

RIIFO



Large-size System

Technical Manual

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Revised on September 21, 2023

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ABOUT RIIFO

RIIFO is a leading multinational corporation, providing one-stop piping solutions applied in residential, commercial, agricultural, industrial, and infrastructural sectors. With continuous innovation since 1996, over 8000 employees, 70 branches and subsidiaries, and 300,000 distributors, we serve customers in more than 100 countries and regions.

With an integrated value chain from R&D to manufacturing, and retail distribution, we continually strive to offer ideal piping products and solutions to the market.

8,000

Employees

300,000

Distributors worldwide

100+

Serving over 100
countries & regions

70

Branches & Subsidiaries

SYSTEM OVERVIEW

RIIFO's large diameter piping systems consist of pipes and fittings. These products are developed and manufactured in-house and are therefore perfectly matched to each other.

Quality and environmental protection are key objectives in the development and production process. Our large diameter products and systems have been certified for quality worldwide and we are proud to hold several certificates with the standards of ISO 9001:2015, ISO 14001:2015 and ISO 45001:2018.

All RIIFO systems are fully reliable and suitable for all sorts of applications including potable water distribution and radiant heating etc. RIIFO large diameter press-fit systems extend our original dimension which allows an one-stop solution to your project.

Advantages

- Entirely corrosion-resistant
- A barrier to the permeation of oxygen and light
- High flexibility in bending and inherent stability
- Excellent hydrostatic stress performance
- Light in weight
- Smooth inner wall ensuring less pressure loss
- A life expectancy of up to 50 years

Applications

RIIFO Multilayer plumbing system can be used in following applications:

Hot and cold-water distribution.

Certificates

RIIFO multilayer plumbing piping system

ACS - refers to XP P41-250
AENOR - refers to EN ISO 21003
DVGW - refers to DVGW W 534 (P), DVGW W 542, DVGW W 270, UBA KTW, UBA ELASTOM
KIWA - refers to BRL-K536 E
NF - refers to ISO EN ISO 21003
NSF - refers to ASTM F1281 and NSF /ANSI /CAN 61
QB - refers to EN ISO 21003
STF - refers to EN ISO 21003
WaterMark - refers to AS 4176.2 & 3
WRAS - refers to Regulators' Specification

RIFENG Enterprise Group Co., Ltd.

ISO 9001:2015 – Quality management system by TÜV
ISO 14001:2015 – Environmental management system
ISO 45001:2018 – Occupational Health and Safety Management System.

Standards

- EN ISO 21003 - Multilayer Piping Systems for Hot and Cold Water Installations Inside Buildings
- ASTM F1281 - Standard Specification for Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe.
- BRL-K536 E - Plastics Piping Systems of PE-X/Al Intended for the Transport of Cold and Heated Drinking Water
- DVGW W 534 (P) - Pipe Connectors and Pipe Joints in Drinking Water Installation
- DVGW W 542 - Compound Pipes in the Drinking Water Installation; Requirements and Testing
- DVGW W 270 - A Method for the Assessment of Enhancement of Microbial Growth on Non-Metallic Materials in Contact with Drinking Water
- UBA KTW - About Hygienic Property of Material Odor Test
- UBA ELASTOM - Guideline for Hygienic Assessment of Elastomers in Contact With Drinking Water
- AS 4176.2 & 3 - Multilayer Piping for Pressure Applications - Multilayer Piping Systems for Hot and Cold Water Plumbing Applications- Pipes & Fittings
- XP P41-250 - Effect of Materials on the Quality of Water Intended for Human Consumption - Organic Materials
- NSF /ANSI /CAN 61 - Health Effects of Drinking Water System Components



Australia



Australia



USA



USA



Germany



England



France



France



France



Netherlands

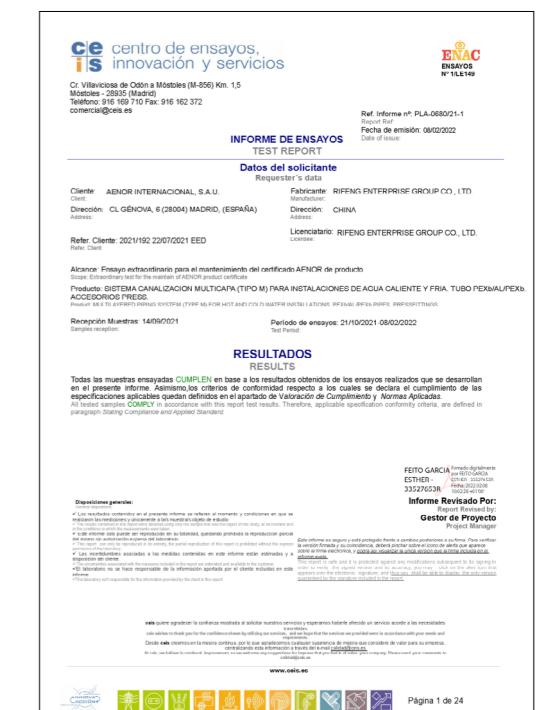


Finland



Spain

Certificates



What is EPD?

Environmental Product Declaration (EPD) is an independently verified and registered document that communicates transparent and comparable information about the life-cycle environmental impact of products. As a voluntary declaration of the life-cycle environmental impact, having an EPD for a product does not imply that the declared product is environmentally superior to alternatives.

The relevant standard for Environmental Product Declarations is ISO 14025, where they are referred to as "type III environmental declarations". A type III environmental declaration is created and registered in the framework of a programme, such as the International EPD® System.

An EPD may be used for many different applications, including green public procurement (GPP) and building assessment schemes. The concept of type III environmental declarations was developed to primarily be used in business-to-business communication, but their use in business-to-consumer communication is not precluded by the standards.



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Production Line

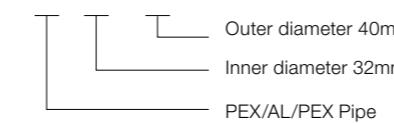
SIZE	40	50	63	75
PIPE				
FITTING				
TOOL				

MULTILAYER LARGE-SIZE PLUMBING PIPES



RIIFO Way Of Naming

Example: B1 - 32 - 40



PE-X internal and external layers

Made of cross-linked polyethylene. The silane cross-linking provides superior chemical and mechanical properties.



Bonding layers

Made of a powerful adhesive that bonds the intermediate aluminum layer with the internal and external layers.

Aluminium intermediate layer

An aluminium alloy longitudinally welded that guarantees a 100% oxygen barrier and provides strength and dimensional stability.

Nominal size(D x e)	40x4.0	50x4.5	63x6.0	75x7.5	
Outside diameter (mm)	40	50	63	75	
Tolerance of Outer diameter (mm)	Min Max	40.00 40.40	50.00 50.50	60.60 63.00	70.70 75.00
Inside diameter(mm)		32	41	51	60
Tolerance of Inner diameter (mm)	Min Max	30.90 31.90	39.40 40.80	49.30 50.80	57.70 59.70
Pipe thickness (mm)		4	4.5	6	7.5
Tolerance of pipe thickness (mm)	Min Max	4.00 4.60	4.50 5.20	6.00 6.80	7.50 8.50

Overlapped welded PEX-AL-PEX pipe (B1 series)

Application: Hot and cold potable water system, Undrefloor heating system

Working Temperature: -40°C ~ +95°C

Max. Working Pressure: 10bar

Lifespan: 50years

Standard: ISO 21003

Physical Appearance: White



Applications and classification of service conditions

The performance requirements for multilayer piping systems conforming to ISO 21003 are specified for four different application classes.

The selection of the applicable class conforming to the table shall be agreed upon by the parties concerned for any application. Each application class shall be combined with a design pressure, p_D , of 4 bar, 6 bar, 8 bar or 10 bar, as applicable (1 bar = 0.1 MPa).

Application class / Design Pressure(bar) for RIIFO products: 1/10 ; 2/10 ; 4/10 ; 5/6

Application class	Design temperature TD	Time at TD	Tmax	Time at Tmax	Tmal	Time at Tmal	Typical field of application
1a	60	49	80	1	95	100	Hot water supply(60°C)
2a	70	49	80	1	95	100	Hot water supply(70°C)
4 ^b	20 plus cumulative 40 plus cumulative 60	2,5 20 25	70	2,5	100	100	Underfloor heating and low-temperature radiators
5 ^b	20 plus cumulative 60 plus cumulative 80	14 25 10	90	1	100	100	High-temperature radiators

a. A country may select either class 1 or class 2 in conformity with its national regulations.

b. Where more than one design temperature for time and associated temperature appears for any class, they should be aggregated. "Plus cumulative" in the table implies a temperature profile of the mentioned temperature over time (e.g. the design temperature profile for 50 years for class 5 is 20 °C for 14 years followed by 60 °C for 25 years, 80 °C for 10 years, 90 °C for 1 year and 100 °C for 100 h)

NOTE - For values of TD, Tmax and Tmal in excess of those in the table, this International Standard does not apply.

CONNECTION

Multiprofile press fittings - F18

Composition

1 Plastic collar

Material: PE

2 Sleeve

Material: stainless steel 304

3 Body

Material: RFH59-2

4 O-rings

Material: EPDM

Advantages



TH - U pressing profiles



The fitting is LBP and can still be adjusted after pressing

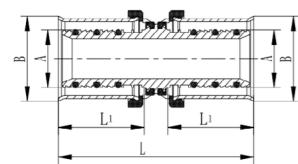


Leak before press (LBP)



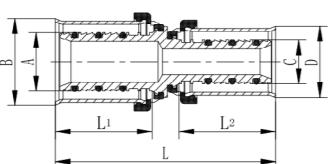
Three/Four O-rings for excellent sealing performance

Couplers



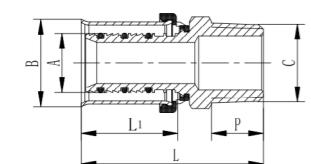
SAP Code	Specification	A	B	L1	L
1100058407	40mm	31.75	43.5	43.2	96
1100058408	50mm	40.75	53.5	43.5	96.7
1100058409	63mm	50.7	67.4	66.2	143.4
1100058410	75mm	59.6	79.6	66.8	143.9

Reducing Couplers



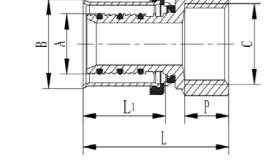
SAP Code	Specification	A	B	L1	C	D	L2	L
1100058487	40x20mm	31.75	43.5	43.2	15.75	24.2	26.1	78.2
1100058478	40x25mm	31.75	43.5	43.2	19.75	29.4	33.3	85.5
1100058399	40x32mm	31.75	43.5	43.2	25.75	36.4	33.3	85.5
1100058479	50x25mm	40.75	53.5	43.5	19.75	29.4	33.3	86.2
1100058400	50x32mm	40.75	53.5	43.5	25.75	36.4	33.3	86.2
1100058401	50x40mm	40.75	53.5	43.5	31.75	43.5	43.2	97.7
1100058480	63x32mm	50.7	67.4	66.2	25.75	36.4	33.3	109.2
1100058402	63x40mm	50.7	67.4	66.2	31.75	43.5	43.2	119.7
1100058403	63x50mm	50.7	67.4	66.2	40.75	53.5	43.5	120.4
1100058488	75x40mm	59.6	79.6	66.8	31.75	43.5	43.2	119.7
1100058404	75x50mm	59.6	79.6	66.8	40.75	53.5	43.5	120.4
1100058405	75x63mm	59.6	79.6	66.8	50.7	67.4	66.2	143.2

Male Couplers



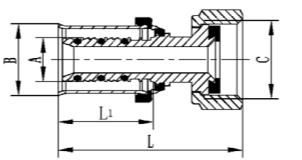
SAP Code	Specification	A	B	C	L1	L	P
1100058495	40mmx1 1/2"	31.75	43.5	R1 1/4	43.2	81	19.5
1100058406	40mmx1 1/4"	31.75	43.5	R1 1/2	43.2	81	19.5
1100058496	40mmx1"	31.75	43.5	R1	43.2	77.5	16
1100058411	50mmx1 1/2"	40.75	53.5	R1 1/2	43.5	81.7	19.5
1100058497	50mmx2"	40.75	53.5	R2	43.5	86.7	24
1100058498	63mmx1 1/2"	50.7	67.4	R1 1/2	66.2	105.2	19.5
1100058412	63mmx2"	50.7	67.4	R2	66.2	109.7	24
1100058413	75mmx2 1/2"	59.6	79.6	R2	66.8	113.7	19.5

Female Couplers



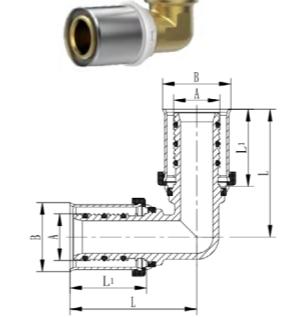
SAP Code	Specification	A	B	C	L1	L	P
1100058499	40mmx1 1/2"	31.75	43.5	G1 1/2	43.2	70.5	19.5
1100058414	40mmx1 1/4"	31.75	43.5	G1 1/4	43.2	72	19.5
1100058415	50mmx1 1/2"	40.75	53.5	G1 1/2	43.5	72.2	19.5
1100058416	63mmx2"	50.7	67.4	G2	66.2	99.7	23.5
1100058417	75mmx2 1/2"	59.6	79.6	G2 1/2	66.8	105.7	27

