TECHNICAL INFORMATION

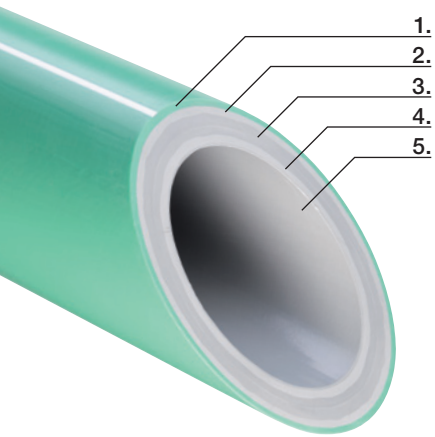
5-Layer Hot & Cold Water Piping

POLO-ECOSAN ML^5

poloplast
PIPE SYSTEMS

POLO-ECOSAN ML5 . The development of PP-R multilayer technology

A new innovation has now been added to the successful polypropylene pipe system from POLOPLAST! The company's experience in multilayer technology proved particularly beneficial in developing this new type of pipe. The development of a polymer compound has also been applied. The newly devised 5-layer fibre composite pipe POLO-ECOSAN ML5 combines the advantages of PP-R CT and glass-fibre reinforced PP-R in one product thanks to the sandwich structure.



5 layers – 5 benefits!
Quality – made in Germany.

1. External layer made from PP-R 80
The outer layer made from high grade polypropylene granulate features the colour coding of the pipe and is used to guarantee the renowned safe processing as well as to protect the inner layers.

2. Second layer made from POLOPLAST compound HPCE
This PP-R glass fibre compound is the result of detailed research carried out at the POLOPLAST Polymer-Engineering division and is a new development in this field. The perfect interaction between the corresponding glass fibres and the PP-R provides outstanding properties in terms of linear expansion, deflection and low-temperature impact strength.

3. Intermediate layer made from PP-R CT
The PP-R CT material is a Polypropylene-Random-Copolymer with a modified material structure. It allows improved long-term stress behaviour with longer periods of operation, especially at higher temperatures

4. Intermediate layer made from POLOPLAST compound HPCE
This layer too offers outstanding properties in terms of linear expansion, deflection and low-temperature impact strength.

5. Inner layer made from PP-R CT
Here, as in the middle layer, improved long-term stress behaviour over longer periods of operation is guaranteed at higher temperatures. The production process ensures a smooth inner surface which reduces deposits and encrustations.

More layers, more benefits

Smooth inner pipe surfaces prevent the build-up of deposits and encrustations.
Low weight design ensures low-cost storage and relocation.
Tried and trusted connecting technology is compatible with POLO-ECOSAN PP-R for all areas of application.
Lifespan of at least 50 years (extrapolated).
No special accessories required: can be used with normal welding tools/ welding machines.
Connection with normal moulded parts from the POLO-ECOSAN assortment.
Environmentally-friendly thanks to the use of modern materials.
Homogenous connection of the layers - produced using one-time extrusion technology.

POLO-ECOSAN ML⁵ is classified according to DIN EN ISO 21003 under application class 1 with 8 bar and under application class 2 with 6 bar and is available in the following dimensions:

Dimension	Art. No.
20 x 2,8 mm	16322
25 x 3,5 mm	16323
32 x 4,4 mm	16324
40 x 5,5 mm	16325
50 x 6,9 mm	16326
63 x 8,6 mm	16327
75 x 10,3 mm	16328
90 x 12,3 mm	16329
110 x 15,1 mm	16330

Focusing on linear expansion: top performance under a high pressure load

Fluctuating operating temperatures cause thermal linear expansion of the pipes. This linear expansion must be taken into account with all installation options in order to avoid potential tensile stress to the raw materials or damage to connections. The linear expansion of pipes embedded in walls or screed is absorbed by insulation in the bends. In general, the thermal expansion forces emitted by plastic pipes are extremely low compared to those of metal substances because the corresponding retention force effectively neutralises any expansion.

