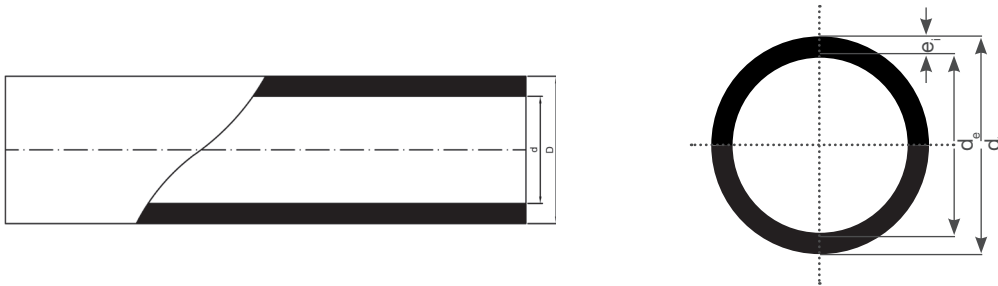
	Reference documents:	PN-EN 12201-2+A1:2013-12
	PKWiU [Polish Classification of Products and Services]:	22.21.21.0
	Customs code:	3917 21 10
	Application:	- supply of glycol - construction of ground collectors for underground heat pump systems - other purposes
	Material:	PE 100-RC
	Nominal pressure (PN):	PN 16 (SDR 11); PN 12,5 (SDR 13,6) ; PN 10 (SDR 17)
	SN:	SN 80 (SDR 11); SN 40 (SDR 13,6); SN 20 (SDR 17)
	Colour:	- black with a colour marker - black
	∅ ext. [mm] - coils:	32; 40
	Coil length [m]:	200
	Notes:	* Possibility of producing pipe with a different coil length * Possibility of producing pipe with an individual overprint * Possibility of producing pipe with different pipe diameters

		SDR-17		SDR-13,6		SDR-11			
	∅ ext.	∇ wall thickness	☰ index	∇ wall thickness	☰ index	∇ wall thickness	☰ index	coil length	bulk packaging
COILS	32	2,0	11281	2,4	11283	3,0	11285	200	1400
	40	2,4	11282	3,0	11284	3,7	11286	200	1000

* product available on request at the minimum production requirement



*System pipes for ground-coupled heat pumps - PE 100



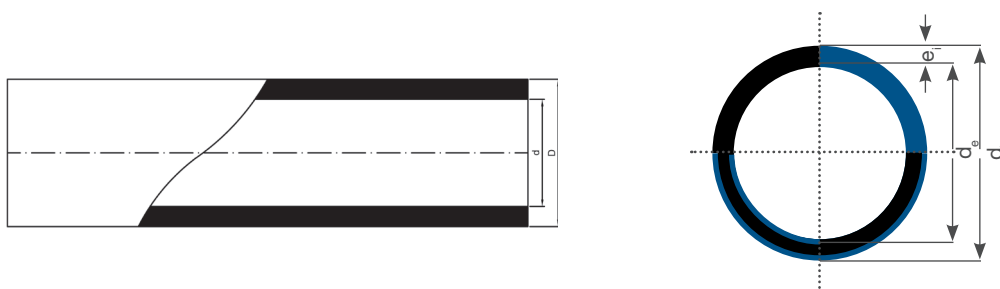
	Reference documents:	PN-EN 12201-2+A1:2013-12
	PKWiU [Polish Classification of Products and Services]:	22.21.21.0
	Customs code:	3917 21 10
	Application:	- supply of glycol - construction of ground collectors for underground heat pump systems - other purposes
	Material:	PE 100
	Nominal pressure (PN):	PN 16 (SDR 11); PN 12,5 (SDR 13,6); PN 10 (SDR 17)
	SN:	SN 80 (SDR 11); SN 40 (SDR 13,6); SN 20 (SDR 17)
	Colour:	- black with a colour marker - black
	ø ext. [mm] - coils:	32; 40
	Coil length [m]:	200
	Notes:	* Possibility of producing pipe with a different coil length * Possibility of producing pipe with an individual overprint * Possibility of producing pipe with different pipe diameters

		SDR-17		SDR-13,6		SDR-11			
	ø ext.	▲ wall thickness	☐ index	▲ wall thickness	☐ index	▲ wall thickness	☐ index	coil length	bulk packaging
COILS	32	2,0	11813	2,4	11815	3,0	11817	200	1400
	40	2,4	11814	3,0	11816	3,7	11818	200	1000

* product available on request at the minimum production requirement



*Smooth system pipes for ground-coupled heat exchangers - HDPE



	Reference documents:	PN-EN 12666-1+A1:2021
	PKWiU [Polish Classification of Products and Services]:	22.21.21.0
	Customs code:	3917 21 10
	Properties:	- antibacterial, - antifungal
	Application:	ground-coupled heat exchangers: - tube heat exchanger - air heat exchanger - gravel heat exchanger
	Material:	HDPE
	Nominal pressure (PN):	PN 8 (SDR 21); PN 6 (SDR 26)
	SN:	SN 5; SN 10
	Colour:	- green - external: green, internal grey - external and internal green with a black core - different colour on request
	∅ ext. [mm] - bars:	110; 125; 140; 160; 180; 200; 225; 250
	Bar length [m]:	6; 12
	Notes:	* Possibility of producing pipe with different length * Possibility of producing pipe with an individual overprint * Possibility of producing pipe with different pipe diameters * Possibility of producing pipe in any colour and with different strength parameters * Non-stock item * In order to determine the minimum delivery requirements, you are kindly asked to contact the sales department

* product available on request at the minimum production requirement



*Smooth system pipes for ground-coupled heat exchangers - HDPE

*Single-layer (green)

