



Plumbing and Heating
For Continental Europe

The brass push-fit solution **with more bite**

Plumbing and heating technical guide



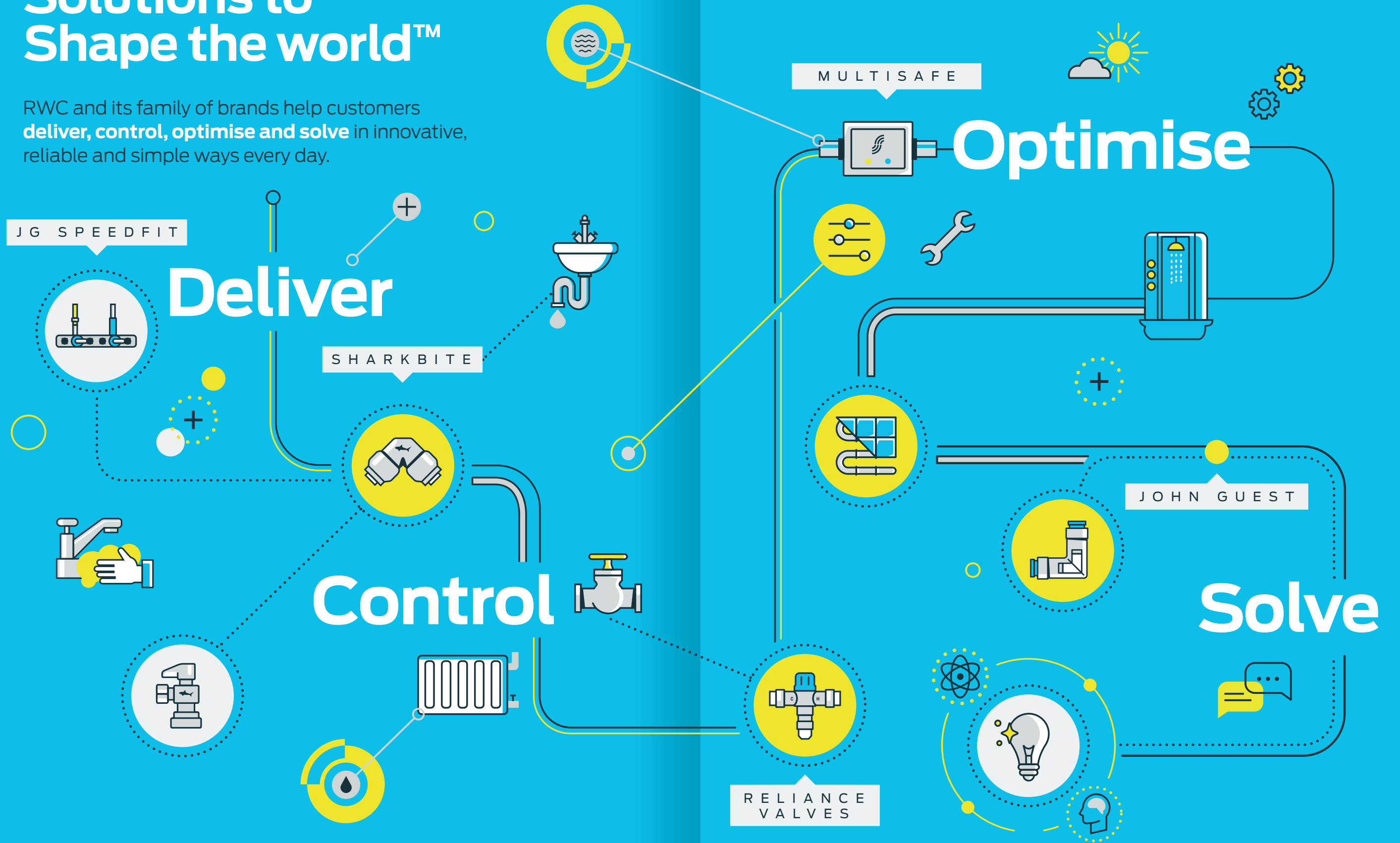
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Solutions to Shape the world™

RWC and its family of brands help customers **deliver, control, optimise and solve** in innovative, reliable and simple ways every day.





The brass push-fit solution with more bite

SharkBite brass push-fit fittings are tough.

SharkBite fittings quickly and securely connect pipes and appliances together. Withstanding high temperature and pressure, the push-fit fittings are ideal for hot and cold water and central heating systems. Made from extra tough material, they are also suitable for connecting copper pipes to boilers (excluding gas applications), as well as recirculating systems.

Manufactured from lead-free 4MS compliant DZR brass, SharkBite's slimline design looks good in front of the wall and is easily detectable when installed behind the wall.

Using a simple and instant push action, SharkBite is safer and cleaner to install than traditional methods as there is no need for tools, soldering, crimping, clamps or glue. SharkBite is also compatible with copper or JG Speedfit PEX Barrier pipe.

Features

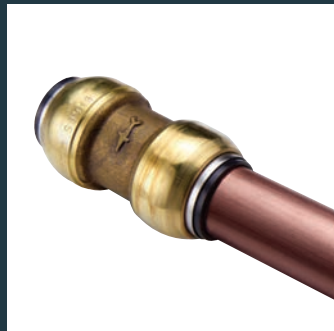
- Instant push-fit connection
- Stainless steel grab ring firmly and securely grips copper or JG Speedfit PEX Barrier pipe
- KIWA Class III approved EDPM O-Ring withstands high temperatures
- Lead-free and non-toxic 4MS compliant DZR brass
- Electrically continuous without the need for extra earth bonding
- Slimline profile available in 12 to 28mm sizes

Benefits

- Durable solution with high pressure and temperature rating
- 40% faster to install than traditional methods
- Secure tamperproof demounting
- Safe and simple to install using no tools, hot works, crimping, clamps or glue
- Easy to fit, especially in tight spaces when manoeuvring tools is difficult
- Brass slimline design looks good in front, and easily detectable, behind the wall

One solution for Copper and JG Speedfit PEX Barrier pipe

The SharkBite fitting and valve range has been developed to provide a single solution for copper and innovative JG Speedfit PEX Barrier pipes – for domestic and commercial applications. It has been rigorously tested and approved.



Copper

SharkBite fittings and valves will connect compatibly sized copper pipes that are manufactured in accordance with DIN EN 1057 in sizes from 12mm to 28mm.



JG Speedfit Pex Barrier

JG Speedfit cross linked Polyethylene (PEX) Barrier pipe can be joined with SharkBite fittings and pipe liners for every connection. Available in 2 sizes, 12mm and 15mm, in a range of straight lengths or coils. Inserts are required when installing with PEX barrier pipe.

JG Speedfit PEX Barrier pipe has superior flexibility making the system very easy to handle and simple to install.

The pipe is made of 5 layers, the centre of which is a coloured Oxygen barrier which prevents the ingress of air into the system, reducing the effect of corrosion on metal components.

How to make a copper connection



Step 1: Cut & deburr

Cut the pipe square and deburr



Step 2: Mark

Mark insertion depth using the depth marker on the demount clip or using a tape measure



Step 3: Push & twist

Push pipe into fitting up to the depth mark with a small twist – DONE

Easy removal



Disconnecting clips

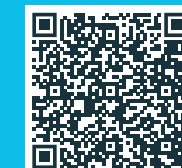
Demount (12 to 28mm), by using the SharkBite disconnecting clip (snap clip onto pipe, push against the release collar & pull pipe at the same time)



Disconnecting tongs

Demount (12 to 28mm), by using SharkBite disconnecting tongs (push tongs over pipe, squeeze tongs together and pull pipe at same time, using the thumb as a lever)

Watch our online how-to SharkBite videos here:



How to make a Speedfit connection

Four simple steps



Step 1: Cut

Cut the pipe square. Recommend using JG pipe cutter JG-TS



Step 2: Insert

Place JG Speedfit TSM insert inside pipe, ensure fully inserted



Step 3: Mark

Mark insertion depth using the depth marker on the demount clip or using a tape measure



Step 4: Push & twist

Push pipe into fitting up to the depth mark with a small twist – DONE

Easy removal



Disconnecting clips

Demount (12 to 28mm), by using the SharkBite disconnecting clip (snap clip onto pipe, push against the release collar & pull pipe at the same time)



Disconnecting tongs

Demount (12 to 28mm), by using SharkBite disconnecting tongs (push tongs over pipe, squeeze tongs together and pull pipe at same time, using the thumb as a lever)

Watch our online how-to SharkBite videos here:



Slip feature function

The 'slip feature' function is designed to permit easy repairs and extensions to be made on wet or dry systems in seconds. Slip couplings and our unique slip tees that are manufactured with one end of the fitting with the 'slip feature' as standard.

