EN

RENO 100®

PE100

Polyethylene piping systems manufactured from PE100 (MRS 10), black in colour with and without brown identification stripes, intended for drainage and sewerage under pressure, vacuum sewer systems and the conveyance of water for general purposes, compliant with the requirements of the international standards EN 12201 and ISO 4427.

DRAINAGE, SEWERAGE AND GENERAL PURPOSES

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RENO 100®

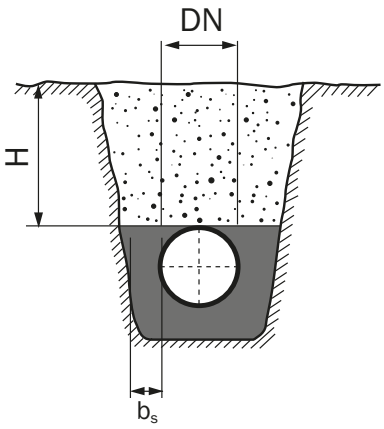
Drainage, sewerage and general purposes

Design considerations

The design of a piping network based on RENO 100 is focused on the determination of the pipe diameter for a specific lay-out once parameters as flow, total length, piezometric height and roughness are completely defined.
The criteria for dimensioning a pipeline, as described in standards, must be able to fulfill the maximum required flow, balancing the water supply according to the demand and evaluating the velocity of the fluid in the pipe, the roughness coefficient of the internal surface and the pressure difference between the ends of the piping system.
The distributed pressure drop may be estimated through an abacus which links the flow (Q) and the velocity (V) of the fluid to the internal diameter (d) of the pipeline. It is generally advisable to operate with a fluid velocity in the range 0.5-2.5 m/s in order to avoid overpressure and stagnation. On the other hand, the pressure drops due to the flow through fittings and valves have to be estimated according to their specific type as described in standards.
Pipelines based on RENO 100 are also suitable for fire-fighting networks provided national rules are taken into account for this specific use.

Installation in trenches

According to the standard ENV 1046 the width of the trench at the springline of the pipe must not be greater than necessary to provide adequate room for jointing the pipe in the trench and compacting the pipe zone backfill at the haunches (typical values are b_s=200 mm for DN ≤ 300, b_s= 300 mm for 300 ≤ DN ≤ 900 and b_s= 400 mm for 900 ≤ DN ≤ 1200).
When determining the trench depth, allowance for a suitable bedding should be incorporated. In general, care should be taken that the depth of cover above the crown of the pipe for pipes passing under traffic areas should usually be a minimum of 600 mm and to prevent the conveyed fluids from being affected by frost. The surface at the trench grade shall be continuous, uniform and free of particles greater than 15 mm for DN < 100, 20 mm for 100 ≤ DN < 300, 30 mm for 300 ≤ DN < 600 and 40 mm for DN ≥ 600. To provide a uniform support for the pipe the bedding layer should generally have a thickness of 100-150 mm and be not less than 50 mm and the material shall be granular such as gravel, sand or crushed rock.
The backfill above the pipe zone should be placed by spreading in approximately uniform layers and compacted according to the various types of equipment and backfill materials.



Ring stiffness

When a calculation of the initial pipe deflection is applied for RENO 100 pipes in vacuum sewer systems, the initial ring stiffness (kN/m^2) shall be taken from the table below (assuming a flexural modulus of 1000 MPa).

SDR 26	SDR 21	SDR 17	SDR 13,6	SDR 11	SDR 9	SDR 7,4
5,3	10,4	20,3	41,7	83,3	162,8	317,9

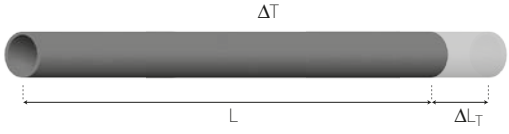
Longitudinal thermal expansion

For above ground installations, the thermal expansion of a piping system based on RENO 100 must be kept under control and adequate compensation systems with holders are needed (otherwise for underground laying the friction forces between soil and pipe completely absorb the effect of dilatation).
The longitudinal thermal expansion can be evaluated with the following formula:

$$\Delta L_T = \alpha \cdot \Delta T \cdot L$$

where

- α = coefficient of linear thermal expansion for polyethylene (about 0.20 mm/m·°C)
- ΔT = difference between the laying temperature and the maximum or minimum operating temperature (°C)
- L = total length of the line subjected to expansion (m)



Bending

RENO 100 pipes have a high degree of flexibility and can follow the undulations of the ground without bends, provided the radius of curvature is higher than a limit value which depends on the SDR. The minimum bending radius at 20 °C is defined as in the aside table.

SDR	Bendig radius	Bendig radius with linear joint*
≤ 11	≥ 25 DN	≥ 25 DN
13,6 - 17	≥ 25 DN	≥ 45 DN
21 - 26	≥ 35 DN	≥ 45 DN

* For example butt-fusion joint, electroweldable sleeve, compression sleeve, etc...