Female Couplers (Swivel)



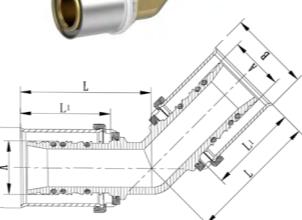
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1100058473	40mmx1 1/2"	31.75	43.5	43.2	G1 1/2	84.2
1100058474	40mmx1 1/4"	31.75	43.5	43.2	G1 1/4	80.2
1100058475	50mmx1 1/2"	40.75	53.5	43.5	G1 1/2	86.5
1100058507	50mmx2"	40.75	53.5	43.5	G2	90.2
1100058476	63mmx2"	50.7	67.4	66.2	G2	112.2
1100058477	75mmx2 1/2"	59.6	79.6	66.8	G2 1/2	113.7

90° Elbows



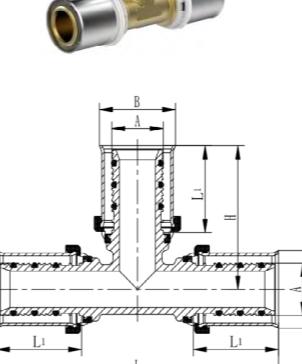
SAP Code	Specification	A	B	L1	L
1100058439	40mm	31.75	43.5	43.2	72
1100058419	50mm	40.75	53.5	43.5	78.3
1100058421	63mm	50.7	67.4	66.2	107.7
1100058423	75mm	59.6	79.6	66.8	110.7

45° Elbows



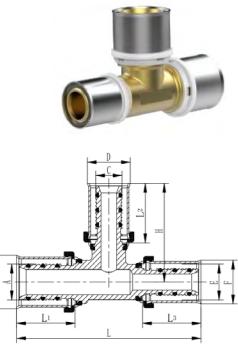
SAP Code	Specification	A	B	L1	L
1100058418	40mm (45°)	31.75	43.5	43.2	67
1100058420	50mm (45°)	40.75	53.5	43.5	70.7
1100058422	63mm (45°)	50.7	67.4	66.2	96.7
1100058424	75mm (45°)	59.6	79.6	66.8	96.7

Tees



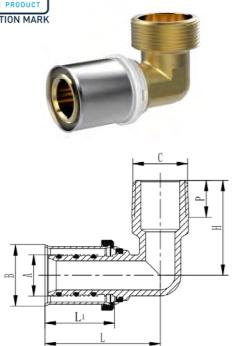
SAP Code	Specification	A	B	L1	L	H
1100058434	40mm	31.75	43.5	43.2	144	72
1100058435	50mm	42.8	53.5	43.5	156.4	78.2
1100058436	63mm	50.7	67.4	66.2	215.4	107.7
1100058437	75mm	59.6	79.6	66.8	221.4	110.7

Reducing Tees



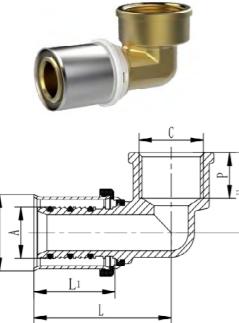
SAP Code	Specification	A	B	L1	C	D	L2	E	F	L3	H	L
1100058489	40x16x40mm	31.75	43.5	43.2	11.75	20.2	26.1	31.75	43.5	43.2	52.2	120
1100058438	40x20x40mm	31.75	43.5	43.2	15.75	24.2	26.1	31.75	43.5	43.2	52.2	124
1100058481	40x25x32mm	31.75	43.5	43.2	19.75	30.4	33.3	25.75	36.4	33.3	61.5	116.5
1100058490	40x25x40mm	31.75	43.5	43.2	19.75	30.4	33.3	31.75	43.5	43.2	61.5	127
1100058440	40x32x32mm	31.75	43.5	43.2	25.75	36.4	33.3	25.75	36.4	33.3	61.5	123.5
1100058441	40x32x40mm	31.75	43.5	43.2	25.75	36.4	33.3	31.75	43.5	43.2	61.5	134
1100058491	40x50x40mm	31.75	43.5	43.2	43.8	53.5	43.5	31.75	43.5	43.2	70.2	155
1100058492	50x20x50mm	40.75	53.5	43.5	15.75	24.2	26.1	43.8	53.5	43.5	58.2	129.4
1100058482	50x25x40mm	40.75	53.5	43.5	19.75	29.4	33.3	31.75	43.5	43.2	65.5	128.7
1100058493	50x25x50mm	40.75	53.5	43.5	19.75	30.4	33.3	43.8	53.5	43.5	65.5	129.4
1100058442	50x32x50mm	40.75	53.5	43.5	25.75	36.4	36.4	43.8	53.5	43.5	65.5	138.4
1100058443	50x40x50mm	40.75	53.5	43.5	31.75	43.5	43.5	43.8	53.5	43.5	77.5	145.4
1100058484	63x25x63mm	50.7	67.4	66.2	19.75	29.4	33.3	50.7	67.4	66.2	73.5	178.4
1100058444	63x32x63mm	50.7	67.4	66.2	25.75	36.4	33.3	50.7	67.4	66.2	73.5	181.4
1100058445	63x40x63mm	50.7	67.4	66.2	31.75	43.5	43.2	50.7	67.4	66.2	84	191.4
1100058446	63x50x63mm	50.7	67.4	66.2	43.8	53.5	43.5	50.7	67.4	66.2	84.7	201.4
1100058485	75x32x75mm	59.6	79.6	66.8	25.75	36.4	33.3	59.6	79.6	66.8	88	194.4
1100058447	75x40x75mm	59.6	79.6	66.8	31.75	43.5	43.2	59.6	79.6	66.8	88.7	199.4
1100058448	75x50x75mm	59.6	79.6	66.8	43.8	53.5	43.5	59.6	79.6	66.8	88.7	211.4
1100058494	75x63x75mm	59.6	79.6	66.8	50.7	67.4	66.2	59.6	79.6	66.8	110.7	211.4

Male Elbows



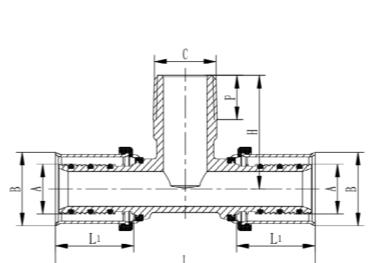
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1100058425	40mmx1 1/4"	31.75	43.5	R1 1/4	43.2	73	19.5	44.5
1100058486	40mmx1 1/2"	31.75	43.5	R1 1/2	43.2	77	19.5	44.5
1100058426	50mmx1 1/2"	40.75	53.5	R1 1/2	43.5	78.2	19.5	50
1100058427	63mmx2"	50.7	67.4	R2	66.2	107.2	24	60
1100058428	75mmx2 1/2"	59.6	79.6	R2 1/2	66.8	120.7	27	72

Female Elbows



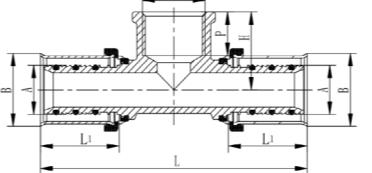
SAP Code	Specification	A	B	C	L1	L	P	H
1100058429	40mmx1 1/4"	31.75	43.5	G1 1/4	43.2	74.5	19.5	38
1100058430	40mmx1 1/2"	31.75	43.5	G1 1/2	43.2	77	19.5	38
1100058431	50mmx1 1/2"	40.75	53.5	G1 1/2	43.5	79.2	19.5	42
1100058432	63mmx2"	50.7	67.4	G2	66.2	107.7	24	48.5
1100058433	75mmx2 1/2"	59.6	79.6	G2 1/2	66.8	119.2	27	60

Male Tees



SAP Code	Specification	A	B	L1	L	L2	C	H
1100058460	40x1/2"x40mm	31.75	43.5	43.2	127	14	R1/2	41
1100058462	40x1"x40mm	31.75	43.5	43.2	137	16	R1	43.5
1100058461	40x3/4"x40mm	31.75	43.5	43.2	132	15	R3/4	41
1100058463	40x1 1/4"x40mm	31.75	43.5	43.2	146	19.5	R1 1/4	45.5
1100058467	50x1 1/2"x50mm	40.75	53.5	43.5	155.4	19.5	R1 1/2	50
1100058464	50x1/2"x50mm	40.75	53.5	43.5	128.4	14	R1/2	46
1100058465	50x3/4"x50mm	40.75	53.5	43.5	131.4	15	R3/4	47
1100058466	50x1"x50mm	40.75	53.5	43.5	138.4	16	R1	48
1100058468	63x1/2"x63mm	50.7	67.4	66.2	174.4	14	R1/2	52.5
1100058470	63x1"x63mm	50.7	67.4	66.2	184.4	15	R1	54
1100058471	63x2"x63mm	50.7	67.4	66.2	215.4	24	R2	61
1100058469	63x3/4"x63mm	50.7	67.4	66.2	177.4	15	R3/4	53.5

Female Tees



SAP Code	Specification	A	B	L1	L	P	C	H
1100058449	40x1/2"x40mm	31.75	43.5	43.2	126	14	G1/2	31
1100058472	40x3/4"x40mm	31.75	43.5	43.2	131	15	G3/4	31
1100058450	40x1"x40mm	31.75	43.5	43.2	138	16	G1	36
1100058451	40x1 1/4"x40mm	31.75	43.5	43.2	138	19.5	G1 1/4	48
1100058452	50x1/2"x50mm	40.75	53.5	43.5	128.4	14	G1/2	36
1100058453	50x3/4"x50							



SAP Code	Specification
1100018264	QQQ-75

Reamer (used with electrical drill or handle)



SAP Code	Specification
1100018264	40mm
1100018265	50mm
1100018266	63mm
1100018267	75mm

Handle for Reamers



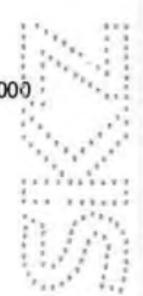
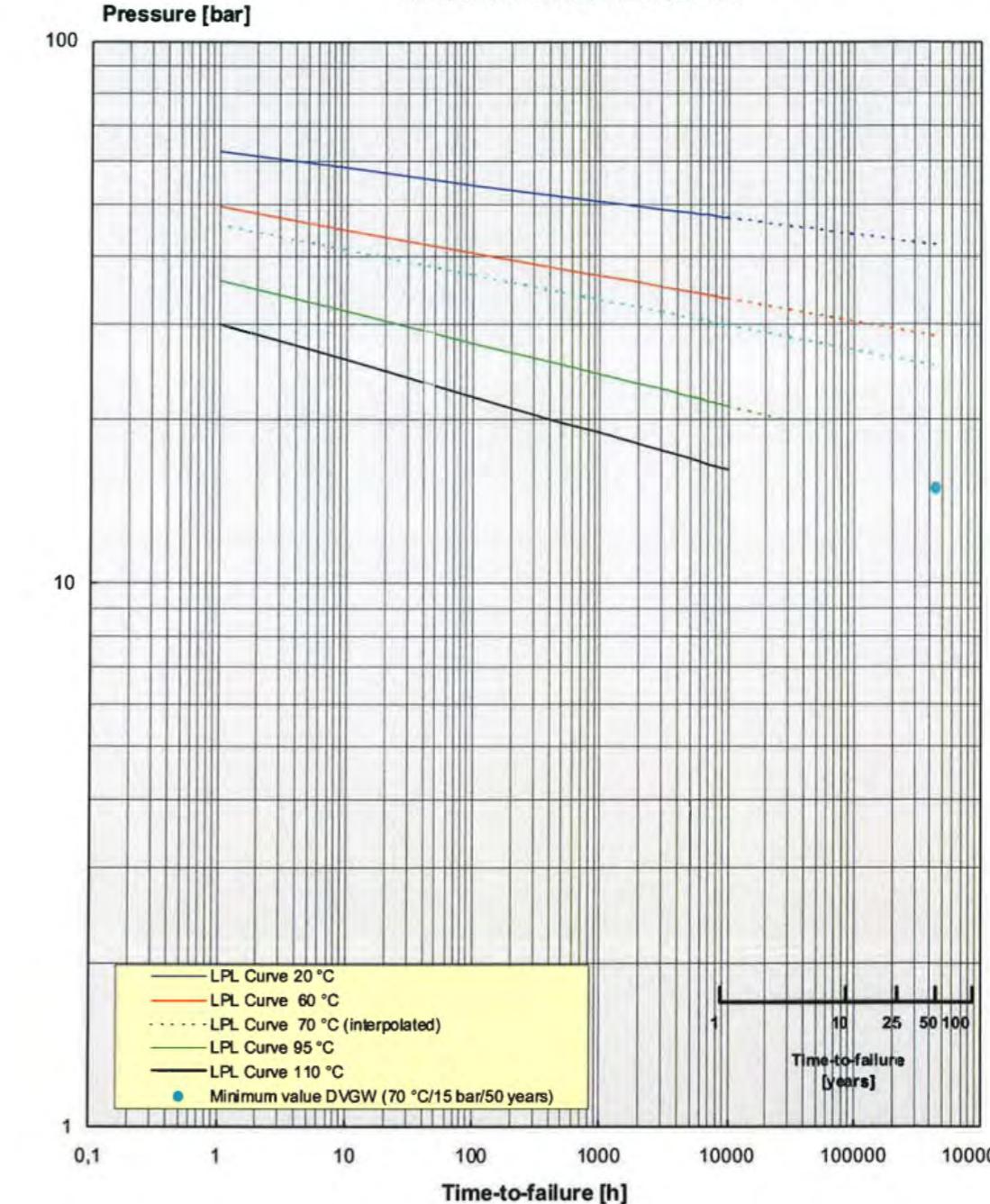
SAP Code	Specification
1100018254	40-75

