LARETER
PRODUCTION OF PVC PIPES AND FITTINGS

PVC-A

PVC-A PIPES AND FITTINGS FOR CONDUCTS OF FLUIDS UNDER PRESSURE

TECHNICAL CATALOG – JUNE 2020

Introduction

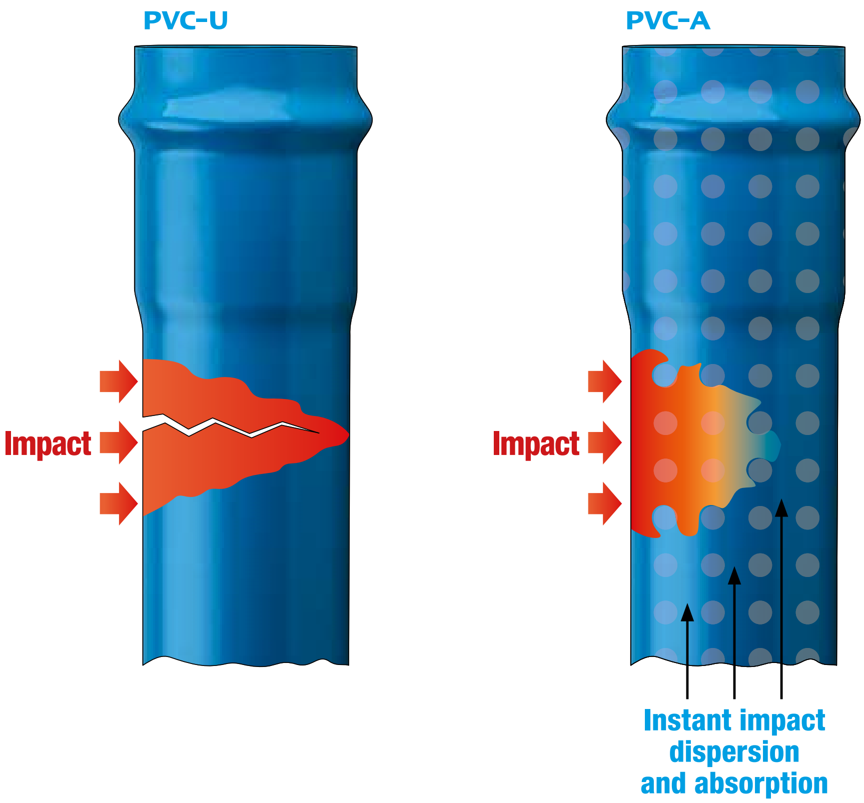
PVC-A is a **Polymeric Alloy** born in **1995** from the collaboration of the British Institution **North West Water** with the Research Institute on Plastics **Pipeline Development Ltd**, aimed at manufacturing products with higher performance, compared to the traditional ones, in terms of greater sealing guarantees of pipelines over time, higher quality of the water transported, easier use and consequently lower operating and depreciation costs.

The research was born from the need to ensure good continuity of customer service (**no breakages, no leaks, life cycle over 50/80 years, water quality**), as well as low maintenance costs.

For this purpose, we studied the rupture mechanisms of existing plastics and we concluded that the **risk of ductile-brittle transition**, in rupture modes, **had to be eliminated.**

PVC-U has a high resistance, but it behaves in a fragile way if subjected to certain mechanical stresses and in presence of blunt objects; therefore an attempt was made to modify the formulation with **polyethylene chloride** to increase its ductility. The introduction of these additives, gives the **PVC-A Alloy** the same mechanical characteristics as **rigid PVC-U**, adding the ductility of **HDPE**.

To test the **toughness of PVC-A**, we decided to subject to traction a suitably carved sample and to measure the breaking load after 15'. While carrying out the tests, we noticed that the tip of the notch, in the case of **PVC-A**, almost immediately took on a rounded shape and a white plastic area was formed all around. This area, on which the stresses were concentrated, was enlarged compared to a normal rigid PVC and more energy was required to continue the advancement of the crack. This new alloy, called **PVC-A**, always appears as ductile. The material has high flexibility, so much that it is possible to perform manually quite large bends at cold-start, lightness, easier installation, reliability over time, ability to withstand high peak loads even with cracked materials, great impact resistance.



Physical-Mechanical Characteristics

The new PVC Polymer Alloy with Additive **(PVC-A)** combines the resistance of **PVC-U** with the ductility of Polyethylene, thus creating a product highly resistant to crack propagation, which is the major cause of breakage during installation and laying operations.

The **Lareter PVC-A** Pipes and Fittings System has been designed to provide the best performance for the specific application of the transport of water and fluids under pressure.

Features:

- High resistance to crack propagation during installation
- Significant impact resistance to concentrated loads, even at low temperatures
- Excellent tolerance to chemicals
- Lighter, if compared to traditional pipes in plastic materials of the same diameters

The **PVC-A Lareter** range includes **PVC-A** pipes and fittings from **Ø 50** mm to **Ø 500** mm diameter, with operating pressures of **8 - 10 - 12,5 - 16 - 20 bar**.

FEATURES	UNITS	VALUE	METHOD
Specific Weight	gr/cm^3	1,38 - 1,40	ISO 1183
Yeld Load	Mpa	≥ 40	EN ISO 6259-1
Longitudinal Tension	%	≤ 5	ISO 2505
Softening Temperature (VICAT degree)	°C	≥ 80	ISO 2507
Resistance to Internal Pressure			
1 h at 20°C 36 Mpa	Hours	> 1	BS PAS 27
Opacity	%	≤ 0,2	ISO 7686
Young's Modulus (E)	Mpa	2500	-
Coefficient of Thermal Expansion	α	7×10^5	-
Poisson Coefficient	v	0,38	-
Roughness	mm	0,003	-
Ductility (C Ring Test)	Type - Aspect	Ductile Break	BS PAS 27
Impact resistance	TIR	≤5%	BS PAS 27

Certifications

Standard Reference

The **Lareter PVC-A** Pipes and Fittings System complies with the production criteria of **BS PAS 27: 1999 "Unplasticized poly(vinyl chloride) alloy (PVC-A) pipes and bends for water under pressure"**. This standard describes the requirements of the new generation of **PVC-A** pipes and fittings, based on a plastic alloy which combines the **high resistance of PVC with the ductility of PE.**

Material

The materials have been chosen and mixed carefully, in order to obtain a pipe which could guarantee toughness and durability. The combination of these materials has produced **a new generation polymer alloy**, able to comply with the needs of the water industry. From the combination of the characteristics of ductility and tenacity of polyethylene chloride and the characteristics of high resistance of **PVC-U**, we obtained a new product with higher performance at the same cost.

The characteristics of the material are such, that the high levels of breaking strength, even in presence of concentrated loads, combined with the high yield load (ductility), lead the Lareter **PVC-A** pipes to perform better than others plastic materials on the market.

The **Lareter PVC-A** pipes and fittings are certified by the **KIWA** European institution for testing, inspection and certification (TIC) with the **KQ KIWA QUALITY KIP-105133** brand, which fully incorporates and mutates **BS PAS 27: 1999**.