Identify the area for repair or additional pipework

Identify the section to be removed for repair using a slip coupling or if you are adding additional pipework to an existing pipe, use a slip tee.

Mark the section to be removed, dependent upon the pipe size as shown below:

15mm pipe – repairable section 34mm

18mm pipe – repairable section 34mm

22mm pipe – repairable section 39mm

Note: It is important the correct size section is removed as detailed above. Any smaller section will not provide sufficient space to engage the second pipe and may partially block the flow of the branch on a tee. Larger removed sections would create short pipe engagement.

Cut

Cut out the section using a proprietary pipe cutter and deburr the pipe. Ensure that the pipe is free from burrs, scratches and debris. Mark the pipe insertion depths (see insertion depths section) on both pipes.

Push

Align pipe 1 with the bore of the slip end of the fitting and insert fully until the stop end of the fitting is clear of pipe 2.

Note: At this point the bore of the branch is completely blocked.

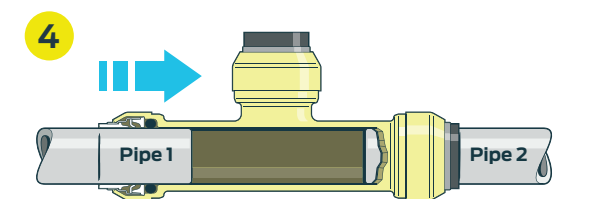
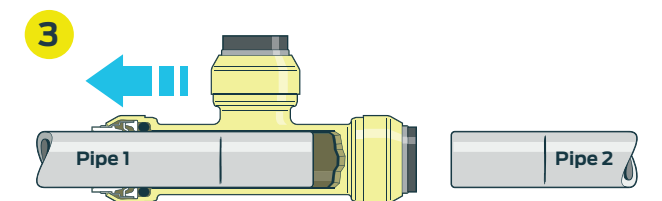
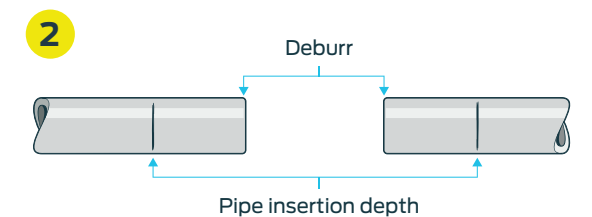
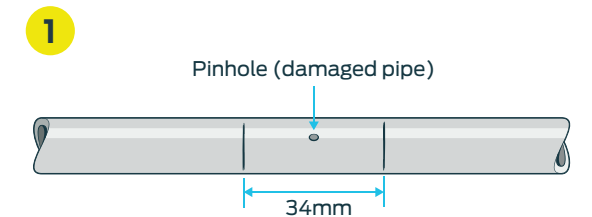
Withdraw pipe 1 allowing pipe 2 to engage up to the insertion mark. Do not withdraw pipe 1 further than the depth insertion mark.

Note: The pipe is now clear of the branch.

Done

You have now completed a repair or added additional pipework into an existing system in minutes.

Diagram shows the repairable section to a 15mm pipe



Applications & approvals

SharkBite is ideal for both domestic and commercial applications in accordance with the specification including:

- Potable water applications
- Vented and unvented hot water systems
- Hot and cold-water services
- Heating and chilled water applications
- Pressurised, vented and sealed central heating systems
- Recirculating hot water systems with copper pipe

Guarantee



Approvals

The SharkBite range has been designed to exceed all approval requirements and has been certified by the following approval bodies:



*For copper pipe 12-28mm



*For copper pipe 12-28mm & JG Speedfit PEX Barrierpipe 12 and 15mm



*For copper pipe 12-28mm & JG Speedfit PEX Barrierpipe 12 and 15mm

SharkBite design

The SharkBite logo represents genuine, high quality plumbing fittings that redefine the meaning of high performance and efficiency in the plumbing industry.

SharkBite fittings provide a fast, secure and heat-free pipework connection solution that will reduce installation times and the requirement to return to an installation in the future. Their slim-line design provides an aesthetically pleasing appearance when surface mounted. It also makes the fittings ideal for installation in tight spaces and easier to insulate, if required.

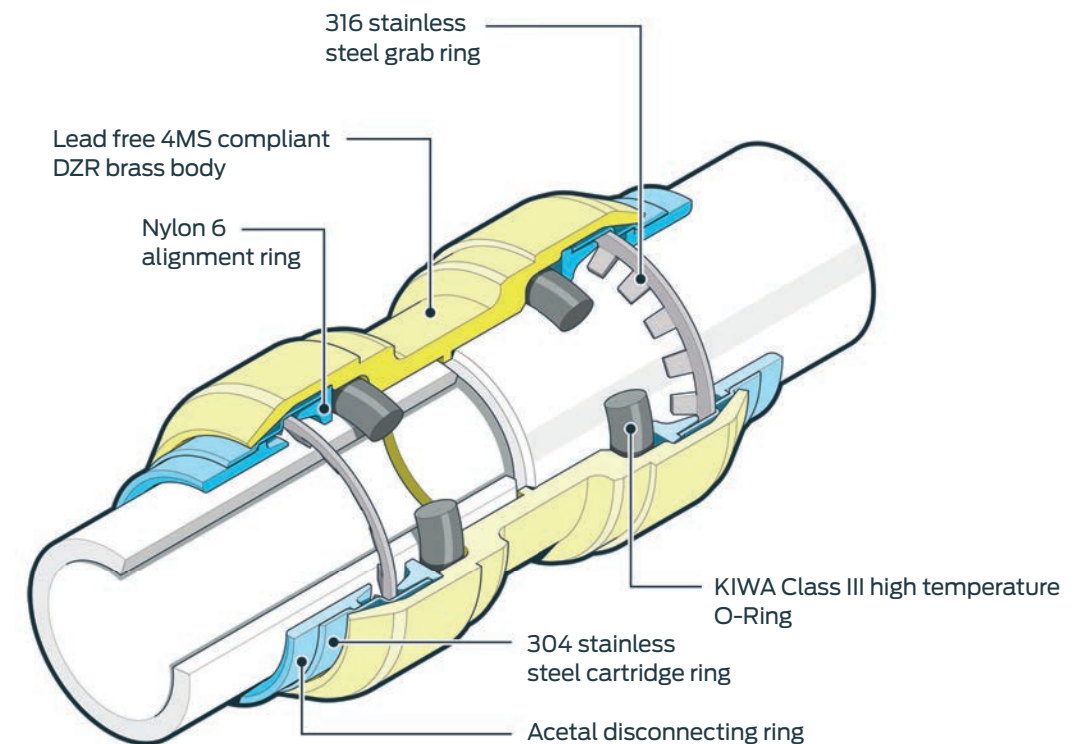
The fitting bodies are manufactured from robust lead free 4MS compliant DZR brass. The toothed grab ring is manufactured from 316 stainless steel which provides the firm bite that ensures the strongest of joints is made.

The cartridge ring is manufactured from 304 stainless steel to provide guaranteed electrical continuity. The KIWA Class III high temperature O-Ring provides a long lasting and watertight seal and can be used with recirculating hot water systems.

Features:

- 12mm – 28mm fittings rated to 10 bar at 120°C when using copper pipe
- All fittings' bodies are also date marked to ensure full traceability

Engineering built to last



SharkBite specification

An approved range of 12-28mm lead free 4MS compliant DZR Brass push-fit plumbing fittings and valves, with a stainless steel cartridge ring. DVGW and KIWA approved with copper pipe (12-28mm) and KIWA plus KOMO approved with JG Speedfit PEX Barrier pipe (12mm and 15mm).

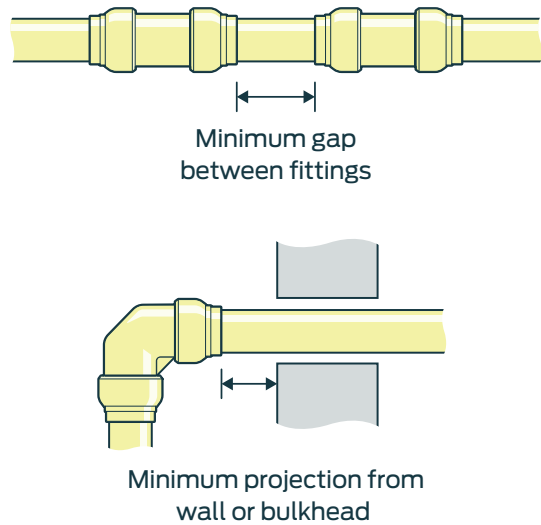
De-mountable and instantly re-useable, providing electrical continuity for metallic installations and compact to assist in system lagging. Suitable for secondary recirculating systems. Date marking on the actual fitting to ensure full traceability.