TECHNICAL INFORMATION

Long-term Behavior Diagram Of Multilayer Pipe

Long-term hydrostatic pressure test diagram of multilayer pipe, dim. 16 x 2.0 mm

Long-term hydrostatic pressure test according to DVGW W 542
 Foshan Rifeng Enterprise Co., Ltd Multilayer pipe PE-Xb/Al/PE-Xb ø 16 x 2.0 mm (Al 0.21 mm)
 Test results - Order no.: 64004/04



RAW MATERIAL

Material	Test item	Requirement
Polyethylene	Density	HDPE : 0.941~0.959 g/cm ³ MDPE : 0.926~0.941 g/cm ³
	Melt flow index	HDPE, MDPE≥0.1 g/10min (190,2.16kg)
	Tensile strength	HDPE≥21MPa; MDPE≥14MPa
	Elongation	≥400%
	Vicat soft point	Vicat soft point≥105°C
	Cross-linking degree	≥65%
	ESCR	≥165h
Colour masterbatch	Moisture content	≤0.15%
	Appearance	Uniform granular
	Volatile content	≤0.5%
Catalyst	Density	≥0.93 g/cm ³
	Melt flow index	≥0.9 g/10min (190°C , 5.00kg)
	Volatile content	≤0.35%
	Appearance	Uniform granular
Adhesive resin	Density	≥0.926 g/cm ³ ;
	Melt flow index	2.0~6.0 g/10min (190°C, 2.16kg)
	Vicat soft point	Vicat soft point≥105°C
	T peeling strength	≥70N/25mm
	Surface quality	Water brush test≥class
	Tensile strength	105MPa ~ 125MPa
	Appearance	Without oil on surface
Aluminum	Hardness(HV)	28 ~ 33
	T peeling strength	Minimum value≥60N/25mm

Chemical Resistance

TYPE		
Overlapped welded		B1 (PEX-AL-PEX)
Roughness(mm)		0.0007
Density (g/cm ³)		~ 0.926-0.959
Modulus of elasticity(MPa)		7200
Thermal conductivity (w/mK)		0.45
Coefficient of thermal expansion (mm/mK)		0.025

Pipe Pressure Loss

Calculation formula

$$r = f * \frac{L}{D} * \rho * \frac{V^2}{2}$$

$$\frac{1}{\sqrt{f}} = -2 \log \left(\frac{e}{3.7D} + \frac{2.51}{Re \sqrt{f}} \right)$$

$$Re = \frac{\rho * V * D}{\mu}$$

Where:

r= head loss, Pa

f= friction factor

ρ = density of the fluid, kg/m³

V= the mean velocity of the fluid, m/s D= the pipe inner diameter, m

L=pipe length,m

e=relative roughness

Re=Reynolds number

μ=dynamic viscosity, Pa·s

Pressure loss table of PEX/AL/PEX Pipe water temperature = 25° C

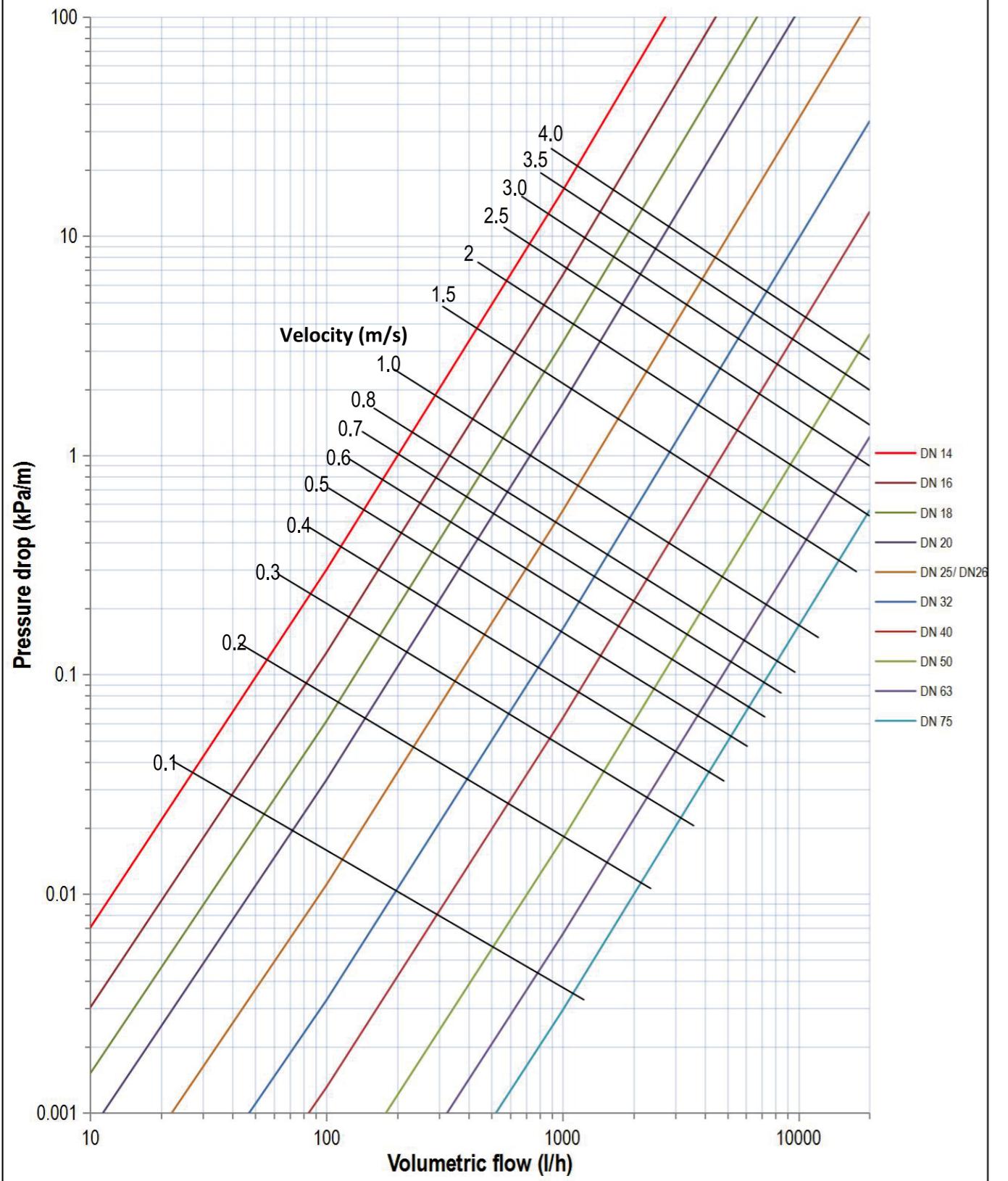
Pressure loss table of PEX/AL/PEX Pipe water temperature = 25° C																																																			
Q L/S	1014		1216		1418		1620		2025		2026		2632		3240		4150		5163		6075																														
	i KPa/m	V m/s																																																	
0.02	0.15	0.26	0.06	0.18	0.03	0.13	0.02	0.10																																											
0.04	0.50	0.52	0.21	0.36	0.10	0.27	0.05	0.20	0.02	0.13	0.02	0.13																																							
0.06	1.01	0.79	0.42	0.54	0.20	0.40	0.11	0.31	0.04	0.19	0.04	0.19	0.01	0.11																																					
0.08	1.66	1.05	0.69	0.73	0.34	0.53	0.18	0.41	0.06	0.25	0.06	0.25	0.02	0.15	0.01	0.10																																			
0.10	2.45	1.31	1.02	0.91	0.49	0.67	0.26	0.51	0.09	0.32	0.09	0.32	0.02	0.19	0.01	0.13																																			
0.12	3.37	1.57	1.40	1.09	0.68	0.80	0.36	0.61	0.12	0.38	0.12	0.38	0.03	0.23	0.01	0.15																																			
0.14	4.41	1.84	1.83	1.27	0.89	0.94	0.47	0.71	0.15	0.45	0.15	0.45	0.04	0.26	0.02	0.18																																			
0.16	5.58	2.10	2.32	1.45	1.12	1.07	0.59	0.82	0.19	0.51	0.19	0.51	0.06	0.30	0.02	0.20	0.01	0.12																																	
0.18	6.86	2.36	2.85	1.63	1.38	1.20	0.72	0.92	0.24	0.57	0.24	0.57	0.07	0.34	0.03	0.23	0.01	0.13																																	
0.20	8.27	2.62	3.43	1.81	1.66	1.34	0.87	1.02	0.28	0.64	0.28	0.64	0.08	0.38	0.03	0.26	0.01	0.15																																	
0.30	16.96	3.94	7.01	2.72	3.39	2.01	1.78	1.53	0.58	0.95	0.58	0.95	0.17	0.57	0.07	0.38	0.02	0.22	0.01	0.15																															
0.40			11.69	3.63	5.64	2.67	2.96	2.04	0.96	1.27	0.96	1.27	0.28	0.76	0.11	0.51	0.03	0.30	0.01	0.19	0.00	0.14																													
0.50					8.39	3.34	4.39	2.55	1.43	1.59	1.43	1.59	0.41	0.95	0.16	0.64	0.05	0.37	0.02	0.24	0.01	0.17																													
0.60					11.61	4.01	6.08	3.06	1.97	1.91	1.97	1.91	0.57	1.13	0.22	0.77	0.06	0.45	0.02	0.29	0.01	0.21																													
0.70							8.00	3.57	2.59	2.23	2.59	2.23	0.75	1.32	0.29	0.89	0.08	0.52	0.03	0.34	0.01	0.24																													
0.80								10.15	4.08	3.29	2.55	3.29	2.55	0.95	1.51	0.37	1.02	0.10	0.60	0.04	0.39	0.02	0.28																												
0.90									4.05	2.86	4.05	2.86	1.17	1.70	0.46	1.15	0.13	0.67	0.05	0.44	0.02	0.31																													
1.00										4.89	3.18	4.89	3.18	1.41	1.89	0.55	1.28	0.15	0.75	0.05	0.49	0.02	0.35																												
1.20											6.78	3.82	6.78	3.82	1.95	2.27	0.76	1.53	0.21	0.90	0.08	0.58	0.03	0.41																											
1.40														2.56	2.65	1.00	1.79	0.28	1.05	0.10	0.68	0.04	0.48																												
1.60															3.26	3.03	1.27	2.04	0.35	1.20	0.13	0.78	0.06	0.55																											
1.80																4.02	3.40	1.56	2.30	0.44	1.35	0.15	0.87	0.07	0.62																										
2.00																	4.86	3.78	1.89	2.55	0.53	1.50	0.19	0.97	0.08	0.69																									
2.20																		5.49	4.16	2.24	2.81	0.62	1.65	0.22	1.07	0.10	0.76																								
2.40																			2.62	3.06	0.73	1.80	0.26	1.16	0.12	0.83																									
2.60																				2.88	3.32	0.84	1.95	0.30	1.26	0.13	0.90																								
2.80																					3.29	3.57	0.96	2.10	0.34	1.36	0.15	0.97																							
3.00																						3.73	3.83	1.09	2.24	0.39	1.46	0.17	1.04																						
3.20																							4.39	4.08	1.22	2.39	0.43	1.55	0.19	1.11																					
3.40																									1.30	2.54	0.48	1.65	0.21	1.18																					
3.60																										1.44	2.69	0.53	1.75	0.24	1.24																				
3.80																											1.59	2.84	0.59	1.84	0.26	1.31																			
4.00																												1.74	2.99	0.65	1.94	0.29	1.38																		
4.20																													1.99	3.14	0.67	2.04	0.31	1.45																	
4.40																														2.17	3.29	0.73	2.13	0.34	1.52																
4.60																															2.35	3.44	0.79	2.23	0.37	1.59															
4.80																																2.53	3.59	0.85	2.33	0.40	1.66														
5.00																																	2.73	3.74	0.96	2.43	0.41	1.73													
5.20																																		2.93	3.89	1.03	2.52	0.44	1.80												
5.40																																			3.13	4.04	1.11	2.62	0.47	1.87											
5.60																																					1.18	2.72	0.50	1.94											
5.80																																						1.26	2.81	0.53	2.01										
6.00																																							1.34	2.91	0.59	2.07									
6.20																																								1.42	3.01	0.63	2.14								
6.40																																									1.50	3.10	0.67	2.21							
6.60																																									1.59	3.20	0.70	2.28							
6.80																																									1.68	3.30	0.74	2.35							
7.00																																										1.77	3.40	0.78	2.42						