The **Lareter PVC-A** range is manufactured at the **Lareter** Headquarters of **Fiesso Umbertiano (Rovigo - Italy)**, a Company certified **UNI EN ISO 9001** (Quality Management System issued by IIP - Italian Plastics Institute), **UNI EN ISO 14001** (Environmental Management System issued by BSI - British Standard Institutions) and **ISO 45001** (Occupational Health and Safety issued by BSI - British Standard Institutions).

C-Ring Test

For the evaluation of the ductility of **PVC-A**, the **BS PAS 27: 1999** standard expect the passing of the **C-RING TEST** carried out to evaluate the long-term performance under load of the pipe and in particular to evaluate its resistance to crack propagation and the failure of the product following the application of loads.

KQ KIWA QUALITY KIP-105133

Certified drinkability with Ministerial Decree no. 174/2004

UNI EN 1622 Water quality - Threshold odour number (TON) and flavour number

Company Certifications

EN ISO 9001

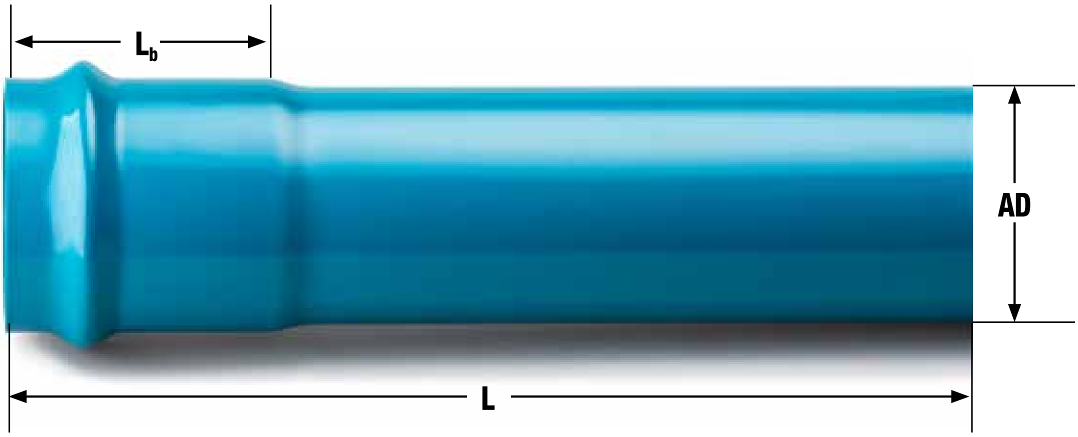
EN ISO 14001

ISO 45001

Dimensional Range

OD	L	PN 8	PN 10	PN 12,5	PN 16	PN 20	PIPES	Lb*
[mm]	[mm]	th. [mm]	th. [mm]	th. [mm]	th. [mm]	th. [mm]	x pallet	[mm]
50	6.000	–	–	2,4	3,0	3,9	194	110
63	6.000	–	2,1	2,9	3,2	4,7	123	110
90	6.000	–	2,6	3,1	4,0	4,9**	96	130
110	6.000	2,7	3,1	3,8	4,9	6,0	57	130
125	6.000	3,1	3,5	4,8	5,5	6,8**	51	150
140	6.000	3,5	3,9	5,4	6,2	7,6	45	160
160	6.000	3,6	4,5	5,6	7,0	8,7	33	165
200	6.000	4,5	5,6	6,9	8,8	11,5	20	180
225	6.000	5,5	6,3	8,6	9,9**	12,2**	18	200
250	6.000	5,6	7,0	9,2	11,0	13,6**	12	210
280	6.000	6,9	7,8	10,7	12,3	15,2**	11	210
315	6.000	7,1	8,8	10,9	13,8	17,1	9	230
355	6.000	8,5**	9,9	12,3**	15,6	–	5	250
400	6.000	9,4	11,2	15,0	17,5	–	5	250
500	6.000	11,9	13,9	19,1	–	–	2	255

*Lenght **On request



Advantages

- Cost Saving (the PVC-A pipe is lighter than the other pipes, for example it weighs 25% less than a Polyethylene pipe of the same PN)
- Quicker installation compared to other types of pipes
- Reduction of water losses and maximum flexibility thanks to the FORSHEDA POWER-LOCK gasket
- Better mechanical characteristics, due to its ductility and limitation of crack propagation
- Hight impact resistance
- Lower pressure drop and lower pumping energy required, thanks to the larger internal diameter of the pipes

PVC-A Pipes, with Forsheda Power-Lock™ gasket

The gasket consists of two elements:

- A flexible rubber element, aimed at obtaining a perfect adhesion between the gasket and the pipe inserted into it.
- A polypropylene reinforcement material, adhered to the rubber element, which keeps the gasket locked in, avoiding any detachment.

In this way the gasket becomes an integral part of the thermoforming process, giving shape to the throat, where the gasket is located, thus minimizing irregularities and tolerances.

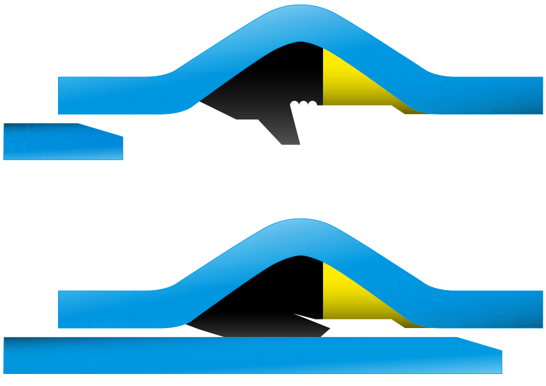
Features

- Excellent hydraulic flow
- Less organic deposit accumulation
- Flexibility of the joint
- Resistance to chemical attack and abrasion
- Simplicity of installation and assembling
- The seal is firmly locked in the socket and does not show any irregularity of adhesion

Advantages for installers, operators, designers

- Time saving during installation and tests
- Guarantee of hydraulic tightness both with positive and negative pressure up to - 0.5 bars
- Greater reliability regarding tightness of seals
- Angular deflection of gaskets up to 3° (high compensation)
- Pipe and gasket form an unique and supportive element
- Gasket cannot be lost anymore
- Considerable reduction of forces during assembling of pipes
- No risk for gaskets assembled in the wrong way and therefore no leaks
- Guarantee of correct functionality of the whole system

Axonometric view of the PVC-A pipe with FORSHEDA POWER-LOCK gasket mechanically heat pre-inserted during the thermoforming process



Adhesion performance of the FORSHEDA POWER-LOCK gasket, mechanically pre-inserted during the thermoforming process of the socket of the PVC-A pipe

Operating Performance

Operating performances vary according to the temperatures, as indicated in the following table, in accordance with DIN 8061-62.