The multilayer fibre reinforced pipe structure of the POLO-ECOSAN ML⁵ reduces linear expansion by 75% compared to a standard PP-R pipe!

Glass-fibre reinforced robustness. Under all conditions.
The linear expansion coefficient for the POLO-ECOSAN ML⁵ fibre pipes is α 0,038 mm/mK.

The linear expansion was tested by the Austrian Research Institute for Chemistry and Technology (OFI) according to defined test apparatus (test number: 406.255-1).

Linear expansion is calculated according to the following formula:

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

Δl	Length variation	[mm]
L	Length before temperature change	[m]
α	Linear expansion coefficient	$\left[\frac{mm}{m \cdot K}\right]$
ΔT	Max. temperature difference between installation and operating temperature in K	[K]

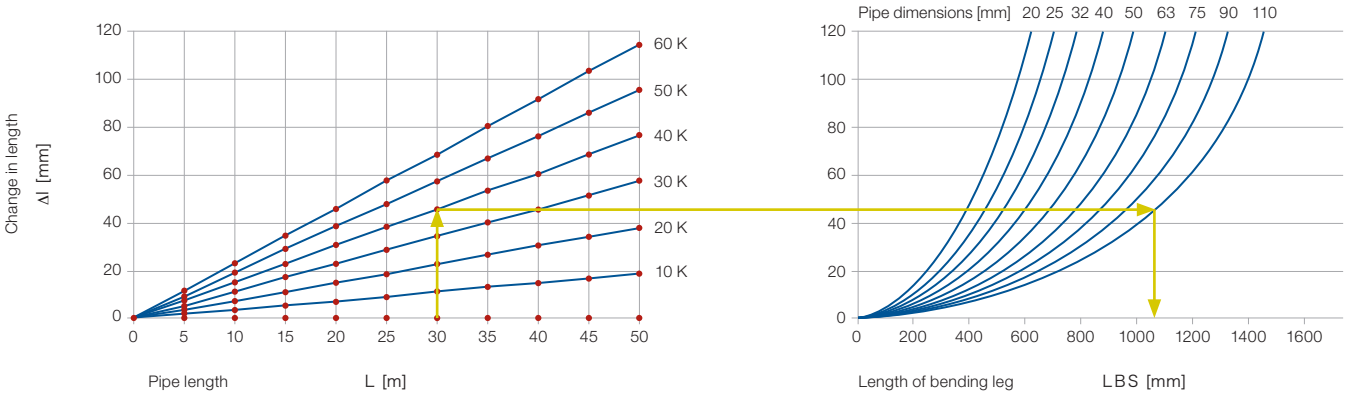
e.g.:

Fibre reinforced ML⁵ pipe
Length: 30 m
Installation temperature: 20°C
Operating temperature: 60°C

$$\Delta l = 0{,}038 \left[\frac{mm}{m \cdot K}\right] \cdot 30m \cdot (60 - 20)K$$

Δl = 45,6 mm

Diagram for identifying temperature-influenced changes in length for POLO-ECOSAN ML⁵



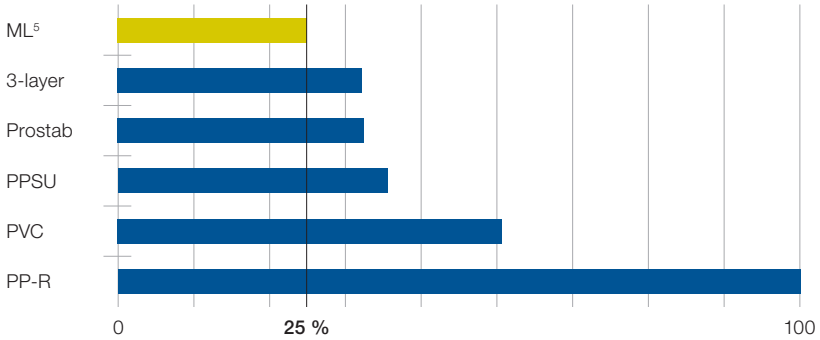
Strictly regulated certification

- OFI certificate for linear expansion
- Strict controls by state recognised testing body for plastics (Süddeutsches Kunststoff-Zentrum – SKZ)
- KTW-tested based on recommendations of Federal Department for the Environment

SKZ Das Kunststoff-Zentrum · TZW Prüfstelle Wasser · ofi · qualityaustria Erfolg mit Qualität

Clear proof – a comparison

A comparison graph against a standard PP-R pipe clearly shows that the temperature-influenced linear expansion is reduced by 75% with POLO-ECOSAN ML⁵.