System design

Minimum distances

To facilitate the disconnection of SharkBite fittings, it is essential that sufficient space is allowed between the fitting and wall or bulkhead to allow demounting.

Fitting size	Minimum gap	Minimum projection
12mm	15mm	45mm
15mm	15mm	45mm
18mm	15mm	50mm
22mm	15mm	50mm
28mm	15mm	55mm



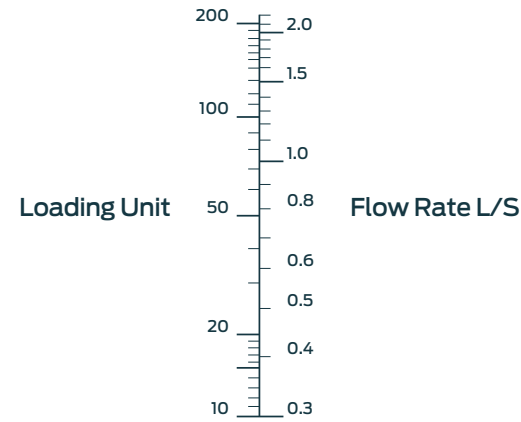
Loading units

When designing an installation, system demand, pipe sizes and flow rates need to be considered and calculated.

Demand is calculated by considering the flow rate of the appliance, the frequency and length of time used. Examples of loading units are shown in the table below. The total loading units can then be converted into demand in litres per second.

Appliance	Loading Units
Toilet Cistern	2
Washbasin 1/2" – DN15	1.5-3
Bath Taps 3/4" – DN20	10
Bath Tap 1" – DN25	20
Shower	3
Sink Tap 1/2" – DN15	3
Sink Tap 3/4" – DN20	5
Washing Machine 1/2" – DN15	3

Conversion Loading Units to Flow Rate



Pressure loss and flow rates

Pressure or head loss at 10°C due to selected pipe diameter and the resistance of the fittings can be calculated in metres per 100 metres from the table below:

Lamont's smooth pipe formula S3
 $v = 0.5545 d^{0.6935} i^{0.5645}$

where: v is the velocity (m/s);
 d is the diameter (mm);
 i is the hydraulic gradient

$$\text{and } R = 10 \left[\frac{v}{0.5545 d^{0.6935}} \right]^{1.7715}$$

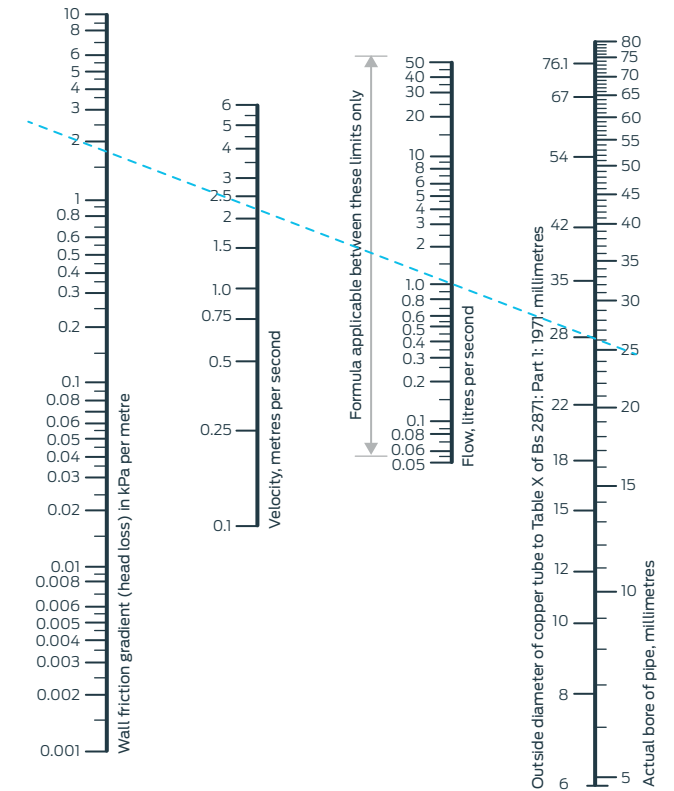
where: R is the wall friction gradient (kPa)

Example

Assuming a loading rate of 75 gives a flow rate of 1 litre/second

Draw a straight line through the selected pipe OD and the flow rate

Therefore a 28mm OD pipe would provide a water velocity of 2.1m/s and a head loss of 1.8Kpa per metre



Pressure loss at 15.5°C – copper pipe

Pressure drop Pa/m	12mm			15mm			18mm			22mm			28mm		
	Average velocity m/s	Average velocity l/s	Average velocity kg/hr	Average velocity m/s	Average velocity l/s	Average velocity kg/hr	Average velocity m/s	Average velocity l/s	Average velocity kg/hr	Average velocity m/s	Average velocity l/s	Average velocity kg/hr	Average velocity m/s	Average velocity l/s	Average velocity kg/hr
100	0.262	0.0206	74.04	0.286	0.0379	136.43	0.309	0.0622	223.78	0.341	0.1071	385.33	0.408	0.2000	719.56
120	0.228	0.0179	64.28	0.274	0.0363	130.58	0.319	0.0642	231.04	0.381	0.1196	430.25	0.451	0.2216	797.14
140	0.252	0.0198	71.05	0.300	0.0399	143.35	0.349	0.0702	252.40	0.414	0.1301	467.82	0.495	0.2428	873.23
160	0.272	0.0214	76.83	0.325	0.0431	155.16	0.378	0.0760	273.40	0.449	0.1410	507.09	0.533	0.2618	941.65
180	0.293	0.0230	82.72	0.349	0.0463	166.50	0.405	0.0814	292.67	0.479	0.1506	541.56	0.571	0.2803	1,008.39
200	0.312	0.0245	88.18	0.372	0.0493	177.37	0.431	0.0866	311.60	0.510	0.1602	576.31	0.609	0.2990	1,075.31
220	0.327	0.0257	92.45	0.391	0.0519	186.67	0.455	0.0914	328.88	0.540	0.1696	609.92	0.641	0.3149	1,132.52
240	0.345	0.0271	97.46	0.412	0.0547	196.58	0.479	0.0962	346.05	0.568	0.1783	641.28	0.674	0.3308	1,189.91
260	0.364	0.0286	102.85	0.433	0.0574	206.61	0.501	0.1008	362.64	0.593	0.1863	670.10	0.707	0.3468	1,247.49
280	0.378	0.0297	106.80	0.450	0.0598	214.96	0.522	0.1050	377.85	0.619	0.1944	699.19	0.738	0.3623	1,303.20
300	0.396	0.0311	111.75	0.470	0.0624	224.51	0.545	0.1096	394.10	0.645	0.2025	728.29	0.767	0.3767	1,354.99
350	0.432	0.0339	121.94	0.513	0.0681	244.80	0.594	0.1194	429.48	0.702	0.2205	793.27	0.841	0.4128	1,484.90
400	0.469	0.0369	132.59	0.556	0.0738	265.57	0.643	0.1293	465.13	0.759	0.2384	857.68	0.905	0.4442	1,597.83
450	0.500	0.0392	141.15	0.594	0.0788	283.35	0.687	0.1382	497.10	0.813	0.2553	918.13	0.968	0.4751	1,709.06
500	0.533	0.0419	150.67	0.632	0.0839	301.85	0.731	0.1470	528.77	0.863	0.2711	975.20	1.028	0.5045	1,814.69
600	0.595	0.0467	168.08	0.704	0.0934	335.87	0.812	0.1633	587.27	0.957	0.3006	1,081.14	1.140	0.5597	2,013.04
700	0.648	0.0509	183.10	0.768	0.1019	366.43	0.887	0.1783	641.38	1.046	0.3286	1,181.99	1.244	0.6106	2,196.43
800	0.701	0.0550	197.89	0.829	0.1100	395.67	0.957	0.1924	692.11	1.128	0.3544	1,274.65	1.342	0.6586	2,368.80