		SDR-26		SDR-21			
	∅ ext.	∇ wall thickness	☐ index	∇ wall thickness	☐ index	bar length	bulk packaging
BARS	110	4,2	11560	5,3	12649	12	26/312
	125	4,8	12639	6,0	12650	12	38/456
	140	5,4	12640	6,7	12651	12	38/456
	160	6,2	11563	7,7	12652	12	20/240
	180	6,9	12641	8,6	12653	12	17/204
	200	7,7	11565	9,6	12654	12	14/168
	225	8,6	11566	10,8	12655	12	11/132
	250	9,6	11567	11,9	12656	12	11/132

*Two-layer (external: green, internal: grey)

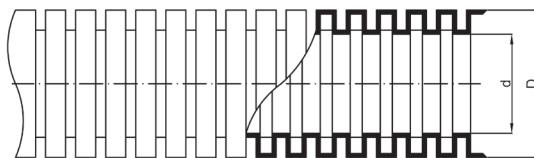
		SDR-26		SDR-21			
	∅ ext.	∇ wall thickness	☐ index	∇ wall thickness	☐ index	bar length	bulk packaging
BARS	110	4,2	11568	5,3	11592	12	26/312
	125	4,8	11569	6,0	12657	12	38/456
	140	5,4	11570	6,7	12658	12	38/456
	160	6,2	11571	7,7	12659	12	20/240
	180	6,9	11572	8,6	12660	12	17/204
	200	7,7	11573	9,6	12661	12	14/168
	225	8,6	11574	10,8	12662	12	11/132
	250	9,6	11575	11,9	12663	12	11/132












*Three-layer (both external layers: green, internal: black)

		SDR-26		SDR-21			
	∅ ext.	∇ wall thickness	☐ index	∇ wall thickness	☐ index	bar length	bulk packaging
BARS	110	4,2	11576	5,3	11801	12	26/312
	125	4,8	12642	6,0	11802	12	38/456
	140	5,4	12643	6,7	11803	12	38/456
	160	6,2	12644	7,7	11804	12	20/240
	180	6,9	12645	8,6	11805	12	17/204
	200	7,7	12646	9,6	11806	12	14/168
	225	8,6	12647	10,8	11807	12	11/132
	250	9,6	12648	11,9	11808	12	11/132

* product available on request at the minimum production requirement

*Double-layer corrugated system pipes for ground-coupled heat exchangers - HDPE



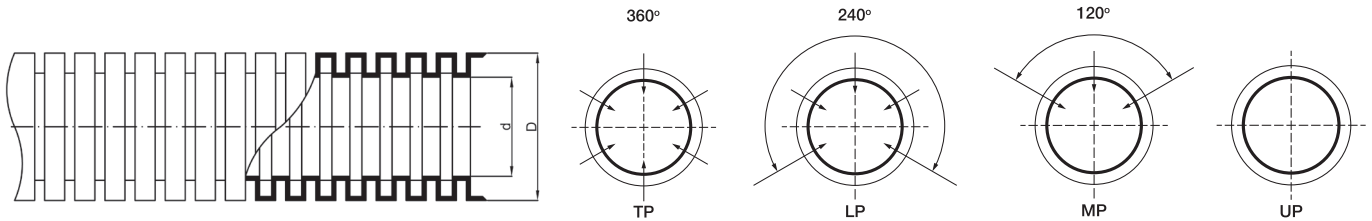
	Reference documents:	PN-EN 13476-3+A1; PN-EN 16798
	PKWiU [Polish Classification of Products and Services]::	22.21.21.0
	Customs code::	3917 21 10
	Properties:	- antibacterial, - antifungal
	Application:	ground-coupled heat exchangers: - tube heat exchanger - air heat exchanger - gravel heat exchanger
	Material:	HDPE
	Compressive resistance:	750 N
	Colour:	- external: green - internal: natural
	∅ ext. [mm] - coils:	110; 160; 234
	Coil length [m]:	25, 50
	Notes:	* Possibility of producing pipe with a different length * Possibility of producing pipe with an individual overprint * Possibility of producing pipe in any colour and with different strength parameters

	∅ ext.	index	coil length
COILS	110	11809	25
	110	11810	50
	160	11811	25
	234	11812	25

* product available on request at the minimum production requirement



*Drainage pipes - TT-DREN



	Reference documents:	NATIONAL TECHNICAL ASSESSMENT IBDiM
	PKWiU [Polish Classification of Products and Services]:	22.21.21.0
	Customs code:	3917 21 10
	Division:	<ul style="list-style-type: none"> - TP (Totally Perforated) = full drainage pipe (perforation throughout its 360° circumference) - LP (Locally Perforated) = half drainage pipe (perforation in the upper part of the pipe at 240°) - MP (Multi-Purpose Pipe) = multi-functional drainage pipe (perforation in the upper part of the pipe at 120°) - UP (Unperforated Pipe)
	Application:	<ul style="list-style-type: none"> - drainage of fields, including croplands - drainage of tracks, roads and motorways - drainage of airports - drainage of car parks and manoeuvring areas - drainage of landfill sites and other waste areas - rainwater distribution
	Material	HDPE
	Stiffness value:	SN 8 do SN 16
	Colour:	black
	∅ ext. [mm] - bars:	110; 160
	Bar length [m]:	6
	Notes:	<ul style="list-style-type: none"> * Possibility of producing pipe in a different colour and/or with a different stripe colour * Possibility of producing pipe in a different length

		TT-DREN - TP	TT-DREN - LP	TT-DREN - MP	TT-DREN - UP		
	∅ ext.	index	index	index	index	bar length	bulk packaging
BARS	110	12476	12477	12478	12479	6	48/288
	160	12480	12481	12482	12483	6	48/288

* product available on request at the minimum production requirement



INSTALLATION GUIDELINES FOR PE PIPES

The PE 80, PE 100, PE 100-RC single-layer polyethylene pipes and PE 100, PE 100-RC, PE 100-RC / PE 100, PE 100-RC / PE 100 / PE 100-RC multilayer co-extruded pipes intended for the supply of gaseous fuels, water and sewer under pressure.