CATEGORY	TEMPERATURE °C	OPERATING PERFORMANCES (BAR)				
		PN 8	PN 10	PN 12,5	PN 16	PN 20
PVC-A	20°	8	10	12,5	16	20
PVC-A	40°	5	6	7	8	10
PVC-A	60°	-	2	2	3	3

The maximum working temperature for Lareter PVC-A pipes is 60°C

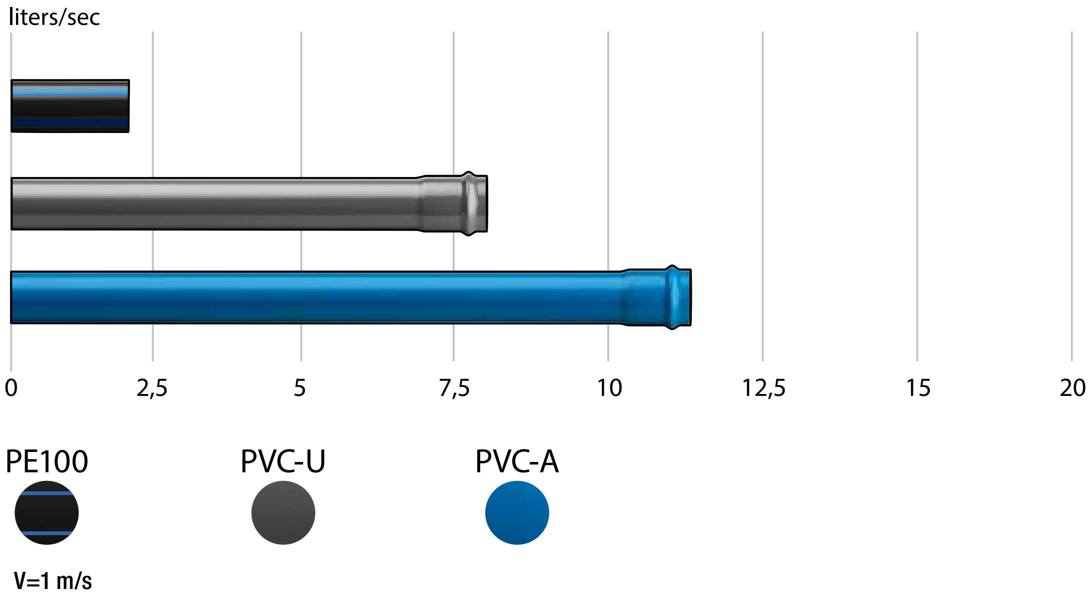
Correlation between nominal pressure and annular stiffness

Lareter **PVC-A** pipes can also be used for the transport of gravity fluids. In this case the reference mechanical quantity is the annular stiffness SN (KN/m²).

PN (bar)	8	10	12,5	16	20
SN (KN/m²)	3	5	10	20	40

Flow

Data are calculated for pipes DN 160 PN 16 (PVC-A, PVC-U, PE 100)



PVC-A Pressure Drop - 8 bar

Hydraulic flow (Q) Liters/sec	V / J	Ø Est. mm	50	63	90	110	125	140	160	200	225	250	280	315	355	400	500
		Ø Int. mm				104,6	118,8	133	152,8	191	214	238,8	266,2	300,8	338	381,2	476,2
0,5	V																
	J																
1,0	V																
	J																
1,5	V					0,18											
	J					0,35											
2,0	V					0,24	0,19										
	J					0,59	0,32										
2,5	V					0,3	0,23	0,19									
	J					0,89	0,48	0,28									
3,0	V					0,35	0,28	0,22									
	J					1,24	0,67	0,39									
3,5	V					0,41	0,32	0,26	0,2								
	J					1,65	0,89	0,52	0,27								
4,0	V					0,47	0,37	0,29	0,22								
	J					2,11	1,14	0,66	0,34								
5,0	V					0,59	0,46	0,37	0,28	0,18							
	J					3,19	1,72	0,99	0,51	0,17							
5,5	V					0,65	0,5	0,4	0,31	0,2							
	J					3,81	2,05	1,19	0,61	0,21							
6,0	V					0,7	0,55	0,44	0,33	0,21	0,17						
	J					4,47	2,41	1,39	0,71	0,24	0,14						
6,5	V					0,76	0,59	0,47	0,36	0,23	0,19						
	J					5,19	2,79	1,61	0,82	0,28	0,16						
7,0	V					0,82	0,64	0,51	0,39	0,25	0,2	0,16					
	J					5,95	3,2	1,85	0,94	0,32	0,19	0,11					
7,5	V					0,88	0,68	0,55	0,41	0,27	0,21	0,17					
	J					6,76	3,64	2,1	1,07	0,36	0,21	0,13					
8,0	V					0,94	0,73	0,58	0,44	0,28	0,23	0,18					
	J					7,61	4,1	2,37	1,21	0,41	0,24	0,14					
9,0	V					1,05	0,82	0,65	0,5	0,32	0,26	0,21	0,17				
	J					9,46	5,09	2,94	1,5	0,51	0,29	0,17	0,11				
10,0	V					1,17	0,91	0,73	0,55	0,35	0,28	0,23	0,18				
	J					11,5	6,19	3,57	1,82	0,62	0,36	0,21	0,13				
12,0	V					1,4	1,09	0,87	0,66	0,42	0,34	0,27	0,22	0,17			
	J					16,11	8,67	5	2,55	0,86	0,5	0,29	0,18	0,1			
14,0	V					1,64	1,27	1,01	0,77	0,49	0,39	0,32	0,26	0,2			
	J					21,42	11,53	6,65	3,39	1,15	0,66	0,39	0,23	0,13			
16,0	V					1,87	1,45	1,16	0,88	0,56	0,45	0,36	0,29	0,23	0,18		
	J					27,43	14,76	8,52	4,34	1,47	0,84	0,5	0,3	0,16	0,1		
18,0	V					2,1	1,63	1,3	0,99	0,63	0,51	0,41	0,33	0,26	0,21		
	J					34,1	18,35	10,59	5,39	1,82	1,05	0,62	0,37	0,2	0,12		
20,0	V					2,33	1,81	1,45	1,1	0,7	0,56	0,45	0,36	0,29	0,23		
	J					41,44	22,3	12,87	6,55	2,21	1,27	0,75	0,44	0,25	0,14		
25,0	V					2,92	2,26	1,81	1,37	0,88	0,7	0,56	0,45	0,36	0,28	0,22	
	J					62,61	33,69	19,44	9,89	3,34	1,92	1,13	0,67	0,37	0,21	0,12	
30,0	V					3,5	2,71	2,17	1,64	1,05	0,84	0,68	0,54	0,43	0,34	0,27	
	J					87,73	47,2	27,24	13,86	4,68	2,69	1,58	0,93	0,52	0,3	0,17	
35,0	V					4,08	3,17	2,53	1,92	1,23	0,98	0,79	0,63	0,5	0,4	0,31	
	J					116,68	62,77	36,22	18,43	6,22	3,58	2,1	1,24	0,69	0,39	0,22	
40,0	V					4,66	3,62	2,89	2,19	1,4	1,12	0,9	0,72	0,57	0,45	0,36	0,23
	J					149,37	80,36	46,37	23,59	7,96	4,58	2,69	1,58	0,88	0,5	0,28	0,1
45,0	V					5,25	4,07	3,25	2,46	1,58	1,26	1,01	0,81	0,64	0,51	0,4	0,26
	J					185,74	99,93	57,66	29,34	9,9	5,69	3,34	1,97	1,09	0,62	0,35	0,12
50,0	V						4,52	3,61	2,73	1,75	1,4	1,12	0,9	0,71	0,56	0,44	0,29
	J						121,43	70,07	35,65	12,03	6,92	4,06	2,39	1,32	0,75	0,42	0,15