Pressure loss at 65°C – copper pipe

Pressure drop Pa/m	12mm			15mm			18mm			22mm			28mm		
	Average velocity			Average velocity			Average velocity			Average velocity			Average velocity		
	m/s	l/s	kg/hr	m/s	l/s	kg/hr	m/s	l/s	kg/hr	m/s	l/s	kg/hr	m/s	l/s	kg/hr
100	0.241	0.0189	66.72	0.286	0.0379	133.90	0.331	0.0665	234.85	0.391	0.1228	433.65	0.455	0.2235	788.98
120	0.269	0.0212	74.68	0.319	0.0423	149.25	0.368	0.0739	260.98	0.433	0.1361	480.51	0.505	0.2479	875.22
140	0.294	0.0231	81.42	0.348	0.0462	162.95	0.402	0.0808	285.24	0.474	0.1489	525.71	0.552	0.2708	955.95
160	0.317	0.0249	87.79	0.375	0.0498	175.72	0.433	0.0871	307.63	0.511	0.1606	567.02	0.595	0.2921	1,031.18
180	0.339	0.0266	93.97	0.401	0.0533	188.02	0.464	0.0932	329.08	0.547	0.1718	606.39	0.636	0.3124	1,102.74
200	0.361	0.0283	100.02	0.427	0.0566	199.85	0.492	0.0990	349.43	0.580	0.1822	643.27	0.677	0.3321	1,172.47
220	0.382	0.0300	105.89	0.451	0.0599	211.33	0.520	0.1046	369.18	0.612	0.1923	679.04	0.714	0.3503	1,236.68
240	0.402	0.0316	111.50	0.474	0.0629	222.23	0.546	0.1099	387.81	0.643	0.2018	712.59	0.750	0.3680	1,299.07
260	0.419	0.0329	116.20	0.495	0.0657	232.07	0.571	0.1149	405.61	0.673	0.2114	746.41	0.785	0.3851	1,359.62
280	0.439	0.0345	121.75	0.518	0.0687	242.61	0.596	0.1199	423.33	0.701	0.2203	777.75	0.818	0.4018	1,418.33
300	0.456	0.0358	126.32	0.538	0.0714	251.98	0.620	0.1246	440.03	0.730	0.2292	809.08	0.851	0.4179	1,475.21
350	0.497	0.0390	137.70	0.585	0.0777	274.24	0.674	0.1355	478.31	0.792	0.2488	878.40	0.930	0.4565	1,611.64
400	0.537	0.0422	148.95	0.634	0.0841	296.97	0.730	0.1468	518.37	0.859	0.2699	952.70	1.002	0.4917	1,735.76
450	0.576	0.0452	159.73	0.679	0.0901	317.94	0.781	0.1570	554.31	0.918	0.2882	1,017.59	1.070	0.5255	1,855.03
500	0.611	0.0480	169.47	0.720	0.0955	337.27	0.828	0.1665	587.93	0.973	0.3057	1,079.14	1.136	0.5577	1,968.79
600	0.678	0.0533	188.04	0.799	0.1060	374.17	0.919	0.1847	652.19	1.079	0.3391	1,196.98	1.259	0.6180	2,181.63
700	0.742	0.0583	205.85	0.873	0.1158	408.84	1.003	0.2016	711.64	1.176	0.3695	1,304.28	1.373	0.6741	2,379.79
800	0.801	0.0629	222.15	0.941	0.1249	441.06	1.081	0.2174	767.51	1.268	0.3984	1,406.32	1.480	0.7266	2,565.11

Pressure loss at 110°C – copper pipe

Pressure drop Pa/m	12mm			15mm			18mm			22mm			28mm		
	Average velocity			Average velocity			Average velocity			Average velocity			Average velocity		
	m/s	l/s	kg/hr	m/s	l/s	kg/hr	m/s	l/s	kg/hr	m/s	l/s	kg/hr	m/s	l/s	kg/hr
100	0.272	0.0214	72.91	0.321	0.0425	144.99	0.369	0.0741	252.59	0.433	0.1360	463.35	0.499	0.2448	834.31
120	0.302	0.0237	80.75	0.355	0.0472	160.71	0.409	0.0822	280.15	0.480	0.1509	514.21	0.554	0.2718	926.42
140	0.329	0.0258	87.99	0.387	0.0514	175.07	0.445	0.0895	305.13	0.523	0.1643	559.98	0.604	0.2963	1,009.67
160	0.358	0.0281	95.86	0.420	0.0557	189.77	0.481	0.0967	329.53	0.563	0.1768	602.54	0.651	0.3196	1,089.38
180	0.382	0.0300	102.21	0.448	0.0595	202.78	0.515	0.1035	352.69	0.603	0.1895	645.91	0.696	0.3415	1,163.78
200	0.402	0.0316	107.66	0.473	0.0628	214.09	0.544	0.1094	372.97	0.639	0.2007	684.18	0.738	0.3623	1,234.64
220	0.426	0.0334	113.91	0.500	0.0664	226.19	0.574	0.1155	393.65	0.674	0.2117	721.39	0.779	0.3825	1,303.72
240	0.447	0.0351	119.68	0.526	0.0698	237.84	0.604	0.1215	414.16	0.709	0.2228	759.40	0.818	0.4018	1,369.26
260	0.471	0.0370	126.06	0.552	0.0733	249.82	0.634	0.1274	434.16	0.742	0.2331	794.47	0.856	0.4199	1,431.26
280	0.489	0.0384	130.94	0.574	0.0762	259.78	0.659	0.1326	451.80	0.773	0.2428	827.39	0.892	0.4376	1,491.48
300	0.509	0.0399	136.11	0.597	0.0792	270.07	0.686	0.1378	469.74	0.804	0.2524	860.32	0.928	0.4553	1,551.71
350	0.552	0.0433	147.71	0.647	0.0858	292.57	0.742	0.1491	508.24	0.868	0.2728	929.64	1.010	0.4958	1,689.72
400	0.600	0.0472	160.70	0.703	0.0933	318.02	0.806	0.1620	552.07	0.943	0.2961	1,009.14	1.090	0.5348	1,822.73
450	0.639	0.0502	170.98	0.750	0.0995	339.17	0.861	0.1731	589.83	1.009	0.3169	1,080.08	1.164	0.5712	1,946.72
500	0.679	0.0533	181.82	0.796	0.1057	360.20	0.913	0.1836	625.81	1.069	0.3359	1,144.86	1.235	0.6060	2,065.40
600	0.754	0.0592	201.81	0.883	0.1171	399.22	1.011	0.2033	692.84	1.183	0.3715	1,266.12	1.367	0.6710	2,286.82
700	0.819	0.0643	219.24	0.961	0.1276	434.73	1.103	0.2218	755.81	1.292	0.4060	1,383.63	1.491	0.7318	2,494.07
800	0.885	0.0695	237.01	1.037	0.1377	469.23	1.189	0.2391	814.82	1.392	0.4372	1,489.89	1.606	0.7884	2,687.15

Working pressures and temperatures

Fittings – Manufacturers' ratings

Size	Pipe	Pressure/Temperature			
12mm	Copper	20 Bar / -24°C*	20 Bar / 30°C	16 Bar / 65°C	10 Bar / 120°C
	PEX	12 Bar / -20°C*	12 Bar / 20°C	6 Bar / 65°C	6 Bar / 95°C
15mm	Copper	20 Bar / -24°C*	20 Bar / 30°C	16 Bar / 65°C	10 Bar / 120°C
	PEX	12 Bar / -20°C*	12 Bar / 20°C	6 Bar / 65°C	6 Bar / 95°C
18mm	Copper	20 Bar / -24°C*	20 Bar / 30°C	16 Bar / 65°C	10 Bar / 120°C
22mm	Copper	20 Bar / -24°C*	20 Bar / 30°C	16 Bar / 65°C	10 Bar / 120°C
28mm	Copper	20 Bar / -24°C*	20 Bar / 30°C	16 Bar / 65°C	10 Bar / 120°C

*Pipes should be protected to prevent frost damage

Quarter turn ball valves – manufacturers' ratings

Size	Pipe	Pressure/Temperature		
15mm	Copper	16 Bar / 20°C	10 Bar / 65°C	10 Bar / 85°C
	PEX	12 Bar / 20°C	6 Bar / 65°C	6 Bar / 85°C
22mm	Copper	16 Bar / 20°C	10 Bar / 65°C	10 Bar / 85°C