1. Installation Guidelines

These instruction guidelines refer to the installation of soil pipes and PE line pipes used for pressure and gravity pipelines, in particular water, gas and sewer pipelines.

The maximum operating pressure of water and sewer pipelines corresponds to the nominal pressure (PN) of the pipe and depends on the material class, the pipe size series (SDR) and the construction safety factor (C) according to table A1 of EN 12201-2.

Pipes intended for the gas supply systems including PE100-RC/ PE100-RC multi-layer pipes with MOP 1.0 MPa within the range between 0°C and 20°C. For temperatures higher than 20°C, the maximum operating pressure (MOP) should be calculated taking into consideration the factors (DF) according to Table A.1 of EN 1555-5. For temperatures lower than 0°C, the critical pressure for rapid crack propagation determined for the expected operating temperature should be used to calculate the maximum operating pressure (MOP).

1.1. Terminology

Figure No 1 shows a trench cross-section and provides terms and definitions used herein.

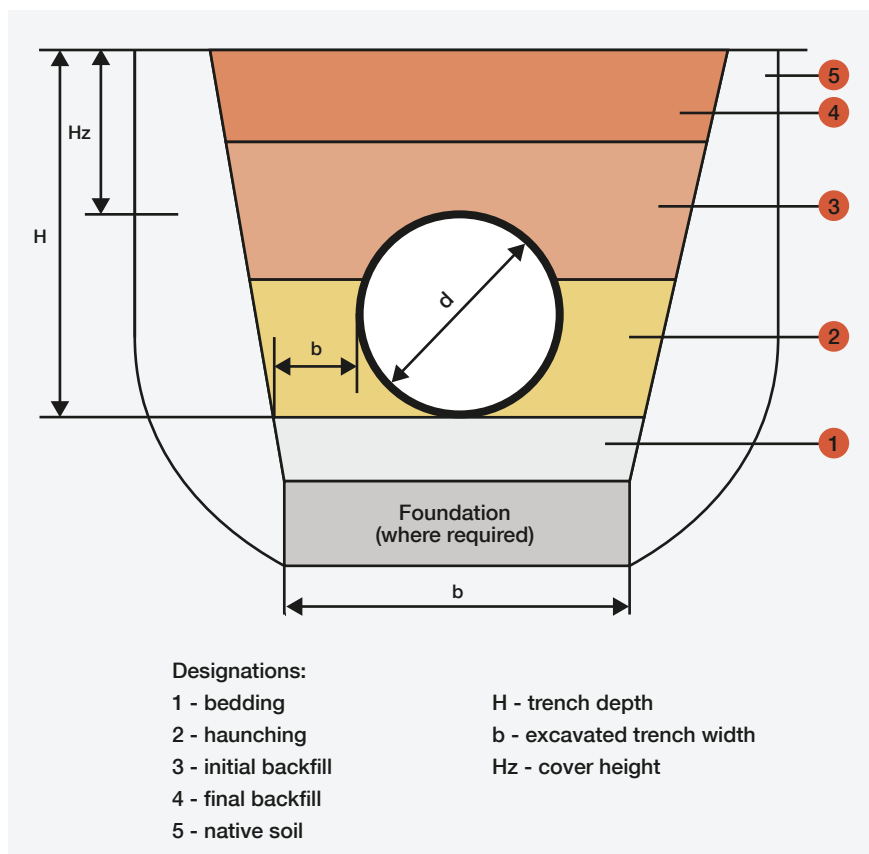


Figure No 1. Cross-section - terminology

1.1.1. Physical properties of PE pipes under load

PE pipelines, when exposed to certain loads, adapt to the surrounding substrate. This means that the final deflection value depends on the bedding and backfill of the pipeline.

Initial deflection occurs when the bedding and backfill is completed. This phenomenon builds up over time and takes the value of a long-term deflection. The observance of the installation guidelines set forth below will minimise this process.

1.1.2. Allowable deflections

The strength calculation methods contained in the EN 1295-1:2019-05 standard can be used to calculate the deformation of a pipe and to determine the allowable deflection. A pipe laid in a trench is subject to forces which cause deflection. This is called an initial deflection. This value, as a result of creeping, increases until a certain time, when it takes a final deflection value. The values obtained will therefore be our minimum and maximum deflection values. These values allow us to calculate the average deflection value, which is needed to calculate the allowable deflection value. A basic prerequisite for adequate strength is the quality of the pipe material.

As a result of the method of packaging used, the pipe ovalisation may occur (in pipes packed in coils, for instance, 50 metres).

1.2. Design considerations

1.2.1. General considerations

Soil conditions have a considerable impact on the trench construction and pipe installation. These conditions need to be determined before the commencement of design works and selection of the backfill designed for the specific type of soil.

Type of soil	Group of soils	To be used as initial backfills or final backfills
Loose	coarse-grained, gravel, sand and gravel mixes;	YES
	medium- and fine-grained gravel; sand and gravel mixes;	YES
	coarse-grained, gravel, sand and gravel mixes;	YES
Cohesive	medium- and fine-grained gravel; sand and gravel mixes;	YES
Organic	coarse-grained, gravel, sand and gravel mixes	NO
	medium- and fine-grained gravel; sand and gravel mixes;	NO

Table No 1. Types of soil and its use in construction works

Description	Soil compaction ratio			
	≤80	81-90	91-94	95-100
Standard Proctor compaction test	≤80	81-90	91-94	95-100
Blow test	0-10	43833	31-50	>50
Expected soil compaction achieved in the compaction classes are defined in this standard.	Low (N)			
	Medium (M)			
	High (W)			
Loose soil	loose	moderately compacted	concentrated	highly concentrated
Cohesive and organic soil	soft	compacted	stiff	hard

Table No 2. Types of soil density

If no information is available regarding the subsoil, a compaction rate of 91-97% of the Standard Proctor compaction test (SPD) is assumed.