Pressure loss table of PEX/AL/PEX Pipe water temperature = 70° C

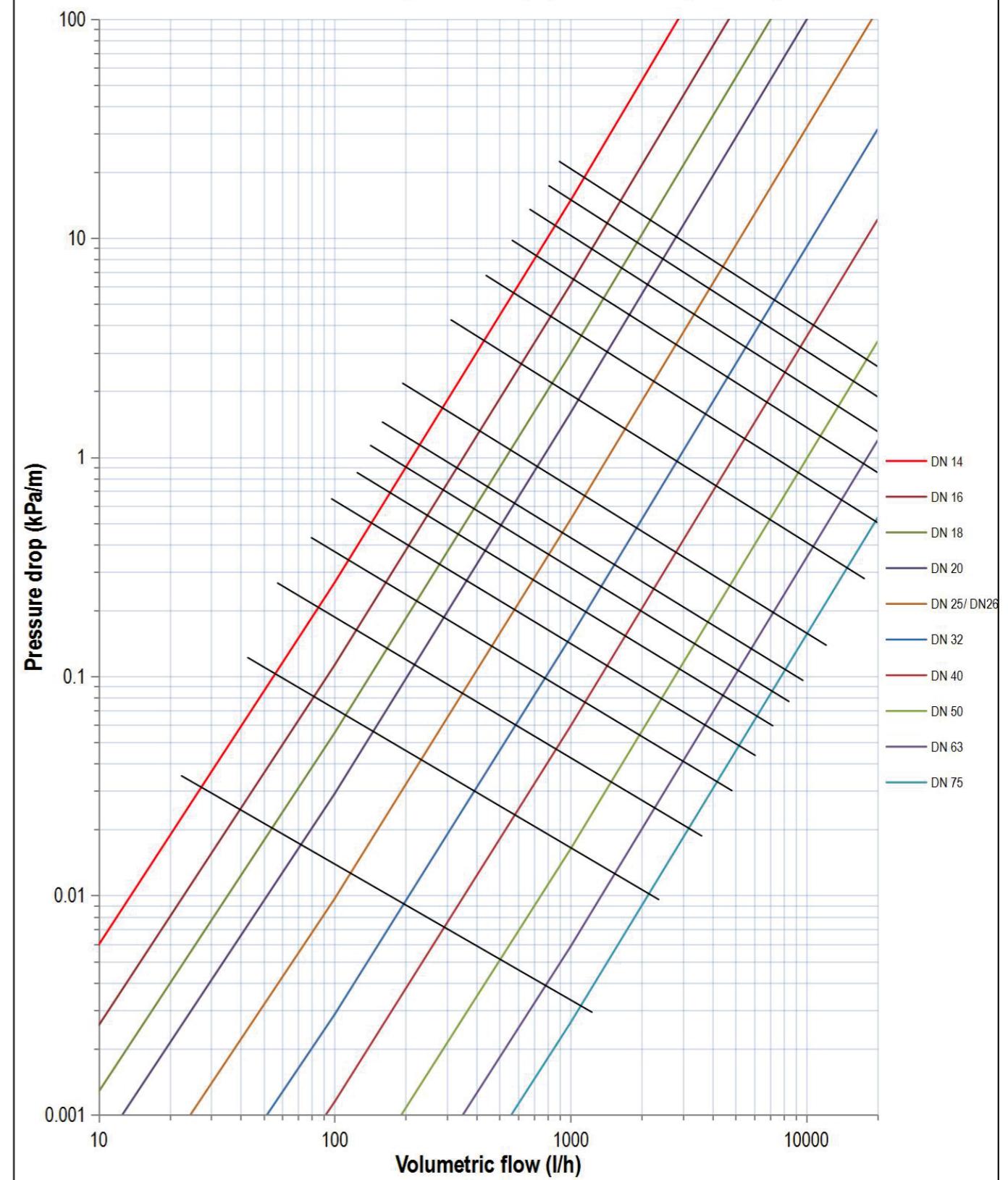
Pressure loss table of PEX/AL/PEX Pipe water temperature = 70° C

Q L/S	1014		1216		1418		1620		2025		2026		2632		3240		4150		5163		6075									
	i KPa/m	V m/s																												
0.02	0.12	0.26	0.05	0.18	0.02	0.13	0.01	0.10																						
0.04	0.40	0.52	0.16	0.36	0.08	0.27	0.04	0.20	0.01	0.13	0.01	0.13																		
0.06	0.81	0.79	0.33	0.54	0.16	0.40	0.09	0.31	0.03	0.19	0.03	0.19	0.01	0.11																
0.08	1.34	1.05	0.56	0.73	0.27	0.53	0.14	0.41	0.05	0.25	0.05	0.25	0.01	0.15	0.01	0.10														
0.10	1.99	1.31	0.82	0.91	0.40	0.67	0.21	0.51	0.07	0.32	0.07	0.32	0.02	0.19	0.01	0.13														
0.12	2.75	1.57	1.14	1.09	0.55	0.80	0.29	0.61	0.09	0.38	0.09	0.38	0.03	0.23	0.01	0.15														
0.14	3.61	1.84	1.49	1.27	0.72	0.94	0.38	0.71	0.12	0.45	0.12	0.45	0.04	0.26	0.01	0.18														
0.16	4.42	2.10	1.89	1.45	0.91	1.07	0.48	0.82	0.16	0.51	0.16	0.51	0.05	0.30	0.02	0.20	0.00	0.12												
0.18	5.47	2.36	2.25	1.63	1.13	1.20	0.59	0.92	0.19	0.57	0.19	0.57	0.06	0.34	0.02	0.23	0.01	0.13												
0.20	6.63	2.62	2.72	1.81	1.31	1.34	0.71	1.02	0.23	0.64	0.23	0.64	0.07	0.38	0.03	0.26	0.01	0.15												
0.30	13.83	3.94	5.67	2.72	2.72	2.01	1.42	1.53	0.46	0.95	0.46	0.95	0.14	0.57	0.05	0.38	0.01	0.22	0.01	0.15										
0.40			9.57	3.63	4.59	2.67	2.39	2.04	0.77	1.27	0.77	1.27	0.22	0.76	0.09	0.51	0.02	0.30	0.01	0.19	0.00	0.14								
0.50					6.88	3.34	3.59	2.55	1.15	1.59	1.15	1.59	0.33	0.95	0.13	0.64	0.04	0.37	0.01	0.24	0.01	0.17								
0.60						9.59	4.01	4.99	3.06	1.60	1.91	1.60	1.91	0.46	1.13	0.18	0.77	0.05	0.45	0.02	0.29	0.01	0.21							
0.70								6.61	3.57	2.12	2.23	2.12	2.23	0.60	1.32	0.23	0.89	0.06	0.52	0.02	0.34	0.01	0.24							
0.80									8.42	4.08	2.70	2.55	2.70	2.55	0.77	1.51	0.30	1.02	0.08	0.60	0.03	0.39	0.01	0.28						
0.90										3.35	2.86	3.35	2.86	0.95	1.70	0.37	1.15	0.10	0.67	0.04	0.44	0.02	0.31							
1.00										4.05	3.18	4.05	3.18	1.16	1.89	0.45	1.28	0.12	0.75	0.04	0.49	0.02	0.35							
1.20											5.65	3.82	5.65	3.82	1.61	2.27	0.62	1.53	0.17	0.90	0.06	0.58	0.03	0.41						
1.40															2.13	2.65	0.82	1.79	0.23	1.05	0.08	0.68	0.04	0.48						
1.60																2.71	3.03	1.05	2.04	0.29	1.20	0.10	0.78	0.05	0.55					
1.80																	3.36	3.40	1.30	2.30	0.36	1.35	0.13	0.87	0.06	0.62				
2.00																	4.08	3.78	1.58	2.55	0.44	1.50	0.15	0.97	0.07	0.69				
2.20																		1.87	2.81	0.52	1.65	0.18	1.07	0.08	0.76					
2.40																		2.20	3.06	0.61	1.80	0.21	1.16	0.09	0.83					
2.60																		2.54	3.32	0.70	1.95	0.25	1.26	0.11	0.90					
2.80																		2.91	3.57	0.80	2.10	0.28	1.36	0.13	0.97					
3.00																		3.30	3.83	0.91	2.24	0.32	1.46	0.14	1.04					
3.20																		3.49	4.08	1.02	2.39	0.36	1.55	0.16	1.11					
3.40																			1.14	2.54	0.40	1.65	0.18	1.18						
3.60																			1.27	2.69	0.45	1.75	0.20	1.24						
3.80																			1.40	2.84	0.49	1.84	0.22	1.31						
4.00																			1.54	2.99	0.54	1.94	0.24	1.38						
4.20																			1.58	3.14	0.59	2.04	0.26	1.45						
4.40																			1.73	3.29	0.64	2.13	0.28	1.52						
4.60																			1.87	3.44	0.70	2.23	0.31	1.59						
4.80																			2.03	3.59	0.75	2.33	0.33	1.66						
5.00																			2.19	3.74	0.76	2.43	0.36	1.73						
5.20																			2.35	3.89	0.82	2.52	0.39	1.80						
5.40																			2.52	4.04	0.88	2.62	0.41	1.87						
5.60																				0.94	2.72	0.44	1.94							
5.80																					1.00	2.81	0.47	2.01						
6.00																					1.07	2.91	0.47	2.07						
6.20																					1.14	3.01	0.50	2.14						
6.40																					1.21	3.10	0.53	2.21						
6.60																					1.28	3.20	0.56	2.28						
6.80																					1.35	3.30	0.59	2.35						
7.00																					1.42	3.40	0.63	2.42						

Pressure drop of the pipes 10°C (kPa/m)

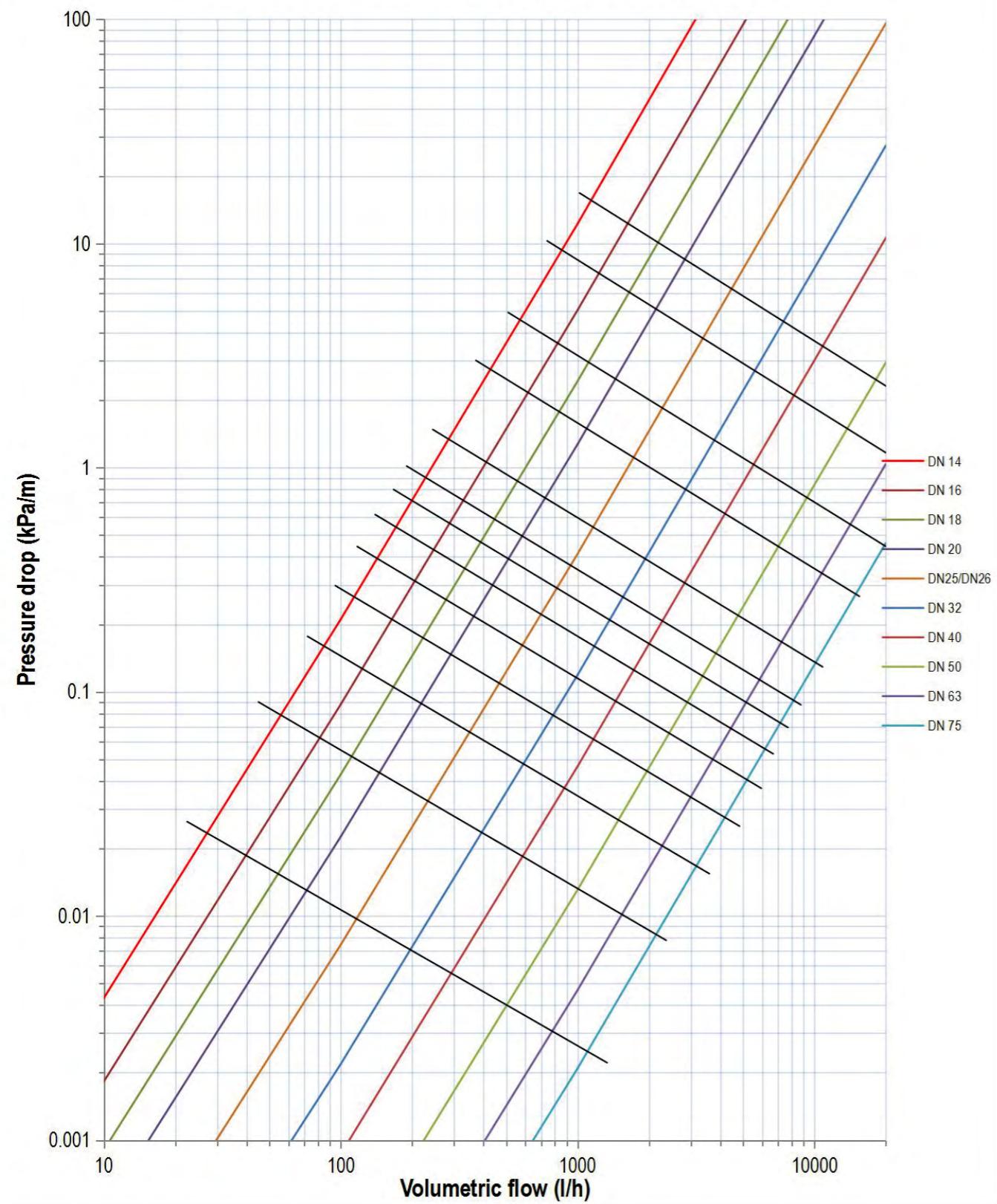


Pressure drop of the pipes 25°C (kPa/m)