Thermal expansion tables

Copper pipe

The design of the system must consider thermal expansion. Copper pipes will expand with temperature and long runs may buckle or bend unless compensation is incorporated into the system. This can be prevented by installing copper bellows or a telescopic expansion device, which will absorb the expansion and contraction. The amount of expansion in a copper system can be calculated using the formula below:

$$L = \frac{1}{2} \left(\frac{3E}{P} \right)^{1/2} (d_0 e)^{1/2}$$

Where

- L – Length of expansion loop or offset
- E – Modulus of elasticity of Copper, in psi
- P – Design fibre stress of material in flexure, in psi
- do – Outside diameter of pipe, in inches
- e – Amount of expansion to be absorbed, in inches

For annealed copper pipe

- E = 17,000,000psi
- P = 6,000psi

$$\therefore L = 7.68 (d_0 e)^{1/2}$$

Copper pipe expansion

Temperature	3 metres	4 metres	5 metres	6 metres	7 metres	8 metres	9 metres	10 metres	12 metres	25 metres
10°	0.5mm	0.7mm	0.9mm	1.0mm	1.2mm	1.4mm	1.5mm	1.7mm	2.0mm	4.3mm
20°	1.0mm	1.4mm	1.7mm	2.0mm	2.4mm	2.7mm	3.0mm	3.4mm	4.0mm	8.5mm
30°	1.5mm	2.0mm	2.6mm	3.1mm	3.6mm	4.1mm	4.6mm	5.1mm	6.1mm	13.0mm
40°	2.0mm	2.7mm	3.4mm	4.1mm	4.8mm	5.4mm	6.1mm	6.8mm	8.2mm	17.0mm
50°	2.6mm	3.4mm	4.3mm	5.1mm	6.0mm	6.8mm	7.7mm	8.5mm	10.2mm	21.0mm
60°	3.1mm	4.1mm	5.1mm	6.1mm	7.1mm	8.2mm	9.2mm	10.2mm	12.2mm	26.0mm
70°	3.6mm	4.8mm	6.0mm	7.1mm	8.3mm	9.5mm	10.7mm	11.9mm	14.3mm	30.0mm
80°	4.1mm	5.4mm	6.8mm	8.2mm	9.5mm	10.9mm	12.2mm	13.6mm	16.3mm	34.0mm
90°	4.6mm	6.1mm	7.7mm	9.2mm	10.7mm	12.2mm	13.8mm	15.3mm	18.4mm	38.0mm
100°	5.1mm	6.8mm	8.5mm	10.2mm	11.9mm	13.6mm	15.3mm	17.0mm	20.4mm	43.0mm

JG Speedfit Barrier PEX pipe expansion

Temperature	3 metres	4 metres	5 metres	6 metres	7 metres	8 metres	9 metres	10 metres	12 metres	25 metres
10°	2.4mm	3.2mm	4.0mm	4.8mm	5.6mm	6.4mm	7.2mm	8.0mm	9.6mm	20.0mm
20°	4.8mm	6.4mm	8.0mm	9.6mm	11.2mm	12.8mm	14.4mm	16.0mm	19.2mm	40.0mm
30°	7.2mm	9.6mm	12.0mm	14.4mm	16.8mm	19.2mm	21.6mm	24.0mm	28.8mm	60.0mm
40°	9.6mm	12.8mm	16.0mm	19.2mm	22.4mm	25.6mm	28.8mm	32.0mm	38.4mm	80.0mm
50°	12.0mm	16.0mm	20.0mm	24.0mm	28.0mm	32.0mm	36.0mm	40.0mm	48.0mm	100.0mm
60°	14.4mm	19.2mm	24.0mm	28.8mm	33.6mm	38.4mm	43.2mm	48.0mm	57.6mm	120.0mm
70°	16.8mm	22.4mm	28.0mm	33.6mm	39.2mm	44.8mm	50.4mm	56.0mm	67.2mm	140.0mm
80°	19.2mm	25.6mm	32.0mm	38.4mm	44.8mm	51.2mm	57.6mm	64.0mm	76.8mm	160.0mm
90°	21.6mm	28.8mm	36.0mm	43.2mm	50.4mm	57.6mm	64.8mm	72.0mm	86.4mm	180.0mm
100°	24.0mm	32.0mm	40.0mm	48.0mm	56.0mm	64.0mm	72.0mm	80.0mm	96.0mm	200.0mm

Expansion and contraction

Compared with steel or copper, PEX has a high coefficient of expansion, and precautions should be taken to compensate for this. The coefficient of expansion for JG Speedfit PEX Barrier pipe increases from about $1.5 \times 10^{-4} \text{m}/^\circ\text{C}$ at 20°C to approximately $2.8 \times 10^{-4} \text{m}/^\circ\text{C}$ at 82°C .

N.B. Allow for 1% expansion on the length when pipe is installed at 20°C for use up to 82°C .

Where JG Speedfit PEX Barrier pipe is to be surface mounted and used in visible situations for either hot-water supply or central-heating pipework, long straight runs should be avoided since some distortion may occur. Where this is not practicable, pipework should be boxed. Care should be taken to ensure that pipework is laid out to allow for expansion and contraction. Where appropriate, expansion loops may be employed.

System installation

Pipe guidance

SharkBite includes a special component which provides pipe guidance and reduces the risk of misalignment or damaging the O-Ring during installation, thus offering 'superior O-Ring protection'.

The table below shows the pipe insertion depths for SharkBite fittings, if marking the pipe with a tape measure.

Insertion depths

Fitting size		Insertion depth
12mm	Copper + Speedfit BPEX	24mm
15mm	Copper + Speedfit BPEX	22mm
18mm	Copper	26mm
22mm	Copper	28mm
28mm	Copper	32mm

Fitting materials

Body	CW724R Lead Free CW724R Lead Free 4MS compliant DZR Brass3 Brass
O-Ring	Ethylene Polypropylene Diene Monomer (EPDM)
Cartridge Ring	304 stainless steel
Alignment Ring	Nylon 6
Grab Ring	316 stainless steel
Disconnecting Ring	Acetal Copolymer

Ball valve materials

Body	CW724R Lead Free 4MS compliant DZR Brass
Ball	CW724R Lead Free 4MS compliant DZR Brass
Stem	CW724R Lead Free 4MS compliant DZR Brass
Lever	PVC Coated Steel
O-Ring	Ethylene Polypropylene Diene Monomer (EPDM)
Cartridge Ring	304 stainless steel
Alignment Ring	Nylon 6
Grab Ring	316 stainless steel
Disconnecting Ring	Acetal Copolymer

Electrical continuity

SharkBite fittings provide electrical continuity when used with copper pipe.

Manufacturing standards

Male BSP threaded connectors are available with tapered threads up to 1". Female BSP parallel threaded connectors are manufactured to ISO7.

Threaded adaptors

When assembling threaded adaptors, we recommend the use of standard sealing procedures with hemp, PTFE and other installation approved sealing materials.

Care should be taken to ensure that adaptors are not over-tightened as this could create leaking or joint failure.

Installing with copper pipework

Pipework sizing

For general guidance on pipework sizing, please refer to EN 806 international guidelines.

For each diameter there are SharkBite disconnecting clips and disconnecting tongs available.

Pipework insulation

The insulation requirements should comply with EN 806 international guidelines.

Clipping

RWC recommends the use of pipe clips and trunking systems designed for use with copper wherever possible, making due allowance for expansion and contraction of the pipework. Where copper pipe is to be surface mounted and visible, the following clipping distances are recommended:

Fittings Size	Copper	
	Horizontal	Vertical
12mm	1.0m	1.5m
15mm	1.2m	1.8m
18mm	1.4m	2.0m
22mm	1.8m	2.4m
28mm	1.8m	2.4m

Pipe bending information

Bending copper pipe

Copper pipe up to 28mm should be bent using a portable bending machine. Bending copper pipe correctly will avoid the pipe wrinkling or flattening which can affect flow conditions.

To eliminate the risk of the pipe wall collapsing, most bending machines bend the pipe between the formers and guides to support the outside diameter (OD) of the pipe. The point at which the bending pressure is applied must remain consistent at the correct distance in front of the former's point of support. It is important to ensure bending equipment is well maintained and kept lubricated.

Chemical effects

Only water or oil-based paints should be used. Do not allow SharkBite fittings to come into contact with jointing compounds, cellulose based paints, paint thinners or strippers, solder flux, acid based descalents or aggressive cleaning products including those below pH4, high in hypochlorite (e.g. bleach) or containing hydrogen peroxide.