Jointing

A piping system based on RENO 100 can be jointed through butt-fusion welding, electrofusion or mechanical compression joints. The choice of the most adequate jointing technique can affect the reliability and the long term behaviours of the pipe network. The range of pipe diameters intended to be assembled with different methods is summarised in the following table.

Jointing method	Range of DN
Butt-fusion	DN ≥ 63 mm
Electrofusion	DN ≥ 20 mm

Testing

A piping network for water supply has to be subjected to a hydrostatic pressure test to ensure the integrity of pipes, couplings, fittings and other components, such as anchor blocks, following the instructions given in standards such as EN 805.

Testing should be done after the backfilling of the trench leaving the joints uncovered. Filling of the piping network with water must be done slowly to avoid water hammers, air must be expelled and finally the venting devices must be closed.

The system test pressure (STP) must be calculated according to the maximum design pressure (MDP) as follows:

- for calculated water hammer:

  STP = MDPc + 1000 kPa

- without calculated water hammer:

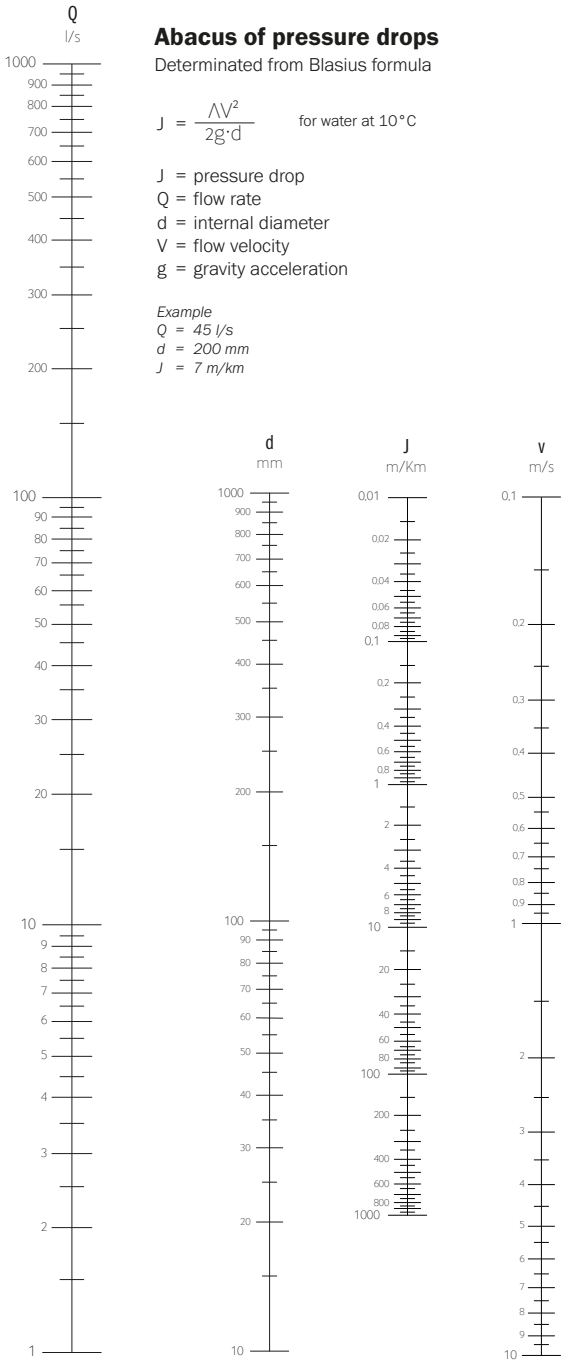
  STP = MDPa • 1,5 or MDPa + 500 kPa

  (the lower of the two values)

Operation

When a piping system based on RENO 100 is to be operated at a constant temperature higher than 20 °C, up to 40 °C, a pressure reduction coefficient as given in the following table applies (extract from EN 12201-1).

°C	PN 6	PN 8	PN 10	PN 12,5	PN 16	PN 20	PN 25
≤ 20	6	8	10	12,5	16	20	25
30	5,2	7	8,7	10,8	13,9	17,4	21,7
40	4,4	4,9	7,4	9,2	11,8	14,8	18,5



Abacus of pressure drops

Determinated from Blasius formula

$$J = \frac{\Lambda V^2}{2g \cdot d}$$ for water at 10°C

J = pressure drop
Q = flow rate
d = internal diameter
V = flow velocity
g = gravity acceleration

Example
Q = 45 l/s
d = 200 mm
J = 7 m/km

The designer of a piping system shall consider and carefully evaluate the implications of the parameters of each specific project with technical or law regulations.