V= Speed m/sec – J= Pressure Drop m/Km
Data of Pressure Drop Tables have been calculated using Hazen-Williams Formula

PVC-A Pressure Drop - 10 bar

Hydraulic flow (Q) Liters/sec	V / J	Ø Est. mm	50	63	75	90	110	125	140	160	200	225	250	280	315	355	400	500
		Ø Int. mm		58,8	70,4	84,8	103,8	118	132,2	151	188,8	212,4	236	264,4	297,4	335,2	377,6	472,2
0,5	V			0,19	75													
	J			0,75	0,31													
1,0	V			0,37	0,26	0,18												
	J			2,69	1,12	0,46												
1,5	V			0,56	0,39	0,27	0,18											
	J			5,69	2,37	0,96	0,36											
2,0	V			0,74	0,52	0,36	0,24	0,19										
	J			9,68	4,03	1,63	0,61	0,33										
2,5	V			0,93	0,65	0,45	0,3	0,23	0,19									
	J			14,62	6,09	2,46	0,92	0,5	0,29									
3,0	V			1,11	0,78	0,54	0,36	0,28	0,22									
	J			20,49	8,53	3,45	1,29	0,69	0,4									
3,5	V			1,3	0,91	0,63	0,42	0,33	0,26	0,2								
	J			27,25	11,34	4,58	1,72	0,92	0,53	0,28								
4,0	V			1,48	1,03	0,71	0,48	0,37	0,3	0,23								
	J			34,88	14,52	5,87	2,2	1,18	0,68	0,36								
5,0	V			1,85	1,29	0,89	0,6	0,46	0,37	0,28	0,18							
	J			52,7	21,93	8,86	3,31	1,78	1,02	0,54	0,18							
5,5	V			2,03	1,42	0,98	0,66	0,51	0,41	0,31	0,2							
	J			62,86	26,16	10,57	3,95	2,12	1,22	0,64	0,22							
6,0	V			2,22	1,55	1,07	0,71	0,55	0,44	0,34	0,22	0,17						
	J			73,84	30,73	12,42	4,64	2,49	1,43	0,76	0,26	0,15						
6,5	V			2,4	1,68	1,16	0,77	0,6	0,48	0,37	0,24	0,19						
	J			85,63	35,63	14,4	5,38	2,88	1,66	0,87	0,3	0,17						
7,0	V			2,59	1,81	1,25	0,83	0,65	0,52	0,4	0,26	0,2						
	J			98,21	40,87	16,51	6,17	3,31	1,9	1	0,34	0,19						
7,5	V			2,77	1,93	1,33	0,89	0,69	0,55	0,42	0,27	0,22	0,14					
	J			111,58	46,43	18,76	7,01	3,76	2,16	1,13	0,39	0,22	0,13					
8,0	V			2,95	2,06	1,42	0,95	0,74	0,59	0,45	0,29	0,23	0,19					
	J			125,73	52,32	21,14	7,9	4,23	2,44	1,28	0,43	0,25	0,15					
9,0	V			3,32	2,32	1,6	1,07	0,83	0,66	0,51	0,33	0,26	0,21	0,17				
	J			156,34	65,05	26,29	9,82	5,26	3,03	1,59	0,54	0,31	0,18	0,11				
10,0	V			3,69	2,58	1,78	1,19	0,92	0,73	0,56	0,36	0,29	0,23	0,19				
	J			189,98	79,05	31,94	11,94	6,4	3,68	1,93	0,65	0,37	0,22	0,13				
12,0	V				3,09	2,13	1,42	1,1	0,88	0,68	0,43	0,34	0,28	0,22	0,18			
	J				110,76	44,75	16,72	8,96	5,15	2,7	0,91	0,52	0,31	0,18	0,1			
14,0	V				3,61	2,49	1,66	1,29	1,03	0,79	0,51	0,4	0,33	0,26	0,21			
	J				147,31	59,52	22,24	11,91	6,85	3,59	1,21	0,69	0,41	0,24	0,14			
16,0	V				4,12	2,84	1,9	1,47	1,17	0,9	0,58	0,46	0,37	0,3	0,24	0,19		
	J				188,59	76,2	28,47	15,25	8,77	4,59	1,55	0,88	0,53	0,3	0,17	0,1		
18,0	V				4,63	3,2	2,13	1,65	1,32	1,01	0,65	0,51	0,42	0,33	0,26	0,21		
	J				234,5	94,74	35,4	18,96	10,9	5,71	1,93	1,09	0,65	0,38	0,22	0,12		
20,0	V					3,55	2,37	1,84	1,46	1,12	0,72	0,57	0,46	0,37	0,29	0,23		
	J					115,13	43,02	23,04	13,25	6,94	2,34	1,32	0,79	0,46	0,26	0,15		
25,0	V					4,44	2,96	2,29	1,83	1,4	0,9	0,71	0,58	0,46	0,37	0,29	0,23	
	J					173,97	65	34,81	20,02	10,48	3,53	1,99	1,2	0,69	0,39	0,22	0,13	
30,0	V						3,55	2,75	2,19	1,68	1,08	0,85	0,69	0,55	0,44	0,35	0,27	
	J						91,07	48,78	28,05	14,68	4,95	2,79	1,67	0,96	0,55	0,31	0,17	
35,0	V						4,15	3,21	2,56	1,96	1,26	0,99	0,81	0,64	0,51	0,4	0,32	
	J						121,12	64,87	37,3	19,52	6,58	3,71	2,22	1,28	0,72	0,41	0,23	
40,0	V						4,74	3,67	2,92	2,24	1,44	1,14	0,92	0,73	0,58	0,46	0,36	0,23
	J						155,06	83,05	47,76	24,99	8,42	4,75	2,84	1,64	0,93	0,52	0,29	0,1
45,0	V						5,33	4,12	3,29	2,52	1,61	1,28	1,03	0,83	0,65	0,52	0,41	0,26
	J						192,81	103,27	59,38	31,08	10,47	5,9	3,54	2,04	1,15	0,64	0,36	0,13
50,0	V							4,58	3,65	2,8	1,79	1,42	1,15	0,92	0,73	0,57	0,45	0,29
	J							102,49	72,16	37,77	12,73	7,17	4,3	2,47	1,4	0,78	0,44	0,15

V= Speed m/sec – J= Pressure Drop m/Km
Data of Pressure Drop Tables have been calculated using Hazen-Williams Formula