If there is a risk of any chemical treatments coming into contact with the system, please contact the Technical team first to check compatibility.

System testing

On completion of the plumbing and heating system it is essential that system checking and a hydraulic wet test takes place. Connections to boilers, radiators and sanitary ware should first be capped or plugged. Testing should be carried out at 2 bar for 10 minutes followed by 10 bar for 10 minutes. This testing combined with other relevant checks, should reveal most system problems. Any components within the system not designed to take these pressures should be disconnected.

Before carrying out a pressure test ensure all pipe and fittings are installed correctly.

Pressure testing is NOT a substitute for making sure fittings are clean and free of any grit, dirt or swarf and that the pipe is correctly inserted (see Making a Good Connection).

Fluxes

RWC does not recommend that fluxes of any type come into contact with our pipe and fittings. However, if fluxes are used in an environment where our pipe and fittings are installed, then we recommend installers use non-acidic and zinc chloride free fluxes such as Fernox Flux.

System commissioning and flushing

With existing systems, flushing prior to the use of RWC pipe and fittings is essential to remove any harmful contamination or chemical residues from elsewhere in the system.

For the installation of central heating systems, flushing procedures must be in line with EN1264-4:2009 and DIN 4726 codes of practice for the treatment of water in domestic hot water heating systems. Flux residues used in the soldering of capillary fittings are very corrosive. Dirt and grit, which can enter the system when pipe is being pushed through underfloor or across a roof space, must be removed.

During the commissioning of a heating system, all air must be removed from the system before the boiler is allowed to fire. This will ensure pockets of air do not cause localized overheating within the system, as this could have a detrimental effect on the pipework and boiler.

Connection to boilers

Although most modern boilers have a high limit thermostat, residual heat can be conducted by the heat exchanger. Therefore, RWC recommend a minimum of 1 metre from the boiler casing should be run in copper pipe unless otherwise stated in the boiler manufacturer's installation literature.

A gravity primary circuit operating on an uncontrolled cooking range or solid fuel boiler should be run entirely in copper and the heating circuit run in copper for the first metre. Refer to ISO1167 and ISO21103 for further clarification.

All appliances should have safety devices to make sure they cannot operate above the working temperature and pressure ranges. If safety devices are not incorporated within the appliance, then external controls will be needed.

Water meters (and other devices) can contain check valves that prevent the expansion of heated water back down the main supply from a combi boiler. If plastic pipe is to be used, a suitable expansion vessel must be fitted. This is especially important to consider if a water meter is fitted retrospectively. RWC do not recommend the use of plastic pipe on the main supply between a water meter and a combi boiler if an expansion vessel is not fitted.

RWC pipe and fittings should not be fitted to a sealed system oil boiler, a back fired boiler or other uncontrolled heat source.

Continuously operated re-circulating systems (Secondary hot water circulation/ring main installations)

A continuously operated re-circulating system is a water-replenished circulating system which is maintained at a constant high temperature to provide a constant source of hot water. Continuously operated re-circulating systems are used to distribute constant hot water to draw off points that may be distant from the source or hot water storage vessel.

SharkBite when used with copper pipe is approved for use with re-circulating systems operating within our published specifications.

Unvented pressurised cylinders

Unvented pressurised cylinders can be installed using SharkBite systems. However, if the safety parameters of the cylinder exceed those of the pipe and fittings it is possible to fit a pressure reduction valve on the outgoing hot supply pipe. This will not interfere with any other cylinder safety devices demanded by regulations as they are all fitted in the incoming side of the cylinder.

Run a short length of copper pipe from the cylinder connection (about 150mm – 300mm) then fit a suitable pressure reduction valve. This will protect the pipe and fittings from excessive pressure in the event of boiler/ cylinder malfunction. The factory fitted temperature/ pressure relief valve on the cylinder will discharge below 100°C therefore protecting the pipe from excessive temperature.

Connection to cylinders and water heaters

SharkBite systems can be used on sealed and open vented heating systems, where boilers are either heating a hot water storage cylinder or instantaneous hot water such as a combination boiler. The temperature and pressure limits of the system must not exceed the maximum values stated under the heading 'Working Temperatures and Pressures'.

When using a traditional copper vented cylinder SharkBite systems can be installed with direct connections to the cylinder. Unvented pressurised cylinders can be installed using SharkBite systems. However, insertion depths on compression joints that form part of the cylinder must be checked prior to installation.

Installing with JG Speedfit PEX Barrier pipe

Additional information

JG Speedfit PEX Barrier pipe (BPEX)

JG Speedfit PEX Barrier pipe is made up of 5 layers, the centre of which is a blue coloured oxygen barrier which prevents the ingress of air into the system, thereby reducing the effect of corrosion on metal components. Because of its low thermal conductivity when carrying hot water, Speedfit pipe is cooler and therefore safer to touch.

Relatively low heat loss through radiation means that a system retains its heat longer and delivers hot water more quickly and with less wastage than a metal system.

The pipe is available in coils and straight lengths. Pipe markings are spaced to aid the making of a good connection when using a JG Speedfit standard TSM pipe insert.

Pipework sizing

For general guidance on pipework sizing, please refer to EN 806 international guidelines.

For each diameter there are SharkBite disconnecting clips and disconnecting tongs available.

Pipe bending

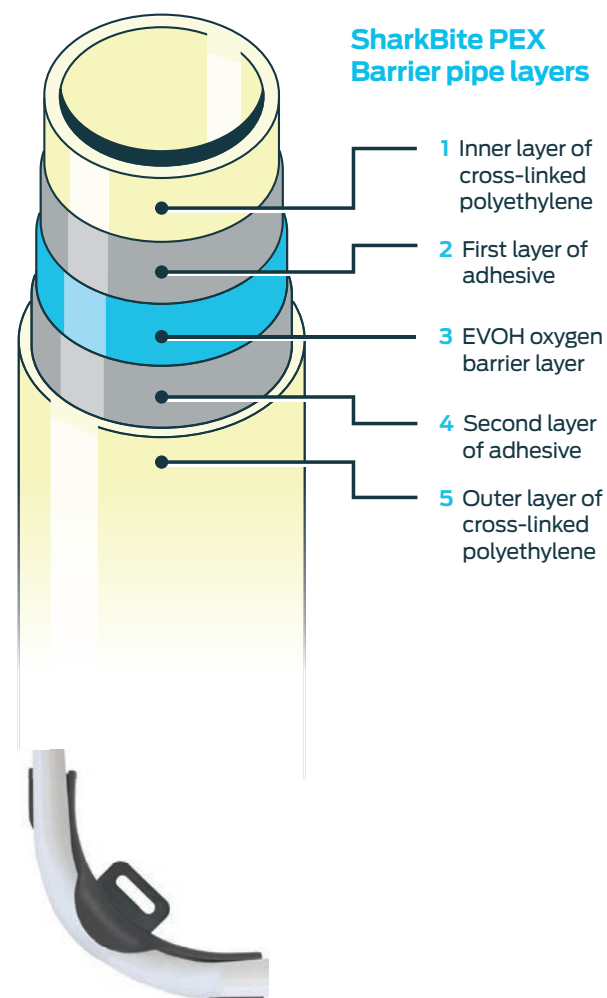
Gentle bends can be made with pipe clips on either side of the curve, positioned to maintain the bend radius.

Tighter bends can be achieved by using the John Guest cold forming bends shown.

It is also possible to bend Speedfit pipe using a standard pipe bender. The pipe should not be heated with a blowlamp or hot air gun.

Minimum bend radii for JG Speedfit PEX Barrier pipe are as follows:

Speedfit min radius	Pipe diameter	
	12mm	15mm
With cold forming bends	N/A	75mm
With clips	120mm	75mm



Clipping

Where JG Speedfit PEX Barrier pipe is to be surface mounted and visible, the following clipping distances are recommended:

Fittings	JG Speedfit PEX Barrier pipe	
	Horizontal	Vertical
12mm	0,3m	0,5m
15mm	0,3m	0,5m

JG Speedfit PEX Barrier pipe dimensions & weights

Dimensions	12mm	15mm
Outside diameter (mm)	12+0.3-0	15 ± 0.1
Wall thickness (mm)	1.7-2.0	1.5-1.8
Weight / 100 (metres)	6kg	7.2kg
Standard lengths	-	2m, 3m & 6m
Standard coils (metres)	5/25	5/25

Exposed pipework

On long exposed runs of pipework, the expansion of Speedfit pipe when warm (1% on length between 20 to 82°C) can cause it to sag between clip fixings. When this is undesirable, pipework can be boxed in.