Fitting Pressure Loss

Pressure drop of the pipes 70°C (kPa/m)



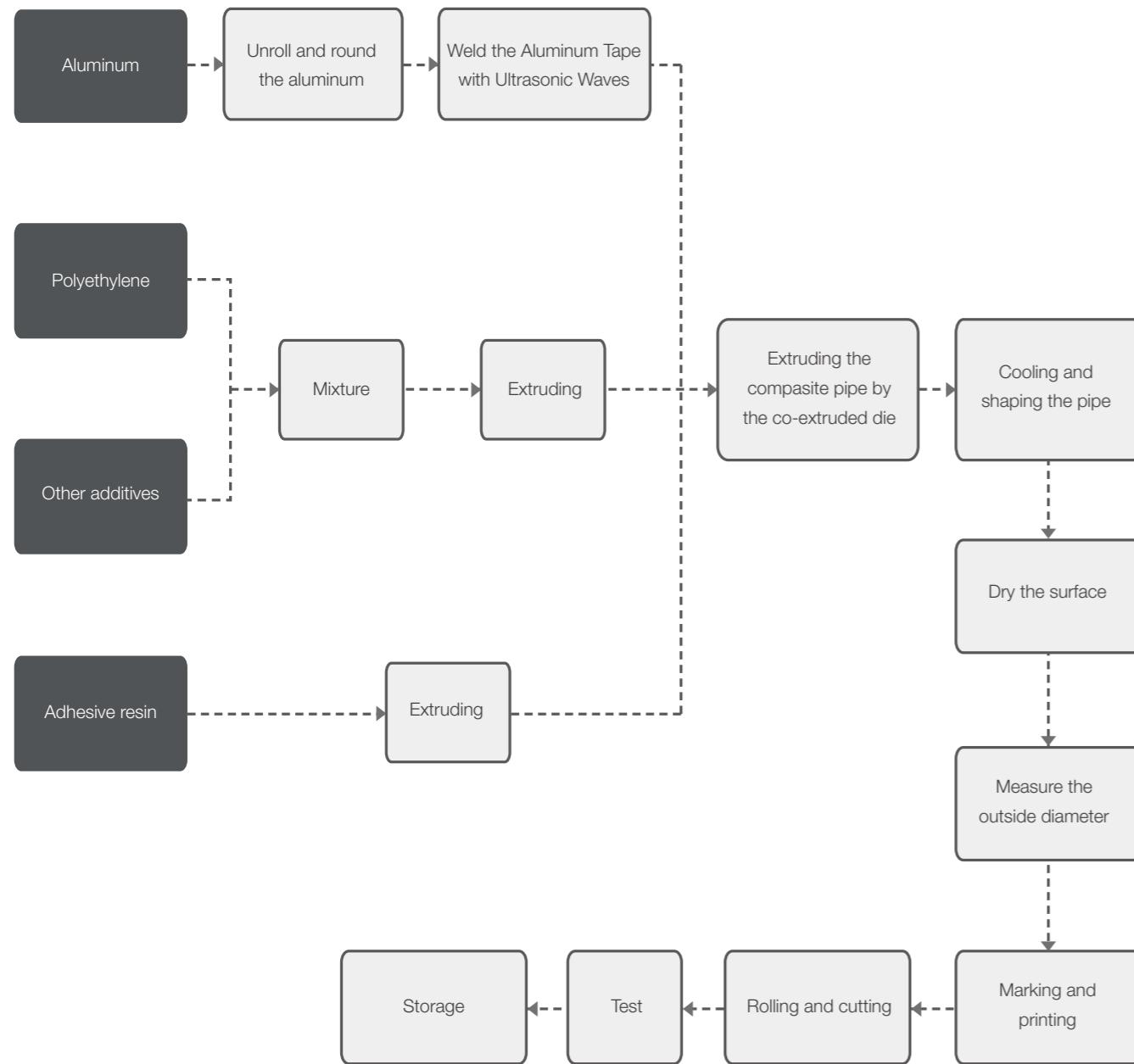
Pressure loss - Press Fitting

F18 U,TH profile press fittings for water supply								
Inside Dimension [mm] Outside Dimension [mm]	3240		4150		5163		6075	
Zeta values ζ (-)/equivalent Pipe length eL [ml]	ζ	eL	ζ	eL	ζ	eL	ζ	eL
Press Elbow 90	0.93		2.31	1.08	0.90	1.08	0.90	1.20
Equal Straight Union	0.46		1.16	0.62	0.52	-	-	0.76
Straight at flow spee	0.51		1.42	0.67	1.58	0.67	1.58	0.80
Branch at flow speed	1.28		3.56	0.56	1.32	0.56	1.32	0.40
Equal Tee "Y" type	-		-	1.20	1.00	1.20	1.00	-

PRODUCTION AND QUALITY CONTROL

Production Of Pipe

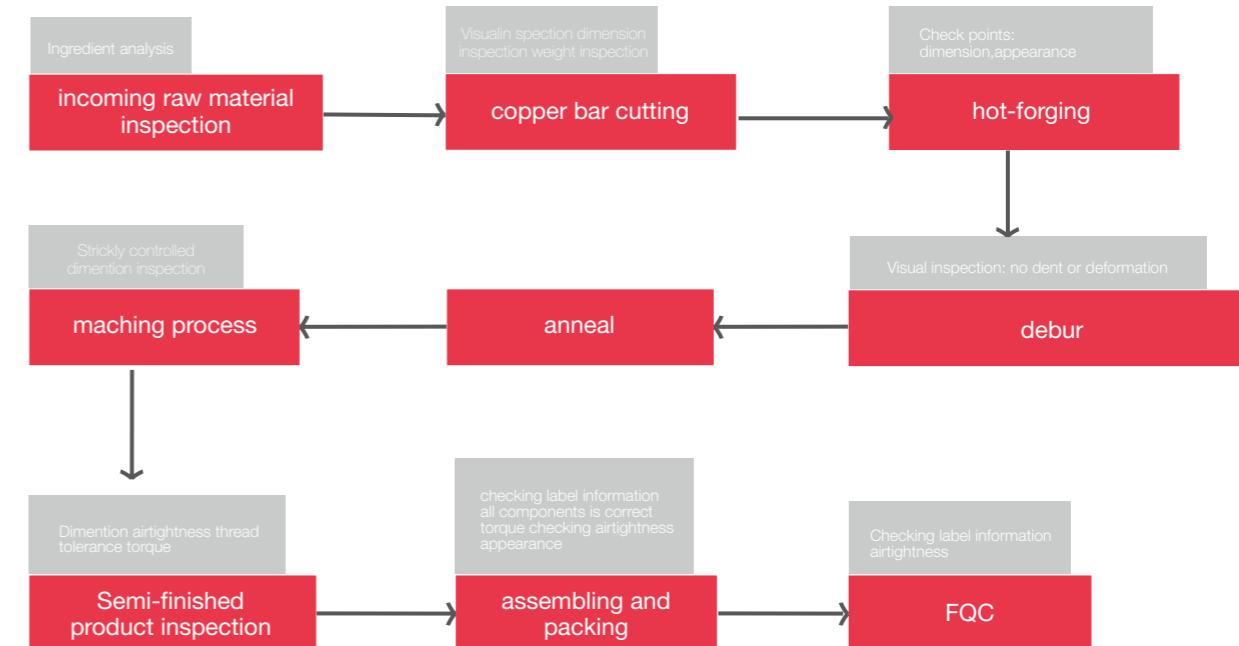
Production Process for Multilayer Pipe with Aluminum Layer Overlapped Welded



Test

Test Item	Testing results
Dimension	Comply with EN ISO 21003 standard or customer requirements
Appearance and marking	The surface of inner and external should be smooth, no bubble, hole, nick and other deflection.
Tensile strength	Comply with required force > 2500 N
Pressure strength	Measure and calculate in accordance with ISO 9080 standard.
Thermal durability	50 % of the stress for a 1 year test, without ductile failure occurring.
Delamination	$F_{pull} \geq 15 \text{ N/cm}$, no delamination
Internal pressure test	Resistance to internal pressure 95°C, 1000 h, 15bar, the joint assembly shall not leak
Bending test	Tested with required radius bending, the joint shall not leak.
Pull-out test	The joint assemblies shall withstand the pull-out force without being separated, force calculated by $F = \pi/4 \cdot d_n^2 \cdot P_D$
Thermal cycling test	The pipes, fittings or joints shall withstand the test without leakage after 5000 cycles at 10bar between 20°C and 95°C.
Pressure cycling test	Tested with cycles between 15bar and 0.5bar, the joint assembly shall not leak.
Vacuum test	The change in vacuum pressure shall not be greater than 0.05 bar
Hygienic test	Shall be in compliance with national Regulations

Production Of Fitting



Product test

Test Item	Requirement
Appearance	Pipe should be no crack, no delamination, no crack and no core body deformation phenomenon
	Threads are not allowed to have shortages, crushed or tooth profile is not complete.
	Fittings should be acute blunt, no burr, no sand holes and no uneven phenomenon.
	Fittings shall not be wrong, missing or incomplete.
	The processed surface shall not have scratches, grooves, steps or collision scars and unprocessed black fur.
	Fittings should be clean, the surface color should be consistent, no blackening, no mildew, no oxidation, no rust
	Marking such as trademark patterns, specifications, models, identification codes and anti-counterfeiting labels shall be clear and correct on fittings.
	For fittings whose surface is shot blasting, the shot blasting size should be uniform and the surface of pipe fittings should be flat. The fittings for nickel plating should not be spalling, leaking plating, bubbling, exposing copper and so on.
	The axis of the connecting end should coincide with the central axis of the fitting, and no eccentricity, no asymmetry, or no perpendicularity shall be allowed
	The o-ring of pipe fitting shall be completely installed in the sealing groove of fitting. The O-ring of pipe fitting shall not be shifted.
Size	The dimension of tolerance marked on the drawing is the dimension of inspection control.
	The thread gauge shall be rotated to pass the whole thread section, and the stop gauge shall not pass completely
	Thread spacing should be no more than 2.5 mmThe wall thickness shall not be less than 1.5mm except the fitting part.
Air tightness	At room temperature, the test pressure shall be no less than 0.6 Mpa for 10s, no leakage shall occur to the pipe fitting.
Torsional moment test	Specification of pipe thread 3/8 1/2 3/4 1 11/4
	Torque (Nm) 35 75 100 125 160
Stress corrosion resistance	Testing according to ISO 6957 "Copper alloys - Ammonia test for stress corrosion resistance" in a solution of pH 9.5.
Assembling	The pipe fittings shall not be short of O-rings, retainers, steel sleeves and other parts of specifications. The O-ring of pipe fitting shall be completely installed in the sealing groove of pipe fitting. The O-ring of pipe fitting shall not be shifted.
Package	The package quantity and package mark should be correct. Short package number, mixed package, no package mark or unclear package mark should be allowed. The printing patterns of packing boxes and boxes should be clear and correct, the surface should be clean and level, and no twisting and damage should occur.

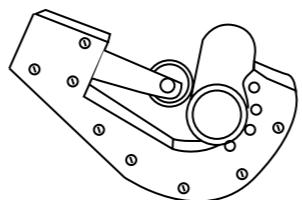


INSTALLATION

Press Fitting

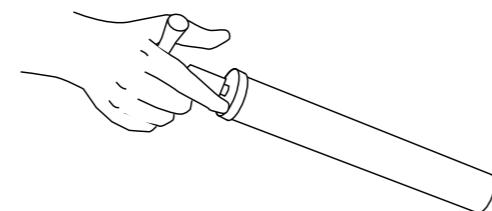
Step1:

Cut the pipe vertically by RIIFO pipe cutter. Make sure to cut it quickly and precisely.