PVC-A Pressure Drop - 12,5 bar

Hydraulic flow (Q) Liters/sec	V / J	Ø Est. mm	50	63	75	90	110	125	140	160	200	225	250	280	315	355	400	500
		Ø Int. mm	45,2	57,2	69,2	83,8	102,4	115,4	129,2	148,8	186,2	207,8	231,6	258,6	293,2	330,4	370	461,8
0,5	V		0,32	0,2	0,14													
	J		2,69	0,86	0,34													
1,0	V		0,63	0,39	0,27	0,19												
	J		9,67	3,07	1,22	0,48												
1,5	V		0,94	0,59	0,4	0,28	0,19											
	J		20,46	6,5	2,58	1,02	0,39											
2,0	V		1,25	0,78	0,54	0,37	0,25	0,2										
	J		34,83	11,07	4,38	1,73	0,65	0,37										
2,5	V		1,56	0,98	0,67	0,46	0,31	0,24	0,16									
	J		52,63	16,73	6,62	2,61	0,99	0,55	0,32									
3,0	V		1,88	1,17	0,8	0,55	0,37	0,29	0,23									
	J		73,75	23,43	9,27	3,65	1,38	0,77	0,45									
3,5	V		2,19	1,37	0,94	0,64	0,43	0,34	0,27	0,21								
	J		98,08	31,16	12,33	4,86	1,83	1,03	0,59	0,3								
4,0	V		2,5	1,56	1,07	0,73	0,49	0,39	0,31	0,24								
	J		125,57	39,89	15,78	6,22	2,35	1,31	0,76	0,38								
5,0	V		3,12	1,95	1,34	0,91	0,61	0,48	0,39	0,29	0,19							
	J		189,74	60,28	23,85	9,39	3,54	1,98	1,14	0,58	0,2							
5,5	V		3,44	2,15	1,47	1	0,67	0,53	0,42	0,32	0,21							
	J		226,32	71,9	28,44	11,2	4,22	2,36	1,36	0,69	0,23							
6,0	V			2,34	1,6	1,09	0,73	0,58	0,46	0,35	0,23	0,18						
	J			84,46	33,41	13,16	4,96	2,77	1,6	0,81	0,27	0,16						
6,5	V			2,54	1,73	1,18	0,8	0,63	0,5	0,38	0,24	0,2						
	J			97,94	38,74	15,25	5,75	3,22	1,86	0,94	0,32	0,19						
7,0	V			2,73	1,87	1,28	0,86	0,67	0,54	0,41	0,26	0,21						
	J			112,33	44,44	17,5	6,59	3,69	2,13	1,07	0,36	0,21						
7,5	V			2,93	2	1,37	0,92	0,72	0,58	0,44	0,28	0,23	0,18					
	J			127,62	50,48	19,88	7,49	4,19	2,42	1,22	0,41	0,24	0,15					
8,0	V			3,12	2,13	1,46	0,98	0,77	0,62	0,47	0,3	0,24	0,2					
	J			143,81	56,89	22,4	8,44	4,72	2,72	1,37	0,46	0,27	0,16					
9,0	V			3,51	2,4	1,64	1,1	0,87	0,69	0,52	0,34	0,27	0,22	0,18				
	J			178,82	70,73	27,85	10,49	5,87	3,39	1,7	0,58	0,34	0,2	0,12				
10,0	V			3,9	2,67	1,82	1,22	0,96	0,77	0,58	0,37	0,3	0,24	0,2				
	J			217,3	85,96	33,84	12,75	7,13	4,11	2,07	0,7	0,41	0,24	0,14				
12,0	V				3,2	2,18	1,46	1,15	0,92	0,7	0,45	0,36	0,29	0,23	0,18			
	J				120,44	47,41	17,87	9,98	5,76	2,9	0,98	0,57	0,34	0,2	0,11			
14,0	V				3,73	2,55	1,71	1,34	1,07	0,81	0,52	0,42	0,34	0,27	0,21			
	J				160,18	63,06	23,76	13,28	7,66	3,85	1,3	0,76	0,45	0,27	0,15			
16,0	V					2,91	1,95	1,54	1,23	0,93	0,59	0,48	0,39	0,31	0,24			
	J					80,73	30,42	17	9,81	4,93	1,66	0,97	0,58	0,34	0,19			
18,0	V					3,27	2,19	1,73	1,38	1,04	0,67	0,54	0,43	0,35	0,27	0,22		
	J					100,38	37,82	21,13	12,19	6,13	2,06	1,21	0,72	0,42	0,23	0,13		
20,0	V					3,63	2,44	1,92	1,53	1,16	0,74	0,6	0,48	0,39	0,3	0,24		
	J					121,98	45,96	25,68	14,82	7,45	2,5	1,47	0,87	0,51	0,28	0,16		
25,0	V					4,54	3,04	2,4	1,91	1,44	0,92	0,74	0,6	0,48	0,38	0,3	0,24	
	J					184,32	69,44	38,8	22,39	11,26	3,78	2,22	1,31	0,77	0,42	0,24	0,14	
30,0	V						3,65	2,88	2,3	1,73	1,11	0,89	0,72	0,58	0,45	0,36	0,28	
	J						97,3	54,37	31,37	15,77	5,29	3,1	1,83	1,07	0,58	0,33	0,19	
35,0	V						4,26	3,35	2,68	2,02	1,29	1,04	0,84	0,67	0,52	0,41	0,33	
	J						129,4	72,31	41,72	20,97	7,04	4,13	2,44	1,43	0,78	0,44	0,25	
40,0	V						4,87	3,83	3,06	2,31	1,48	1,19	0,96	0,77	0,6	0,47	0,38	0,24
	J						165,66	92,57	53,4	26,85	9,01	5,28	3,12	1,82	0,99	0,56	0,32	0,11
45,0	V						5,47	4,31	3,44	2,6	1,66	1,33	1,07	0,86	0,67	0,53	0,42	0,27
	J						206	115,1	66,4	33,38	11,2	6,57	3,88	2,27	1,23	0,69	0,4	0,14
50,0	V							4,79	3,82	2,88	1,84	1,48	1,19	0,96	0,75	0,59	0,47	0,3
	J							139,87	80,69	40,56	13,62	7,98	4,71	2,75	1,5	0,84	0,49	0,17

V= Speed m/sec – J= Pressure Drop m/Km
Data of Pressure Drop Tables have been calculated using Hazen-Williams Formula