RENO 100®

Drainage, sewerage and general purposes

DN mm	PN 4 SDR 41		PN 6 SDR 26		PN 8 SDR 21		PN 10 SDR 17		PN 12,5 SDR 13,6		PN 16 SDR 11		PN 20 SDR 9		PN 25 SDR 7,4	
	e_n mm	DI mm	e_n mm	DI mm	e_n mm	DI mm	e_n mm	DI mm	e_n mm	DI mm	e_n mm	DI mm	e_n mm	DI mm	e_n mm	DI mm
20	-	-	-	-	-	-	2,0•	16,0	2,0•	16,0	2,0	16,0	2,3	15,4	3,0	14,0
25	-	-	-	-	-	-	2,0•	21,0	2,0	21,0	2,3	20,4	3,0	19,0	3,5	18,0
32	-	-	-	-	-	-	2,0	28,0	2,4	27,2	3,0	26,0	3,6	24,8	4,4	23,2
40	-	-	-	-	2,0	36,0	2,4	35,2	3,0	34,0	3,7	32,6	4,5	31,0	5,5	29,0
50	-	-	-	-	2,4	45,2	3,0	44,0	3,7	42,6	4,6	40,8	5,6	38,8	6,9	36,2
63	-	-	-	-	3,0	57,0	3,8	55,4	4,7	53,6	5,8	51,4	7,1	48,8	8,6	45,8
75	-	-	-	-	3,6	67,8	4,5	66,0	5,6	63,8	6,8	61,4	8,4	58,2	10,3	54,4
90	-	-	-	-	4,3	81,4	5,4	79,2	6,7	76,6	8,2	73,6	10,1	69,8	12,3	65,4
110	2,7••	104,6	4,2	101,6	5,3	99,4	6,6	96,8	8,1	93,8	10,0	90,0	12,3	85,4	15,1	79,8
125	3,1••	118,8	4,8	115,4	6,0	113,0	7,4	110,2	9,2	106,6	11,4	102,2	14,0	97,0	17,1	90,8
140	3,5••	133,0	5,4	129,2	6,7	126,6	8,3	123,4	10,3	119,4	12,7	114,6	15,7	108,6	19,2	101,6
160	4,0••	152,0	6,2	147,6	7,7	144,6	9,5	141,0	11,8	136,4	14,6	130,8	17,9	124,2	21,9	116,2
180	4,4••	171,2	6,9	166,2	8,6	162,8	10,7	158,6	13,3	153,4	16,4	147,2	20,1	139,8	24,6	130,8
200	4,9••	190,2	7,7	184,6	9,6	180,8	11,9	176,2	14,7	170,6	18,2	163,6	22,4	155,2	27,4	145,2
225	5,5••	214,0	8,6	207,8	10,8	203,4	13,4	198,2	16,6	191,8	20,5	184,0	25,2	174,6	30,8	163,4
250	6,2••	237,6	9,6	230,8	11,9	226,2	14,8	220,4	18,4	213,2	22,7	204,6	27,9	194,2	34,2	181,6
280	6,9••	266,2	10,7	258,6	13,4	253,2	16,6	246,8	20,6	238,8	25,4	229,2	31,3	217,4	38,3	203,4
315	7,7	299,6	12,1	290,8	15,0	285,0	18,7	277,6	23,2	268,6	28,6	257,8	35,2	244,6	43,1	228,8
355	8,7	337,6	13,6	327,8	16,9	321,2	21,1	312,8	26,1	302,8	32,2	290,6	39,7	275,6	48,5	258,0
400	9,8	380,4	15,3	369,4	19,1	361,8	23,7	352,6	29,4	341,2	36,3	327,4	44,7	310,6	54,7	290,6
450	11,0	428,0	17,2	415,6	21,5	407,0	26,7	396,6	33,1	383,8	40,9	368,2	50,3	349,4	61,5	327,0
500	12,3	475,4	19,1	461,8	23,9	452,2	29,7	440,6	36,8	426,4	45,4	409,2	55,8	388,4	-	-
560	13,7	532,6	21,4	517,2	26,7	506,6	33,2	493,6	41,2	477,6	50,8	458,4	62,5	435,0	-	-
630	15,4	599,2	24,1	581,8	30,0	570,0	37,4	555,2	46,3	537,4	57,2	515,6	70,3	489,4	-	-
710	17,4	675,2	27,2	655,6	33,9	642,2	42,1	625,8	52,2	605,6	64,5	581,0	79,3	551,4	-	-
800	19,6	760,8	30,6	738,8	38,1	723,8	47,4	705,2	58,8	682,4	72,6	654,8	89,3	621,4	-	-
900	22,0	856,0	34,4	831,2	42,9	814,2	53,3	793,4	66,1	767,8	81,7	736,6	-	-	-	-
1000	24,5	951,0	38,2	923,6	47,7	904,6	59,3	881,4	73,5	853,0	90,8	818,4	-	-	-	-
1200	29,4	1141,2	45,9	1108,2	57,2	1085,6	-	-	-	-	-	-	-	-	-	-

DN = nominal outside diameter DI = inner diameter e_n = nominal thickness PN = nominal pressure

SDR = standard dimensional ratio (DN/e_n)

• Thickness rounded to lower SDR

•• Not included in the standard EN 12201

The range of certified products can be checked on www.idrotherm2000.com and on the websites of the certification bodies

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