

# System description

## 1. General

COOLMANT is the registered trade name for a rigid pipe system from Brugg Pipe Systems with carrier pipes made of polyethylene. This pipe system is especially suitable for use in local and district cooling networks, in industrial and with restrictions also for combined heat pump systems (cooling and heating).

The COOLMANT district cooling pipe has a carrier pipe produced from high-density polyethylene (PE100) as per standard EN 12162. The polyethylene pressure pipes are the standard for drinking water and waste water systems, and also for the gas supply sector. The pipes are joined by means of standard screwed connectors, mechanical pipe couplings, with normal commercial electro fusion fittings or by means of butt fusion welding technology.

The insulation is made of fine-pore CFC-free rigid polyurethane foam and, together with the medium pipe, it forms a compact composite system with excellent insulation properties. The outer casing meets the requirements for plastic casing pipes as per EN 253, ensuring that the district cooling pipe is reliably protected against mechanical influences and the possibility that water could penetrate the system. The pipes can therefore be installed at outdoor temperatures down to 0°C.

In combination with the flexible COOLFLEX district cooling system, these features make it possible to implement applications involving widely varying requirements imposed by the terrain – so the installation outlay is substantially reduced.

## 2. Range of applications

Max. continuous operating temperature  $T_{Bmax}$ : -20 to +40 °C\*  
Max. permitted operating pressure p: max. 16 bar

\*warm water application with limited lifetime and operating pressure (as per DIN 8074)

# System description

## 1. Medium pipe

Material: Polyethylene class PE100 with high density, to DIN EN ISO 12162  
 Life expectancy: 50 years at 20 °C (16 bar) or 40 °C (11.6 bar) as per DIN 8074 (SF 1.25)  
 Properties: suitable as district cooling, cold water and waste water pipe

PE carrier pipe	Reference temperature	Value	Test standard
Density	–	952 - 960 kg/m <sup>3</sup>	DIN 53479
Thermal conductivity	40 °C	0.40 W/mK	DIN 52612
Tensile strengts	20 °C	32 N/mm <sup>2</sup>	DIN 53455
Modulus of elasticity	20 °C	1000 N/mm <sup>2</sup>	DIN 53457
Linear expansion coefficient	20 °C	1.8 · 10 E-4 1/K	DIN 52328
Crystallite melting range	–	130 - 135 °C	–

## 2. Thermal insulation

Material: CFC-free, 100 % CO<sub>2</sub>-blown polyurethane foam (PUR)

PUR insulation	Reference temperature	Rigid pipes Ø 125 - Ø 315	Test standard
Density	–	> 60 kg/m <sup>3</sup>	ISO 845
Thermal conductivity	30	≤ 0.024 W/mK	EN 253 and ISO 8497
Percentage of closed cells	–	≥ 90 %	–
Water absorption after 24 hours	–	≤ 10 %	EN 253

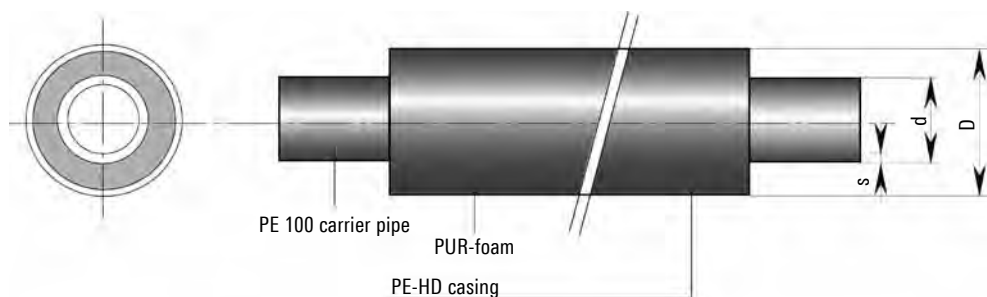
## 3. Protective casing

Material: linear polyethylene, low density (LLD-PE), seamlessly extruded  
 Purpose: mechanical protection and moisture resistance

LLD-PE protective casing	Reference temperature	Rigid pipes	Test standard
Density	–	950 kg/m <sup>3</sup>	ISO 1183
Thermal conductivity	–	0.38 W/mK	DIN 52612
Crystallite melting range	–	126 - 130 °C	ISO 11357-3

# COOLMANT range

Ø 125 - 315 mm / SDR 11/SDR 17 (bars)