PVC-A Pressure Drop - 16 bar

Hydraulic flow (Q) Liters/sec	V / J	Ø Est. mm	50	63	75	90	110	125	140	160	200	225	250	280	315	355	400	500
		Ø Int. mm	44	56,6	67,6	82	100,2	114	127,6	146	182,4	205,2	228	255,4	287,4	323	361,8	
0,5	V		0,33	0,2	0,14													
	J		3,06	0,9	0,38													
1,0	V		0,66	0,4	0,28	0,1												
	J		11,02	3,24	1,37	0,54												
1,5	V		0,99	0,6	0,42	0,29	0,2											
	J		23,32	6,85	2,89	1,13	0,43											
2,0	V		1,32	0,8	0,56	0,38	0,26	0,2										
	J		39,71	11,65	4,91	1,92	0,73	0,39										
2,5	V		1,65	1	0,7	0,48	0,32	0,25	0,2									
	J		60	17,61	7,42	2,9	1,1	0,59	0,34									
3,0	V		1,98	1,2	0,84	0,57	0,39	0,3	0,24									
	J		84,07	24,67	10,39	4,06	1,53	0,82	0,48									
3,5	V		2,31	1,4	0,98	0,67	0,45	0,35	0,28	0,21								
	J		111,81	32,81	13,82	5,4	2,04	1,09	0,63	0,33								
4,0	V		2,64	1,6	1,12	0,76	0,51	0,4	0,32	0,24								
	J		177,99	42	17,69	6,91	2,61	1,39	0,81	0,42								
5,0	V		3,3	1,99	1,4	0,95	0,64	0,5	0,4	0,3	0,2							
	J		216,3	63,46	26,72	10,44	3,94	2,1	1,22	0,63	0,22							
5,5	V		3,63	2,19	1,54	1,05	0,7	0,54	0,44	0,33	0,22							
	J		258,01	75,69	31,88	12,45	4,69	2,51	1,45	0,75	0,26							
6,0	V		3,95	2,39	1,68	1,14	0,77	0,59	0,47	0,36	0,23	0,19						
	J		303,07	88,91	37,44	14,62	5,51	2,94	1,7	0,89	0,3	0,17						
6,5	V			2,59	1,82	1,24	0,83	0,64	0,51	0,39	0,25	0,2						
	J			103,01	43,42	16,96	6,39	3,41	1,97	1,03	0,35	0,2						
7,0	V			2,79	1,96	1,33	0,89	0,69	0,55	0,42	0,27	0,22						
	J			118,25	**49,8**	19,45	7,33	3,91	2,26	1,18	0,4	0,23						
7,5	V			2,99	2,1	1,43	0,96	0,74	0,59	0,45	0,29	0,23	0,19					
	J			134,35	56,58	22,09	8,33	4,44	2,57	1,34	0,46	0,26	0,16					
8,0	V			3,19	2,24	1,52	1,02	0,79	0,63	0,48	0,31	0,25	0,2					
	J			151,38	63,65	24,89	9,38	5,01	2,89	1,5	0,51	0,29	0,18					
9,0	V			3,59	2,52	1,71	1,15	0,89	0,71	0,54	0,35	0,28	0,23					
	J			188,24	79,27	30,95	11,66	6,22	3,6	1,87	0,64	0,36	0,22					
10,0	V			3,98	2,79	1,9	1,27	0,99	0,79	0,6	0,39	0,31	0,25	0,2				
	J			288,75	96,33	37,61	14,17	7,56	4,37	2,27	0,77	0,44	0,26	0,15				
12,0	V				3,35	2,28	1,53	1,18	0,94	0,72	0,46	0,37	0,3	0,24	0,19			
	J				134,97	52,7	19,86	10,6	6,12	3,18	1,08	0,61	0,37	0,21	0,21			
14,0	V				3,91	2,66	1,78	1,38	1,1	0,84	0,54	0,43	0,35	0,28	0,22			
	J				179,5	70,09	26,41	14,09	8,14	4,23	1,43	0,81	0,49	0,28	0,28			
16,0	V					3,04	2,04	1,57	1,26	0,96	0,62	0,49	0,4	0,32	0,25	0,2		
	J					89,73	33,81	18,04	10,42	5,41	1,83	1,04	0,62	0,36	0,36	0,12		
18,0	V					3,42	2,29	1,77	1,41	1,08	0,69	0,55	0,45	0,36	0,28	0,22		
	J					111,57	42,04	22,43	12,96	6,73	2,28	1,29	0,77	0,45	0,45	0,15		
20,0	V					3,8	2,54	1,97	1,57	1,2	0,77	0,61	0,5	0,4	0,31	0,25		
	J					135,59	51,08	27,25	15,74	8,17	2,77	1,56	0,94	0,54	0,54	0,18		
25,0	V					4,74	3,18	2,46	1,96	1,5	0,96	0,76	0,62	0,49	0,39	0,31	0,25	
	J						77,19	41,18	23,79	12,35	4,18	2,36	1,41	0,82	0,82	0,26	0,15	
30,0	V						3,81	2,95	2,35	1,8	1,15	0,91	0,74	0,59	0,47	0,37	0,3	
	J						108,15	57,7	33,33	17,3	5,85	3,3	1,98	1,14	1,14	0,37	0,21	
35,0	V						4,45	3,44	2,74	2,1	1,35	1,06	0,86	0,69	0,55	0,43	0,35	
	J						143,84	76,74	44,32	23	7,78	4,39	2,63	1,51	1,51	0,49	0,28	
40,0	V						5,08	3,93	3,14	2,4	1,54	1,22	0,99	0,79	0,62	0,49	0,39	
	J						184,15	98,24	56,74	29,45	9,96	5,62	3,36	1,94	1,94	0,62	0,36	
45,0	V						5,72	4,42	3,53	2,7	1,73	1,37	1,11	0,88	0,7	0,55	0,44	
	J						228,98	122,15	70,56	36,62	12,39	6,98	4,18	2,41	2,41	0,77	0,45	
50,0	V							4,91	3,92	2,99	1,92	1,52	1,23	0,98	0,78	0,62	0,49	
	J							148,44	85,74	44,5	15,05	8,48	5,08	2,93	2,93	0,94	0,54	

V= Speed m/sec – J= Pressure Drop m/Km
Data of Pressure Drop Tables have been calculated using Hazen-Williams Formula