1.2.2. Types of pipe-laying methods in a trench

One of the most common ways of laying down pipes in a trench consists in preparing the ground by using a bedding material and backfill of the same material. The use of pipes with a nominal diameter less than or equal to DN 250 does not require applying a secondary backfill, i.e., a two-layer backfill.

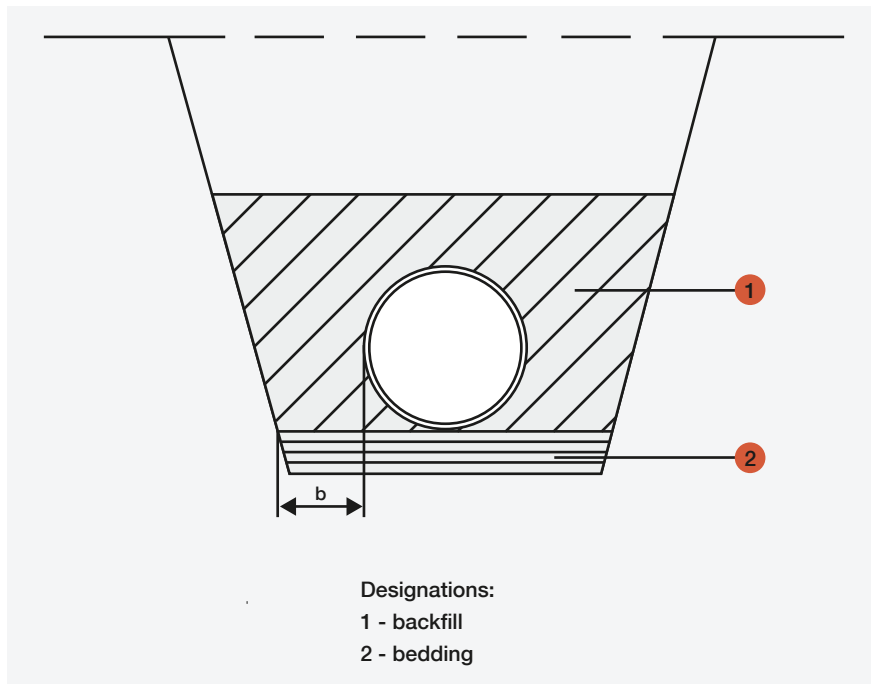


Figure No 2. Trench with uniform backfill layer

1.2.3. Laying multiple pipelines in a trench

Pipelines laid in parallel in one trench should have appropriate spaces to allow the backfill to be compacted using professional equipment. The minimum spacing between the pipelines should be 150 mm. The backfill between the pipes should be compacted to the same density as the backfill between the trench wall and the pipe. The only exception to the above is the laying of the pipeline in a stepped manner, in which the backfill should consist of loose material and be well-compacted.

1.3. Trench construction

1.3.1. Safety

Trench-related works should be performed in a non-life or health threatening conditions to the employees. The edges of the trench should be protected, if there is a risk of collapse or landslide. Foreign material must not get into the bedding and backfill, as this may reduce the quality of performance. The excavated material should be placed at a distance of not less than 0.5 m from the edge of the trench. Occupational health and safety rules and regulations must be observed during the excavation works.

1.3.2. Trench specifications

The width of the trench when laying down the pipeline depends on the ability to properly join the pipes in the trench and the compaction of the bedding and the backfill. For pipes below DN 300, typical values for the horizontal spacing between the pipe and the trench wall or adjacent pipe (see Figure No 2) are 200 mm. This is a theoretical value, due to the installation of the pipeline. When the pipeline is installed at great depths and in unstable soil, a wider trench may be required. In turn, in the case of a laying technology that eliminates or impedes human access (narrow-trench method), there is no need for excavating such a wide trench.

The depth of the trench must be determined in accordance with the design specifications. The key conditions are:

- purpose of the pipeline
- type and method of supply of the medium
- characteristics and size of pipes
- local conditions
- soil properties
- static and dynamic loads

In addition, the depth of the trench depends on the thickness of the bedding and the conditions within the working area, as well as the groundwater. It is not recommended that the excavation takes place before the installation of the pipes. The subsequent factor is low temperature. In such a case, the trench must be protected against freezing so that the laid pipe does not lie on a frozen layer of soil.

1.3.3. Trench bottom preparation and special conditions

The trench bottom should be properly prepared before the pipeline is laid. Bedding is of key importance as it protects the pipeline from excessive stresses, enabling it to minimise the risk of damage to the pipe. The thickness of the bedding may vary between 100[mm] and 150[mm], but should not be less than 50[mm]. The bedding must not be compacted and must be evenly distributed along the entire length of the trench. For this purpose, crushed rock gravel, gravel or sand may be used. If the substrate is made of soft material that can be formed freely and safely to ensure that the pipeline is properly aligned and is free of large rock objects, for instance, sharp stones or objects that could slipped, then bedding is not required.

In the case of special conditions such as:

- soil settlement
- risk of pipe flotation
- low temperatures
- other types of soil than non-cohesive soil
- soil loosening
- groundwater and flowing water

In situations referred to above, special design solutions are recommended, such as:

- application of reinforcement mats
- pipe insulation against low temperatures
- use of drains or other ways of draining water
- use of trench bottom reinforcement structures

1.4. Installation of the pipeline

1.4.1. Pipe storage

Pipes should be stored in a manner that is safe for the environment and the people staying in their vicinity. Pipes must be checked for damage and cleanliness before installation.