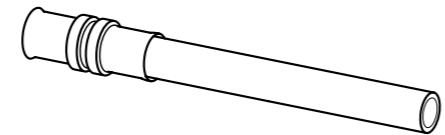
Step2:

Use an electric or hand-held reamer to round and bevel the end holes of the pipe.



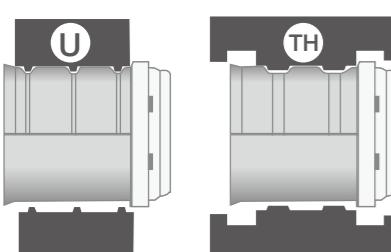
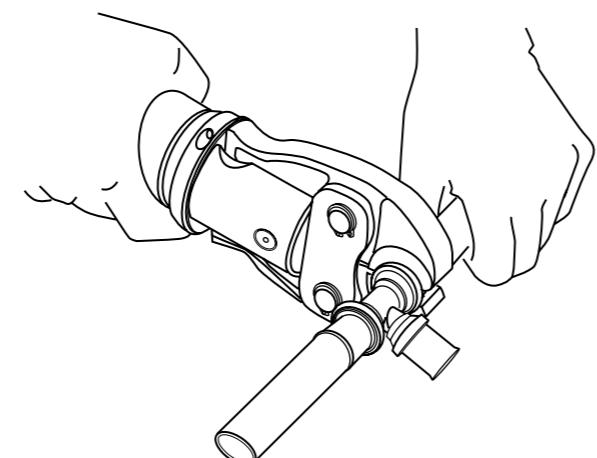
Step3:

Choose the right size sleeved-fitting for the pipe and aim the pipe end at the ring-shape hole of the fitting integrated with stainless steel sleeve. Push the pipe into the fitting up to the shoulder.



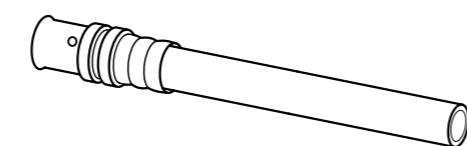
Step4:

Open the electric pressing tool and position the tool directly onto the stainless steel sleeve.



Step5:

The margin of the block must be placed against/cover the press section.



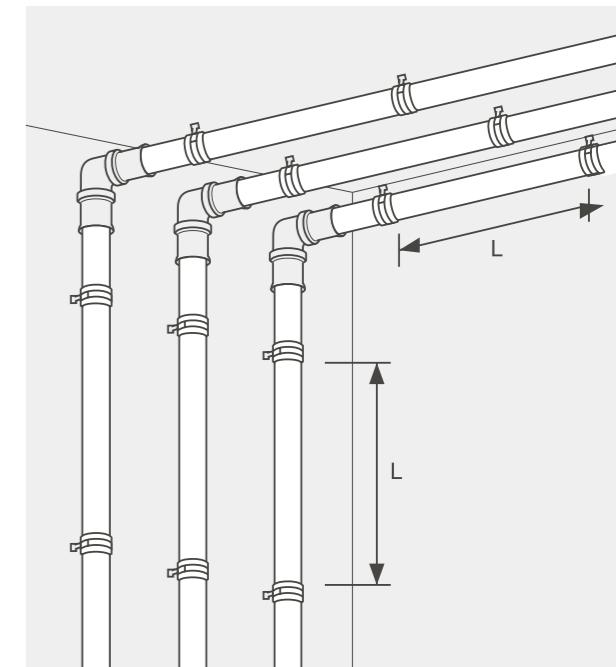
Press the activation button on the machine and wait until the pressing cycle is completed. Open the jaw and remove the tool. The connection has been made. Check the inspection holes again to make sure the fitting is fully inserted just in case.

CONSTRUCTION STANDARD

When Mounting Pipes On Surfaces

RIIFO recommends that you use straight lengths of pipes when mounting on surfaces. Pipe brackets must be used when fixing multilayer pipes to the wall or ceiling. The suspension brackets are made from a synthetic material or from metal and have a rubber inlay for protecting the pipe. The specified maximum distance between the brackets must be adhered to. See table below.

Nominal outer diameter	Standpipe support spacing (mm)	Crosspipe support spacing (mm)
16	700	500
20	900	600
25	1000	700
32	1100	800
40	1300	1000
50	1600	1200
63	1800	1400
75	2000	1600



- For pipes with a nominal diameter of 32mm, there is no compensation when laying directly or non-directly.
- For pipes with a nominal diameter 40mm, the pipe should be turned as far as possible to compensate for expansion and contraction with free arms.
- For pipes with a nominal outer diameter of 40mm or more, when the distance between cold water pipes is 6m, and the distance between hot water pipes is 3m. When the fixing bracket is fixed, the pipe retractor may not be provided.
- Free-arm should be set at the branch pipe part of the indoor pipe leading from the main pipe to the water supply equipment or container.
- The pipe sections buried in indoor pipes may not be provided with pipe expansion compensation devices.

ΔL = Telescopic length of the pipe, mm
 α = Linear expansion coefficient of the pipe, mm / m.°C, take 0.025
 L = Length of the pipe, m
 Δt_s = Maximum temperature change of water in the pipe, °C
 Δt_g = Maximum environment temperature change of the outside the pipe, °C

$$\Delta L = L * \alpha (0.65\Delta t_s + 0.1\Delta t_g)$$

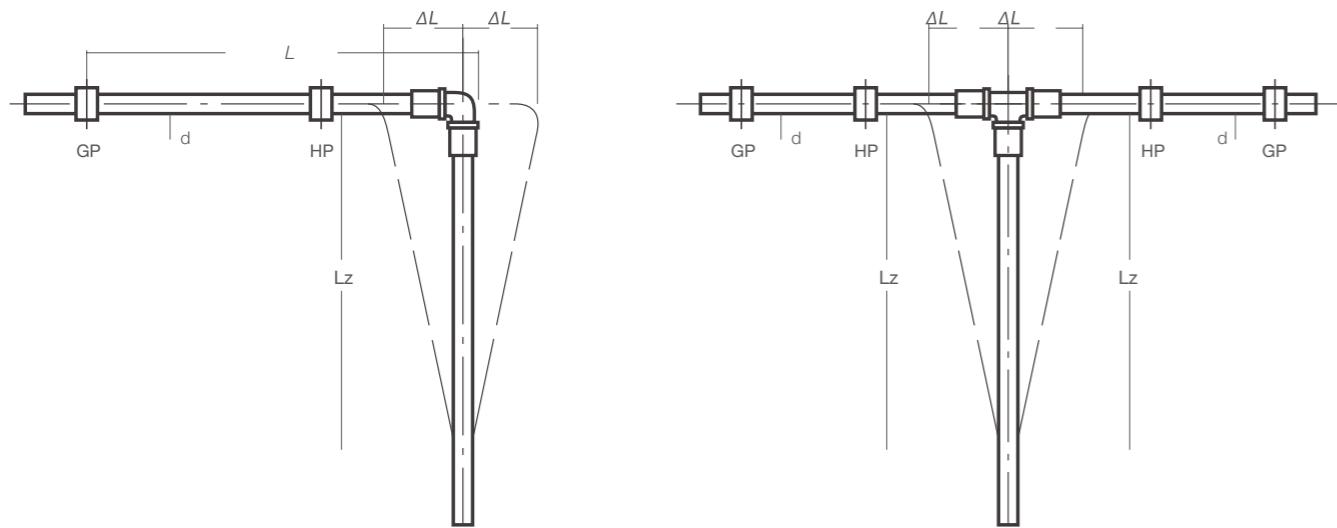
Compensation For Pipeline

Expansion bends

It is very important that sliding points and fixed points are positioned correctly when you use expansion bends and expansion loops. You should use expansion bends whenever the pipe changes direction. We recommend that you always use fittings to make the direction change. For pipes with a diameter of 32 mm or greater this is compulsory

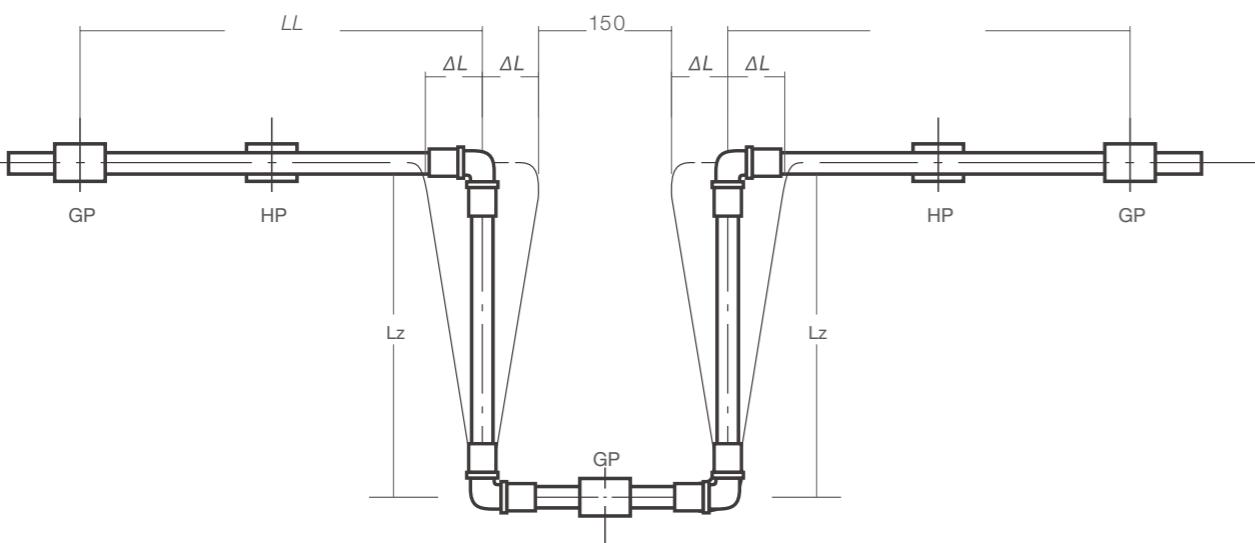
L = length of the pipe
Lz = Minimum free arm

GP = fixed point
HP = sliding point
Expansion bend for L (Lb)



Expansion loops

When a long pipe does have any change of direction, you should use expansion loops. An expansion loop is also called a lyra or omega bend. The drawing shows an expansion bend more clearly. The expansion loop is formed in principle from two expansion bends. A fixed point must therefore be provided at the bottom in the middle of the loop



Pipe Laying In The Wall

1) The pipe sheath tube laid in the wall should not be larger than 25mm, the wall should be solid wall, and the surface of the pipeline should have a protective sleeve. There is no joint in the middle of the embedded pipe. The height of the horizontal pipe from the ground should not be greater than 0.45m, with the hot water pipe up and the cold water pipe down.

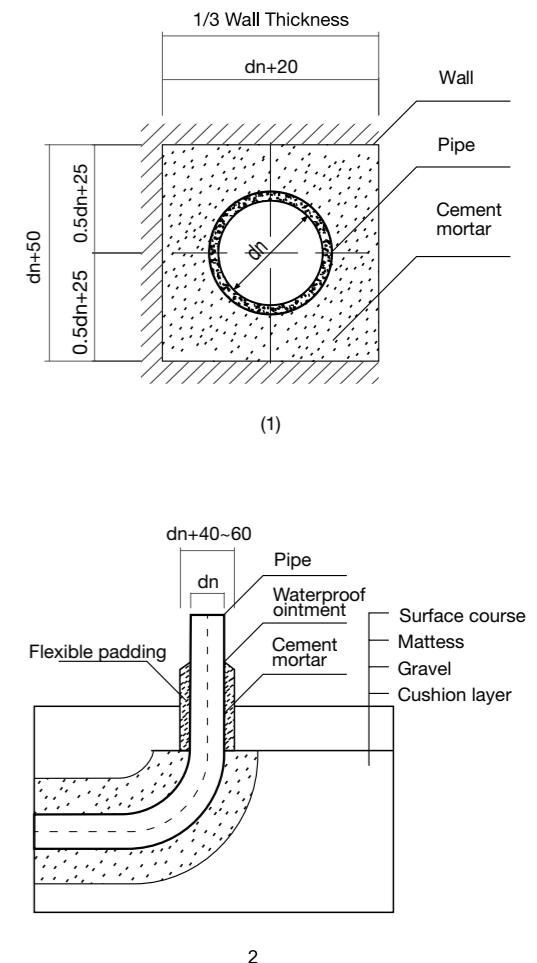
2) The groove of the pipeline directly buried in the leveling layer of the floor (ground) in the residence should not be greater than 25mm.

3) When the entrance pipe passes through the outer wall, holes should be added, and the height of the hole should be determined according to the building. In general, the clear height above the pipe top should not be less than 100mm. Pipes with a nominal length De of not less than 40mm should be bent into the house after horizontal bending.