Focusing on span distance: stable and economical in all locations

The special multilayer pipe structure of POLO-ECOSAN ML5 ensures a higher stability level which enables greater span distances and saves on costs and materials. No supports are required when laying POLO-ECOSAN ML5.

Please ensure that the specified distances are not exceeded with laying pipes horizontally.

POLO-ECOSAN ML5 / SDR 7,4							
Dimensions	Media temperature [°C]						
	10	20	30	40	50	60	70
	Span distances [cm]						
20	110	95	90	85	85	80	70
25	120	105	105	95	95	90	80
32	140	120	120	110	110	105	95
40	160	140	135	125	125	120	110
50	185	155	155	145	145	135	130
63	200	175	175	165	165	155	145
75	215	190	190	175	175	165	155
90	230	210	210	195	195	180	180
110	250	220	220	210	200	200	190

Focusing on long-term internal pressure: Long-term temperature resistance

Long-term stress behaviour with safety factor 1.25					
Temperature °C	Years of operation				
	1	5	10	25	50
	Maximum service pressure in bar				
20 °C	28,5	26,8	26,1	25,2	24,5
30 °C	24,2	22,7	22,1	21,3	20,7
40°C	20,6	19,2	18,7	18	17,4
50°C	17,4	16,2	15,7	15,1	14,7
60 °C	14,7	13,6	13,2	12,7	12,3
70 °C	12,3	11,7	11,1	9,6	8,1
80 °C	10,3	9,1	7,7	6,2	
95 °C	7,3	4,9			