1.4.2. Laying down of pipes in the trench and changes in direction

The pipes should be laid down in the trench so that they lie loosely in the bedding over their entire length, which allows for their contraction or expansion. This is particularly important when weather conditions are unsuitable. Pipes must be installed in accordance with the instruction manual.

The direction of the pipeline may be changed using appropriate fittings.

1.5. Initial backfill and final backfill

1.5.1. Main method

When laying down pipes below DN 300, a uniform backfill layer is sufficient. The initial backfill should be brought up evenly on both sides of the pipe so that the additional stress is avoided. The initial backfill should be compacted using professional equipment. The final backfill may be made of native soil, if it meets the relevant requirements. The final backfill should be placed in even layers and compacted.

1.5.2. Laying area of the pipeline

The type and quality of the initial backfill is mainly affected by the depth on which the pipes are to be laid, the properties of the native soil and the stiffness of the pipe. A uniformly graded material should be used, however, if the initial backfill material has a predominance of one material fraction, then a particle size as indicated in Table No 3 is recommended.

Nominal Diameter DN	Maximum particle size
DN < 100	15
100 ≤ DN < 300	20
300 ≤ DN < 600	30
600 ≤ DN	40

Table No 3. Maximum particle sizes

Native soil may be used as initial backfill, if it meets the appropriate requirements, i.e.:

- is free from contaminants such as waste, wood, asphalt
- if compaction is required, then the material is subject to compaction
- is not a frozen material
- does not contain particles larger than those contained in Table No 3 and does not contain lumps of soil larger than double the size for the pipe application in question

Soils characterised by high plasticity index, as well as fine-grained soils are not considered good initial backfill material, unless this has been taken into consideration during the pipeline design. The strength of the initial backfill depends mainly on the degree of compaction and the type of raw material used.

The strength conditions of the pipes within the initial backfill zone depend on the material used for this purpose and the degree of compaction. Degrees of soil compaction are determined according to the standard Proctor compaction test, obtained in three compaction classes, appropriate to the soil used.

Compacted class	Description	Soil group used for initial backfill			
	English	4 SPD [%]	3 SPD [%]	2 SPD [%]	1 SPD [%]
N	Not	75-80	79-85	84-89	90-94
M	Moderate	81-89	86-92	90-95	95-97
W	Well	90-95	93-96	95-100	98-100

Table No 4. Soil compaction according to the Standard Proctor compaction test

1.5.3. Final backfill

If the depth of the trench above the pipe is more than 30 cm, this trench can be backfilled with native soil. It is also important that the final backfill material is susceptible to compaction, if required, with a maximum particle size of no more than 2/3 of the compacted layer.

In the case of high-traffic areas, it is required that the final backfill is well-compacted. In the case of low-traffic areas, the final backfill may be low-compacted.

1.6. Quality control

The soil compaction should be controlled by at least one of the following methods:

- supervision over compaction procedures
- initial pipe deflection test
- soil compaction test

The initial backfill and final backfill material must be compacted to the same degree as the soil immediately adjacent to the trench.

1.7. Safety precautions

When laying down the pipeline, the bedding must not be disturbed. In addition, measures must be taken to prevent the pipe flotation. Special attention must be paid when removing the formwork or other trench protection systems. These operations should be carried out together with the excavation of the trench and the compaction of the individual layers. If this is not possible, it is recommended to use pipes prepared for this purpose.

When making the initial backfill, the pipe must be protected from falling objects or unwanted native soil. The initial backfill and final backfill should be compacted to ground level. It is not advisable to compact the initial backfill directly above the pipe, if it has insufficient thickness.

1.8. Laying down pipes in the trench

One of the two methods of storing PE pipes is to coil them. In this way, a greater length of pipe is joint-free. When pipes in coils are stored, the pipe ovalisation occurs. In order to restore the pipes to their previous shape, pipe straighteners are used. If the ends of the pipe have an oval shape, calibrators are used to restore them to their original shape. The use of electrofusion fittings is recommended when joining pipes in coils. During electrofusion, coupler fittings must be used. Thanks to the properties of PE100-RC pipes, they can be used for various types of installation, such as drilling and jacking.

2. Control and test

2.1. Control

During acceptance, the pipes should be checked by the purchaser or the purchaser's representative. The markings and condition of pipes must be checked. In addition, it is important to verify whether the pipes are damaged. Any damaged pipes should be put aside and the damaged section of pipe cut off or returned to the manufacturer.

2.2. Test

Before pressure testing begins, it is important to ensure whether the pipeline is properly laid down in the trench and whether the fittings and bends are able to withstand rated pressure by the proof test. The proof test should be carried out in accordance with the relevant standard. Any possible exceptions are included in the system standard.

Pipeline requirements and tests included in the standard: EN 805 introduces methods for the leakage test of PE pipelines to be carried out in accordance with the procedure contained in Annex A.27 of PE-EN 805.

The contents of this Annex are set out below.

A.27 Main pressure test

A.27.1 General provisions

This alternative method for viscoelastic pipes (such as polyethylene and polypropylene pipes) is based on the fact that the characteristic creep of the material is not sufficiently taken into consideration in the main pressure test. Therefore, a specific procedure is set out below.

A.27.2 Test procedure

The entire test procedure consists of the necessary initial phase, which includes a relaxation period, an integrated pressure drop test and a main test phase.

A.27.3 Preliminary phase

The completion of the preliminary phase is a prerequisite for the main test phase.

The aim of the preliminary phase is to specify the initial conditions for the volume variation as a function of pressure, time and temperature.