PVC-A Pressure Drop - 20 bar

Hydraulic flow (Q) Liters/sec	V / J	Ø Est. mm	50	63	75	90	110	125	140	160	200	225	250	280	315	355	400	500
		Ø Int. mm	42,2	53,6	63,8	80,2	98	111,4	124,8	142,6	177	200,6	222,8	249,6	280,8			
0,5	V		0,36	0,23	0,16													
	J		3,75	1,17	0,51													
1,0	V		0,72	0,45	0,32	0,2												
	J		13,5	4,22	1,81	0,6												
1,5	V		1,08	0,67	0,47	0,3	0,2											
	J		28,59	8,92	3,82	1,26	0,48											
2,0	V		1,44	0,89	0,63	0,4	0,27	0,21										
	J		48,67	15,19	6,51	2,14	0,81	0,44										
2,5	V		1,79	1,11	0,79	0,5	0,34	0,26	0,21									
	J		73,54	22,95	9,83	3,23	1,22	0,66	0,33									
3,0	V		2,15	1,34	0,94	0,6	0,4	0,31	0,25									
	J		103,4	32,16	13,77	4,52	1,71	0,92	0,46									
3,5	V		2,51	1,56	1,1	0,7	0,47	0,36	0,29	0,22								
	J		137,04	42,77	18,31	6,01	2,27	1,22	0,61	0,37								
4,0	V		2,87	1,78	1,26	0,8	0,54	0,42	0,33	0,26								
	J		175,44	54,75	23,44	7,7	2,9	1,56	0,78	0,47								
5,0	V		3,58	2,22	1,57	1	0,67	0,52	0,41	0,32	0,21							
	J		265,09	82,73	35,42	11,63	4,38	2,35	1,18	0,71	0,25							
5,5	V		3,94	2,44	1,73	1,09	0,73	0,57	0,46	0,35	0,23	0,18						
	J		316,21	98,68	42,25	13,87	5,23	2,8	1,41	0,85	0,3	0,16						
6,0	V			2,67	1,88	1,19	0,8	0,62	0,5	0,38	0,25	0,2						
	J			115,91	49,63	16,29	6,14	3,29	1,65	0,99	0,35	0,19						
6,5	V			2,89	2,04	1,29	0,87	0,67	0,54	0,41	0,27	0,21						
	J			134,41	57,55	18,89	7,12	3,82	1,91	1,15	0,4	0,22						
7,0	V			3,11	2,2	1,39	0,93	0,72	0,58	0,44	0,29	0,23						
	J			154,16	66	21,67	8,17	4,38	2,19	1,32	0,46	0,25						
7,5	V			3,33	2,35	1,49	1	0,78	0,62	0,48	0,31	0,24	0,2					
	J			175,15	74,99	24,61	9,28	4,97	2,49	1,5	0,53	0,29	0,17					
8,0	V			3,55	2,51	1,59	1,07	0,83	0,66	0,51	0,33	0,26	0,21					
	J			197,36	84,5	27,74	10,45	5,6	2,81	1,69	0,59	0,32	0,2					
9,0	V			4	2,82	1,79	1,2	0,93	0,74	0,57	0,35	0,29	0,24					
	J			245,41	105,07	34,49	13	6,96	3,49	2,1	0,73	0,4	0,24					
10,0	V			4,44	3,14	1,99	1,33	1,03	0,82	0,63	0,41	0,32	0,26	0,21				
	J			298,22	127,68	41,91	15,79	8,46	4,24	2,55	0,89	0,49	0,29	0,17				
12,0	V				4,39	2,38	1,6	1,24	0,99	0,76	0,49	0,39	0,31	0,25	0,2			
	J				178,89	58,72	22,12	11,86	5,94	3,57	1,25	0,68	0,41	0,24	0,14			
14,0	V				4,39	2,78	1,86	1,44	1,15	0,88	0,57	0,45	0,36	0,29	0,23			
	J				237,92	78,09	29,42	15,77	7,9	4,74	1,66	0,9	0,54	0,31	0,18			
16,0	V				5,01	3,18	2,13	1,65	1,31	1,01	0,66	0,51	0,42	0,33	0,26			
	J				304,59	99,97	37,67	20,18	10,11	6,07	2,12	1,16	0,69	0,4	0,23			
18,0	V					3,57	2,39	1,85	1,48	1,13	0,74	0,58	0,47	0,37	0,3			
	J					124,31	46,84	25,09	12,57	7,54	2,64	1,44	0,86	0,5	0,28			
20,0	V					0,397	2,66	2,06	1,64	1,26	0,82	0,64	0,52	0,41	0,33			
	J					151,06	56,92	30,49	15,27	9,17	3,2	1,74	1,05	0,6	0,34			
25,0	V					4,96	3,32	2,57	2,05	1,57	1,02	0,8	0,65	0,52	0,41			
	J					228,26	86	46,08	23,07	13,85	4,84	2,63	1,58	0,91	0,52			
30,0	V						3,99	3,09	2,46	1,89	1,23	0,96	0,78	0,62	0,49			
	J						120,5	64,56	32,33	19,4	6,78	3,69	2,21	1,27	0,72			
35,0	V						4,65	3,6	2,87	2,2	1,43	1,11	0,9	0,72	0,57			
	J						160,26	85,86	43	25,8	9,01	4,9	2,94	1,69	0,96			
40,0	V						5,31	4,11	3,28	2,51	1,63	1,27	1,03	0,82	0,65			
	J						205,17	109,92	55,04	33,03	11,53	6,27	3,76	2,17	1,22			
45,0	V						5,98	4,63	3,69	2,83	1,84	1,43	1,16	0,93	0,73			
	J						255,12	136,68	68,44	41,07	14,34	7,8	4,68	2,69	1,52			
50,0	V							5,14	4,1	3,14	2,04	1,59	1,29	1,03	0,81			
	J							166,09	83,17	49,9	17,42	9,47	5,68	3,27	1,85			

V= Speed m/sec – J= Pressure Drop m/Km
Data of Pressure Drop Tables have been calculated using Hazen-Williams Formula

Lareter Power Bends

An innovative system for conveying drinking water and food liquids, which provides a thermoformed joint while heating the pipe and inserting the gasket in the extrusion phase, locked in and a whole with the socket.

Description:
PVC bends produced from PVC pipes certified by KIWA with KQ KIWA QUALITY brand KIP-105133, which fully incorporates and mutates BS PAS 27, with heat pre-inserted gasket FORSHEDA 601 POWER-LOCK™

Color:
RAL 5015 blue

Sectors Of Use:
irrigation and waterworks

Dimensional Range:
Ø 63-400 mm

PN:
6, 10, 16

Degrees:
11°, 22°, 30°, 45°, 90°

Bends Produced From Certified Pipes According To Uni En 1452 From:
- KQ KIWA QUALITY KIP-105133 - BS PAS 27
- Certified drinkability with Ministerial Decree no. 174/2004
- UNI EN 1622 Water Quality - (threshold odour and flavour number)

Self-locking fittings

Self-locking fittings, suitable for **PVC-A** pipes. Once mounted, the pipe cannot be removed. Concrete anchor blocks are not required for standard and no-dig drinking water applications.

Material
Fitting: **PVC-U**
Gasket: **SBR**
RVS 304 - EPDM

D	PN12,5	Ext. D	L	Max. Press.
63	+	84	250	PN 16
90	+	115	280	PN 16
110	+	140	280	PN 16
160	+	200	335	PN 16
200	+	250	372	PN 16

Instructions for installation

The abutment done manually up to half the diameter of the pipe and compacted by walking simply with feet (**Fig. 1**)

The filling up to the upper part of the pipe, carried out manually and again compacted with the feet (**Fig. 2**)

A layer of 150 mm compacted by a machine, can be added, provided that it is not done directly on the upper part of the pipe (**Fig.3**)

The abutment and the filling up to 150 mm on the upper part of the pipe can be done in one solution, if using material such as sand or loose and sieved ground (**Fig. 4**)

The remaining backfill can be completed and compacted in layers of not more than 250 mm, if it is not compacted directly on the pipe. This can be done up to 300 mm of height from the upper part of the pipe (**Fig. 5**)

The remaining backfill can be completed and compacted according to the requirements of surface finish (**Fig. 6**)