## Dimensions Ø 125 - 315 mm / SDR 11

Type	Inches	PE inner pipe d x s mm	Outer casing D x s1 mm	Volume Inner pipe l/m	Weight kg/m	Standard length m
125/225	5	125 x 11.4	225 x 3.5	8.203	7.61	6/12
140/225	-	140 x 12.7	225 x 3.5	10.315	8.38	6/12
160/250	6	160 x 14.6	250 x 3.9	13.437	10.67	6/12
180/280	7	180 x 16.4	280 x 4.4	17.018	13.45	6/12
200/315	8	200 x 18.2	315 x 4.9	21.021	16.77	6/12
225/315	9	225 x 20.5	315 x 4.9	26.590	18.91	6/12
250/355	10	250 x 22.7	355 x 5.6	32.878	23.68	6/12
280/400	11	280 x 25.4	400 x 6.3	41.259	29.85	6/12
315/450	12	315 x 28.6	450 x 7.0	52.198	37.69	6/12

## Dimensions Ø 125 - 315 mm / SDR 17

Type	Inches	PE inner pipe d x s mm	Outer casing D x s1 mm	Volume Inner pipe l/m	Weight kg/m	Standard length m
125/225	5	125 x 7.4	225 x 3.5	9.230	6.63	6/12
140/225	-	140 x 8.3	225 x 3.5	11.960	6.82	6/12
160/250	6	160 x 9.5	250 x 3.9	15.610	8.60	6/12
180/280	7	180 x 10.7	280 x 4.4	19.760	10.85	6/12
200/315	8	200 x 11.9	315 x 4.9	24.380	13.58	6/12
225/315	9	225 x 13.4	315 x 4.9	30.850	14.86	6/12
250/355	10	250 x 14.8	355 x 5.6	38.150	18.67	6/12
280/400	11	280 x 16.6	400 x 6.3	47.840	23.60	6/12
315/450	12	315 x 18.7	450 x 7.0	60.520	29.78	6/12