In order to avoid erroneous test results at the main test phase, the following rules should be applied for the implementation of the preliminary phase::

- after flushing and venting, reduce pressure in the pipeline to atmospheric pressure; such condition is to be held for 60 minutes in order to release any pressure-related stress; do not allow air to enter the test section;
- after this relaxation period, raise the pressure continuously and quickly (not less than 10 minutes) to the System Test Pressure (STP). Maintain STP for a period of 30 minutes by pumping continuously or at short intervals. During this time, carry out an inspection in order to identify any obvious leaks;
- after 30 minutes, one-hour relaxation period is required (without pumping) during which the pipeline may expand due to visco-elastic creep;

- reduce the pressure at the end of this period.

If the preliminary test is completed successfully, control the test procedure. If the pressure has decreased by more than 30% of STP interrupt the preliminary test and de-pressurize the test section. Check the test conditions (for instance, influence of temperature, indication of leakage) and only restart the test procedure after a relaxation period of at least 60 min.

A.27.4 Integrated pressure drop test

The results of the main test phase can only be assessed, if the remaining volume of air in the test section is adequately low. The following steps should be taken:

- reduce rapidly the remaining actual pressure measured at the end of the preliminary phase by discharging water from the system to produce Δp of 10 % to 15 % of STP
- measure precisely the removed volume ΔV ;
- calculate the allowable water loss ΔV_{\max} using the following formula and check that the removed volume ΔV does not exceed ΔV_{\max}

$$\Delta V_{\max} = 1,2 \cdot V \cdot \Delta p \left(\frac{1}{E_w} + \frac{D}{e \cdot E_R} \right)$$

ΔV_{\max} is the allowable water loss in litres;

V is the volume of the tested pipeline section in litres;

Δp is the measured pressure loss in kilopascals;

E_w is the bulk modulus of water in kilopascals;

D is the internal pipe diameter in meters;

e is the wall thickness of the pipe in meters;

E_R is the modulus of elasticity of the pipe wall in the circumferential direction in kilopascals;

1,2 is an allowance factor (e.g., for air content) during the main test phase.

For the interpretation of the result, it is important to use the exact value of E_R considering the temperature and the duration of the test. Especially for smaller diameters and shorter test sections Δp and ΔV should be measured as accurately as possible.

If ΔV is more than ΔV_{\max} , interrupt the test procedure and vent again after the pipeline has been depressurized.

A.27.5 Main test phase

The visco-elastic creep due to the stress caused by STP is interrupted by the integrated pressure drop test. The rapid decrease of the pressure leads to a contraction of the pipeline. Observe and record for a period of 30 minutes (main test phase) the increase of pressure resulting from the contraction. The main test phase is considered to be successful, if the pressure curve shows an increasing tendency and does not decrease at any time of this 30-minute period, which is normally long enough to get a good indication (fig. no 3). If during that period the pressure curve shows a falling tendency, it indicates a leak within the system.

In case of doubt, extend the main test phase to 90 minutes. In that case the pressure loss is limited to 25 kPa from the maximum value occurring within the contraction phase.

If the pressure drops by more than 25 kPa, the test fails.

Rectify any defect in the installation revealed by the test and repeat the test.

The repetition of the main test phase may only be done upon carrying out the whole test procedure including the relaxation period of 60 minutes in the preliminary phase.

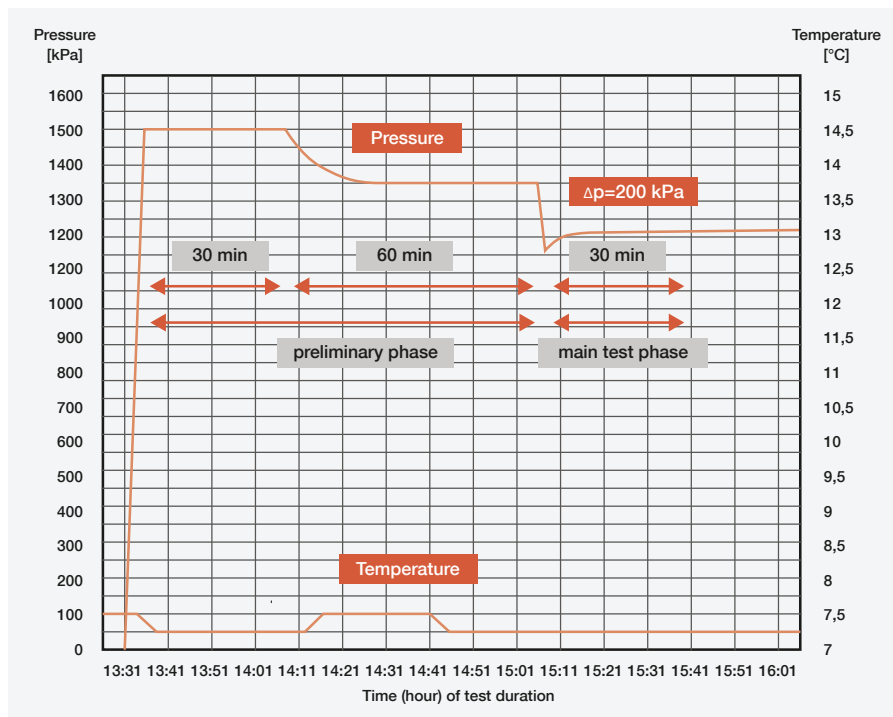


Figure No 3. Example of pressure test scheme (time/hour of test)

2.3. Leakage test of the gas pipeline

The leakage test of polyethylene gas pipelines should be carried out in accordance with PN-92-M-34503 "Gas pipelines and gas installations. Testing of pipelines".

The test pressure level used does not induce as much PE creep (as in the case of water pipelines). The compressibility of the gas used in the sample means that changes in piping volume have no noticeable effect on changes in internal pressure.

Due to the fact that polyethylene is a good insulator, once the pipeline has been filled with compressed air using a compressor, the actual leakage test may start once the temperature of the pipe and the air in it has dropped to ambient temperature. This may take several hours. Failure to meet this condition may result in a drop in internal pressure, not only as a result of the leak, but as a result of the gas transformation effect, in which, at a constant volume of the section of pipeline under test, a drop in gas (air) temperature is accompanied by a drop in pressure.