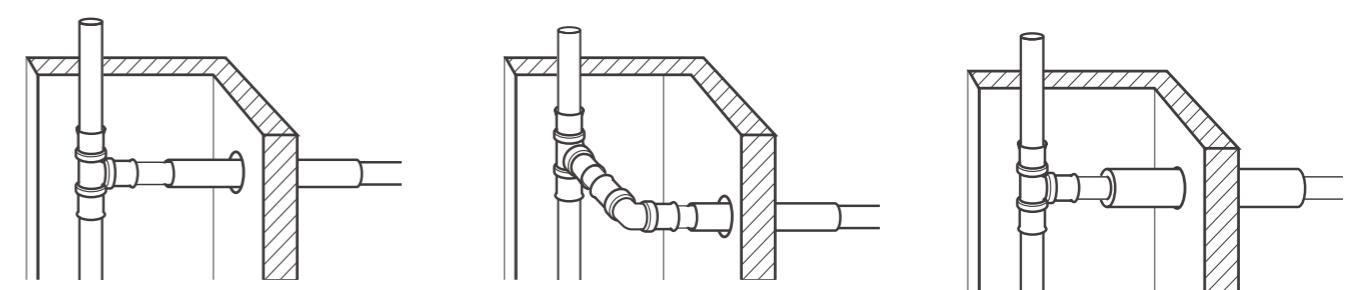
4) The load-bearing displacement of the foundation at the bottom of the buried pipeline trough is less than 80kN/, and there must be no sharp, hard protrusions. When backfilling pipe trenches, the filling within 100 mm around the pipe shall not contain sharp hard stones larger than 10 mm.

5) In addition to the freezing depth, the depth of the soil layer on the top of the underground buried pipeline on the non-traveling ground should not be less than 300mm, and the depth of the traveling ground should not be less than 600mm.

6) Where the pipe protrudes from the indoor floor, it should be a metal sleeve with a length of not less than 100mm, and the root of the sleeve should be inserted into the ground by 30-50mm.



It should be ensured that the pipeline can move freely when passing through the riser in the shaft between floors. In this case, the change in length can also be achieved here by expanding the elbow. The expansion elbow will then adapt to the upward and downward movement.



If there is room to accommodate the expansion bends, it is sufficient to install the sheath tube on the pipe passing through the wall.

If the shaft is too small to fit the expansion bends, the hole in the wall must be made larger to allow enough room for the pipe to move. Pipes must provide insulation when passing through walls.

Non-direct Buried



Exposure To High Temperatures



Expansion loops

Aluminum-plastic pipes can be laid in pipeline wells, suspended ceilings, behind decorative panels, and overhead floors on the floor.

Expansion loops

Aluminum-plastic pipes can also be exposed, but when exposed, they must not pass through bedrooms, storage rooms, substations, computer rooms, and other rooms where water or water may damage equipment or items. Toilet bowl. Protective measures should be taken in places where collision, freezing or direct sunlight is possible.

Installation Exposed To UV And Illuminant



Antifreeze, Heat Insulation



The aluminum-plastic composite pipe should not be exposed outdoors. When it is required to be exposed outdoors:

- (1) The surface-mounted pipes outside shall be arranged in a place that is not directly exposed to sunlight or have shading measures.
- (2) Frost prevention measures shall be taken when the pipes are installed outdoors in freezing areas.

Potential Equalization



- (1) RIIFO aluminum-plastic piping system cannot be embedded with grounding conductors.
- (2) After replacing the existing metal pipes with RIIFO aluminum-plastic piping system, the potential equalization and the effect of the electrical protection device must be verified by an electrician.

- (1) The buried lead-in pipe of the building shall not be less than 300mm in depth.
- (2) The thermal conductivity of the aluminum-plastic composite pipe can be calculated as 0.45 (W/m·K). Directly buried hot water pipes need not be insulated. For hot water pipes with open or indirect burying and dark application, the size of the system can be calculated to determine whether an insulation layer is required.
- (3) Cold water pipes that may freeze should be insulated.
- (4) The insulation layer of outdoor exposed pipelines should have measures to prevent rainwater from penetrating into the insulation layer.
- (5) In areas where cold water pipes are condensed, a dew-proof and cold insulation layer should be used.
- (6) Outdoor exposed pipes without insulation or cold insulation layer should be protected from sunlight and can be wrapped with black polyvinyl chloride film.

Installation Variations

Loop installation

T-fitting installation, as the most commonly deployed installation method, the set up usually starts with a larger dimension that is reduced gradually up to the last tap. It is necessary to install a single pipe from the T-fitting to the tap even though the piping efforts are minor.

The installation variant with T-fittings should only be used for taps that are in use on a daily or regular basis; however, a minimum risk to hygiene cannot be safely excluded due to stagnating water.

Initially larger pipe dimensions could minimize the pressure losses in the installation system.

Even at a low operational pressure, consumers could still benefit from a high level of comfort at the tap.

The advantage of the entire scene installation is that it can effectively reduce costs.



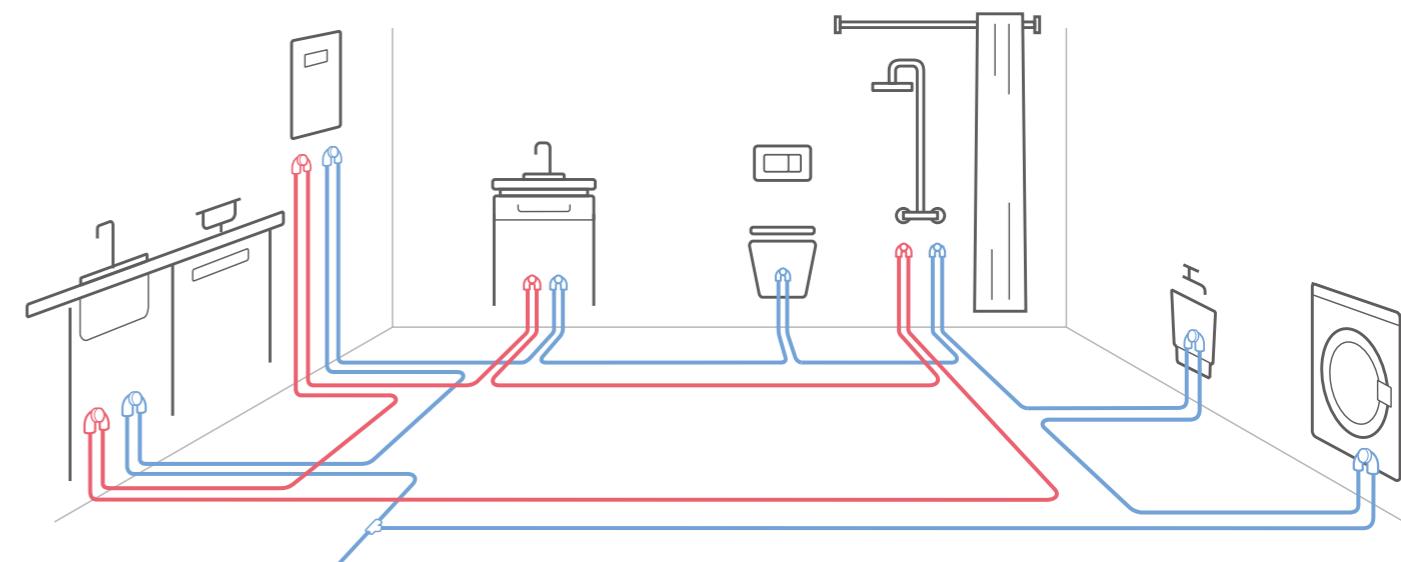
Multilayer Pipe



Elbow



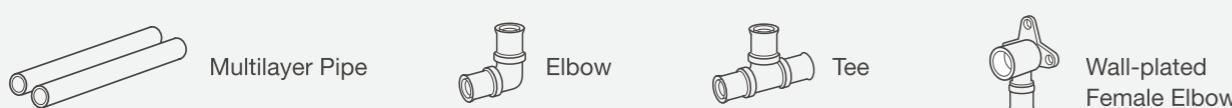
U-shape Female Elbow



T-fitting installation

The U-profile Tap Elbow is used as the connection of the taps to the loop installation and route the PPR pipe directly to the next tap. However, the piping will be routed back to the riser from the last object. Therefore, due to the optimized water circulation in the piping, the ring installation system is impeccable in terms of hygiene. In order to achieve a consistent hygienic flow in the loop installation, it is recommended to choose pipes with the same diameter as far as possible and less than that of the serial installation, as the objects are supplied from both sides.

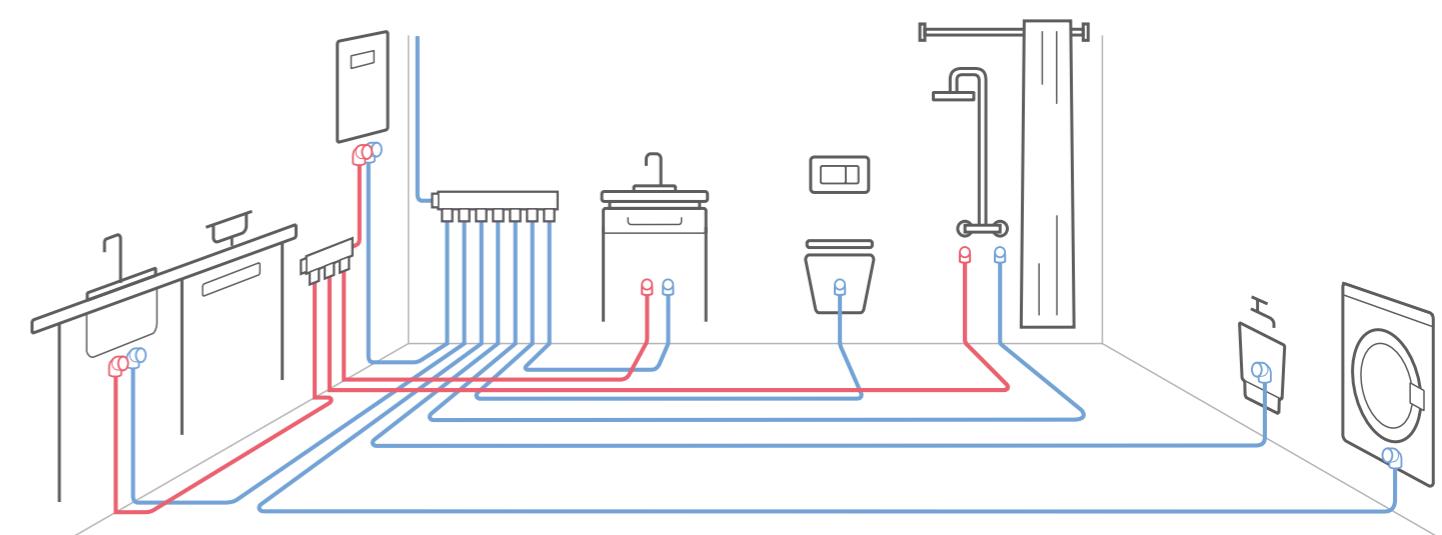
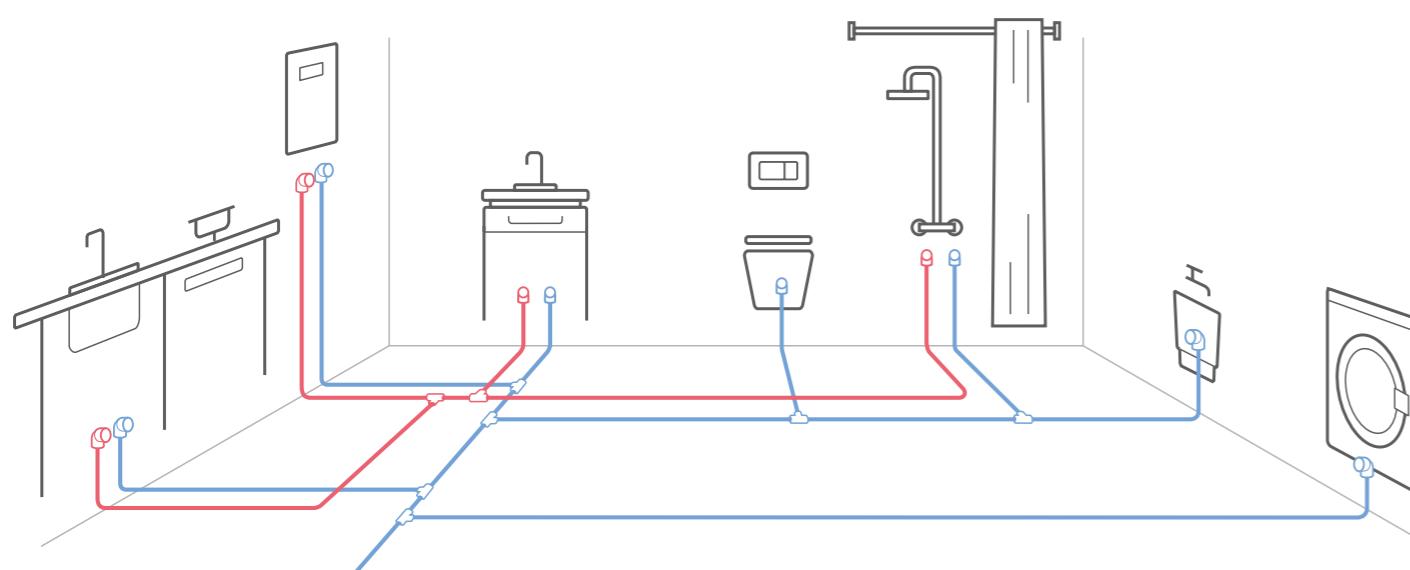
New U-profile tap elbow perfectly fits into hygiene oriented and water flow rate optimized installations using different loop installation methods