Pressure loss table for POLO-ECOSAN ML5 / SDR 7,4

Roughness: 0,007 mm
R = Pressure loss

Density: 998,29 kg/m³
v = flow speed

Kinematic viscosity: 1,004 E-06 m²/s

Temperature: 20° C

			DN 15	DN 20	DN 25	DN 32	DN 40	DN 50	DN 50	DN 65	DN 80
Dimensions in mm			20	25	32	40	50	63	75	90	110
Wall thickness in mm			2,8	3,5	4,4	5,5	6,9	8,6	10,3	12,3	15,1
Inner diameter in mm			14,4	18,0	23,2	29,0	36,2	45,8	54,4	65,4	79,8
Volume in l/m			0,163	0,254	0,423	0,661	1,029	1,647	2,324	3,359	5,001
l/s	m³/h										
0,01	0,04	R in mbar/m	0,10	0,04	0,01						
		v in m/s	0,06	0,04	0,02						
0,02	0,07	R	0,30	0,11	0,03	0,01					
		v	0,12	0,08	0,05	0,03					
0,03	0,11	R	0,58	0,21	0,06	0,02					
		v	0,18	0,12	0,07	0,05					
0,04	0,14	R	0,93	0,33	0,10	0,04	0,01				
		v	0,25	0,16	0,09	0,06	0,04				
0,05	0,18	R	1,34	0,47	0,15	0,05	0,02				
		v	0,31	0,20	0,12	0,08	0,05				
0,06	0,22	R	1,82	0,64	0,20	0,07	0,03	0,01			
		v	0,37	0,24	0,14	0,09	0,06	0,04			
0,07	0,25	R	2,36	0,83	0,25	0,09	0,03	0,01			
		v	0,43	0,28	0,17	0,11	0,07	0,04			
0,08	0,29	R	2,96	1,04	0,32	0,11	0,04	0,01			
		v	0,49	0,31	0,19	0,12	0,08	0,05			
0,09	0,32	R	3,61	1,26	0,38	0,14	0,05	0,02			
		v	0,55	0,35	0,21	0,14	0,09	0,05			
0,10	0,36	R	4,32	1,51	0,46	0,16	0,06	0,02	0,01		
		v	0,61	0,39	0,24	0,15	0,10	0,06	0,04		
0,12	0,43	R	5,90	2,05	0,62	0,22	0,08	0,03	0,01		
		v	0,74	0,47	0,28	0,18	0,12	0,07	0,05		
0,14	0,50	R	7,70	2,67	0,81	0,28	0,10	0,03	0,02		
		v	0,86	0,55	0,33	0,21	0,14	0,08	0,06		
0,16	0,58	R	9,70	3,36	1,01	0,35	0,13	0,04	0,02		
		v	0,98	0,63	0,38	0,24	0,16	0,10	0,07		
0,18	0,65	R	11,91	4,11	1,24	0,43	0,15	0,05	0,02	0,01	
		v	1,11	0,71	0,43	0,27	0,17	0,11	0,08	0,05	
0,20	0,72	R	14,32	4,94	1,48	0,52	0,18	0,06	0,03	0,01	
		v	1,23	0,79	0,47	0,30	0,19	0,12	0,09	0,06	
0,30	1,08	R	29,30	10,01	2,98	1,03	0,36	0,12	0,05	0,02	0,01
		v	1,84	1,18	0,71	0,45	0,29	0,18	0,13	0,09	0,06
0,40	1,44	R	49,02	16,64	4,92	1,70	0,59	0,20	0,09	0,04	0,01
		v	2,46	1,57	0,95	0,61	0,39	0,24	0,17	0,12	0,08
0,50	1,80	R	73,35	24,77	7,29	2,50	0,87	0,29	0,13	0,05	0,02
		v	3,07	1,96	1,18	0,76	0,49	0,30	0,22	0,15	0,10
0,60	2,16	R	102,21	34,36	10,06	3,45	1,20	0,39	0,17	0,07	0,03
		v	3,68	2,36	1,42	0,91	0,58	0,36	0,26	0,18	0,12
0,70	2,52	R	135,57	45,40	13,24	4,52	1,57	0,51	0,23	0,09	0,04
		v	4,30	2,75	1,66	1,06	0,68	0,42	0,30	0,21	0,14
0,80	2,88	R	173,38	57,86	16,82	5,73	1,98	0,64	0,28	0,12	0,05
		v	4,91	3,14	1,89	1,21	0,78	0,49	0,34	0,24	0,16
0,90	3,24	R	215,63	71,73	20,78	7,06	2,43	0,79	0,35	0,15	0,06
		v	5,53	3,54	2,13	1,36	0,87	0,55	0,39	0,27	0,18
1,00	3,60	R	262,30	87,00	25,14	8,52	2,93	0,95	0,42	0,17	0,07
		v	6,14	3,93	2,37	1,51	0,97	0,61	0,43	0,30	0,20
1,10	3,96	R	313,36	103,67	29,87	10,11	3,47	1,12	0,49	0,21	0,08
		v	6,75	4,32	2,60	1,67	1,07	0,67	0,47	0,33	0,22