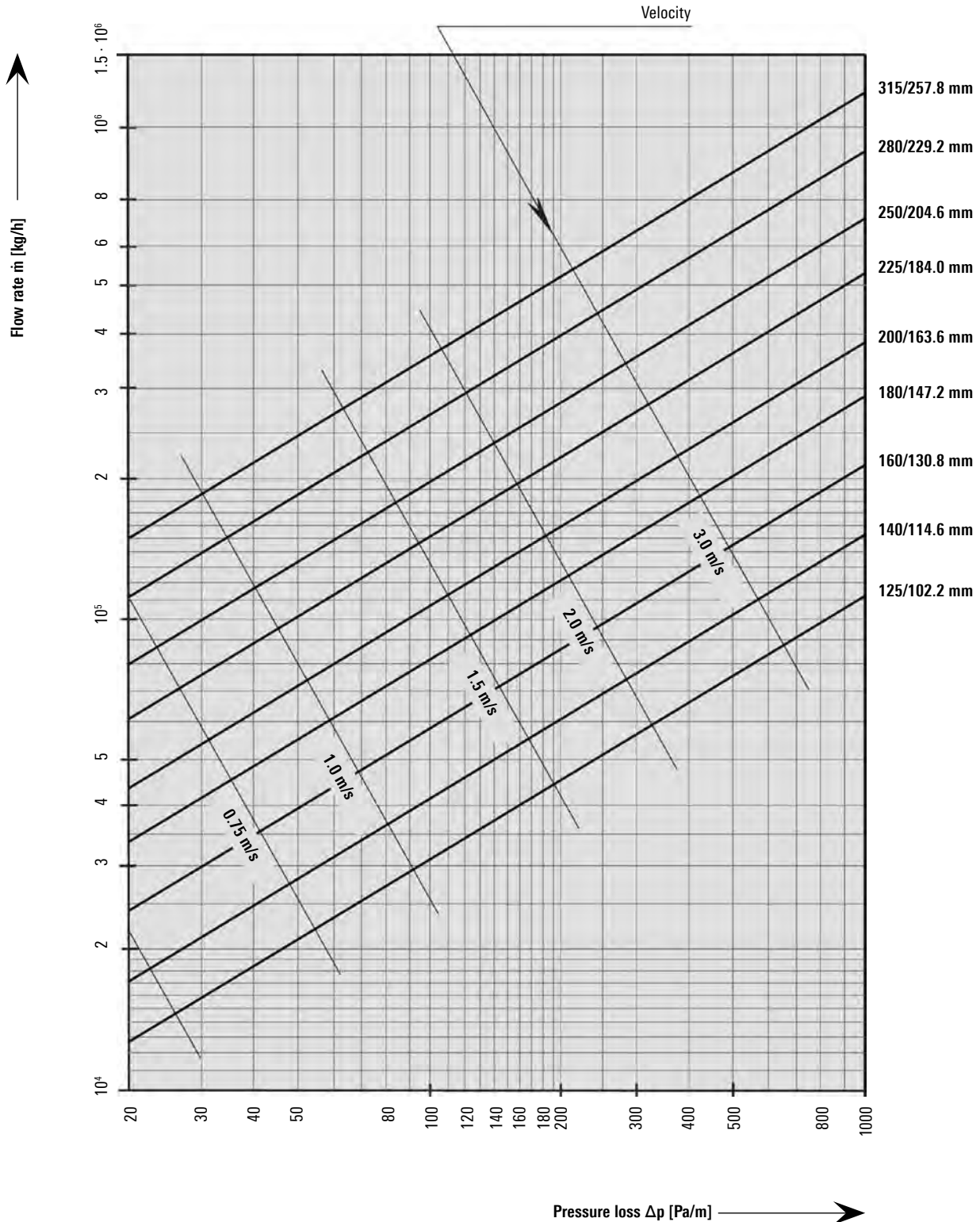
# Pressure loss chart for water

Ø 125 - 315 mm / SDR 11

Water temperature 10 °C

Roughness  $\epsilon = 0.01$  mm (PE100)

(1 mmWS = 9.81 Pa)