JG Speedfit PEX Barrier pipe is stabilised to withstand limited exposure to ultra-violet radiation in sunlight but are not designed for permanent direct exposure. Under such conditions painting or lagging is required. Pipe and fittings should also be lagged to prevent frost damage.

Concealed pipework

The flexibility of Speedfit pipe gives it the ability to be threaded through concealed or inaccessible spaces without disruption to surrounding structures, making major savings in installation time.

Pipework can be 'cabled' through drilled holes in joists and rafters. Therefore, pipework can be installed after floorboards have been laid, working below the floor before the ceiling is installed.

This makes site work far safer as the installer does not have to balance on open joists with the risk of dropping tools or equipment on people below.

This will also eliminate the risk of damage by floorboard nails. There is no need for dry runs since pipe can be cut and connections made in-situ.

Rigid pipe, such as copper, can only be fed under floor in short lengths. However, Speedfit pipe, being flexible, can run from one fitting to another without having to install a connector in between.

SharkBite needs no jointing materials, eliminating the risk of fire from the use of a blowlamp, solder and flux. Installers are also not exposed to the health issues related to breathing in toxic flux fumes.

Acoustic

Properly installed, Speedfit pipes are virtually silent in operation and do not resonate; they absorb the acoustic vibrations and pressure waves created by cavitation, water hammer, float operated valve oscillation and other hydraulic effects. The inherent flexibility of Speedfit pipe effectively eliminates these troublesome problems, including those that occur when, due to thermal expansion, metal pipes rub against structural members and where long, straight runs of rigid pipe amplify water borne noise.

Connection to boilers

JG Speedfit PEX Barrier pipe should never be connected directly to a boiler.

Continuously operated re-circulating systems (Secondary hot water circulation/ring main installations)

SharkBite must not be used with JG Speedfit PEX Barrier pipe on any continuously operated re-circulating systems as they are not approved to do so.

In addition to the information above, further generic detailed information can be found in the section Installing with copper pipework.

Protection against rodents

When used in locations vulnerable to rodent attack, all plastic pipes should be adequately protected within sealed ducts. Speedfit pipe along with other materials such as electrical cables may be damaged if rodents are present. If vermin infestation is suspected, then a rodent exterminator should take appropriate action to prevent structural damage or disease.

Pipework insulation

The insulation requirements for Speedfit pipe are the same as those for copper and should comply with EN 806 international guidelines.

Biological

No taste, colour, odour or toxicity is imparted to water by Speedfit components, nor do they promote microbiological growth. In accordance with ISO21003, the opacity of JG Speedfit PEX Barrier pipe allows insufficient light to pass for the growth of algae.

Tests within DVGW, KIWA and KOMO have passed SharkBite and JG Speedfit PEX Barrier pipe water quality tests.

Construction of installation

Traditional joists

Recommendations for drilling of joists:

- Holes should be no greater than 0.25 of the depth of the joist
- Holes should be drilled at the neutral axis
- Holes should not be less than 3 diameters (centre to centre) apart
- Holes should be located between 0.25 and 0.4 times the span from the support

Timber 'I Beam' joists

Several types of joists are available and RWC recommends that specific manufacturers details are consulted. However, the following can be used for general guidance:

- Holes may be located vertically anywhere in the web but leave 3mm web at the top and/or bottom of hole. Do not cut into joist flanges when cutting the web.
- If more than one hole is to be cut in the web, the distance between the edges of the holes must be at least 2x diameter of the largest hole.
- Generally, joists are manufactured with 38mm perforated knockouts in the web at approximately 300mm centres along the length of the joist.

Cross web joists

Unlike 'I beam' joists, pipe can be cabled anywhere within the open Web as no drilling is required.

However, the top and bottom flanges must not be notched. Avoid damaging the outside diameter of the pipe as you cable through the metal cross web members

Timber framed construction

JG Speedfit PEX Barrier pipe is well suited for timber frame construction. Ensure that the structural integrity is not compromised when installing the pipework. If the pipe passes through an external wall, care must be taken not to damage the vapour barrier and should be installed on the inside of the thermal insulation layer. If this is not possible, the use of conduit should be specified at the design stage.

Steel framed construction

JG Speedfit PEX Barrier pipe is well suited for steel frame construction and care should be taken when installing the pipework. All runs should be installed through preformed hole in the structure and protected by a rubber or plastic grommet.

Where clipping of pipework is restricted, cable ties may be used to secure the pipe. As with all installations, make sure that any pipework passing through walls and floors does not affect the fire-resistant properties of the structure.

Dry lined walls

JG Speedfit PEX Barrier pipe pipework can be easily cabled through studwork and within wall systems as well as behind 'dot and dab' plasterboard installations.

Wet plaster

To prevent surface damage to the plaster caused by expansion and contraction of pipes, it is important to ensure that all the SharkBite system is channelled into the wall and protected with appropriate sleeving. Alternatively, the pipework can be surface mounted and boxed in if required for aesthetic appearance.

Laying of pipe in concrete and masonry

SharkBite fittings with JG Speedfit PEX Barrier pipe can be laid in concrete and masonry providing they are installed in conduit pipe with access boxes for the fittings. As stated in Dutch standard NEN 1006 "General requirements for water supply installations", fittings and pipe should be removable for possible replacement.

Insulation is also recommended to protect against heat loss and the effects of frost but most not be used as a substitute for conduit and access boxes.

Jointing and disconnecting

SharkBite fittings have been engineered to provide an extremely fast, secure and reliable method of joining copper and JG Speedfit PEX Barrier pipes. The assembly method is similar irrespective of fitting size and pipe material and, if followed correctly, will provide a secure joint every time.

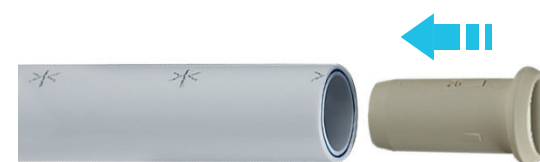
Jointing

Cut

Ensure that the pipe is not damaged or scored and remove any adhesive labels or residue. Cut the pipe squarely using a rotary pipe cutter. For JG Speedfit PEX Barrier pipe, we recommend the use of JG Pipe Cutters (JG-TS).

Deburr

There should be no burrs or sharp edges on the pipe end, as this could damage the O-Ring during pipe insertion. If installing JG Speedfit PEX Barrier pipe, cut the pipe squarely with pipe cutters and insert the JG Speedfit TSM pipe liner.



Mark

Using the appropriate size disconnecting clip/depth marker or tape measure, mark the insertion depth onto the pipe.

Push

Keep the fitting in the bag until it is required for installation, ensure that the fitting and pipe are free from dirt and debris. Locate the end of the pipe squarely in the mouth of the fitting and push the pipe into the fitting with a slight twisting action until the pipe touches the pipe stop.

SharkBite fittings utilise a pre-lubricated O-Ring so no additional lubricants are required. If the pipe is difficult to insert, ensure the pipe is not damaged and has been prepared as described above.

Done

Check the depth mark on the pipe aligns with the disconnecting ring on the SharkBite fitting. Pull the pipe to ensure that the joint is secure.

Disconnecting

The SharkBite range provides two methods of disconnecting the pipe from the fitting – either the patented SharkBite disconnecting/depth marking clip or the SharkBite metal disconnecting tongs.

If disconnecting using the clip, 'snap' the clip over the pipe, with the SharkBite logo positioned facing away from the fitting. Slide the clip up to the disconnecting ring and press firmly on the two finger pads whilst at the same time pulling the pipe to remove.

If using the disconnecting tongs, position the tongs over the end of the fitting and the pipe with the SharkBite logo positioned facing away from the fitting. Squeeze the tongs together to depress the disconnecting ring, whilst at the same time pulling the pipe to remove (using your thumb to assist against the tongs if necessary).

Problem	Identification
Burst or melted pipe	A Parrot beak burst will happen when the water expands within the pipework when it freezes. If the pipe has a melted appearance or gapes open, this could be due to external heat from a blow lamp or similar. It is more likely that water has risen to a high temperature over 128°C due to being pressurised. Melting the pipework and exploding into steam as it is exposed to the atmosphere.
Pipe will be distorted showing either a 'Parrot beak' look or a long opening with the edges of the pipe melted in a wave shape.	