			DN 15	DN 20	DN 25	DN 32	DN 40	DN 50	DN 50	DN 65	DN 80
Dimensions in mm			20	25	32	40	50	63	75	90	110
Wall thickness in mm			2,8	3,5	4,4	5,5	6,9	8,6	10,3	12,3	15,1
Inner diameter in mm			14,4	18,0	23,2	29,0	36,2	45,8	54,4	65,4	79,8
Volume in l/m			0,163	0,254	0,423	0,661	1,029	1,647	2,324	3,359	5,001
l/s	m³/h										
1,20	4,32	R	368,81	121,73	34,99	11,82	4,05	1,31	0,58	0,24	0,09
		v	7,37	4,72	2,84	1,82	1,17	0,73	0,52	0,36	0,24
1,30	4,68	R	428,65	141,17	40,48	13,65	4,67	1,51	0,66	0,28	0,11
		v	7,98	5,11	3,08	1,97	1,26	0,79	0,56	0,39	0,26
1,40	5,04	R	492,86	162,00	46,35	15,60	5,33	1,72	0,76	0,31	0,12
		v	8,60	5,50	3,31	2,12	1,36	0,85	0,60	0,42	0,28
1,60	5,76	R	634,39	207,77	59,21	19,86	6,77	2,18	0,96	0,40	0,15
		v	9,82	6,29	3,78	2,42	1,55	0,97	0,69	0,48	0,32
1,80	6,48	R	793,36	259,03	73,57	24,61	8,37	2,69	1,18	0,49	0,19
		v	11,05	7,07	4,26	2,73	1,75	1,09	0,77	0,54	0,36
2,00	7,20	R		315,77	89,40	29,83	10,12	3,24	1,42	0,59	0,23
		v		7,86	4,73	3,03	1,94	1,21	0,86	0,60	0,40
2,20	7,92	R		377,96	106,70	35,52	12,02	3,85	1,68	0,69	0,27
		v		8,65	5,20	3,33	2,14	1,34	0,95	0,65	0,44
2,40	8,64	R		445,60	125,47	41,67	14,08	4,50	1,96	0,81	0,31
		v		9,43	5,68	3,63	2,33	1,46	1,03	0,71	0,48
2,60	9,36	R		518,69	145,71	48,30	16,29	5,19	2,26	0,93	0,36
		v		10,22	6,15	3,94	2,53	1,58	1,12	0,77	0,52
2,80	10,08	R			167,40	55,38	18,64	5,93	2,58	1,06	0,41
		v			6,62	4,24	2,72	1,70	1,20	0,83	0,56
3,00	10,80	R			190,56	62,93	21,15	6,72	2,92	1,20	0,46
		v			7,10	4,54	2,91	1,82	1,29	0,89	0,60
3,50	12,60	R			254,82	83,82	28,07	8,89	3,86	1,58	0,61
		v			8,28	5,30	3,40	2,12	1,51	1,04	0,70
4,00	14,40	R			328,14	107,58	35,90	11,33	4,91	2,01	0,77
		v			9,46	6,06	3,89	2,43	1,72	1,19	0,80
4,50	16,20	R			410,53	134,19	44,65	14,06	6,07	2,49	0,95
		v			10,65	6,81	4,37	2,73	1,94	1,34	0,90
5,00	18,00	R				163,65	54,32	17,05	7,36	3,01	1,15
		v				7,57	4,86	3,03	2,15	1,49	1,00
5,50	19,80	R				195,95	64,88	20,32	8,75	3,57	1,36
		v				8,33	5,34	3,34	2,37	1,64	1,10
6,00	21,60	R				231,09	76,36	23,86	10,26	4,18	1,60
		v				9,08	5,83	3,64	2,58	1,79	1,20
6,50	23,40	R				269,06	88,73	27,68	11,89	4,84	1,84
		v				9,84	6,32	3,95	2,80	1,93	1,30
7,00	25,20	R				309,86	102,00	31,76	13,62	5,54	2,11
		v				10,60	6,80	4,25	3,01	2,08	1,40
7,50	27,00	R					116,17	36,10	15,47	6,28	2,39
		v					7,29	4,55	3,23	2,23	1,50
8,00	28,80	R					131,24	40,72	17,42	7,07	2,68
		v					7,77	4,86	3,44	2,38	1,60
8,50	30,60	R					147,20	45,60	19,49	7,90	3,00
		v					8,26	5,16	3,66	2,53	1,70
9,00	32,40	R					164,05	50,75	21,67	8,77	3,32
		v					8,74	5,46	3,87	2,68	1,80
9,50	34,20	R					181,80	56,16	23,96	9,69	3,67
		v					9,23	5,77	4,09	2,83	1,90
10,00	36,00	R					200,45	61,84	26,35	10,65	4,03
		v					9,72	6,07	4,30	2,98	2,00

POLOPLAST.
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