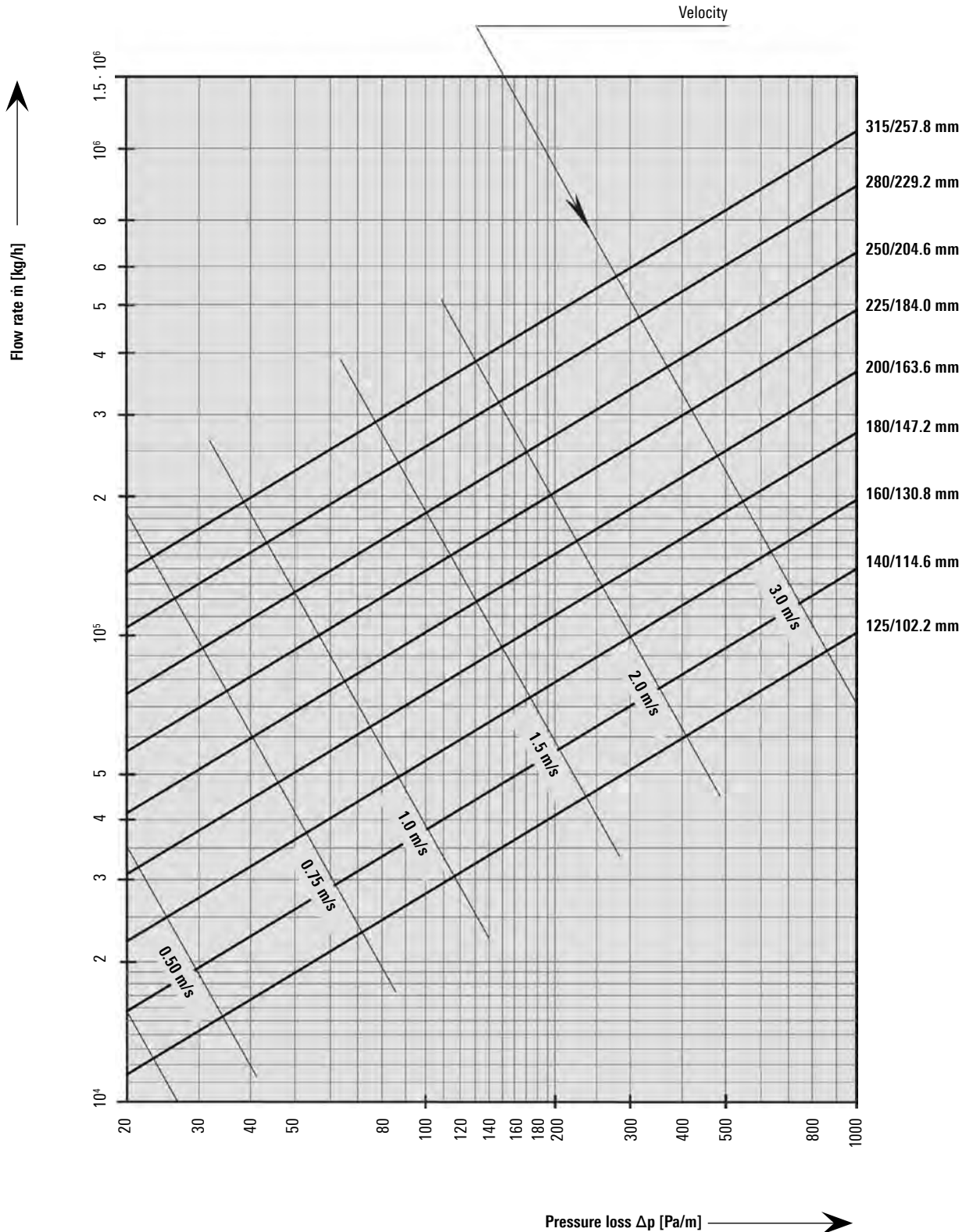


# Pressure loss chart for ethylene glycol concentration

Ø 125 - 315 mm / SDR 11

Medium temperature 10 °C  
Ethylene glycol 30 % concentration

Roughness  $\epsilon = 0.01$  mm (PE100)  
(1 mmWS = 9.81 Pa)