3. Pipe joining methods

Various methods of joining the pipeline are used during installation, ranging from mechanical joining such as compression fittings or butt fusion to electrofusion welding. The use of methods of the pipe joining depends on the conditions in which it is to be made and the purpose of such a joint. Such joints should be made in accordance with the procedures recommended by the manufacturers of these fittings.

3.1. Compression fittings

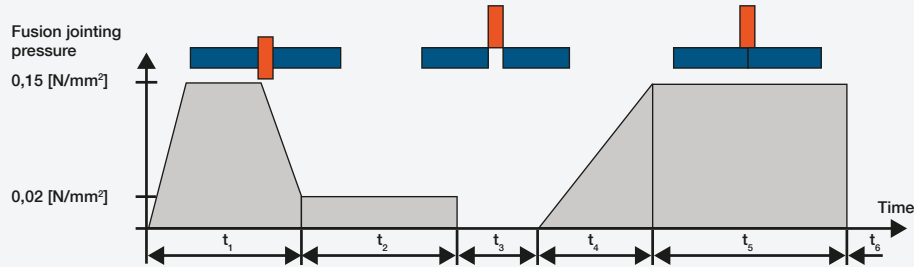
Compression fittings are recommended when joining PE pipes in sizes $\text{Ø}25$ to $\text{Ø}63$. Compression fittings are also used when joining pipes to steel components and fittings. This also depends on the dimension of the fitting and its type. Both the possibility of making multiple joints and the simplicity of its manufacture are in favour of compression fittings.

3.2. Butt fusion

Before proceeding with the butt fusion, it is recommended to:

- prepare the welding area by setting up the butt fusion machine, the generator unit, or by setting up a tent on a dry site; if the area requires it, place a film or board under the butt fusion machine;
- place the welded pipe sections on rollers (this reduces the forces acting on the pipe);
- secure the opposite ends of the pipe sections to be joined with plugs to prevent any possible air flow through the pipes during butt fusion;

- clean the pipe ends (or fittings) over a length of approx. 0.1[m], as well as the heating plate and the shaping machine from dirt;
- fix the pipes or fittings in the butt fusion machine clamps in such a way that a misalignment of no more than 10% of the wall thickness is obtained;
- prepare and align the weld faces with a shaping machine to remove the oxidised layer and to make the faces of the two pipe sections adjoin with each other;
- make the weld and make an assessment on the basis of the following formula.



	t ₁	t ₃	t ₃	t ₄	t ₅
Pipe wall thickness	Welding flash	Heat soak time = 10 x wall thickness	Maximum heater plate removal time	Time to achieve fusion jointing pressure	Minimum fusion jointing time
[mm]	[mm]	[s]	[s]	[s]	[mm]
do 4,5	0,5	45	5	5	6
od 45...7	1	45...70	5...6	5...6	6...10
7...12	1,5	70...120	6...8	6...8	10...16
12...19	2	120...190	8...10	8...11	16...24
19...26	2,5	190...260	10...12	11...14	24...32
26...37	3	260...370	12...16	14...19	32...45
37...50	3,5	370...500	16...20	19...25	45...60
50...70	4	500...700	20...25	25...35	60...80

Figure No 4. Butt weld diagram

Assessment criteria for the butt weld quality:

- the width of the “B” welding flash should have the following value:

$$B=(0,68 \div 1,0) * e \quad *e \text{ where: } e - \text{ wall thickness [mm]}$$

- the difference in width of the welding flash rolls should not exceed 20% of the width of the “B” welding flash, i.e.,

$$S_{\max} - S_{\min} < 0,2B$$

- the groove between the rollers, the “k” value must not be less than zero, i.e.,

$$k \geq 0$$

- the wall offset of the pipes to be joined, the “v” value should not exceed 10% of the wall thickness;

- the shape of the welding flash, the minimum and maximum width of the welding flash must comply with the following values:

$$B_{\min} \geq 0,9 * B_{sr} \quad B_{\max} \leq 1,1 * B_{sr} \quad B_{sr} = 0,5 * (B_{\min} + B_{\max})$$

- alignment of welded pipes - $\Delta m \leq 1$ [mm] over a length of 300 [mm].

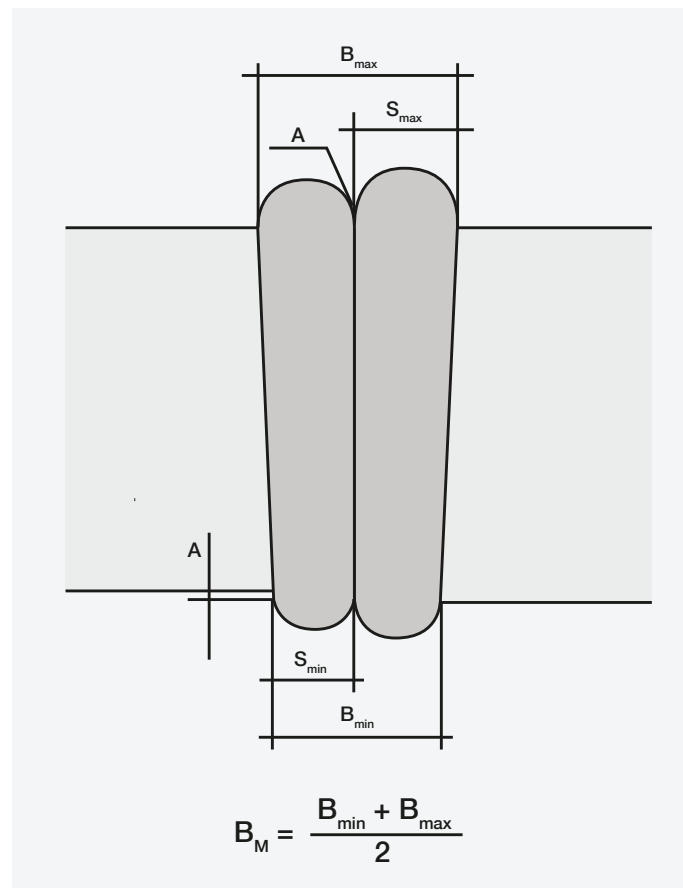


Figure No 5. Test scheme for correct joining

The quality of the weld is also affected by:

- keeping the cleanliness of the surfaces to be joined
- proper preparation of the joining procedure
- compliance with welding parameters
- proper relaxation of pipes

3.3. Electrofusion welding

The electrofusion welding procedure is as follows:

1. clean the pipe, cut the pipe at right angles, remove any burrs and shavings
2. remove the oxidised surface layer of the pipe using a suitable scraping tool to the length that is inside the fitting (it is important not to take off too much material)
3. clean the welding surface with a welding wipe containing degreasing fluid (ethanol)
4. mark the insertion depth of the fitting
5. remove the fitting from the packaging; take care not to touch the inside of the fitting
6. insert the end of the first pipe and assess position, insert the end of the second pipe
7. carry out welding procedures according to welding machine instructions and the instructions placed on the packaging of the fitting
8. assess the weld after the welding process, remove the welding machine from the fitting and leave the pipe to cool down
9. perform a pressure test

TRANSPORT, MOVEMENT AND STORAGE OF POLYETHYLENE PIPES PRODUCED BY TT PLAST S.A. - INSTRUCTIONS

When transporting and storing the pipes, be careful not to damage them. Polyethylene is a material with relatively low mechanical resistance to scratches.

PIPE TRANSPORTATION:

1. Vehicles with a level and flat floor, nail-free and other irregularities in the load compartment or specialised vehicles should be used to transport the pipes.
2. The side supports should be flat, without sharp edges.
3. The largest diameter pipes should be laid at the bottom of the load compartment.
4. Pipes should not be transported outside the load compartment of a vehicle in a section greater than five times their nominal diameter DN expressed in metres, or a length of 2 m, whichever value is less.
5. Special care should be taken during loading and unloading at low ambient temperatures, as the impact resistance of plastic products decreases at low temperatures.
6. The loading height during transport should be such as it does not damage the pipes and ensures their stability.
7. Pipes should be secured against movement during transport.
8. Products should be transported in accordance with current transport regulations.

PIPE MOVEMENT:

1. Special protective measures must be taken to prevent damage to the pipes when they are moved.
2. As a result of contact with sharp-edged objects, dropping, falling, dragging along the ground, plastic pipes can be damaged.
3. When loading or unloading pipes using a crane, slings made of soft ropes (nylon, cotton and hemp ropes, etc.) must be used.
4. Steel ropes or chains must not be used. Improperly used metal beams, slings, hooks or chains may damage the pipe.
5. When loading or unloading pipes using a forklift, it is important to ensure that this industrial truck has smooth forks. Special care must be taken when lifting (lowering) pipes in order to avoid damage.
6. Smaller diameter pipes (for instance, up to 160 mm) may be handled manually on site. It is not allowed to drag the pipes along the ground or to drop or roll them.
7. At low temperatures, the impact resistance of plastic pipes decreases. Special care should be taken when moving the pipes.
8. The utmost care must be observed when unwinding pipes in coils, as the released end of the pipe unwinds with considerable force.

STORAGE OF PIPES:

1. Pipes must be stored on a level, smooth surface, preferably wooden, or a surface free of sharp objects, stones or protrusions that could damage the pipes.
2. Straight pipes, pre-packed in bundles using wooden frames, can be stored in layers up to a height of 3 m, with the frame of the higher bundle resting on the frame of the lower bundle.
3. Pipes in coils may be stored horizontally with a storage height of up to 1.5 m (requirement for gas pipes) or vertically in a single layer - a vertically standing coil, which may not be additionally loaded.
4. Unpacked pipes may be stored in a pile with a maximum of 7 layers and a height of no more than 1 m, with the bottom layer resting on wooden sleepers and secured on the sides with wooden supports to prevent displacement. In the case of storing pipes of different stiffness, the pipes with the higher stiffness should lie at the bottom. Spacing between sleepers and supports should be 1÷2m.
5. Pipes in coils with nominal diameters equal to and greater than DN 90 should be stored vertically in purpose-built racks.
6. When pipes are stored in racks, their design should provide adequate support to prevent permanent deformation of the pipes.
7. Pipes should not be stored in the immediate vicinity of fuels, solvents, oils, greases, paints or heat sources.
8. Pipes should be stored in a closed and covered premises in order to protect them against direct weather conditions. The free flow of air must be ensured. It is not allowed to store pipes in areas directly exposed to sunlight (UV radiation), leading to degradation of the plastic and loss of mechanical properties.
9. The maximum storage time for pipes not protected against sunlight is 3 months. The use of pipes after the aforementioned period is only possible under the full responsibility of the customer. The storage temperature should not exceed 45 °C.
10. In the case of extreme storage conditions, it is required to meet special requirements related to the storage of pipes.

edition: May 2024

The given products are presented for information purposes and do not constitute an offer under the provisions of commercial law. TT PLAST S.A. does not take any responsibility for errors arising in the publication process and reserves the right to change technical parameters for construction or commercial reasons – without prior notice.

This document is intended as a guide only. Whilst the information it contains is believed to be correct, TT PLAST S.A. can take no responsibility for actions taken based on the information contained in this document.

TT PLAST S.A.
Targowisko 476, 32-015 Kłaj

tel. +48 12 284 46 41
fax.+48 12 284 46 42

biuro@ttplast.com
www.ttplast.com