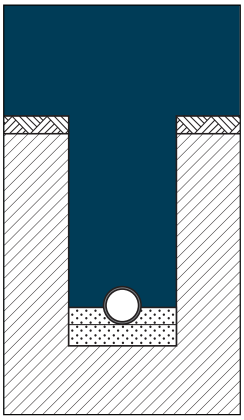


Fig. 1

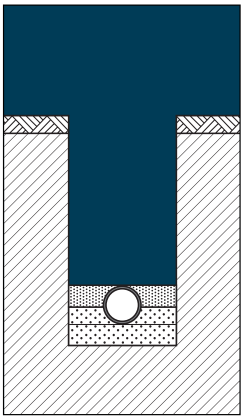


Fig. 2

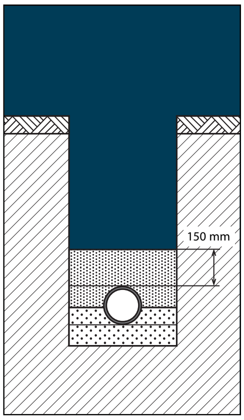


Fig. 3

Fig. 1 - Layer of filling material compacted by hand, up to half of the pipe

Fig. 2 - Layer of filling material, manually compacted, up to the upper part of the pipe

Fig. 3 - Layer of filling material up to 150 mm compacted by a machine

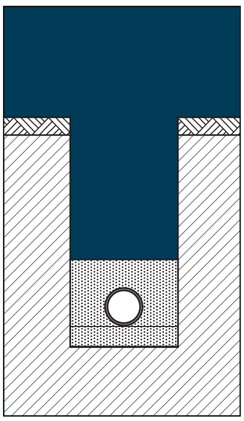


Fig. 4

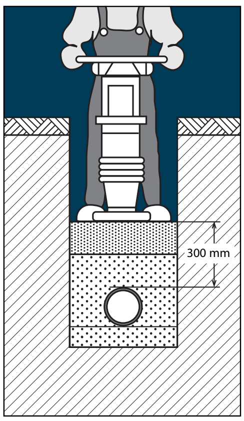


Fig. 5

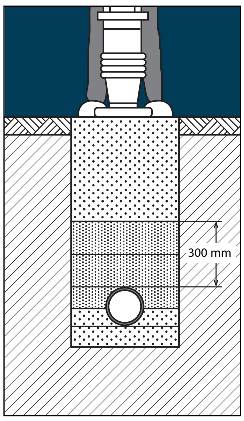


Fig. 6

Fig. 4 - Refilling or backfilling up to 150 mm above the upper part of the pipe in a single solution if using sand or loose and screened earth as material

Fig. 5 - Refilling with material in layers maximum thickness not exceeding 250 mm

Fig. 6 - Total filling with material in layers, depending on the surface finish requirements

Technical specifications

Supply of Polymeric Alloy Pipes **(PVC-A),** free from plasticizing charges, intended for the conveyance of drinking water, suitable for the construction of underground water systems, irrigation systems and pressurized sewage systems produced in compliance with the technical specification **KQ KIWA QUALITY KIP - 105133**, which incorporates and integrates **BS PAS 27: 1999**, to the Ministerial Healthcare Circular No. 102 of 02/12/1978 - **DM n ° 174 of 06/04/2004** *"Regulation concerning materials and objects that can be used in fixed systems for the collection, treatment, adduction and distribution of water intended for human consumption"* and the standard **UNI EN 1622 Water quality - (threshold odour and flavour number)**, having the following characteristics:

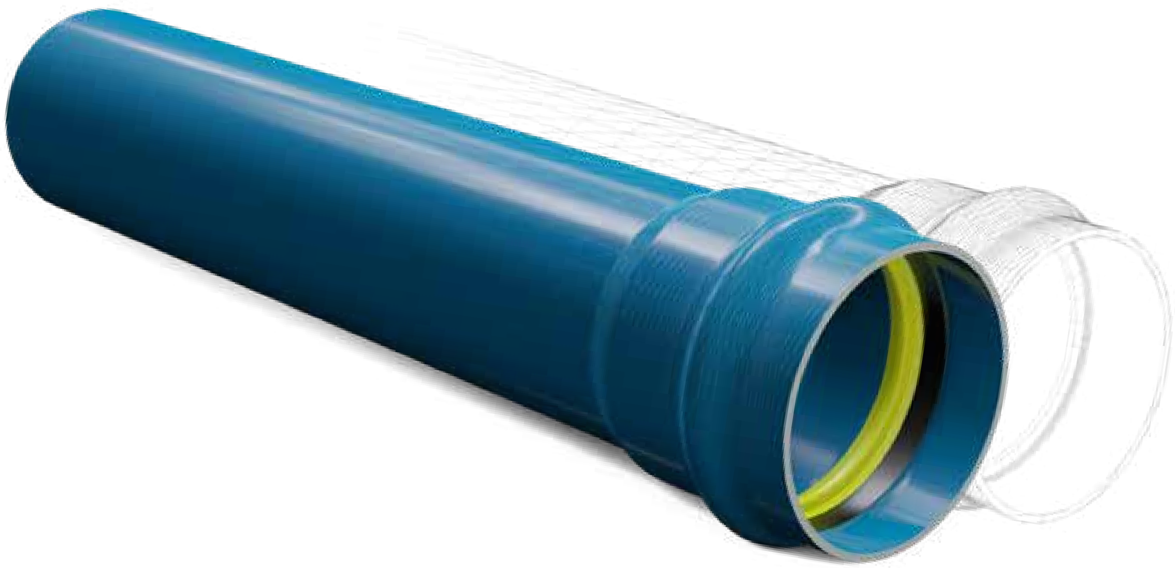
Nominal diameter (Ø):

Pressure class (PN):

The **Polymeric Alloy Pipes PVC-A** must be supplied with a **POWER-LOCK socket joint system** with integrated gasket mechanically hot pre-inserted during the socket formation phase in order to make it a unique piece. The gasket, without metal inserts inside, will consist of an EPDM elastomer element according to **UNI EN 681-1** co-molded with a yellow reinforced polypropylene stiffening ring, designed to guarantee perfect immovability. The pipes, in elements of **6 meters including the socket**, will be supplied with protective caps in Polypropylene (PP) at the ends, will be **blue RAL 5015** and must bear the following information: Name or Brand of the manufacturer, nominal size, nominal pressure, KQ standard, date, time and production line.

The pipes must also be produced by companies in possession of a management system certification for quality, environment and safety in compliance with the **UNI EN ISO 9001, UNI EN ISO 14001 and ISO 45001: 2018 standards** respectively, certified by an organization accredited according to ***UNI CEI EN ISO / IEC 17021.***

DN ____ PN ____ SN ____ €/m ____



KQ KIWA QUALITY KIP-105133

LARETER
PRODUCTION OF PVC PIPES AND FITTINGS

CERTIFIED COMPANY:

EN ISO 9001

EN ISO 14001

ISO 45001

LARETER Spa

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