Manifold installation

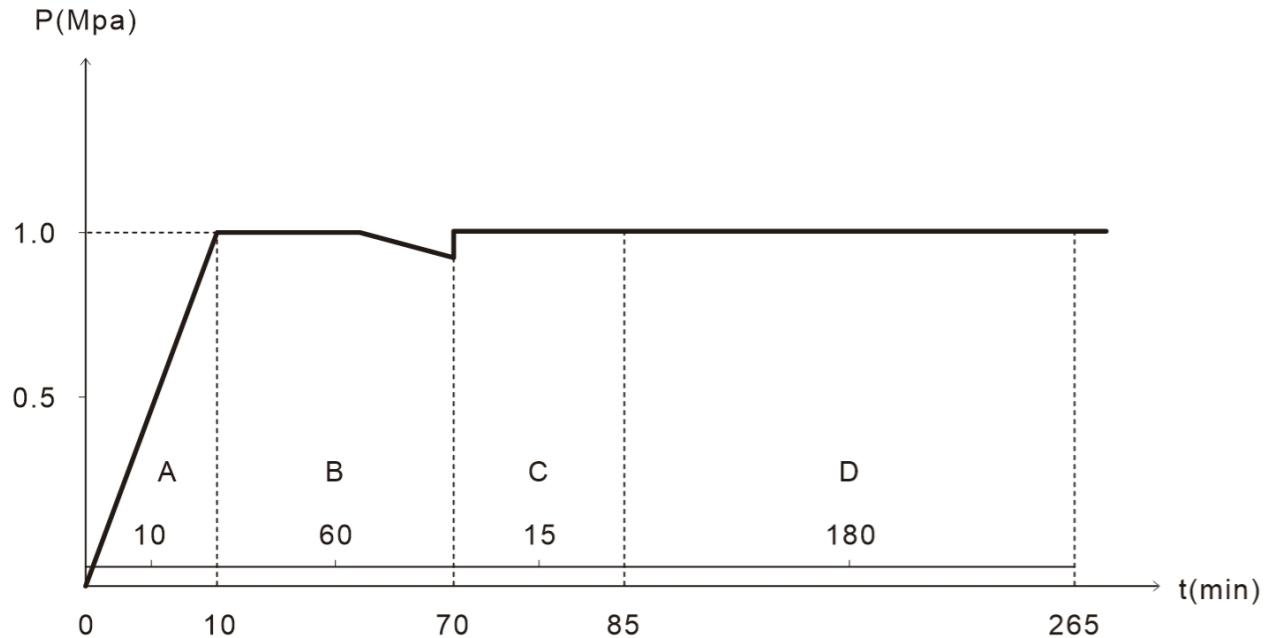
The plumbing manifolds system consists of separate manifold chambers for hot and cold water distribution. The cold water manifold feed the water through main service line, and hot water flows from the water heater and separate from the cold water line.

The water pressure is maintained by main service line, and the manifolds system offer an end to end installation that can reduce the use of pipe fittings, thereby reducing the risk of pressure drop and the risk of leakage will also be greatly reduced.



Pressure Testing

The pressure testing should be carried before the acceptance check. Testing standard differs from different regions. Here shows a reference:



- 1 Using a manual pressure pump to slowly pressurize the pipeline to 1.0 MPa. During this pressurization process, the time should not be less than 10 minutes.
- 2 If the difference between ambient temperature and water temperature exceeds 10°C, wait 30 minutes.
- 3 After pressurizing, maintain the pressure for 60 minutes, and check that there is no leakage in the pipe and all connection in the piping system.
- 4 After maintaining the pressure for 60 minutes, the pressure may decrease. It is necessary to raise it to the specified test pressure.
- 5 Within 15 minutes, the pressure drop should not exceed 0.05MPa.
- 6 After the pressure test is completed, the holding pressure test is performed again. Pressurize the system to the test pressure again for 180 minutes.
- 7 During the test, visually inspect all connection and pipes for leaks
- 8 Record the pressure in the pipeline system during the test time. If the test pressure decreases and exceeds the specified value:
— Check the installation, outlet and connection again.— After resolving the cause of the pressure drop, repeat steps 1-7 when no leaks are found in the visual inspection, the pressure test ends.
The above guidance serves as reference. In actual usage, it is recommended to follow the local custom or the specified project requirements.

WARRANTY UNDER PROFESSIONAL INSTALLATION

Subject to the conditions and limitations of this Limited Warranty, RIIFO UK Ltd ("RIIFO"), warrants to the property owner ("Owner") that the components in its RIIFO Piping Systems as described below (the "Products"), when properly installed by licensed plumbers in potable water and radiant heating systems and subject to normal conditions of use, shall be free from failure caused by manufacturing defects for the respective periods set forth below, each of which periods shall commence on the date of original purchase of the Product (whether or not by Owner).

In the event that a RIIFO Product fails during the applicable warranty period due to a manufacturing defect as determined by RIIFO and all conditions for coverage under his or her exclusive remedy: (i) at RIIFO's sole election, either (a) the replacement of the same type, size and like quantity of non-defective Product at the original point of delivery, at no cost to Owner or (b) credits, offsets, refunds or a combination thereof, for the purchase price of the defective Product; and (ii) if the Product in question is covered by either the 10-year or 25-year limited warranty and the failure occurred during the first ten (10) years of such warranty period and was the direct cause of a leak at the Owner's property, RIIFO will reimburse the Owner for all reasonable and necessary costs of repair or replacement for physical damage to the property, including drywall, flooring and painting costs, as well as damages to personal property, resulting from the failure or leak.

Installation: This Limited Warranty applies only if the applicable Product is configured and installed by a licensed professional plumbing contractor in accordance with RIIFO's instructions, good plumbing practices, and applicable code requirements and industry standards.

FAILURE TO INSTALL THE PRODUCTS IN COMPLIANCE WITH THESE REQUIREMENTS WILL VOID THIS WARRANTY AND MAY RESULT IN SEVERE WATER DAMAGE. RIIFO DOES NOT GUARANTEE OR IN ANY WAY WARRANT THE INSTALLATION OF ITS PRODUCTS.

Exclusions From Coverage: This Limited Warranty excludes defects or failures caused after shipment of the Product by:

- (i) components not manufactured or sold by RIIFO;
- (ii) improper installation (as set forth above);
- (iii) use in improper applications or conditions or in conjunction with improper materials (including, without limitation, improper lubricants, pastes, solvents or sealants);
- (iv) exposure to damaging physical or chemical conditions, including, but not limited to, chemically corrosive or aggressive water conditions, abnormal operating conditions, accident, abuse, and misuse;
- (v) freezing or overheating of liquids within the Product, or unusual pressure surges or pulsation;
- (vi) vibration;
- (vii) exposure to temperatures and/or pressures exceeding the ranges for the Product as specified in RIIFO's design manuals and installation guides;
- (viii) exposure to ultraviolet lights or other high-energy radiation;
- (ix) failure to adhere to RIIFO instructions and/or specifications concerning the proper handling, installation, testing and use of the Product;
- (x) failure to adhere to applicable standards set forth by local laws, codes, or regulations and the applicable industry standards;
- (xi) abuse, misuse, alteration, accidental damage, Acts of God (such as flood, hurricanes, tornadoes or fire) or any other improper activities (including but not limited to repairing or attempt by anyone other than RIIFO authorized service agent) not listed above or damage caused by the fault or negligence of anyone other than RIIFO.

DISCLAIMER OF OTHER WARRANTIES: THIS LIMITED WARRANTY IS THE ONLY WARRANTY APPLICABLE TO THE PRODUCTS, WHICH ARE OTHERWISE SOLD "AS IS." THERE ARE NO OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ALL SUCH WARRANTIES ARE SPECIFICALLY DISCLAIMED. NO STATEMENT, CONDUCT OR DESCRIPTION BY RIIFO OR ITS REPRESENTATIVES, IN ADDITION TO OR BEYOND THIS LIMITED WARRANTY, SHALL CONSTITUTE A WARRANTY.

SOLE REMEDY/LIMITATION OF LIABILITY: THE SOLE AND EXCLUSIVE REMEDY FOR BREACH OF THIS LIMITED WARRANTY AND THE SOLE AND EXCLUSIVE OBLIGATION OF RIIFO WITH RESPECT TO ANY CLAIMS FOR BREACH OF THIS LIMITED WARRANTY, SHALL BE AS SET FORTH ABOVE. IN NO EVENT SHALL RIIFO BE LIABLE FOR ANY SPECIAL, CONSEQUENTIAL, INCIDENTAL, PUNITIVE, OR INDIRECT DAMAGES, LOST PROFITS, LOSS OF GOODWILL, LOSS OF BUSINESS OPPORTUNITIES, OR DAMAGE TO REPUTATION.

Warranty Claim Process: Any warranty claim by Owner regarding an alleged defective Product shall be made in writing to RIIFO, postmarked within the applicable warranty period and no later than ten (10) days after the date the defect is discovered, or in the exercise of ordinary care should have been discovered. Such notification should be sent to the RIIFO address indicated in www.riifo.co.uk, and must include a description of the Product (with model number, if available), date of purchase and/or date of installation (with proof of purchase, if available), and a description of alleged defect. If the Owner cannot determine the date of purchase, RIIFO will deem the production date to be the date of purchase for purposes of this Limited Warranty. Owner shall keep all Products alleged to be defective and, at RIIFO's request and expense, ship the Product(s) to RIIFO for inspection. In the event Owner is seeking the reimbursement of property damages as set forth above, Owner must detailed documentation of the claimed damages, including photographs, estimates, and invoices. RIIFO shall also have the right, but not the obligation, to inspect the site of installation/damage. Upon receipt of a complete warranty claim, RIIFO will diligently perform an investigation to determine if a manufacturing defect is present.

If RIIFO determines warranty coverage applies, it will promptly notify Owner and provide the remedy set forth in this Limited Warranty. No action by RIIFO under this warranty shall be construed as an admission of liability.

Transferability: This Limited Warranty shall apply for the full applicable warranty period with respect to the original Owner of the real property at which the Product is installed and to any subsequent owner(s) of such property, provided such ownership transfer(s) occur within 10 years of the Product purchase date. Any change in ownership of the property after such 10-year period will void any remaining warranty coverage.

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Product Warranty Periods

PRODUCT NAME/TYPE	WARRANTY PERIOD (FROM DATE OF PURCHASE)	CONDITIONS
PEXa/PEX-b pipe	25 years (if connected and used with RIIFO pipe/fittings) or 10 years if otherwise (subject to written technical approval by RIIFO UK Ltd)	Must comply with ISO 15875
PEX-AL-PEX pipe	25 years (if connected and used with RIIFO pipe/fittings) or 10 years if otherwise (subject to written technical approval by RIIFO UK Ltd)	Must comply with ISO 21003
PE-AL-PE pipe	25 years (if connected and used with RIIFO pipe/fittings) or 10 years if otherwise (subject to written technical approval by RIIFO UK Ltd)	Must comply with ISO 21003
PERT-AL-PERT pipe	25 years (if connected and used with RIIFO pipe/fittings) or 10 years if otherwise (subject to written technical approval by RIIFO UK Ltd)	Must comply with ISO 21003
PPR pipe	25 years (if connected and used with RIIFO pipe/fittings) or 10 years if otherwise (subject to written technical approval by RIIFO UK Ltd)	Must comply with ISO 15874
PF5/PF15 fitting	10 years (if connected and used with RIIFO pipe/fittings) or 5 years if otherwise (subject to written technical approval by RIIFO UK Ltd)	Must comply with ISO 15875
F5 / F8/ F9 /F18 /F6 fitting	10 years (if connected and used with RIIFO pipe/fittings) or 5 years if otherwise (subject to written technical approval by RIIFO UK Ltd)	Must comply with ISO 21003
F1 fitting	2 years	Must comply with ISO 21003
PPR fitting	5 years (if used together with RIIFO pipe)	Must comply with ISO 15874
VALVE	3 years	Must be installed per installation instructions
Water Manifold	3 years	Must be installed per installation instructions
Heating Manifold	3 years	Must be installed per installation instructions