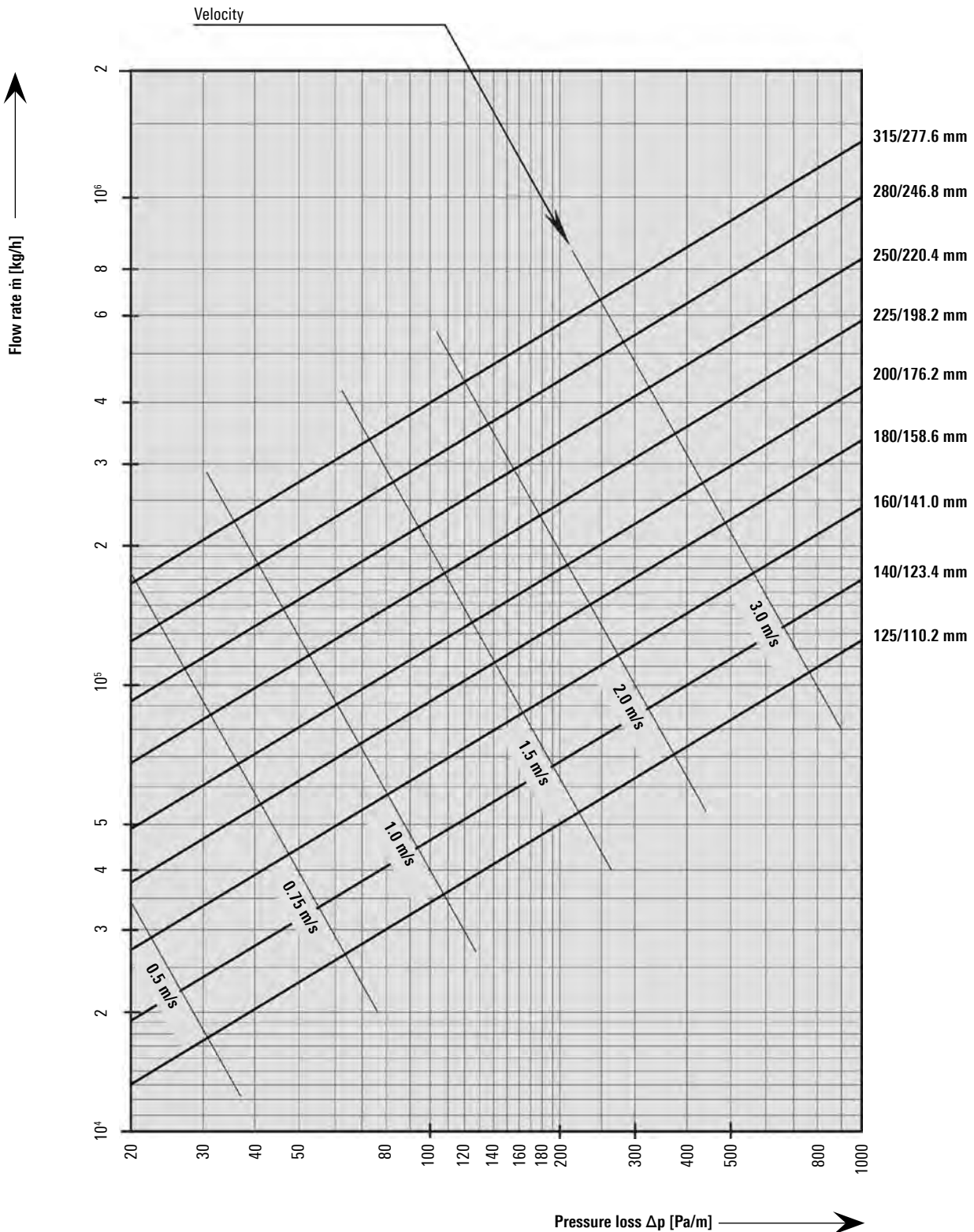


# Pressure loss chart for ethylene glycol concentration

Ø 125 - 315 mm / SDR 17

Medium temperature 10 °C  
Ethylene glycol 30 % concentration

Roughness  $\epsilon = 0.01$  mm (PE100)  
(1 mmWS = 9.81 Pa)



# Energy losses

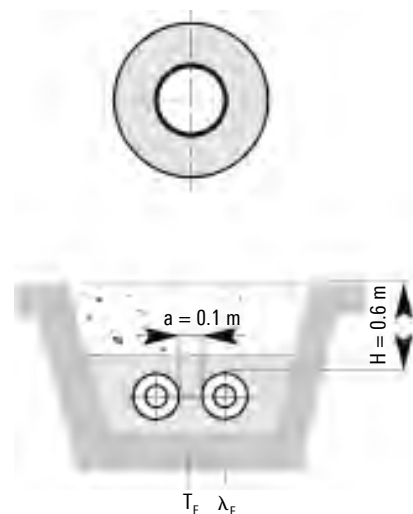
Applications laid in the ground

## Dimensions Ø 125 - 315 mm / SDR 11

Heat losses q [W/m]						
COOLMANT	U-value [W/mK]	Average operating temperature $T_B$ [°C]				
		6°	8°	10°	12°	14°
125/225 - SDR 11	0.233	-0.9	-0.5	0.0	0.5	0.9
140/225 - SDR 11	0.282	-1.1	-0.6	0.0	0.6	1.1
160/250 - SDR 11	0.299	-1.2	-0.6	0.0	0.6	1.2
180/280 - SDR 11	0.303	-1.2	-0.6	0.0	0.6	1.2
200/315 - SDR 11	0.296	-1.2	-0.6	0.0	0.6	1.2
225/315 - SDR 11	0.385	-1.5	-0.8	0.0	0.8	1.5
250/355 - SDR 11	0.373	-1.5	-0.7	0.0	0.7	1.5
280/400 - SDR 11	0.366	-1.5	-0.7	0.0	0.7	1.5
315/450 - SDR 11	0.370	-1.5	-0.7	0.0	0.7	1.5

## Dimensions Ø 125 - 315 mm / SDR 17

Heat losses q [W/m]						
COOLMANT	U-value [W/mK]	Average operating temperature $T_B$ [°C]				
		6°	8°	10°	12°	14°
125/225 - SDR 17	0.234	-0.9	-0.5	0.0	0.5	0.9
140/225 - SDR 17	0.284	-1.1	-0.6	0.0	0.6	1.1
160/250 - SDR 17	0.301	-1.2	-0.6	0.0	0.6	1.2
180/280 - SDR 17	0.305	-1.2	-0.6	0.0	0.6	1.2
200/315 - SDR 17	0.299	-1.2	-0.6	0.0	0.6	1.2
225/315 - SDR 17	0.389	-1.6	-0.8	0.0	0.8	1.6
250/355 - SDR 17	0.378	-1.5	-0.8	0.0	0.8	1.5
280/400 - SDR 17	0.373	-1.5	-0.7	0.0	0.7	1.5
315/450 - SDR 17	0.374	-1.5	-0.7	0.0	0.7	1.5



Installation type CLM:	2-pipe, laid in the ground
Pipe distance:	a = 0.10 m
Covera above pipe:	H = 0.60 m
Ground temperature:	$T_E$ = 10.00 °C
Soil conductivity:	$\lambda_E$ = 1.2 W/mK
Conductivity of PUR foam:	$\lambda_{PU}$ = 0.024 W/mK
Conductivity of PE pipe:	$\lambda_{PU}$ = 0.40 W/mK
Conductivity of PE casing:	$\lambda_{PU}$ = 0.33 W/mK

### Heat loss during operation:

$$q = U (T_B - T_E) \text{ [W/m]}$$

U = Heat transfer coefficient [W/mK]

$T_B$  = Average operating temperature [°C]

$T_E$  = Average ground temperature [°C]

VL = Flow

RL = Return

On request, we shall be glad to calculate the heat losses for surface mounted pipe systems.