Disinfection & specific requirements

Disinfection of hot and cold-water systems

SharkBite fittings with JG Speedfit PEX Barrier pipe or copper pipe can be disinfected with chlorine (sodium hypochlorite) after installation. Domestic systems are disinfected with a solution of chlorine with a concentration of 50ppm (mg/l) for one hour. The concentration should not be less than 300ppm at all draw off points after this time.

Other disinfection methods and chemicals (e.g. ozone and hydrogen peroxide) are now in common use. Only those specifically recommended as suitable for contact with plastic plumbing systems and, where necessary, employing specialist contractors may be used with SharkBite fittings & JG Speedfit PEX Barrier pipe.

Disinfection solutions must only come into contact with the internal (wet) surfaces of the system. If any normally dry surfaces of a SharkBite fitting come into contact with disinfection solution the whole fitting must be replaced immediately. The disinfection solution must be immediately flushed out at all draw off points with fresh, wholesome water at the end of the disinfection period.

The solution must not be left in the system.

Specific requirements

Gas pipe

SharkBite fittings or JG Speedfit PEX Barrier pipe must NEVER be used to carry gas.

Hard/soft water areas

In hard water areas, the smooth bore and flexibility of JG Speedfit PEX Barrier pipe prevents lime scale from adhering to the inner surface of the pipe, therefore JG Speedfit PEX Barrier pipe is the ideal pipe to use where water is of a temporary hard nature. Unlike rigid metal pipes, JG Speedfit PEX Barrier pipe is not dissolved or corroded by soft acidic waters.

Other specific requirements

Low water content boilers with cast iron heat exchangers

A minimum of 1 metre of copper tube is required between the boiler connections and JG Speedfit PEX Barrier pipe. Furthermore, a permanent by-pass must be fitted directly after the pump between the main flow and return pipes to allow the pump to dissipate residual heat from the boiler under all circumstances.

Lightweight system boilers with copper heat exchangers

JG Speedfit PEX Barrier pipe may be connected directly to the boiler connections provided that (a) the boiler incorporates a high limit stat, (b) the connections are outside the casing, and (c) these connections are more than 350mm from the heat exchanger. Note that all three requirements must be met.

All heat emitting appliances

A minimum of 1 metre of copper tube is required between the appliance connections and JG Speedfit PEX Barrier pipe.

All appliances should incorporate a high limit stat to protect pipework in the event of boiler malfunction.

Solid fuel boilers

The gravity circuit on a solid fuel heating system should always be installed using copper pipe. JG Speedfit PEX Barrier pipe may be used on the secondary (pumped) side of a solid fuel heating system, provided that the nearest connection to the boiler is at least one metre away from the boiler and outside the fireplace.

Electrical connections

Since it is extruded from a plastic material, JG Speedfit PEX Barrier pipe is an insulator and is not suitable for earthing electrical appliances.

Paint and Chemicals

Use only water or oil-based paint. Do not allow contact with jointing compounds, cellulose based paints, paint thinners or strippers, solder flux, acid based descalers or aggressive cleaning products, including those below pH4, high in hypochlorite (e.g. bleach) or containing hydrogen peroxide.

Installation troubleshooting

Installation requirements

The SharkBite Push-to-Connect Plumbing System is simple and effective when executed in accordance with the jointing procedures in this manual. However, if sufficient care is not taken, this can result in an ineffective joint. SharkBite fittings are not suitable for use on stainless steel or carbon steel pipe. Installation is subject to the requirements of the applicable regulatory authority.

Installation best practice

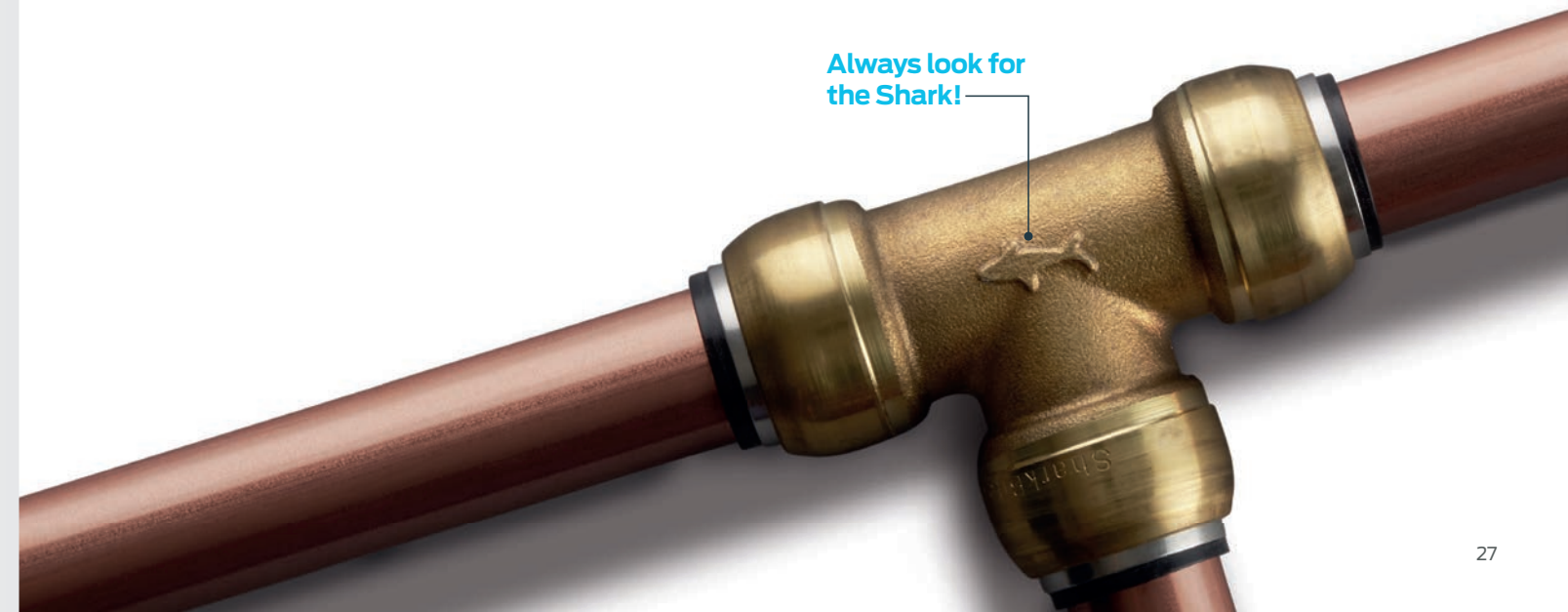
- All SharkBite O-Rings are pre-lubricated during manufacture, do not apply additional lubrication.
- Cut the pipe square – use cutting tools with sharp, undamaged cutting blades to ensure a clean, square cut. Do not use a hacksaw when cutting copper pipe and appropriate deburring & gauge tools to ensure the ends are free from burrs.
- Keep it clean – ensure your pipe and fittings are free from building-site contamination such as dirt, sand, sawdust, concrete dust etc.
- To ensure fittings stay clean and the O-Ring is protected from damage, fittings must be kept in their original packaging until immediately prior to installation.
- Push the pipe all the way in – use SharkBite depth indicator as featured on the disconnecting clip to ensure the pipe has achieved full insertion.
- If the pipe is difficult to insert or will not engage into the fitting do not force the pipe. Remove and check for obstructions inside the fitting and check for damage to the end of the pipe.
- If JG Speedfit PEX Barrier pipe is to be refitted to a SharkBite fitting, it is important to trim the pipe before remaking the joint.

- SharkBite fittings are not to be installed back-to-back. Please observe the minimum fittings distance requirements as detailed in this manual.
- If you are soldering/sweating copper pipe solder/sweat all connections first, then make the SharkBite connections – Do NOT solder next to SharkBite connection.
- SharkBite fittings used on coiled annealed copper tube is not recommended. In the case of copper pipe, we recommend straight lengths.
- Always pressure test with water on completion and before covering the pipe.

Systems using JG Speedfit PEX Barrier pipe

- Pressure testing should be carried out at 2 bar for 10 minutes followed by 10 bar for 10 minutes.
- For sections of the system, which can be subjected to full mains pressure, apply a minimum pressure of the available mains water pressure.
- For sections of the system downstream of a pressure control valve, apply a pressure equal to the pressure control valve setting.

Always look for the Shark!





Technical support

At Reliance Worldwide Corporation Ltd we are extremely proud of our heritage and reputation for providing excellent products and customer service levels.

Our highly trained Customer Service Team and Technical Support Team are available and keen to help with product advice, technical enquiries and installation issues; and our Sales Managers are available throughout Europe to discuss product and installation specifications.



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